L&T Switchgear * Business IS NOW

Lauritz Knudsen
Electrical & Automation

TECHNICAL CATALOGUE
ENERGY MANAGEMENT SOLUTION

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.

EMS Architecture

SmartComm EMS on-prem

SmartComm EMS Cloud

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Energy Management

## Trend in Electrical Power & its usage

Energy management stands at the forefront of modern-day sustainability efforts, encompassing a wide array of strategies and technologies aimed at optimizing energy usage while minimizing environmental impact. As industries, buildings, and infrastructure systems strive for greater efficiency, the integration of advanced technologies and digital solutions has become instrumental in shaping the future of energy management practices.

Across the world, diverse industries are witnessing notable trends in energy management. From the widespread integration of renewable energy sources such as solar and wind power to the implementation of smart grid technologies, organizations are embracing innovative approaches to optimize energy consumption. Furthermore, the rise of energy analytics and real-time monitoring systems has empowered industries to gain actionable insights, enabling informed decision-making and proactive energy management strategies.

The convergence of technology and digitalization has revolutionized energy management practices. Advanced metering devices, such as power analyzers, have enabled precise monitoring and analysis of energy usage, facilitating the identification of inefficiencies and opportunities for improvement. Cloud technologies have revolutionized the remote management of energy systems, allowing for real-time monitoring, predictive maintenance, and data storage. Artificial intelligence and machine learning algorithms are being leveraged to forecast energy demand, optimize operational efficiencies, and automate energy conservation measures. The integration of digital twins and energy management software has empowered industries to simulate and optimize energy systems, leading to substantial cost savings and reduced environmental footprint. Various software-software integrations have also streamlined data management, enabling seamless integration of energy management systems with broader operational platforms. Robust cybersecurity measures have become indispensable in safeguarding critical energy infrastructure from potential cyber threats, ensuring the resilience and security of energy management systems.

In conclusion, the evolution of energy management is deeply intertwined with technological advancements, paving the way for sustainable and resilient energy ecosystems across industries. As organizations continue to prioritize environmental stewardship and operational efficiency, the role of technology in shaping the future of energy management cannot be overstated.

As a leader in the energy management solutions space, Lauritz Knudsen Electrical & Automation has consistently pioneered innovative approaches to optimize energy usage and drive sustainable practices across diverse industries, buildings, and infrastructure systems. With SmartComm EMS, we have been at the forefront of integrating advanced technologies and digital solutions into our comprehensive suite of energy management offerings. Leveraging our expertise in the electrical and automation industry, we have empowered our clients to achieve significant reductions in energy consumption, lower operational costs, and minimize their environmental footprint. Our proactive approach to embracing cutting-edge technologies has positioned us as a trusted partner for organizations seeking to navigate the complexities of modern energy management and embark on a path towards a more sustainable and resilient future.
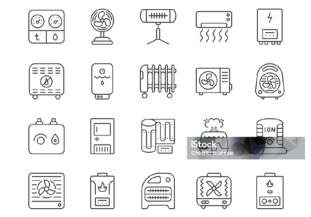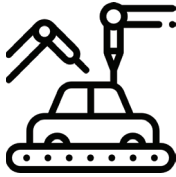
SmartComm EMS Footprint

SmartComm EMS: Proven Success in Diverse Industries

Lauritz Knudsen Electrical & Automation's SmartComm EMS software & our Range of Digital Panel Meter (DPM) have already made a significant impact across a wide range of industries since many years. Here are some examples of its successful implementation:

Automotive: Leading automotive manufacturers have adopted SmartComm EMS to optimize energy consumption in their production facilities. By monitoring and analysing energy usage in areas like assembly lines, painting booths, these companies have achieved substantial energy savings and reduced their carbon footprint.
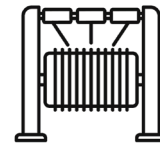
Textile: Textile manufacturers have successfully used SmartComm EMS to reduce energy consumption in their dyeing, weaving, and finishing processes. By monitoring and controlling machinery, optimizing lighting systems, and implementing energy-saving measures, these companies have achieved significant cost reductions and improved their environmental performance.

Commercial Buildings: Major commercial property owners and managers have deployed SmartComm EMS to enhance energy efficiency in their buildings. The software has helped to Manage the Tenants Billing, Monitoring, and identify energy-usage patterns, resulting in lower energy costs and improved Tenant's comfort.

Life Science: Research institutions, pharmaceutical companies, and biotechnology firms have benefited from SmartComm EMS's ability to optimize energy consumption in their facilities. The software has helped control temperature and humidity levels, monitor equipment performance, and reduce energy losses, ensuring optimal conditions for research and production.

SmartComm EMS Footprint

Educational Institutions: Schools, universities, and colleges have implemented SmartComm EMS to reduce their energy costs and improve sustainability. By optimizing lighting systems, HVAC controls, and monitoring energy usage in classrooms, laboratories, and administrative buildings, these institutions have achieved significant energy savings and reduced their environmental impact.

Chemical Industries: Chemical plants have deployed SmartComm EMS to optimize energy consumption in their production processes. By monitoring and controlling equipment, optimizing process parameters, and reducing energy losses, these companies have achieved significant energy savings and improved their environmental performance.

Metal Industries: Metal fabrication, smelting, and forging companies have successfully used SmartComm EMS to improve energy efficiency and reduce costs. By monitoring and controlling equipment, optimizing process parameters, and reducing energy losses, these companies have achieved significant energy savings and improved their overall operational efficiency.

Empowering OEM Solutions: Digital Panel Meters along with the SmartComm EMS are vital for OEMs, offering precise parameter monitoring & Analysis. Integrated Digital & Analog IOs enable control, event logging, and facilitate sensor integration. This trio enhances OEM equipment across sectors, ensuring adaptability, high performance in a compact and reliable package.

These are just a few examples of the industries that have successfully implemented SmartComm EMS & our range of Digital Panel Meters. It's versatility and effectiveness have made it a valuable tool for businesses seeking to optimize their energy consumption, reduce costs, and improve sustainability.

PDCA cycle for Green Buildings

This standard specifies energy management system requirements, upon which an organizationcan develop and implement an energy policy, and establish objectives, targets, and action plans which take into account legal requirements and information related to significant energy use. An energy management system performance demonstrates the conformity of the system to the requirements of this standards. This standard applies to the activities under the control of the organization and can be customized to fit the specific requirements of the organizations, including the complexity of the system, degree of documentation, and resources.

This standard is based on the Plan–Do-Check-act (PDCA) continual improvement framework and incorporates energy management into everyday organizational practices, as illustrated in
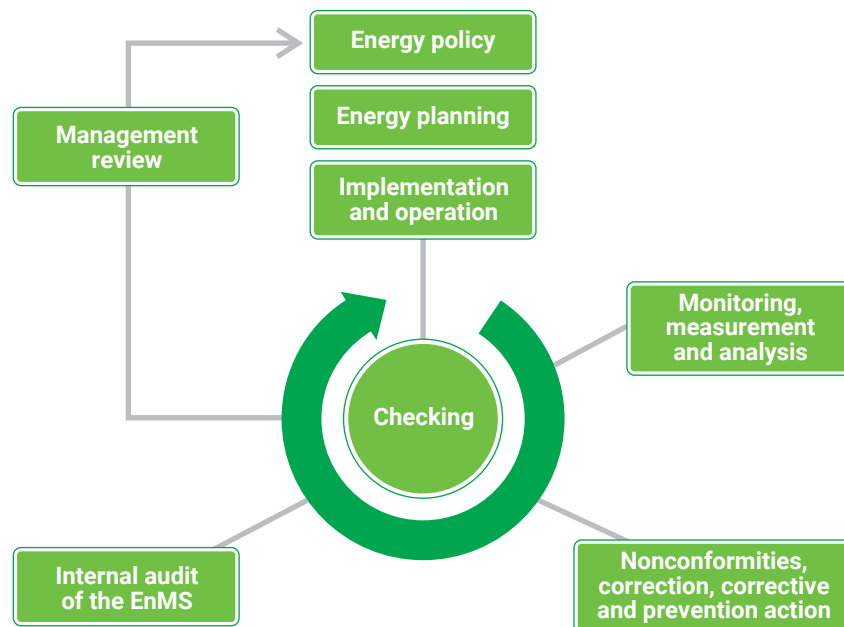
figure 1.

Continual Improvement

Figure1 - Energy management system model for this international standard

The PDCA approach can be outlined as follows:

PLAN: Conduct energy review and establish the baseline, energy performance indicators, objectives, targets and action plans necessary to deliver results that will improve energy performance in accordance with the organizations energy policy.

DO: Implement the energy management action plans CHECK: Monitor and measure processes and the key characteristics of operations that determine energy performance against the energy policy and objectives, and report the results

ACT: Take actions to continually improve energy performance and the energy management system.

The implementation of an energy management system is intended to result in improved energy performance. This standard is based on the premise that the organization will periodically review and evaluate its energy management system in order to identify opportunities for improvement and their implementation.

Measurement and monitoring always provides the insight you need to start and sustain an effective energy management program.

PDCA cycle for Green Buildings

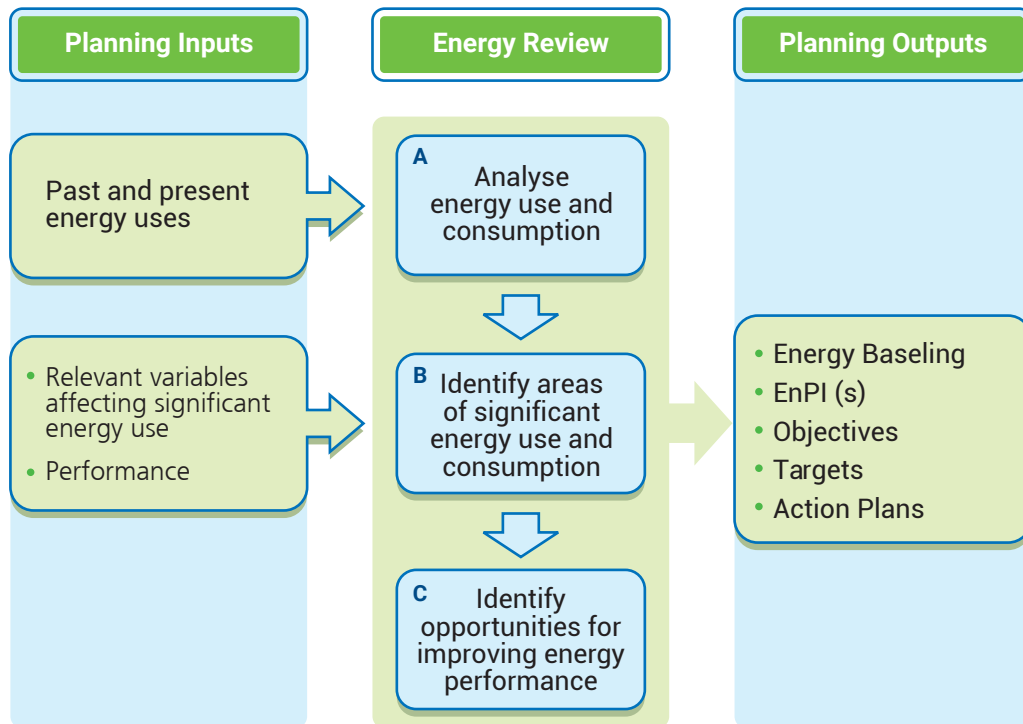| Planning Inputs	Energy Review	Planning Outputs
Past and present energy uses	**A** Analyse energy use and consumption	• Energy Baseling • EnPI (s) • Objectives • Targets • Action Plans
• Relevant variables affecting significant energy use • Performance	**B** Identify areas of significant energy use and consumption	
	C Identify opportunities for improving energy performance	

Figure 2 - Energy planning process concept diagram

The implementation of an energy management system is intended to result in improved energy performance this standard is based on the premise that the organization will periodically review and evaluate its energy management system in order to identify opportunities for improvement and their implementation

Measurement and monitoring always provides the insight you need to start and sustain an effective energy management program.

Analysis of the electrical system for energy usage can be done with the help of SmartComm EMS software which enables the user and the organization to identify areas of energy wastage and improve the operations of its system, processes or equipment.

Green Factory, Vadodara

Administrative Building, Vadodara

Unnati building at C&A Mahape (Navi Mumbai)

DPM Family

Multifunction Meter
4400, 4405, 4410, 4420, 4430, 4440, 5010, 5000 Series

Accuracy Class 1 as per IEC 62053-21 and Class 0.5, 0.5S, 0.2, 0.2S as per IEC 62053-22

True RMS measurement

Expert in Load monitoring

Password protection provision for security

THD for Voltage and Current (31st Individual harmonics in 5000 series)

Phase wise Voltage & Current wave forms in LCD meter

Site selectable for 3 Phase 4 wire, 3 Phase 3 wire, 1 Phase

Maximum Demand measurement with Real Time Clock in 4440, 5000 & 5010 series

Analog output can be independently programmed for 0-20 / 4-20 mA configurable for VLL, A, F, W, PF, VA.

Data logging provision is available in 5000 series

Auto scrolling and freeze mode for constant single page viewing available

Terminals with sealing provision (optional)

Direct access key for Basic parameters, Power and Energy parameters

My Favourite screen option for user selectable parameters in LCD series

Technical Chart

Type of measurement	Type	3 Phase 4 Wire, 3 Phase 3 Wire, 1 Phase True RMS, 128 samples per cycle except 4400, 4405 (64 samples) 1 sec update time, 4 Quadrant Power & Energy in select models
Measurement Accuracy		Class 1 as per IEC 62053-21 Class 0.5, 0.5S, 0.2, 0.2S as per IEC 62053-22
Display type and resolution	LED	4 digit for instantaneous and 6 digits for cummulative
	LCD	4 digit for instantaneous and 7 digits for cummulative
Measuring circuit	Input voltage	50 - 520 VLL PT Primary and Secondary user programmable for LT and HT applications Burden: 0.2VA max per phase
	Input current	-/5A and -/1A site selectable Current range from 50mA-5A with overload capacity upto 120% In (i.e. 6A) Starting current: 0.4% of full scale$, Burden: 0.2VA max per phase CT Primary and Secondary user programmable for LT and HT applications
	Frequency	40-70 Hz
Auxilliary circuit	Aux voltage Aux burden Freq range	80 - 300VAC/DC <5VA 40-70 Hz
Power Details	Test of power consumption Voltage dips and interrupts Short time over current protection	as per IEC 62053-21 as per IEC 62053-21 10A max continuous, 20 times of In for 3 sec
Electro-Magnetic Compatibility (EMC)	Fast transients burst test Immunity to electrostatic discharge Radiated, radio-frequency, electromagnetic field immunity test Immunity to electromagnetic HF fields through conducted lines Surge immunity test Rated power frequency magnetic fields Emission	±4 kV as per IEC 61000-4-4 ±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2 10 V/m as per 61000-4-3 10 V/m as per IEC 61000-4-6 ±6 kV as per IEC 61000-4-5 1 A/m as per IEC 61000-4-8 Class B as per CISPR 22
Insulation Properties	Impulse voltage test AC voltage test	±6 kV as per IEC 62052-11 4 kV double insulation as per IEC 62053-21
Operating Conditions	Operating temperature Storage temperature Humidity Recommended connecting wire	-10°C to +55°C -25°C to +70°C 5% to 95% relative humidity non-condensing 12 to 14 SWG with U type lug of max 6.75mm width
Mechanical Conditions	Shock Vibration Casing	As per standard IEC 60068-2 10 to 55 Hz, 0.15 mm amplitude Plastic mould protected to IP51 from front side
Safety	Measurement category Pollution degree Protection	CAT III 2 IP20 at terminals, IP 54 when mounted on panel
Weight and Dimensions	Product weight Bezel dimension (W X H X D) Panel cutout	300 gms 96 X 96 X 58 mm 90 X 90$^{+2.0}_{-0.0}$ mm
Outputs		Meter constant for LED 4400, 4405 series: 1250/(external CT ratio X PT ratio) Meter constant for LCD 4400 series: 2500/ (external CT ratio X PT ratio) Meter constant for 44xx & 50xx series :10000/ (external CT ratio X PT ratio)
Communication	Type Baud rate Parity Slave id Isolation	RS485 port Modbus RTU, Ethernet (optional) 2400, 4800, 9600, 19200, 38400* bps (preferred 9600) Odd, Even, None 1 to 247 (programmable) 2 kVAC isolation for 1 minute between communication and other circuits
Certifications		CE, RoHS

* not applicable for 4400 & 4405 series $ 0.6% for 4400 & 4405 series

Technical Chart

	Parameters	Basic MFM 4400/4405	4410	4420	4430	4440	5010	5000
			MFM				Advanced MFM	
Instantaneous Parameters	V1, V2, V3, V12, V23, V31, Avg (VLN, VLL)	✓	✓	✓	✓	✓	✓	✓
	A1, A2, A3, Aavg	✓	✓	✓	✓	✓	✓	✓
	An (Computed)		✓	✓	✓	✓	✓	✓
	F	✓	✓	✓	✓	✓	✓	✓
	% A Unbal, % V Unbal (Avg and Phase wise)		✓	✓	✓	✓	✓	✓
	PF-1, PF-2, PF-3, PF (Avg)	✓	✓	✓	✓	✓	✓	✓
	RPM (Rotations per minute)		✓	✓	✓	✓	✓	✓
	Phase Angle A°1, A°2, A°3, V°1, V°2, V°3		✓	✓	✓	✓	✓	✓
	W1, W2, W3, W (total)	✓	✓	✓	✓	✓	✓	✓
	VA1, VA2, VA3, VA (total)	✓	✓	✓	✓	✓	✓	✓
	VAr1, VAr2, VAr3, VAr (total)		✓	✓	✓	✓	✓	✓
Cumulative Parameters	Import Wh	✓	✓	✓	✓	✓	✓	✓
	Import VAh	✓	✓	✓	✓	✓	✓	✓
	Import VArh (Lead & Lag)		✓	✓	✓	✓	✓	✓
	Import load hours	✓	✓	✓	✓	✓	✓	✓
	Export Wh				✓		✓	✓
	Export VAh				✓		✓	✓
	Export VArh (Lead & Lag)				✓		✓	✓
	Export run hours				✓		✓	✓
	No of Interrupts		✓	✓	✓	✓	✓	✓
Reset (old) Cumulative parameters	Import Wh	✓	✓	✓	✓	✓	✓	✓
	Import VAh		✓	✓	✓	✓	✓	✓
	Import VArh (Lead & Lag)		✓	✓	✓	✓	✓	✓
	Import load hours	✓	✓	✓	✓	✓	✓	✓
	Export Wh				✓		✓	✓
	Export VAh				✓		✓	✓
	Export VArh (Lead & Lag)				✓		✓	✓
	Export run hours				✓		✓	✓
Harmonic	V THD%, V1, V2, V3 - harmonic		✓	✓	✓	✓	✓	✓
	A THD%, A1, A2, A3, - harmonic		✓	✓	✓	✓	✓	✓
	Individual harmonics upto 31st (V, A)						✓	✓
Demand / Load parameters	Maximum demand MD W, MD VA, MD VAr			✓	✓			
	- max avg A (without RTC)							
	Maximum demand MD W, MD VA, MD VAr					✓	✓	✓
	- max avg A (with RTC)							
	Max MD & occurence time						✓	✓
Min / max value	VLL, VLN, A, F, W, VA, VAr, PF		✓	✓	✓	✓	✓	✓
Others	Datalog (8MB)							✓
Communication	RS485 Modus RTU	Optional	Optional	Optional	Optional	Optional	Optional	Optional
	Ethernet							Optional
Input and Output	Digital and Analog (input and output)							Optional
	Pulse Output		Optional					Optional

4400, 4405

Basic + kW, kVA,
kWh/kVA
(site selectable)

4410

Basic + Power,
Energy + THD%

4420

4410 + MD

Description	CAT No.
4400 Series	
LED meter Cl 1	WL440010OOOO
LED meter Cl 1 with RS485	WL440011OOOO
LED meter Cl 0.5 with RS485	WL440021OOOO
LED meter Cl 0.5S with RS485	WL440031OOOO
LCD meter Cl 1	WC440010OOOO
LCD meter Cl 1 with RS485	WC440011OOOO

4405 Series	
LED meter Cl 1	WL440510OOOO
LED meter Cl 1 with RS485	WL440511OOOO
LED meter Cl 0.5 with RS485	WL440521OOOO
LED meter Cl 0.5 with RS485	WL440521OOOO

Description	CAT No.
4410 Series	
LED meter Cl 1	WL441010OOOO
LED meter Cl 1 with RS485	WL441011OOOO
LED meter Cl 0.5 with RS485	WL441021OOOO
LED meter Cl 0.5 with RS485 and 1 Pulse o/p	WL441021COOO
LED meter Cl 0.5S with RS485	WL441031OOOO
LED meter Cl 0.2 with RS485	WL441041OOOO
LED meter Cl 0.2S with RS485	WL441051OOOO
LCD meter Cl 1	WC441010OOOO
LCD meter Cl 1 with RS485	WC441011OOOO
LCD meter Cl 0.5 with RS485	WC441021OOOO
LCD meter Cl 0.5S with RS485	WC441031OOOO
LCD meter Cl 0.2 with RS485	WC441041OOOO
LCD meter Cl 0.2S with RS485	WC441051OOOO

Description	CAT No.
4420 Series	
LED meter Cl 1	WL442010OOOO
LED meter Cl 1 with RS485	WL442011OOOO
LED meter Cl 0.5 with RS485	WL442021OOOO
LED meter Cl 0.5S with RS485	WL442031OOOO
LED meter Cl 0.2 with RS485	WL442041OOOO
LED meter Cl 0.2S with RS485	WL442051OOOO
LCD meter Cl 1	WC442010OOOO
LCD meter Cl 1 with RS485	WC442011OOOO
LCD meter Cl 0.5 with RS485	WC442021OOOO
LCD meter Cl 0.5S with RS485	WC442031OOOO
LCD meter Cl 0.2 with RS485	WC442041OOOO
LCD meter Cl 0.2S with RS485	WC442051OOOO

4430

4420 + IE

4440

4410 + MD (RTC) + Events

5000, 5010

Basic + Power, Energy + THD + Ind Har + Events + Datalog* + Ethernet*

Description	CAT No.
4430 Series	
LED meter Cl 1	WL4430100000
LED meter Cl 1 with RS485	WL4430110000
LED meter Cl 0.5 with RS485	WL4430210000
LED meter Cl 0.5S with RS485	WL4430310000
LED meter Cl 0.2 with RS485	WL4430410000
LED meter Cl 0.2S with RS485	WL4430510000
LCD meter Cl 1	WC4430100000
LCD meter Cl 1 with RS485	WC4430110000
LCD meter Cl 0.5 with RS485	WC4430210000
LCD meter Cl 0.5S with RS485	WC4430310000
LCD meter Cl 0.2 with RS485	WC4430410000
LCD meter Cl 0.2S with RS485	WC4430510000

Description	CAT No.
4440 Series	
LED meter Cl 1 with RS485	WL4440110000
LED meter Cl 0.5 with RS485	WL4440210000
LED meter Cl 0.2 with RS485	WL4440410000
LCD meter Cl 1 with RS485	WC4440110000
LCD meter Cl 0.5 with RS485	WC4440210000
LCD meter Cl 0.2 with RS485	WC4440410000

Description	CAT No.
5010 Series	
LED meter Cl 1	WL5010100000
LED meter Cl 1 with RS485	WL5010110000
LED meter Cl 0.5S	WL5010300000
LED meter Cl 0.5S with RS485	WL5010310000
LED meter Cl 0.2 with RS485	WL5010410000
LED meter Cl 1 RS485 and 1 Pulse o/p	WL501011C000

Description	CAT No.
5000 Series	
LED meter Cl 1 with RS485	WL5000110000
LED meter Cl 1 with Ethernet	WL5000120000
LED meter Cl 0.5 with Ethernet	WL5000220000
LED meter Cl 0.5S with Ethernet	WL5000320000
LCD meter Cl 1 with RS485	WC5000110000
LCD meter Cl 1 with Ethernet	WC5000120000
LCD meter Cl 0.5 with RS485	WC5000210000
LCD meter Cl 0.5S with RS485	WC5000310000
LCD meter Cl 0.5 with Ethernet	WC5000220000
LCD meter Cl 0.5S with Ethernet	WC5000320000
LCD meter Cl 0.2 with RS485	WC5000410000
LCD meter Cl 0.2S with RS485	WC5000510000
LED meter Cl0.5 RS485 4 Digital o/p	WL5000210000D
LED meter CL 1 RS485 2 Analog o/p	WL5000110B00
LED meter Cl0.5RS485 2 Digital i/p	WL5000210OB0
LCD meter Cl0.5 RS485 4 Digital o/p	WC5000210000D
LCD meter Cl 1 RS485 2 Analog o/p	WC5000110B00
LCD meter Cl 0.5 RS485 2 Digital i/p	WC5000210OB0
LED meter Cl0.5 RS485 2 Analog i/p 2 Digital o/p	WL500021B00B
LCD meter Cl0.5 RS485 2 Analog i/p 2 Digital o/p	WC500021B00B
LCD meter Cl 1 RS485 1 Analog o/p 1 Digital o/p	WC5000110A0A

*Only in 5000 series

Maximum Demand Controller

- Accuracy Class 1 as per IEC 62053-21 and Class 0.5S as per IEC 62053-22

- True RMS measurement

- Password Protection provision for security

- Phase wise Voltage & Current Wave Forms in LCD meter

- Site selectable for 3 Phase 4 wire, 3 Phase 3 wire, 1 phase

- Maximum demand measurement with Real time clock

- Time of Day (TOD) provision is available

- 6 Demand and 6 Energy option with MD occurance captured for each TOD

- 4 relay outputs available for proper load control

- Data logging provision is available

- Auto scrolling and freeze mode for constant single page viewing available

- Terminals with sealing provision (optional)

- Direct access key for Basic parameters, Power and Energy parameters

Technical Chart

Type of measurement	Type	3 Phase 4 Wire, 3 Phase 3 Wire, 1 Phase True RMS, 128 samples per cycle 1 sec update time
Measurement Accuracy		Class 1 as per IEC 62053-21 Class 0.5S as per IEC 62053-22
Display type and resolution	LED	4 digit for instantaneous and 6 digits for cummulative
	LCD	4 digit for instantaneous and 7 digits for cummulative
Measuring circuit	Input voltage	50 - 520 VLL PT Primary and Secondary user programmable for LT and HT applications Burden: 0.2VA max per phase
	Input current	-/5A and -/1A site selectable Current range from 50mA-5A with overload capacity upto 120% In (i.e. 6A) Starting current: 0.4% of full scale, Burden: 0.2VA max per phase CT Primary and Secondary user programmable for LT and HT applications
	Frequency	40-70 Hz
Auxilliary circuit	Aux voltage Aux burden Freq range	80 - 300VAC/DC <5VA 40-70 Hz
Power Details	Test of power consumption Voltage dips and interrupts Short time over current protection	as per IEC 62053-21 as per IEC 62053-21 10A max continuous, 20 times of In for 3 sec
Electro-Magnetic Compatibility (EMC)	Fast transients burst test Immunity to electrostatic discharge Radiated, radio-frequency, electromagnetic field immunity test Immunity to electromagnetic HF fields through conducted lines Surge immunity test Rated power frequency magnetic fields Emission	±4 kV as per IEC 61000-4-4 ±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2 10 V/m as per 61000-4-3 10 V/m as per IEC 61000-4-6 ±6 kV as per IEC 61000-4-5 1 A/m as per IEC 61000-4-8 Class B as per CISPR 22
Insulation Properties	Impulse voltage test AC voltage test	±6 kV as per IEC 62052-11 4 kV double insulation as per IEC 62053-21
Operating Conditions	Operating temperature Storage temperature Humidity Recommended connecting wire	-10°C to +55°C -25°C to +70°C 5% to 95% relative humidity non-condensing 12 to 14 SWG with U type lug of max 6.75mm width
Mechanical Conditions	Shock Vibration Casing	As per standard IEC 60068-2 10 to 55 Hz, 0.15 mm amplitude Plastic mould protected to IP51 from front side
Safety	Measurement category Pollution degree Protection	CAT III 2 IP20 at terminals, IP 54 when mounted on panel
Weight and Dimensions	Product weight Bezel dimension (W X H X D) Panel cutout	300 gms 96 X 96 X 58 mm 90 X 90$^{+2.0}_{-0.0}$ mm
Outputs		4 Relay outputs 240VAC, 30VDC, 2A resistive Meter constant for 6000 series: 10000/ (external CT ratio X PT ratio)
Communication	Type Baud rate Parity Slave id Isolation	RS485 port Modbus RTU 2400, 4800, 9600, 19200, 38400 bps (preferred 9600) Odd, Even, None 1 to 247 (programmable) 2 kVAC isolation for 1 minute between communication and other circuits
Certifications		CE, RoHS

Parameter List

	Parameters	6000
Instantaneous parameters	V1, V2, V3, V12, V23, V31, Avg (VLN, VLL)	✓
	A1, A2, A3, Aavg	✓
	An (Computed)	✓
	F	✓
	% A Unbal, % V Unbal (Avg and Phase wise)	✓
	PF-1, PF-2, PF-3, PF (Avg)	✓
	RPM (Rotations per minute)	✓
	Phase Angle A°1, A°2, A°3, V°1, V°2, V°3	✓
	W1, W2, W3, W(total)	✓
	VA1, VA2, VA3, VA(total)	✓
	VAr1, VAr2, VAr3, VAR(total)	✓
Cumulative Parameters	Import Wh	✓
	Import VAh	✓
	Import VArh (Lead & Lag)	✓
	Import load hours	✓
	No of Interrupts	✓
Reset (old) Cumulative parameters	Import Wh	✓
	Import VAH	✓
	Import VArh (Lead & Lag)	✓
	Import load hours	✓
Harmonic	V THD%, V1, V2, V3 - harmonic	✓
	A THD%, A1, A2, A3, - harmonic	✓
Demand / Load parameters	Maximum demand MD W, MD VA, MD VAr, Max Avg A (with RTC)	✓
	Max MD & occurence time	✓
Min / max value	VLL, VLN, A, F, W, VA, VAr, PF	
Communication	RS485 Modus RTU	Optional
Output		4 Relay outputs
Others	Datalog (8MB)	✓

Ordering Information

Description	CAT No.
6000 Series	
MDC 6000 LED meter Cl 1 with RS485	WL600011OOOO
MDC 6000 LCD meter Cl 1 with RS485	WC600011OOOO
MDC 6000 LED meter Cl 0.5S with RS485	WL600031OOOO
MDC 6000 LCD meter Cl 0.5S with RS485	WC600031OOOO

MD controller enables the user to program the threshold values of maximum demand and initiate actions i.e alarm or cut off load when maximum demand / forecast demand / present demand crosses the threshold values. This helps the user to ensure that user doesn't exceed the sanctioned demand and avoid paying huge penalty.
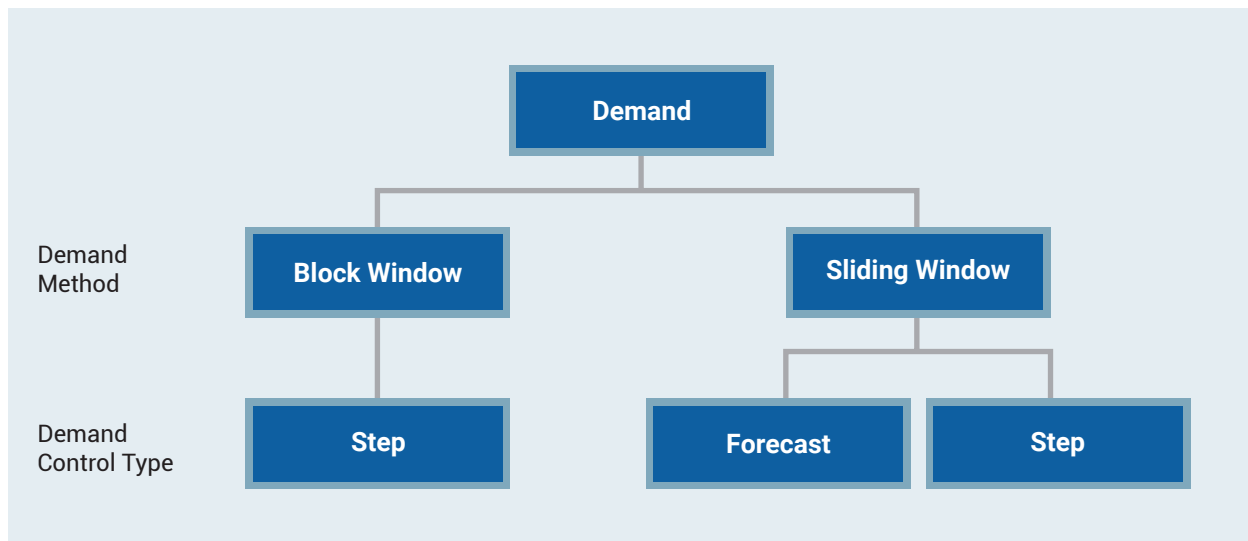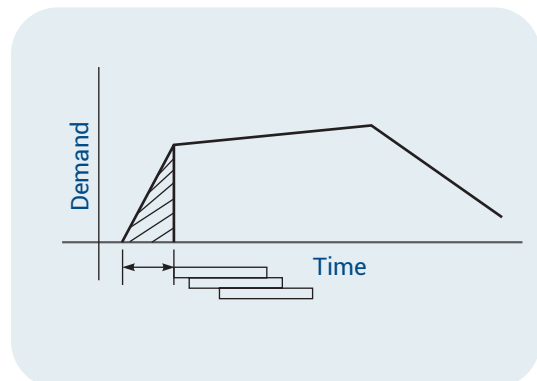

Methods of calculating Max demand

A. Block Window

In the block window method, user has the flexibility to select an integration period called 'block' i.e. time that the device takes for calculation of demand. This window slides with every demand period. The device calculates and updates the demand value at the end of the period. The timing has to be synchronized with EB meter manually. At the end of demand period it will return to zero. This method is usually selected for fairly stable load. The graphical representation of block window shows that the user can set the demand integration time.
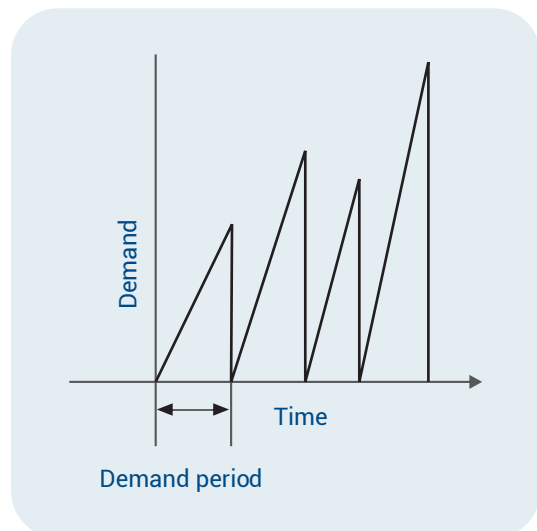
B. Sliding Window

This window slides every 1 second (update time), so it automatically synchronizes with EB meter. But at the end of the demand period it doesn't return to zero. This is the better method of measurement for the fluctuating load. The graphical representation of sliding window is shown below

The demand value at which tripping /alarm is desired has to be programmed in absolute value terms. It can be programmed from 0.5% to 100% of full scale where full scale is

$$\frac{\sqrt{3} \times PT_{py} \times CT_{py}}{1000}$$

1. Forecast demand

Forecast demand control is more suitable for sliding window technique. This control predicts the rising demand before the set time (Forecast Interval) and gives the alarm/annunciation for proactive action. The user can then shed some noncritical loads. 4 relays are used to control the demand

Forecast interval can be set from 20% to 50% of demand period. The meter intelligently forecasts the demand that will occur at the end of forecast interval.

Condition	Relay 1	Relay 2	Relay 3	Relay 4
Low limit	ON	OFF	OFF	OFF
Forecast Demand > Low Limit	OFF	OFF	OFF	OFF
Forecast Demand > High Limit	OFF	ON	OFF	OFF
Rising Demand > High Limit 1	OFF	ON	ON	OFF
Rising Demand > High Limit	OFF	ON	ON	ON
Rising Demand < High Limit	OFF	Y	ON	OFF
Rising Demand < High Limit 1	OFF	Y	OFF	OFF
Forecast Demand < High Limit	OFF	OFF	X	X
Rising Demand < Low Limit	ON	OFF	OFF	OFF
X - depends on Rising Demand				
Y - depends on forecast Demand				

Relay 4 - Shunt release of breaker (Rising demand)
Relay 3 - Alarm / Non essential loads (Rising demand)
Relay 2 - Alarm / Non essential loads (Forecast demand)
Relay 1 - Closing release of breaker (Rising demand)

2. Step demand

Step demand control is suitable for sliding and fixed window. 4 loads or 4 set of loads can be connected to the relays for tripping. Each step tripping level can be programmed independently. In the step demand control the control is based on the rising demand only.

1. Relay 1 will be activated if Rising demand > Step1 Level.
2. Relay 2 will be activated if Rising demand > Step2 Level.
3. Relay 3 will be activated if Rising demand > Step3 Level.
4. Relay 4 will be activated if Rising demand > Step4 Level.
For each 6 TOD slots there are 4 Demand levels for programming

Rd: Running demand i.e present demand of the load

Md: Maximum demand achieved till now

Fd: Forecast demand. The meter predicts the rising demand before the forcast interval for proactive action

AL: Additional load. The user can decide to transfer the exact quantum of load from EB to DG or vice versa to save money

MD Controller with 4 relay outputs

4 relay outputs for alarm, tripping non essential or Incomer to ensure that running demand never exceeds Contract Demand

Energy Meter

4000 Series

- Accuracy Class 1 as per IEC 62053-21 and Class 0.5 as per IEC 62053-22
- True RMS measurement
- Simultaneous sampling of Volts & Amps
- Positive energy accumulation even with CT polarity reversal, reverse lock programmable
- User programmable password protection
- Auto scrolling
- Auto-scaling of Kilo, Mega, Giga values
- Low PT, CT burden
- Programmable PT, CT ratio
- Site selectable for 3 Phase 4 wire, 3 Phase 3 wire, 1 phase
- Old register to store the previously cleared energy value
- Wide operating range of 80 to 300 V AC/DC auxiliary supply
- Site selectable 1A/5A CT secondary

Technical Chart

Type of measurement	Type	3 Phase 4 Wire, 3 Phase 3 Wire, 1 Phase True RMS, 64 samples per cycle 1 sec update time
Measurement Accuracy		Class 1 as per IEC 62053-21 Class 0.5 as per IEC 62053-22
Display type and resolution	LED	4 digit for instantaneous and 6 digits for cummulative
	LCD	4 digit for instantaneous and 7 digits for cummulative
Measuring circuit	Input voltage	50 - 520 VLL PT Primary and Secondary user programmable for LT and HT applications Burden: 0.2VA max per phase
	Input current	-/5A and -/1A site selectable Current range from 50mA-5A with overload capacity upto 120% In (i.e. 6A) Starting current: 0.6% of full scale, Burden: 0.2VA max per phase CT Primary and Secondary user programmable for LT and HT applications
	Frequency	40-70 Hz
Auxilliary circuit	Aux voltage Aux burden Freq range	80 - 300VAC/DC <5VA 40-70 Hz
Power Details	Test of power consumption Voltage dips and interrupts Short time over current protection	as per IEC 62053-21 as per IEC 62053-21 10A max continuous, 20 times of In for 3 sec
Electro-Magnetic Compatibility (EMC)	Fast transients burst test Immunity to electrostatic discharge Radiated, radio-frequency, electromagnetic field immunity test Immunity to electromagnetic HF fields through conducted lines Surge immunity test Rated power frequency magnetic fields Emission	±4 kV as per IEC 61000-4-4 ±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2 10 V/m as per 61000-4-3 10 V/m as per IEC 61000-4-6 ±6 kV as per IEC 61000-4-5 1 A/m as per IEC 61000-4-8 Class B as per CISPR 22
Insulation Properties	Impulse voltage test AC voltage test	±6 kV as per IEC 62052-11 4 kV double insulation as per IEC 62053-21
Operating Conditions	Operating temperature Storage temperature Humidity Recommended connecting wire	-10°C to +55°C -25°C to +70°C 5% to 95% relative humidity non-condensing 12 to 14 SWG with U type lug of max 6.75mm width
Mechanical Conditions	Shock Vibration Casing	As per standard IEC 60068-2 10 to 55 Hz, 0.15 mm amplitude Plastic mould protected to IP51 from front side
Safety	Measurement category Pollution degree Protection	CAT III 2 IP20 at terminals, IP 54 when mounted on panel
Weight and Dimensions	Product weight Bezel dimension (W X H X D) Panel cutout	300 gms 96 X 96 X 58 mm 90 X 90$^{+2.0}_{-0.0}$ mm
Outputs		Meter constant for LED: 1250/ (external CT ratio X PT ratio) Meter constant for LCD: 2500/ (external CT ratio X PT ratio)
Communication	Type Baud rate Parity Slave id Isolation	RS485 port Modbus RTU (Optional) 2400, 4800, 9600, 19200 bps (preferred 9600) Odd, Even, None 1 to 247 (programmable) 2 kVAC isolation for 1 minute between communication and other circuits
Certifications		CE, RoHS

Ordering Information

Description	CAT No.
kWh LED meter Cl 1	WL400010OOOO
kWh LED meter Cl 1 with RS485	WL400011OOOO
kWh LED meter Cl 0.5	WL400020OOOO
kWh LED meter Cl 0.5 with RS485	WL400021OOOO

Description	CAT No.
kWh LCD meter Cl 1	WC400010OOOO
kWh LCD meter Cl 1 with RS485	WC400011OOOO
kWh LCD meter Cl 0.5	WC400020OOOO
kWh LCD meter Cl 0.5 with RS485	WC400021OOOO

Energy Meter Counter Type

4030 Series

Class 1 accuracy as per IS13779

Active energy measurement

Rugged product for control panels to measure active energy

3 phase 4 wire configuration

Stepper motor counter display

Energy pulse LED output

Terminal covers with sealing provision

Meter records correct energy irrespective of current direction

Meter records correct energy under balance & unbalance condition with any phase sequence

Ideal product for DG set panels.

Technical Chart

Type of measurement	Type	3 Phase 4 Wire
Measurement Accuracy		Class 1 as per IS 13779
Display type and resolution	Counter	6 Digit stepper counter with sealing arrangement
Measuring circuit	Input voltage	240 V Burden: 0.2VA max per phase Voltage range for accuracy as per IS 13779
	Input current	-/5A fixed Current range from 0.4% of Ib (20mA-6A) Max current - 200% of Ib Current range for class of accuracy as per IS 13779
	Frequency	50 Hz + 5%
Power Details	Test of power consumption Voltage dips and interrupts	as per IEC 62053-21 as per IEC 61326-1
Electro-Magnetic Compatibility (EMC)	Fast transients burst test Immunity to electrostatic discharge Surge immunity test Emission	±4 kV as per IEC 61000-4-4 ±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2 ±4 kV as per IEC 61000-4-5 Class B as per CISPR 22
Operating Conditions	Operating temperature Storage temperature Humidity Recommended wire	-10°C to +55°C -25°C to +70°C 5% to 95% relative humidity non-condensing 2.5 sq mm
Mechanical Conditions	Shock Vibration Casing	40 g in 3 planes (Double insulation) 10 to 55 Hz, 0.15 mm amplitude Plastic mould protected to IP54 from front side
Weight and Dimensions	Product weight Bezel dimension (W X H X D) Panel cutout	600 gms 96 X 96 X 97 mm 92 X 92
Outputs		Meter constant: 1280

Ordering Information

Description	CAT No.
4030 Series	
kWh Counter type meter Cl 1	WL403010OOOO

Energy Meter DIN Type

4010, 4020 Series

Accuracy Class 1 as per IEC 62053-21

LCD display for clear display of parameter values

Self Powerd Meter (No Auxilary Supply Required)

Whole current operated. 0.1-60A for Single Phase and 0.1-80A for Three Phase

Push button for parameter scrolling

Energy recording at low currents

Pulse output LED available

Compact size and easy mounting

Additional RS485 module for communication over RS485 modbus RTU protocol

These can be mounted inside distribution boxes to monitor electric consumption of identified loads, circuits and areas.

Technical Chart

Parameters	1 Phase DIN (WD4010)	3 Phase DIN (WD4020)
Accuracy	(Default) Class1: IEC 62053-21 (Default)	(Default) Class1: IEC 62053-21 (Default)
Update Rate	1 Sec	1 Sec
Power system type	(Default) 1Phase 2Wire	Star (3Phase 4Wire) /Delta (3Phase 3Wire)
Sensing / Measurement	True RMS, 1 Sec update time 4 Quadrant Power & Energy	True RMS, 1 Sec update time 4 Quadrant Power & Energy
Input voltage	80-300 (VLN)	4 Voltage inputs (V1, V2, V3, VN) Rated voltage - 50-550VLL
Burden	0.2VA Max. per phase	0.2VA Max. per phase
External Fuse Rating	2 Amps	2 Amps
Frequency	45 Hz - 65Hz	45 Hz - 65Hz
Current rating	100mA - 60A (Shunt)	(A1, A2, A3) 100mA-80A
Burden	<2VA Max	<5VA Max
Protection Class	3	Class 3
Measurement Category	CAT lll (As per IEC 61010)	CAT lll (As per IEC 61010)
Humidity	5% to 95% non-condensing	5% to 95% non-condensing
Pollution Degree	2	2
Altitude Below	2000 mts	2000 mts
Insulation	Double Insulation	Double Insulation
Ingress Protection	IP 20	IP 20
Operating Temperature	-10°C to + 55°C (14°F - 131°F)	-10°C to + 55°C (14°F - 131°F)
Storage Temperature	-25°C to +70°C (-13°F - 158°F)	-25°C to +70°C (-13°F - 158°F)
Wire Gauge (Connecting wires)	3 AWG(26.6 mm^2)	11 AWG 1 AWG
Torque for screw terminals	2.5 N-m	1 N-m 2.5 N-m
Container material	PC	PC
Display Type	VA Type	1 Row, LCD
Display Dimension	28.00 mm x 28.00 mm x 0.3 mm	68.4 mm x 18 mm x 2.85 mm
Display Color	Black Background, white digits and Green icons	Black Background, White digits and Green icons
No. of Keys	2	2
Display Resolution	4 Digits for instantaneous, 8 Digits for integrated parameters	4 Digits for instantaneous, 7 Digits for integrated parameters.
Communication	RS 485 serial channel connection Industry standard Modbus. RTU protocol.	RS 485 serial channel connection Industry standard Modbus. RTU protocol.
Baud Rate	4800, 9600, 19.20K, 38.40K (Preferred 9600 bps)	4800, 9600, 19.20K, 38.40K (Preferred 9600 bps)
Isolation	2000 volts AC isolation for 1 minute between communication and other circuits.	2000 volts AC isolation for 1 minute between communication and other circuits.
Parity	Even, Odd, None	Even, Odd, None
Device/Meter ID	1 to 125 (Programmable)	1 to 125 (Programmable)
Dimension	36 x 67 x 90 mm	90 x 90 mm
Mounting	Din Rail	Din Rail
Weight	Unpacked: 150gms, Packed: 250gms	Unpacked: 360gms, Packed: 450gms

Dual Source Energy Meter

4040 Series

Accuracy class 1 as per IEC 62053-21 & class 0.5 as per 62053-22

True RMS measurement

Separate registers for EB and DG energy

Automatic switching of display based on input source as EB or DG through DG sensing input

Positive energy accumulation / reverse lock programmable

Old register to store the previously cleared energy values

User programmable password protection

Auto-scaling of Kilo, Mega, Giga values

Energy pulse LED available

Site selectable for 3 Phase 4 wire, 3 Phase 3 wire, 1 Phase

Optional RS485 port communication

Technical Chart

|		
Type of measurement	Type	3 Phase 4 Wire, 3 Phase 3 Wire, 1 Phase True RMS, 64 samples per cycle 1 sec update time
Measurement Accuracy		Class 1 as per IEC 62053-21 Class 0.5 as per IEC 62053-22
Display type and resolution	LED	4 digit for instantaneous and 6 digits for cummulative
Measuring circuit	LCD	4 digit for instantaneous and 7 digits for cummulative
	Input voltage	UL: 50 - 520 VLL PT Primary and Secondary user programmable for LT and HT applications Burden: 0.2VA max per phase, Burden: 0.2VA max per phase
	Input current	-/5A and -/1A site selectable Current range from 50mA-5A with overload capacity upto 120% In (i.e. 6A) Starting current: 0.6% of full scale, Burden: 0.2VA max per phase CT Primary and Secondary user programmable for LT and HT applications DG sensing input: 230V AC
	Frequency	40-70 Hz
Auxilliary circuit	Aux voltage Aux burden Freq range	80 - 300V AC/DC <5VA 40-70 Hz
Power Details	Test of power consumption Voltage dips and interrupts Short time over current protection	as per IEC 62053-21 as per IEC 62053-21 10A max continuous, 20 times of In for 3 sec
Electro-Magnetic Compatibility (EMC)	Fast transients burst test Immunity to electrostatic discharge Radiated, radio-frequency, electromagnetic field immunity test Immunity to electromagnetic HF fields through conducted lines Surge immunity test Rated power frequency magnetic fields Emission	±4 kV as per IEC 61000-4-4 ±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2 10 V/m as per 61000-4-3 10 V/m as per IEC 61000-4-6 ±6 kV as per IEC 61000-4-5 1 A/m as per IEC 61000-4-8 Class B as per CISPR 22
Insulation Properties	Impulse voltage test AC voltage test	±6 kV as per IEC 62052-11 4 kV double insulation as per IEC 62053-21
Operating Conditions	Operating temperature Storage temperature Humidity Recommended connecting wire	-10°C to +55°C -25°C to +70°C 5% to 95% relative humidity non-condensing 12 to 14 SWG with U type lug of max 6.75 mm width
Mechanical Conditions	Shock Vibration Casing	As per standard IEC 60068-2 10 to 55 Hz, 0.15 mm amplitude Plastic mould protected to IP51 from front side
Safety	Measurement category Pollution degree Protection	CAT III 2 IP20 at terminals, IP54 when mounted on panel
Weight and Dimensions	Product weight Bezel dimension (W X H X D) Panel cutout	300 gms 96 X 96 X 58 mm 90 X 90$^{+2.0}_{-0.0}$ mm
Outputs		Meter constant for LED: 1250 / (external CT ratio X PT ratio) Meter constant for LCD: 2500 / (external CT ratio X PT ratio)
Communication	Type Baud rate Parity Slave id Isolation	RS485 port Modbus RTU 2400, 4800, 9600, 19200 bps (preferred 9600) Odd, Even, None 1 to 247 (programmable) 2 kVAC isolation for 1 minute between communication and other circuits
Certifications		CE, RoHS

Dual Energy Registers

Two separate energy registers are provided, one for EB (Electricity Board supply) and another for DG (Generator Supply). Normally meter accumulates energy in EB register. Whenever the DG sensing signal (230 V AC) is present, meter accumulates energy in DG register.

Separate LED indication is provided on the LED meter front panel, which glows when DG sensing signal is present. LCD meter indicates automatically the source of energy.

Ordering Information

Description	CAT No.
4040 Series*	
Dualsource LED meter Cl1	WL404010OOOO
Dualsource LED meter Cl1 with RS485	WL404011OOOO
Dualsource LED meter Cl0.5	WL404020OOOO
Dualsource LED meter Cl0.5 with RS485	WL404021OOOO
Dualsource LCD meter Cl1	WC404010OOOO
Dualsource LCD meter Cl1 with RS485	WC404011OOOO
Dualsource LCDmeter Cl0.5	WC404020OOOO
Dualsource LCDmeter Cl0.5 with RS485	WC404021OOOO

Typical Connection Diagram of Dual Energy Measurement
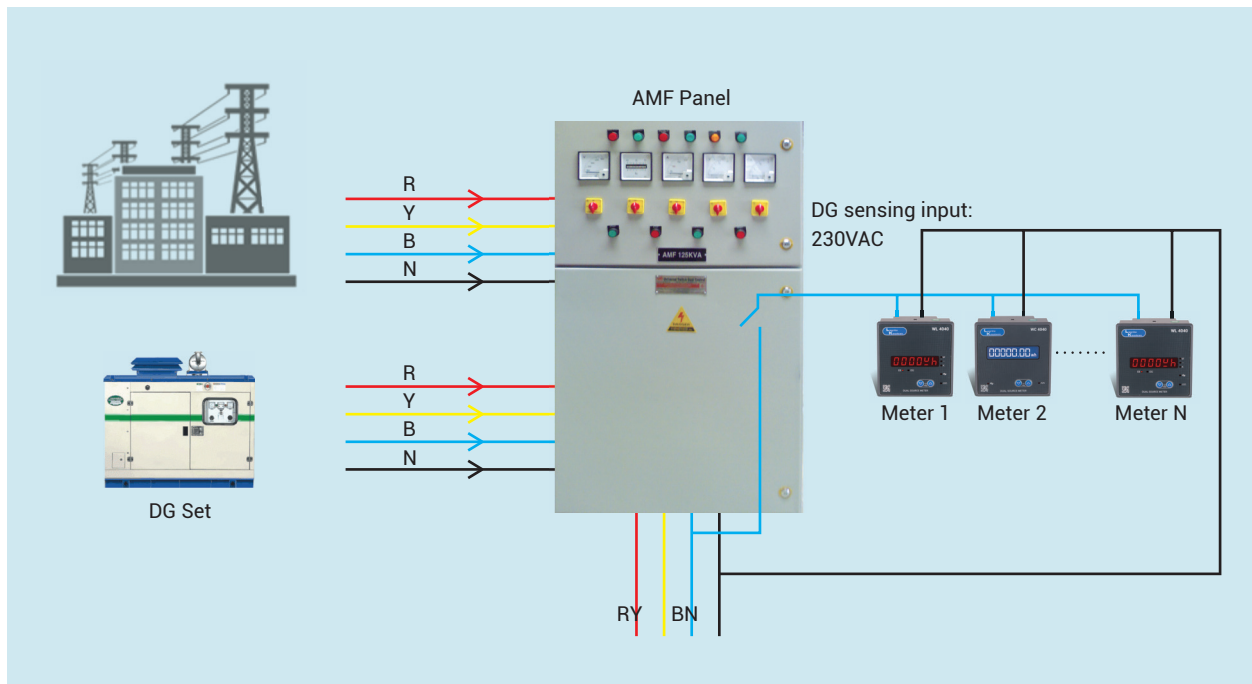
Single Function and VAF Meters

1110, 1120, 1130, 1310, 1320, 4110 Series

Accuracy Class 1 as per IEC 62053-21 and Class 0.5 as per IEC 62053-22

True RMS measurement

Password protection site selectable

Auto and manual scrolling.

Field programmable CT, PT ratio

Site selectable 1A/5A

Phase wise and average display of voltage and current as per applicable meter

Inbuilt selector switch for 3 phase models

Site selectable for 3 Phase 4 wire, 3 Phase 3 wire, 1 phase

Wide operating range of 80 to 300 V AC/DC auxiliary supply*

Suitable for 50/60 Hz

* 80-300 V AC/DC aux supply in single function from Sep'19 vintage

Technical Chart

Type of measurement		3 Phase 4 Wire, 3 Phase 3 Wire, 1 Phase True RMS, 64 samples per cycle 1 sec update time
Measurement Accuracy		Class 1 as per IEC 62053-21 Class 0.5 as per IEC 62053-22 Class 0.2 for frequency meter
Display type and resolution	LED	4 digit
Measuring circuit	Input voltage	50 - 520 VLL PT Primary and Secondary user programmable for LT and HT applications Burden: 0.2VA max per phase
	Input current	-/5A and -/1A site selectable Current range from 50mA-5A with overload capacity upto 120% In (i.e. 6A) starting current: 0.6% of full scale, Burden: 0.2VA max per phase CT Primary and Secondary user programmable for LT and HT applications
	Frequency	40-70 Hz
Auxilliary circuit	Aux voltage Aux burden Freq range	80 -300VAC/DC <5VA 40-70 Hz
Power Details	Test of power consumption Voltage dips and interrupts Short time over current protection	as per IEC 62053-21 as per IEC 62053-21 10A max continuous, 20 times of In for 3 sec
Electro-Magnetic Compatibility (EMC)	Fast transients burst test Immunity to electrostatic discharge Radiated, radio-frequency, electromagnetic field immunity test Immunity to electromagnetic HF fields through conducted lines Surge immunity test Rated power frequency magnetic fields Emission	±4 kV as per IEC 61000-4-4 ±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2 10 V/m as per 61000-4-3 10 V/m as per IEC 61000-4-6 ±6 kV as per IEC 61000-4-5 1 A/m as per IEC 61000-4-8 Class B as per CISPR 22
Insulation Properties	Impulse voltage test AC voltage test	±6 kV as per IEC 62052-11 4 kV double insulation as per IEC 62053-21
Operating Conditions	Operating temperature Storage temperature Humidity Recommended connecting wire	-10°C to +55°C -25°C to +70°C 5% to 95% relative humidity non-condensing 12 to 14 SWG with U type lug of max 6.75mm width
Mechanical Conditions	Shock Vibration Casing	As per standard IEC 60068-2 10 to 55 Hz, 0.15 mm amplitude Plastic mould protected to IP51 from front side
Safety	Measurement category Pollution degree Protection	CAT III 2 IP20 at terminals, IP 54 when mounted on panel
Weight and Dimensions	Product weight Bezel dimension (W X H X D) Panel cutout	300 gms 96 X 96 X 58 mm 90 X 90$^{+2.0}_{-0.0}$ mm
Communication	Type Baud rate Parity Slave id Isolation	RS485 port Modbus RTU 2400, 4800, 9600, 19200 bps (preferred 9600) Odd, Even, None 1 to 247 (programmable) 2 kVAC isolation for 1 minute between communication and other circuits
Certifications		CE, RoHS

4110 Series

In a single screen following parameters can be seen in a page. This enables for quick decision making at a single glance.

With Auto scrolling disabled mode, it can be freezed at any page.

Parameter							
Row 1	V_{LL} (avg)	V_{LL} (avg)	V_{LL} (avg)	V_{RY}	V_R	A_R	PF - R
Row 2	A (avg)	A (avg)	A (avg)	V_{YB}	V_Y	A_Y	PF - Y
Row 3	F	F	PF (total)	V_{BR}	V_B	A_B	PF - B

Ordering Information

Description	CAT No.
1XXX Series	
1Ph Ammeter Cl 1	WL111010OOOO
1Ph Voltmeter Cl 1	WL112010OOOO
3Ph Ammeter Cl 1	WL131010OOOO
3Ph Voltmeter Cl 1	WL132010OOOO
Freq meter Cl 0.2	WL113040OOOO
1Ph Ammeter Cl 0.5	WL111020OOOO
1Ph Voltmeter Cl 0.5	WL112020OOOO
3Ph Ammeter Cl 0.5	WL131020OOOO
3P 3Ph Voltmeter Cl 0.5 h Voltmeter Cl	WL132020OOOO

Description	CAT No.
4110 Series	
VAF + PF meter, Cl 1	WL411010OOOO
VAF + PF meter with RS485, Cl 1	WL411011OOOO
VAF + PF meter, Cl 0.5	WL411020OOOO
VAF + PF meter with RS485, Cl 0.5	WL411021OOOO

| Display parameter list		1 Phase Voltmeter	3 Phase Voltmeter	1 Phase Ammeter	3 Phase Ammeter	Frequency Meter	VAF Meter
Voltage	R Phase	✓	✓				✓
	Y Phase		✓				✓
	B Phase		✓				✓
	Line Voltage		✓				✓
	Average		✓				✓
Current	R Phase			✓	✓		✓
	Y Phase				✓		✓
	B Phase				✓		✓
	Average				✓		✓
	A Peak						✓
Frequency			✓			✓	✓
RPM (Rotations per minute)							✓
Power factor							✓
On Hours							✓

SMARTCOMM
EMS

SmartComm EMS is a simple yet robust solution for organizations seeking to optimize energy consumption and operational efficiency, all within a user-friendly environment. The on-premise implementation gives you direct control and oversight of energy-related data, allowing for real-time monitoring, analysis, and decision-making through an intuitive and easy-to-use interface. With cutting edge features, SmartComm EMS empowers you to proactively manage energy usage, identify savings opportunities, and ensure compliance with sustainability goals and regulations.
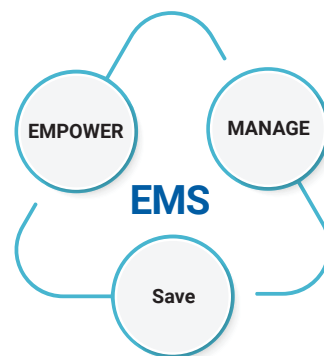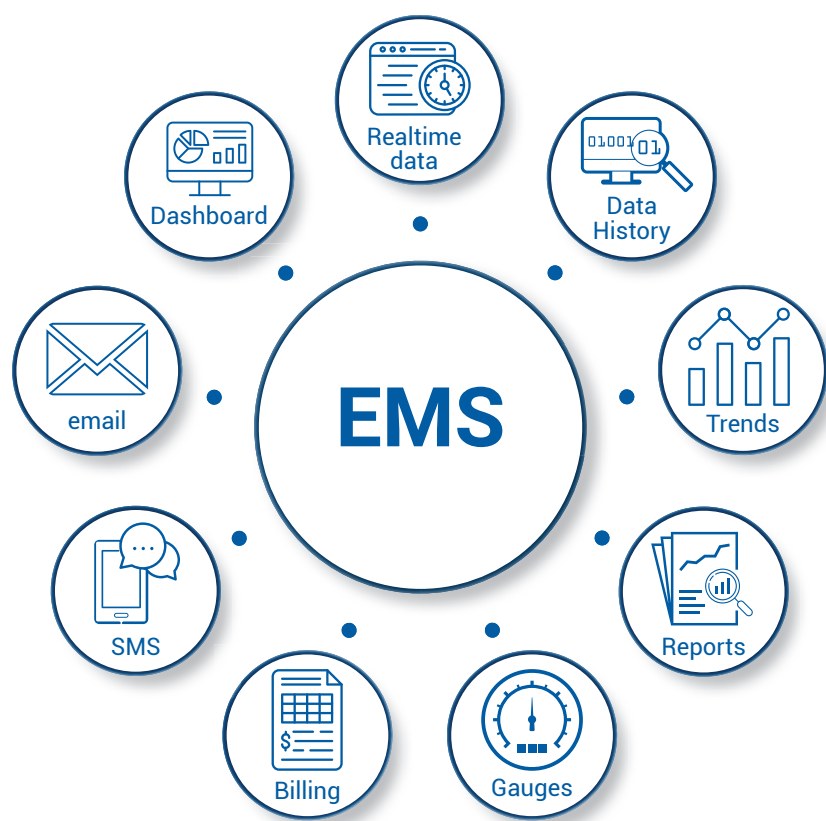
Features

- › Glimpse of all entire energy consumption in the plant through dashboard
- › Quick understanding of energy consumption of today compared to yesterday, this month consumption compared to last month as well as yoy energy comparison through dashboard.
- › Easy navigation through the modules
- › Excel reports with charts
- › All parameters in the device can be monitored from the software

- › Multiple combination of devices and parameters for analysis
- › Provision to generate multiple report types
- › Specific Energy Consumption (SEC) report
- › Access to features defined by user levels
- › Lauritz Knudsen meters preconfigured in the software
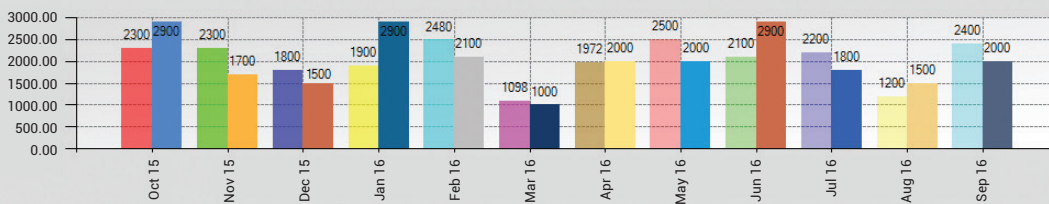
• Year on Year energy consumption at facility / individual feeder level at click of a button

• Quick insights into today and monthly consumption compared to previous period

Today
From 7AM till now

`29.52`

kWhk

⊽ 82 %

compared to yesterdayc

This month
Till now

`1596.54`

Wh

⊽ 12.5 %

ompared to same
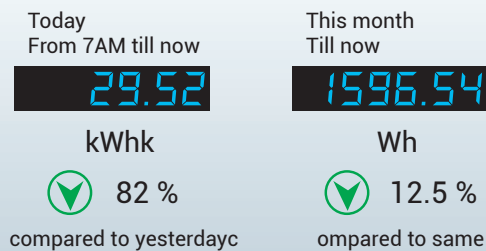
• M essages at your fingertips based on alarms / events immediately

• User management at different access levels for security
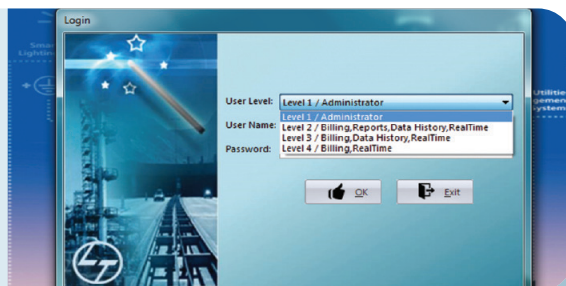
Realtime Monitoring

- › Dashboard has graphical gauge representation of multiple parameters that can be selected by user at site.

- › Bar graph energy consumption representation on hourly basis, monthly basis, yearly basis, TOD basis as well as yoy comparison.

- › Matrix data showing data of all feeders with all parameters

- › Real time view of all parameters for devices.

- › 10 Analog gauges configurable for any device any parameter

- › Realtime trends of multiple parameter values

- › Real time Alarms based on user set threshold levels for parameters with acknowledgement feature

- › Communication diagnostics depicting status of activation

• Monthly energy consumption of last 12 months
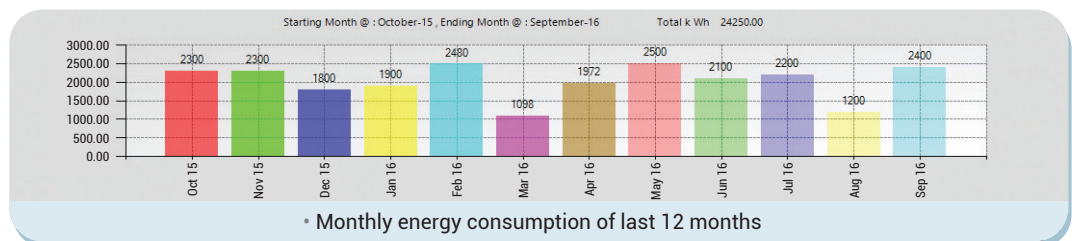
Reports

• Average PF report
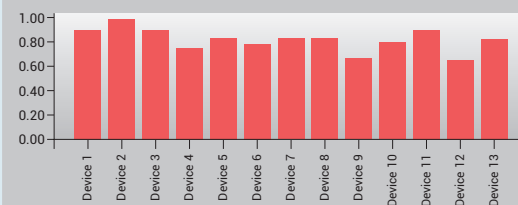
• M y Favourite report section to bookmark 5 most frequently used reports

› Provision to generate 26 reports for analysis that meet user requirements

› Multiple energy reports can be generated including daily, weekly, monthly and yearly basis.

› Provision to set 5 reports as favorites that are frequently used by the user thereby making it easier for quick access

› Provision to generate energy report with Specific Energy Consumption

› Average PF report

› Reports for alarms

› Groupwise energy reports

› Shift reports with user defined timings

› Time of Day report

› Daily logbook report for parameters

Data History

› Trend analysis of historic data from between two dates

› Multiple views of charts with device and parameters

› Provision to save and print the charts

› Zoom in and out feature in charts for detailed analysis

› Generation of historic data as per user for parameters and devices with facility for excel export and printing.

› Device wise alarm history can be generated and analysed

› Device Min-max value analysis

Billing

› Provision to generate bills for commercial complexes

› Options for slab rates, fixed charges, bill no. & date, etc.

Email

› Automated emails of reports at user defined time and email ids.

SMS

› Provision to send SMS to mobile nos configured by user for alarms set for value threshold

› SMS text shall be as per user

› SMS to users as per hourly energy, daily energy and alarms for threshold energy
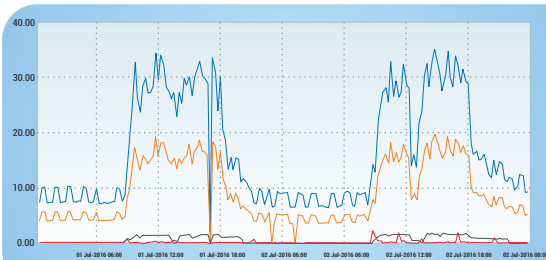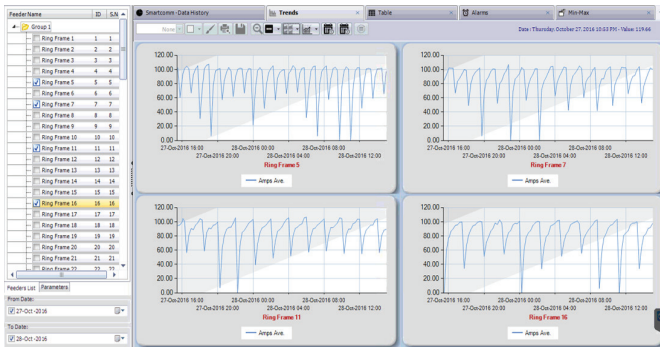
• Trend plot for users analytic requirement

• Time stamped alarms / events

• Lower your carbon footprint, save money and help the environment

SmartComm EMS WebView

SmartComm EMS with the WebView application can be viewed from any location in the plant (using private ip) or anywhere in the world (using public static ip). Now multi location based energy consumption is possible with the help of IoT based MQTT Gateways. Gateways with storage help to maintain the data stored at gateway level and synchronises with SmartComm EMS server on resumption of network. This type of gateways help to avoid any data loss compared to transparent gateways.

MQTT (Message Queuing Telemetry Transport) is a lightweight messaging protocol that provides resource constrained network clients with a simple way to distribute telemetry information. This protocol uses a publish/subscribe communication pattern which is used for machine-to-machine (M2M) communication and plays an important role in the internet of things (IoT).

Types of EMS configurations

Computer maintained at local location

User can monitor on the PC where EMS is installed. Web View can be used to monitor in the same plant but on different PC's using Web browser

Private servers maintained by respective organisations

User can monitor using Web View in the same organisation or outside
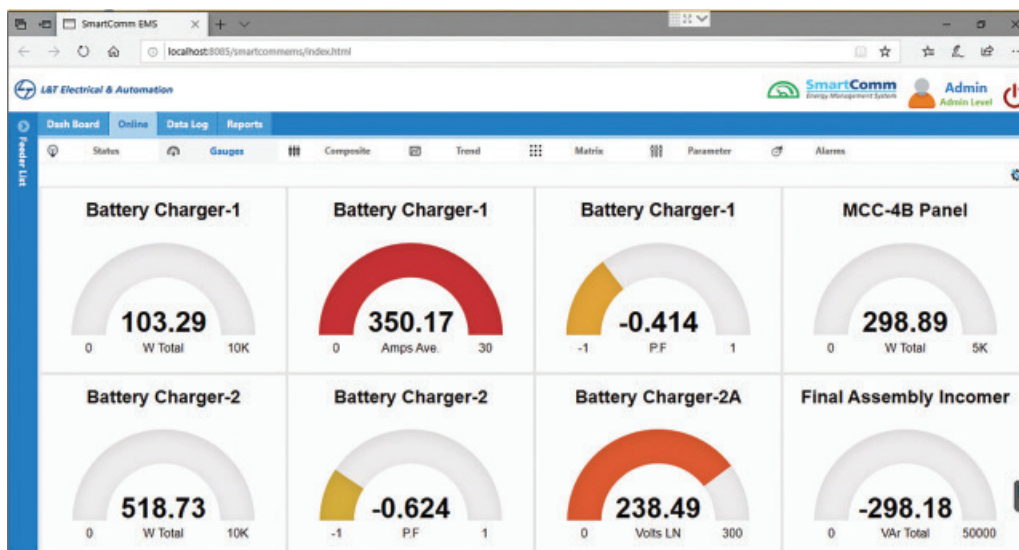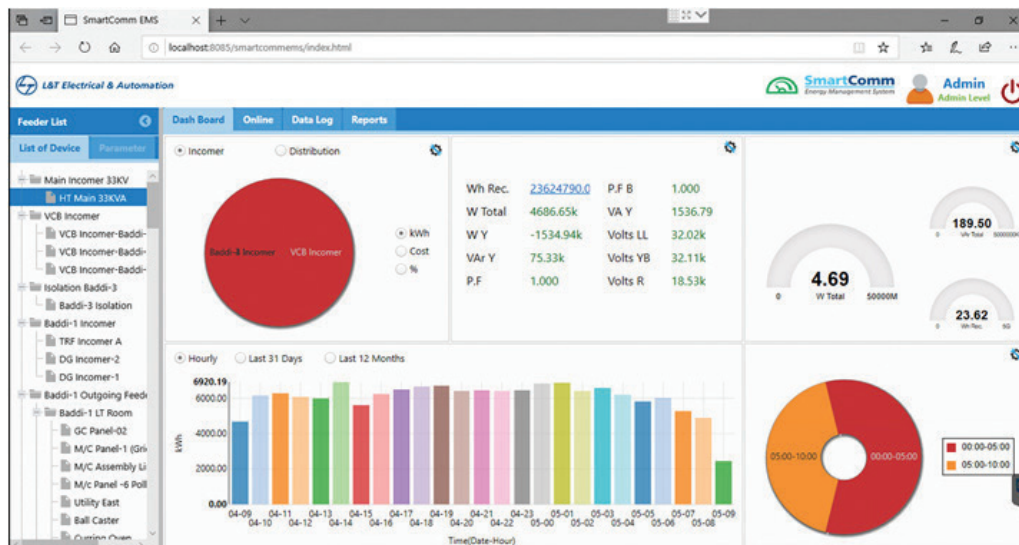
Cloud service provides
eg: AWS (Amazon), Azure (Microsoft), Google Cloud, etc

User can install SmartComm EMS on any public cloud owned by them
User can monitor using Web View from anywhere using web browser

Below is a simple architecture for multi location energy monitoring for an organisation that has multiple plants/offices.
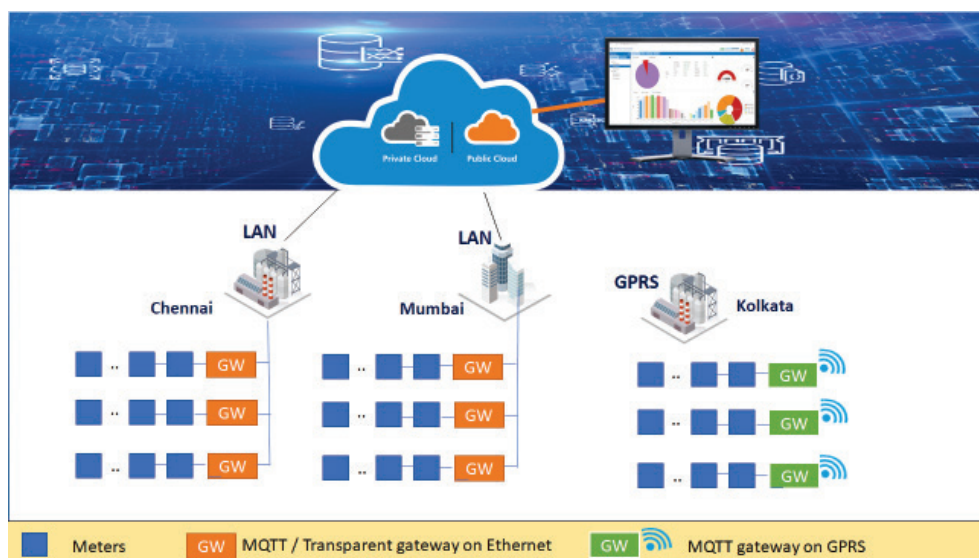
SmartComm EMS WebView

TG 1000

TG1000 is a MODBUS Gateway that converts MODBUS RTU to MODBUS TCP/IP. It bridges the communication-capable products with RS485 port with Smartcomm EMS/PMS installed in a server and thereby leading to connected and intelligent field devices.

Salient Features

› Easy connection with Smartcomm EMS/PMS On-Prem since the default settings is good to go with.

› IP Address conflict indication.

› TG1000 Gateway supports Modbus RTU, ASCII (Master/Slave) with and without mapping.

› TG1000 Gateway supports Modbus TCP (Server/Client) with and without mapping.

› All communication ports and input power supply are isolated from each other. Configurable using embedded web server and Application software.

Datasheet

Power Supply	12 V to 24 V DC, -10% to +25%		
Max Consumption	2 W		
Protocol Conversion	Modbus RTU / ASCII - MODBUS TCP/IP		
Operation Mode	Modbus RTU / ASCII(Master/Slave), Modbus TCP/IP(Client/Server)		
Configuration Management	Web Server and windows-based configuration Application		
Serial Interface	Serial Ports	1	
	Ports	Port1: Screw terminals for RS485 interface.	
	Serial Communication Parameters	Baud Rate: 300 to 115.2Kbps	
		Parity: Odd, Even, None	
		Stop Bits: 1,2	
	Fail safe resistor	4K7 Resistor Pull up (TX+) & Pull Down (TX-) on BUS	
	Terminating Resistor	Connect externally if required	
	Isolation	Isolation 2 KV rms	
LAN Interface	Port	1 RJ45, Ethernet 10/100 Mbps	
	Network Protocols Supported	Protocols for Communication: Modbus TCP	
		Standard Protocols used: HTTP, DHCP, Auto IP, UPnP, TCP, UDP, IP, ARP, ICMP, Protocols used for firmware updating: BOOTP, TFTP	
	Isolation	1.5KV rms magnetic Isolation	
Feature	Mapping and Background Processing Data Block (BPD)		
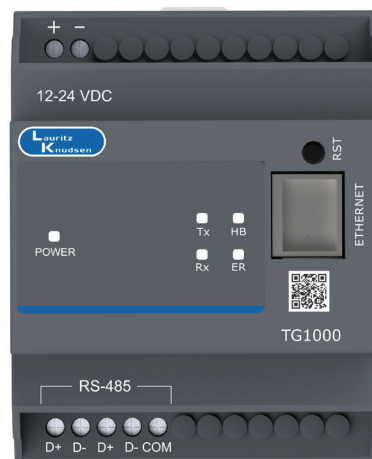
TG 1000

LEDs	Tx/Rx LED indication (Green) for data transmission/reception from RS485/IB	
	LAN: Link and Activity Indication (Yellow & Green)	
	POWER LED: Power ON Indication (Green)	
	HB LED: Factory Reset & Boot Mode Indication (Green)	
	ER LED: Error Indication (Red)	
Environmental Characteristics	Operating Temperature	0° to +55°C
	Storage Temperature	-10° to +70°C
	Humidity	10% to 90% RH
	Pollution Degree	2
	Degree of Protection	IP20 for Terminals
	Enclosure	4M, Flame Retardant UL94-V0
Mechanical Specifications	Mounting	Base / Din Rail
	Dimensions	72 x 90 x 58 mm
	Weight (Unpacked)	185 g
Certifications	CE, RoHS	

Wiring Diagram

› The RS485 devices are looped – up to 16 devices in one loop and connect to the D+, D- of the TG1000 device.

› Connect TG1000 to a computer/Server with Internal LAN network where Smartcomm EMS/PMS is installed, through Ethernet port using CAT6 cable.
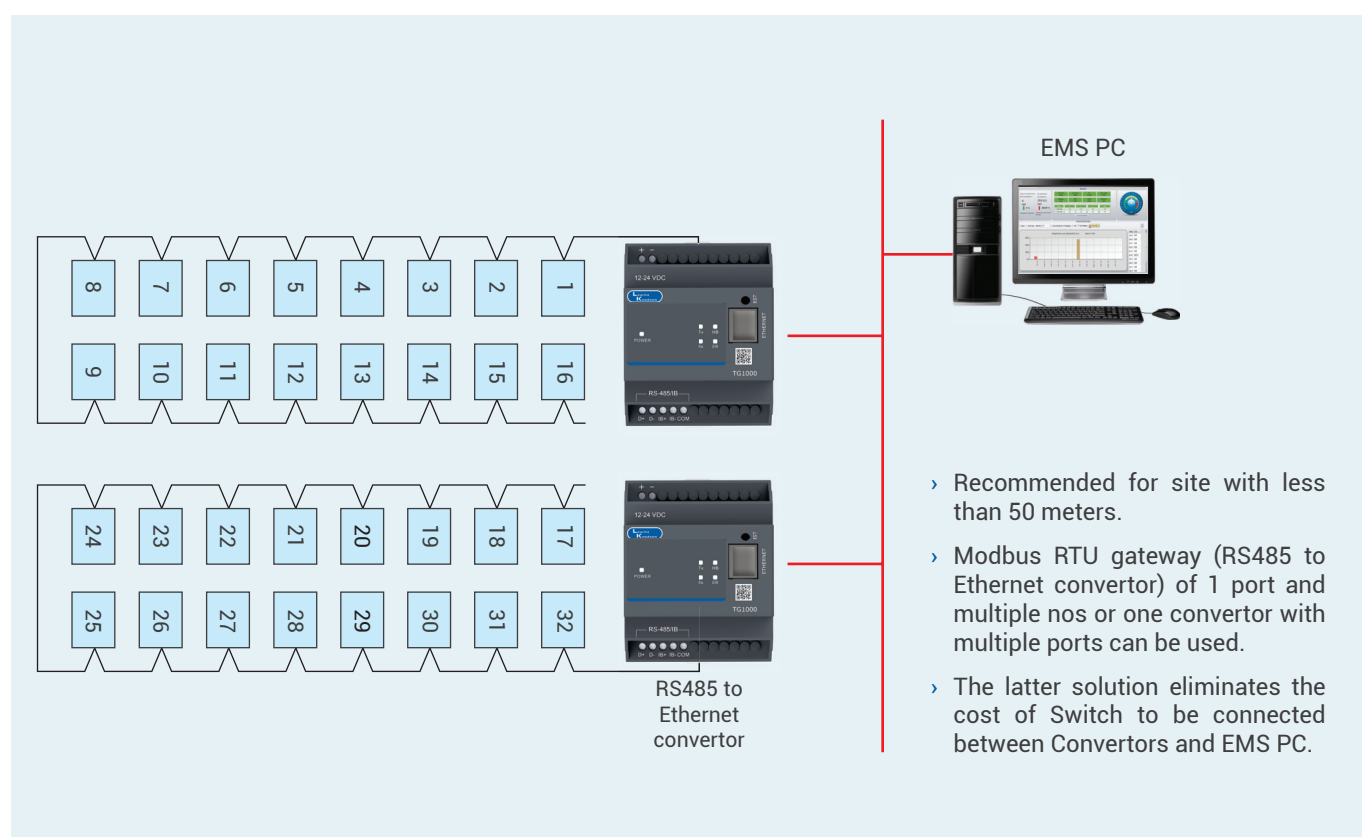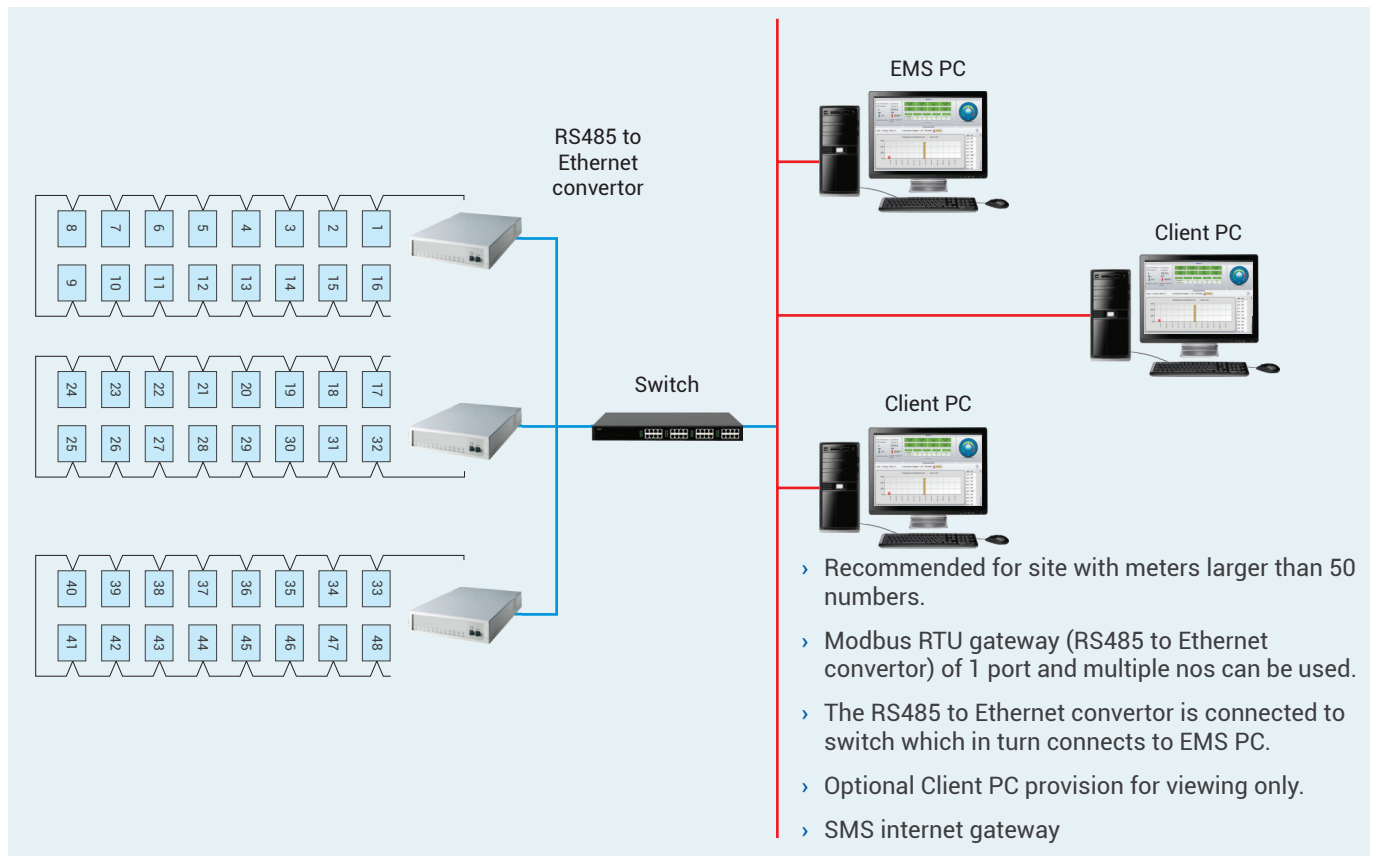
Mechanical Dimensions
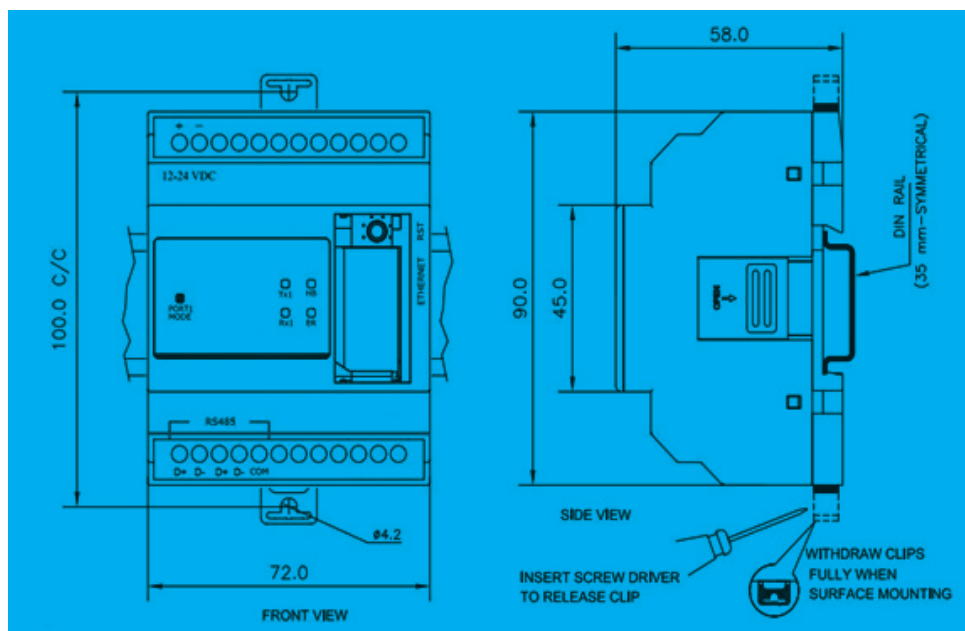
Architecture

The default slave ID of meter is 1. When multiple meters are connected in a network, the slave IDs should be unique to network. RS485 modbus protocol allows up to 247 meters to be connected in a network. But the signal strength of RS485 allows only 32 meters to be connected in a daisy chain. Hence to enable connection up to 247 meters, multiple convertors should be used. Repeaters are used when distance between meter and convertor increases more than 800m. These are used to improve the signal strength.

Termination resistor is used to reduce the reflection of signals at the ends. The value of the termination resistor should be equal to the cable impedance. The cable impedance can be obtained from the cable manufacturer. In case value of cable impedance is not known, usually 120W, 0.5W resistor can be used. Termination resistor has to be connected at the convertor end as well as at the last meter end.

Method 1 - Architecture for basic requirement

EMS PC

RS485 to Ethernet convertor

› Recommended for site with less than 50 meters.

› Modbus RTU gateway (RS485 to Ethernet convertor) of 1 port and multiple nos or one convertor with multiple ports can be used.

› The latter solution eliminates the cost of Switch to be connected between Convertors and EMS PC.

Method 2 - Architecture with client PC

RS485 to Ethernet convertor

Switch

EMS PC

Client PC

Client PC

› Recommended for site with meters larger than 50 numbers.

› Modbus RTU gateway (RS485 to Ethernet convertor) of 1 port and multiple nos can be used.

› The RS485 to Ethernet convertor is connected to switch which in turn connects to EMS PC.

› Optional Client PC provision for viewing only.

› SMS internet gateway

Method 3 - Architecture with wireless connectivity

RS485 to Ethernet convertor

EMS PC

Switch

Router

Wireless Access points

Cellular modem

M2M gateway with static IP

› Recommended for site with meters larger than 50 numbers.

› Modbus RTU gateway (RS485 to Ethernet convertor) of 1 port and multiple nos can be used.

› The RS485 to Ethernet convertor is connected to switch which in turn connects to EMS PC.

› Wi-Fi: Wireless access points and router can be used where meters are connected at far away distance and line of sight is available.

› Cellular modem can be used from any place in the world with SIM cards and static IP at M2M gateway. Speed of data transmission will depend upon numerous site conditions.

Method 4 - Architecture with Fiber Optic connectivity

RS485 to
Ethernet
convertor

EMS PC

Switch

Fibre Optic
Convertor

› Recommended for site with meters larger than 50 numbers.

› Modbus RTU gateway (RS485 to Ethernet convertor) of 1 port and multiple nos can be used.

› The RS485 to Ethernet convertor is connected to switch which in turn connects to EMS PC.

› When distance are large (in kms) Optical fibre should be used. Recommended distance between Ethernet gateway to FOC (Fibre Optic Convertor) should be less than 2km. Recommended distance between FOC convertors can be approx. 10km.

Method 5 - Architecture with redundant network topology

RS485 to
Ethernet
convertor

EMS PC

FOC

Manageable
Switch with FO

› Ring topology is recommended where redundancy is required.

› Manageable switch with Fibre Optic is used to achieve ring topology

› Recommended for critical applications.

Prepaid Metering Solutions

- Class 1 accuracy as per IS 15884

- Current rating 5/30A, 10/60A, 20/80A, CT operated

- Forward energy recording irrespective of current direction

- Provisions for meter terminal sealing arrangement to prevent tampers

- Display consists of auto scrolling and manual scrolling

- 3 Phase 4 Wire or 1 Phase 2 Wire configuration

- Compact wall mounting design

- Communication options: Modbus RS485 RTU or LoRa

- Dual Source provision available

- Unified EB and DG recharging

- Provision to trip on Overvoltage or overload

- Current limiting facility for separate DG/EB with selection of DG power either as 3Ph or

- 1Ph (site selectable) that minimises wiring complexity

- Display blinking feature on meter as well as remote display unit to indicate low balance

- Integration with water meter and gas meter digital outputs in meter.

SMPR 3P 1060RS

SMPR 3P 1060LO

Prepaid Metering Solutions

Prepaid meter solution is a combination of Prepaid meters and SmartComm EMS with Prepaid module.

Prepaid meters offer great flexibility to end users as well as Facility Management by allowing customers the freedom to determine both frequency of recharges and amount of each payment along with the benefit of auto cut off.

Energy consumption data is available on fingertips to help the customer to adjust their consumption behaviour. This may help them to better control their electricity budget through close monitoring of daily consumption and credit balance in the meter

Connect - Disconnect

These pre-paid meters are available with the facility of connection or disconnection of the electric supply based on the credit amount balance in the meter with the help of an internal relay for switching. Once the balance reaches zero, the meter will cut off the supply. If the user exceeds contact/sanctioned load (in kVA), the prepaid meter can trip the load accordingly.

Happy Hours

Happy hours comprise of those hours outside the working hours of the administration including public holidays and weekends.

In case the user account credit gets exhausted in the evening after working hours then a certain amount of credit facility is available to avoid supply disconnection till the beginning of the working hours on the subsequent working day to avail uninterrupted supply. It is possible to have different credit facility for different users.

Recharge

The server is maintained at the respective colony or housing complex admin building. Recharge can be done by customers either by paying cash/cheque at the facility management location or through online options like Paytm, debit card, etc. The online recharge options can be used for the particular user or meter only thereby avoiding theft or unauthorized use.

Friendly Credit Period

There is a provision to provide extra credit limit to its users. As soon as the credit balance of the meter becomes zero, the extra credit limit gets activated and the meter keeps operating till the extra credit limit gets exhausted. On next recharge the differential amount i.e. recharge amount minus credit utilized reflects in the meter.

Tariff Revision

Whenever there is a tariff revision in any month, the Facility manager can update the latest tariff in the software. This will be updated to all meters immediately.

Tamper Proo

Provision for tamper proof is available in the meter. It will be in the scope of Facility Management or contractor to seal the meters to avoid tamper.

IHD: In House Display Unit

In addition to the display screen at the metering unit there is another provision of in-house display unit. This helps the users to access the meter information at any time. Information displayed in the meter is replicated in the house display unit including balance. The distance between the prepaid meter and in-house display unit cannot be more than 50 meters. No separate power supply is required. The display will blink & buzzer will beep in frequent interval to indicate low balance.

There is another provision of mobile app wherein all this information with analytics is available by logging in with the user details. With this in-house display unit won't be required.

Alerts

Users get SMS alerts for activities like low credits, account recharge, recharge status, overload, overvoltage, etc.

User Web Portal | Mobile App

Online Customer Login Portal within site premises - User can check the balance amount as well as log any complaints to the facility management. User can get the balance credit through any of the interface Mobile app or web portal.
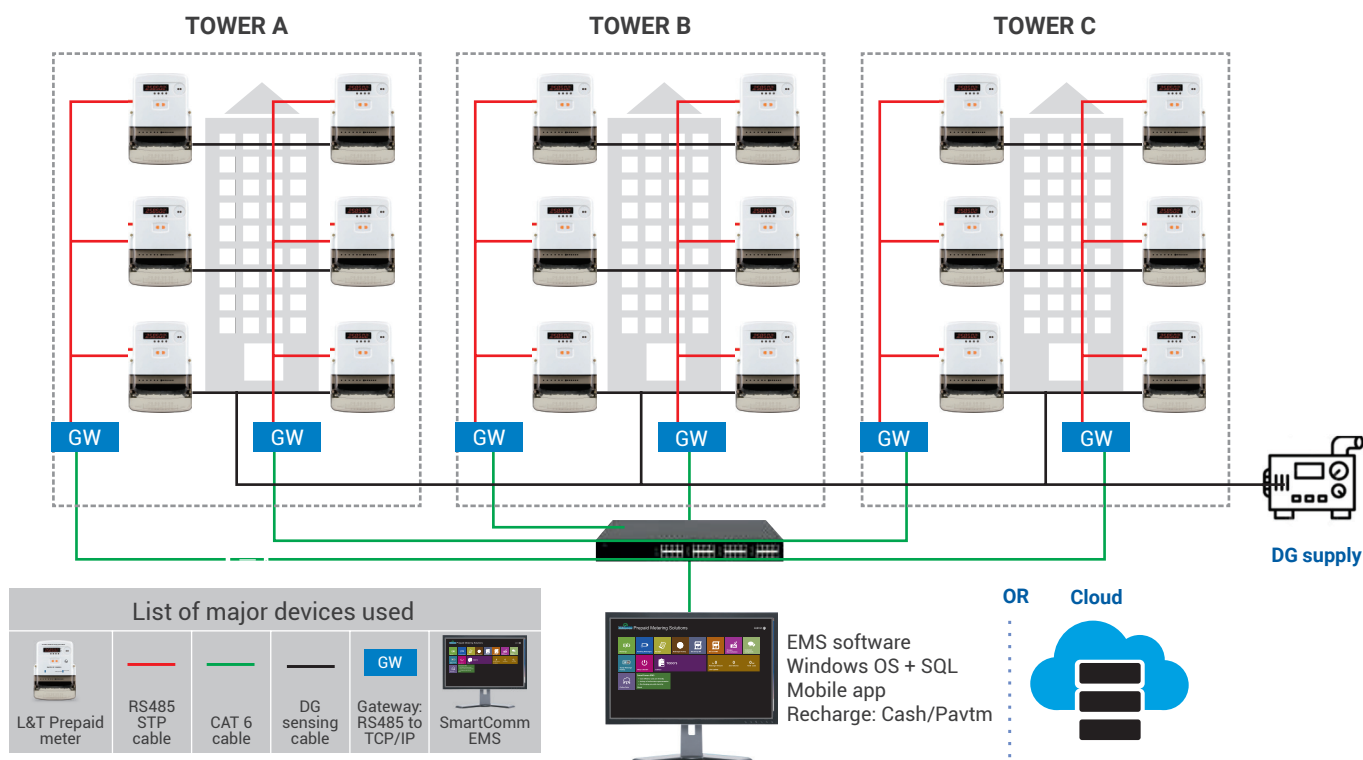
Billing Provision

› Maintenance charges based on area or fixed.

› kW/kWh logging every 15 minutes for future clarification.

› Real time data monitoring

› Monthly billing with breakup of EB/DG energy consumption

› Cheque reconciliation provision is available.

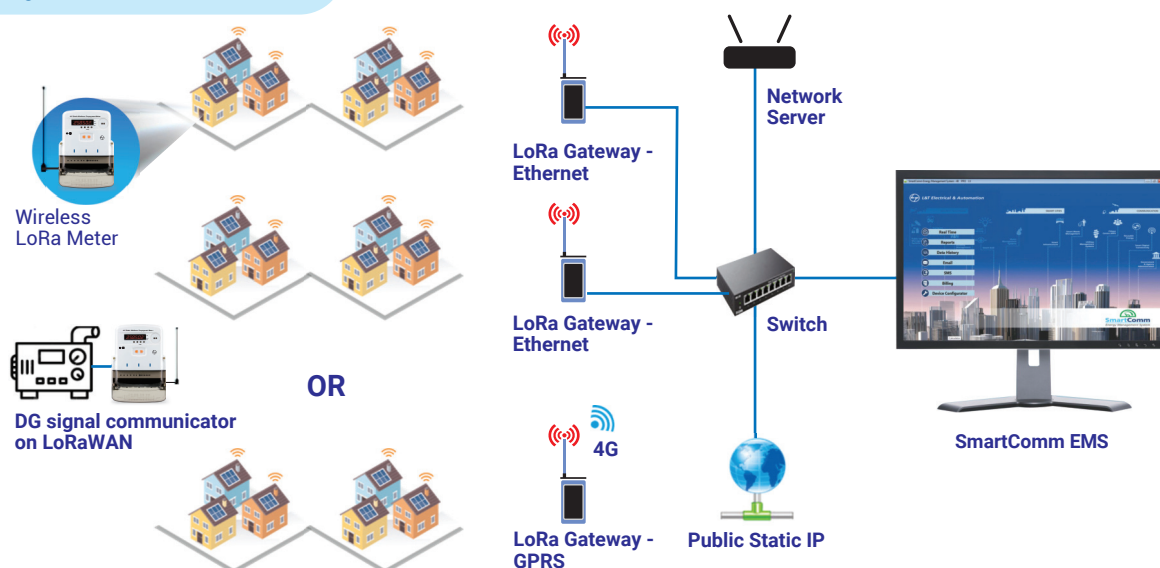› Recharge slip as well as recharge history for the selected date range
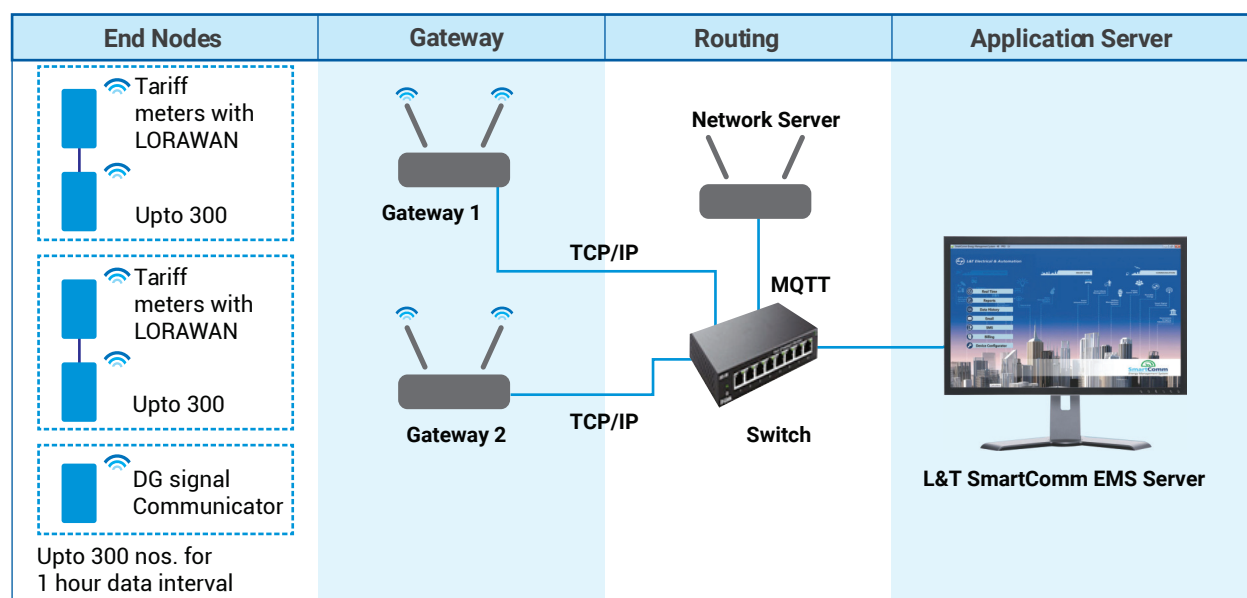
Prepaid Solution Architecture - Wired Solution

TOWER A   TOWER B   TOWER C

GW   GW   GW   GW   GW   GW

DG supply

List of major devices used

| L&T Prepaid meter | RS485 STP cable | CAT 6 cable | DG sensing cable | Gateway: RS485 to TCP/IP | SmartComm EMS |

EMS software
Windows OS + SQL
Mobile app
Recharge: Cash/Pavtm

OR   Cloud

Wireless Metering Solutions - LoRaWAN

› LoRa stands for Long Range

› LPWAN stands for Low Power Wide Area Network and this type of wireless communication is designed for sending small data packages over long distances. LoRa follows 802.15.4g IEEE standard. LoRaWAN is the standard protocol for WAN communications and LoRa is used as a wide area network technology. It uses

› Adaptive Data rate technique to vary output data rate and Tx power of end devices.

› LoRa uses 865 MHz ISM bands which is a free license spectrum.

Wireless solution architecture with LoRaWAN

Wireless LoRa Meter

DG signal communicator on LoRaWAN

OR

LoRa Gateway - Ethernet

LoRa Gateway - Ethernet

4G

LoRa Gateway - GPRS

Network Server

Switch

Public Static IP

SmartComm EMS

Network Architecture Solution 1: LORAWAN Private network

End Nodes	Gateway	Routing	Application Server
Tariff meters with LORAWAN Upto 300		Network Server	
Tariff meters with LORAWAN Upto 300	Gateway 1 TCP/IP	MQTT	
DG signal Communicator	Gateway 2 TCP/IP	Switch	L&T SmartComm EMS Server
Upto 300 nos. for 1 hour data interval			

Private Network:

› Each meters will have barcode. These are scanned with help of LoRa Config app that links the meters scanned with a particular gateway. So communication will be done only with the gateways and meter that are linked.

› Maximum of 5 such gateways can be connected.

› Each gateway can accommodate approx. 300 nos. of meters for 15 min data interval with 10 parameters.

› Distance of upto 1 kms without Line of Sight.

› If data interval is increased above 1 hour then more number of meters can be connected.

› AES encryption is used for data transfer ensuring data security

Network Architecture Solution 2: LORAWAN Private network for longer ranges

End Nodes	Gateway	Routing	Application Server
Tariff meters with LORAWAN — Upto 300	Gateway 1 (4G)	Network Server	
Tariff meters with LORAWAN — Upto 300	Gateway 2 (4G)	MQTT — Switch	L&T SmartComm EMS Server Local static IP
DG signal Communicator		Public Static IP	
Upto 300 nos. for 15 hour data interval			
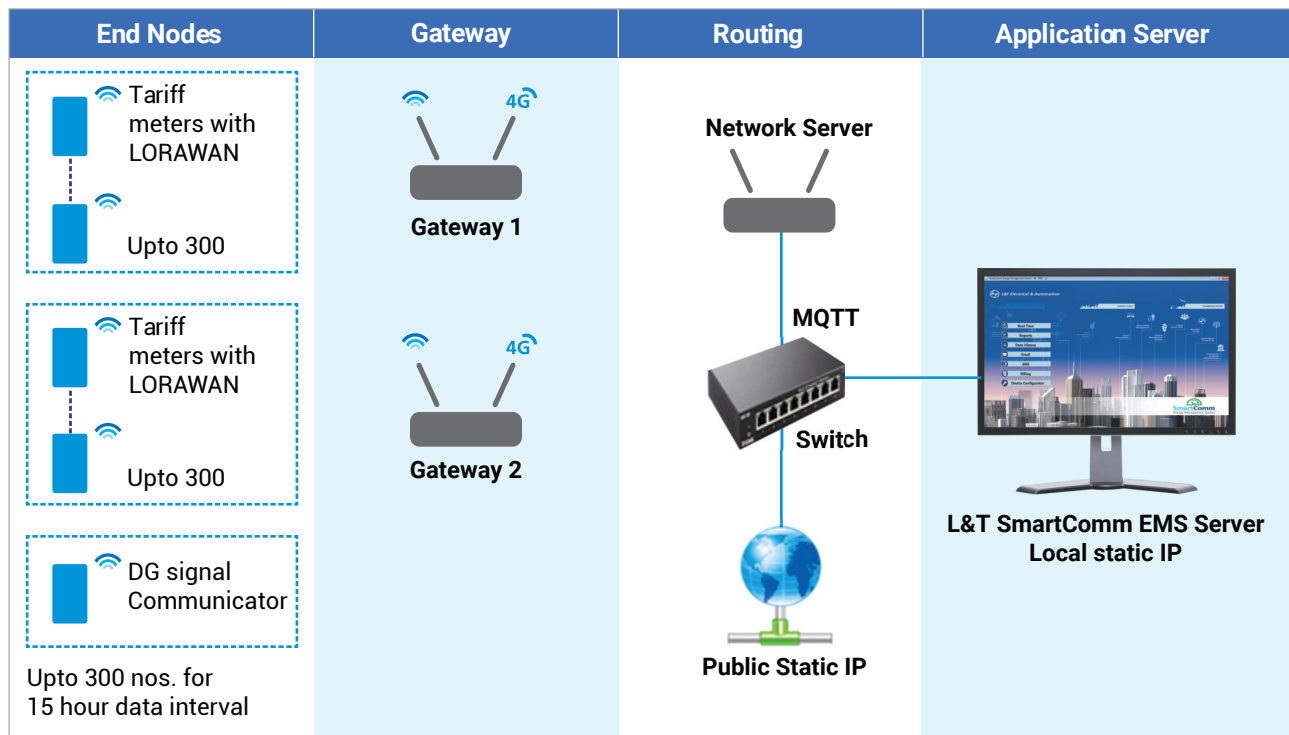
Private Network:

› When cluster of meters are spread out, gateways with 4G connectivity to be used.

› Each meters will have barcode. These are scanned with help of LoRa Config app that links the meters scanned with a particular gateway. So communication will be done only with the gateways and meter that are linked.

› Maximum of 5 such gateways can be connected.

› Each gateway can accommodate approx. 300 nos. of meters for 15 min data interval with approx. 10 parameters.

› If data interval is increased above 1 hour then no of meters that can be connected are more.

› AES encryption is used for data transfer ensuring data security
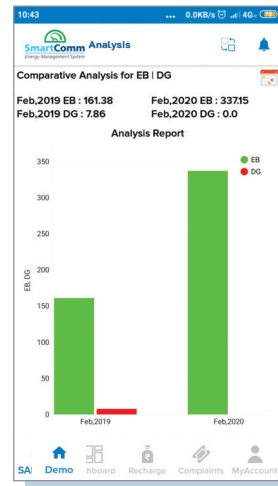
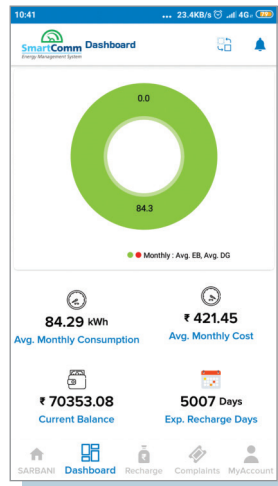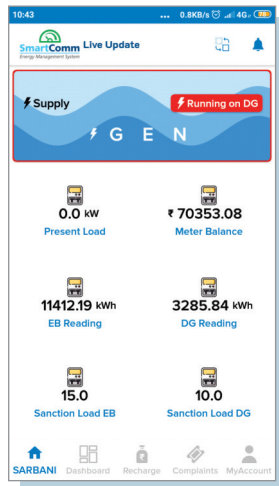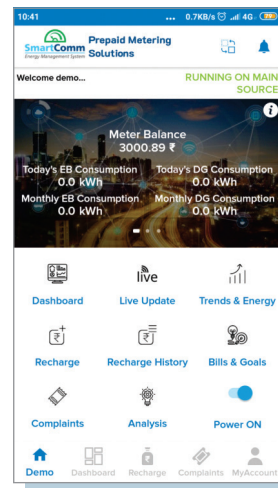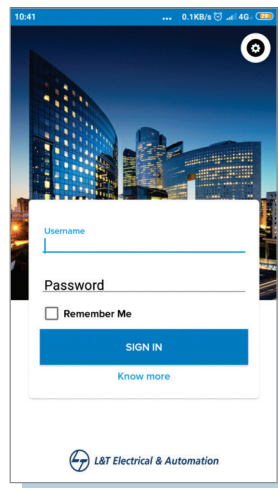## Prepaid Metering Solutions

Admin
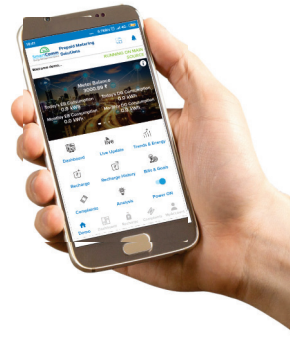
User / Tenants

User app Interface

Advantages over conventional token based system

Software is available at customer premises. Hence no deduction for token generation commission fee

Software license is perpetual

Analytics available compared to reducing balance information

DG sensing is wireless leading to additional savings

Easy configuration through barcode and mobile app

Instant recharge through Paytm

Technical Chart

Type of measurement	Type	3 Phase 4 Wire, 1 Phase 2 Wire Whole Current True RMS, 1 sec update time, 2 Quadrant Power & Energy
Measurement Accuracy		Class 1 as per IS 15884, IS 13779
Display type and resolution	LED	4 digit for instantaneous and 6 digits for cummulative
Measuring circuit		V1, V2, V3, V12, V23, V31, Avg (VLN, VLL)
Parameters		A1, A2, A3, Avg, F
		PF-1, PF-2, PF-3, PF (Avg)
		W1, W2, W3, W (total)
		Wh - EB Received, Wh - DG Received
Measuring circuit	Input voltage	UL: 240VAC. Variation: +20% to -50%
	Input current	1P: 10-60A,
		3P: 10-60A, 20-80A, CT operated
		Starting current: 0.4% of basic current
	Frequency	45-65 Hz
	Power Consumption	As per IS13779
Operating Conditions	Operating temperature	-10° C to $+55^O$ C
	Storage temperature	-25° C to $+70^O$ C
	Humidity	5% to 95% relative humidity non-condensing
Weight and Dimensions	Product weight	1P : 670 gms
		3P : 750 gms
	Bezel dimension (W X H X D)	1P: 158 X 112 mm (Depth 58 mm)
		3P: 270 X 171 mm (Depth 69 mm)
Outputs		Meter constant : 1600
	Type	RS485 port Modbus RTU or LoRa
Communication	Baud rate	2400, 4800, 9600, 19200 bps (site selectable)
	Parity	Odd, Even, None
	Slave id	1 to 247 (programmable)
	Isolation	2 kVAC isolation for 1 minute between communication and other circuits

Mechanical Specification

Single phase: Dimension Bezel:
158 x 112mm (Depth 58 mm)
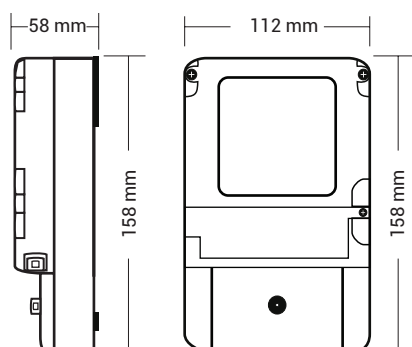
Three phase: Dimension Bezel:
270 x 171 mm (Depth 69 mm)
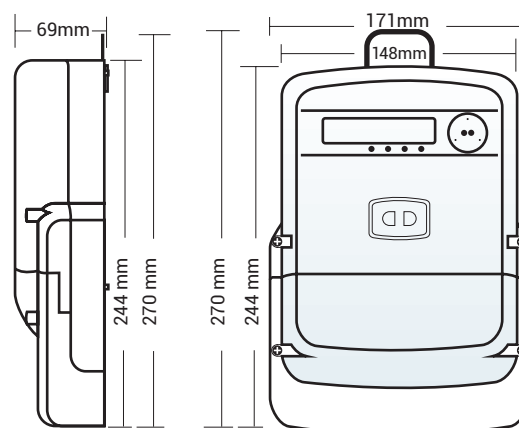
Description	CAT No.
Smart Prepaid meter 1P 10/60A with RS485	SMPR1P1060RS
Smart Prepaid meter 3P 10/60A with RS485	SMPR3P1060RS
Smart Prepaid meter 3P 20/80A with RS485	SMPR3P2080RS
Smart Prepaid meter 3P CT operated RS485	SMPR3PLTCTRS
Prepaid meter in house display unit	SMPRIDU
Smart Postpaid meter 1P 10/60A with LORA	SMPO1P1060LO
Smart Postpaid meter 3P 10/60A with LORA	SMPO3P1060LO
Outdoor Gateway with GPRS with 4G	SMLORAGWGPRS
Network Server for LORA	SMLORANWSERVER
EB/DG signal broadcast meter - LORA	SMLORAEBDG
Smart Prepaid meter 1P 10/60A with LORA	SMPR1P1060LO
Smart Prepaid meter 3P 10/60A with LORA	SMPR3P1060LO

SMARTCOMM
EMS

SmartComm EMS Cloud
**Smart Decisions...
Anytime...Anywhere...**

SmartComm EMS Cloud

Cloud-based SmartComm Energy Management System (EMS) is a ground-breaking solution poised to transform the way we interact with energy monitoring Devices.

Harnessing the power of the cloud technology, this cutting-edge innovative system offers real-time insights and energy consumption tracking like never before.

From any device, at any time, user can access comprehensive data, enabling businesses to make informed decisions that optimize energy usage, reduce operational costs, and contribute to a greener, more sustainable future. Say goodbye to traditional energy management hiccups and say hello to a new era of efficiency and environmental responsibility with SmartComm EMS Cloud.

What's in it for you

Smartcomm EMS Cloud offers a wide range of benefits to organizations with a wealth of data that would leverage efficiency, reduce costs, enhance sustainability, and better overall facility management. It enables data-driven decision-making and helps organizations meet their operational and environmental goals.

› Holistic view of Energy parameters of enterprise with centralized monitoring, while retaining the agility of real-time plant-specific data.

› Lower upfront costs reducing IT maintenance expenses

› Smarter decision making based on Intelligent notifications through SMS and Email based alerts and alarms.

› Make progress on ISO 50001

› Data analytics at its best through widget-based dashboards and reports

› Scalability, ease of license upgradation for any future addition of devices
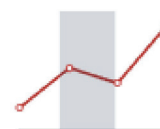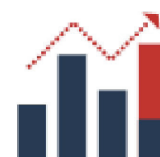
SmartComm EMS Cloud

Features

The Cloud-based SmartComm Energy Management System (EMS) offers a comprehensive suite of powerful features designed to revolutionize energy management:

Real-time Dashboards: SmartComm EMS provides dynamic, real-time dashboards that offer a visual representation of your energy consumption data. Monitor your energy usage and performance briefly, enabling quick decision-making. Simple and widget-based dashboards allow each stakeholder to quickly identify their issues and access reports as needed.

KPI Widgets: Key Performance Indicator (KPI) widgets allow you to track and assess specific metrics critical to your energy efficiency goals. Customize your widgets to display the information that is most relevant to your organization.
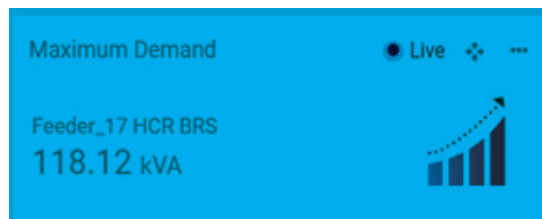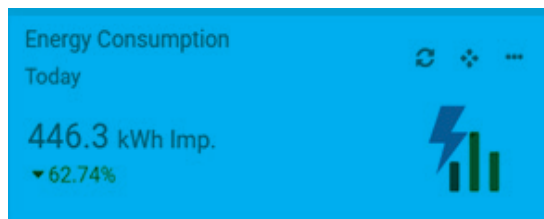
Historical Reports:

Unleash data-driven decision making with various insightful reports. Generate on-demand energy reports, log reports, alerts/alarm reports, machine utilization insights, and more, all delivered to your inbox on your schedule.

Diagrams:

Visualize your entire electrical system with a Single Line Diagram or a factory bird view. This simplified graphical representation offers a clear overview of system's configuration, making it easier to understand and manage.
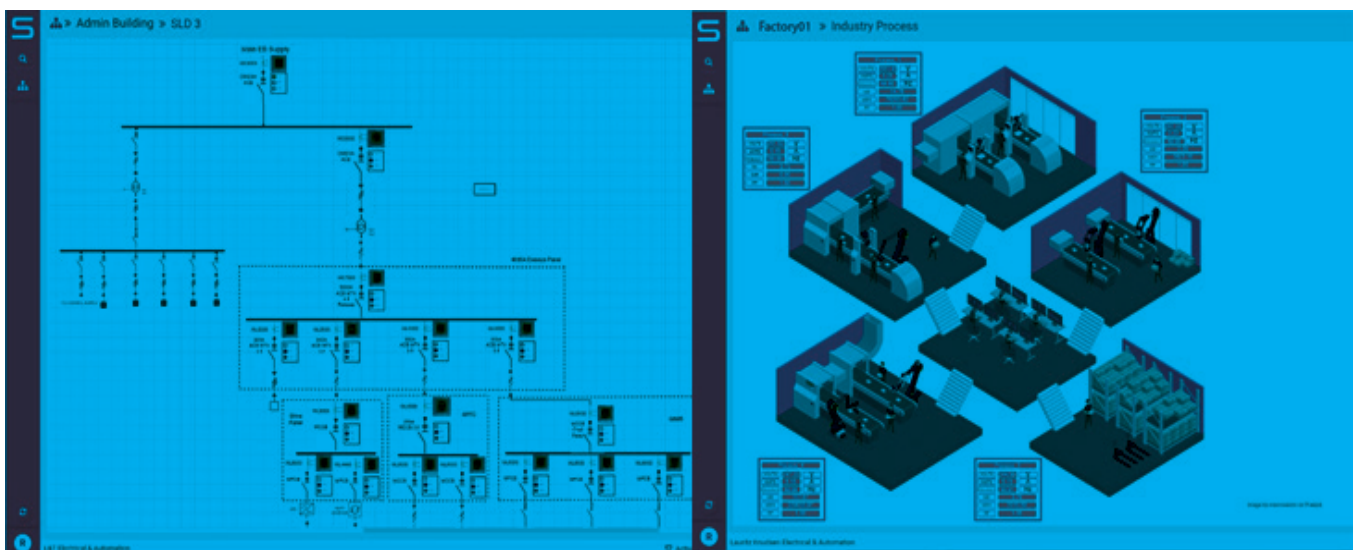
Notifications:

Receive real-time alerts and alarms via email or SMS to stay informed about critical events or anomalies in your energy consumption, ensuring swift response and issue resolution. Like Low PF, Higher Power Consumption, High THD/TDD, Hourly/Daily Energy etc.

Trends:

In energy management, trends function as insightful data points, analogous to a well-defined roadmap. By meticulously analyzing historical consumption patterns, these trends illuminate areas of inefficiency and wasteful practices. This targeted knowledge empowers to prioritize areas for improvement, leading to optimized energy use. Furthermore, trends possess a predictive quality, enabling informed forecasts of future energy requirements.
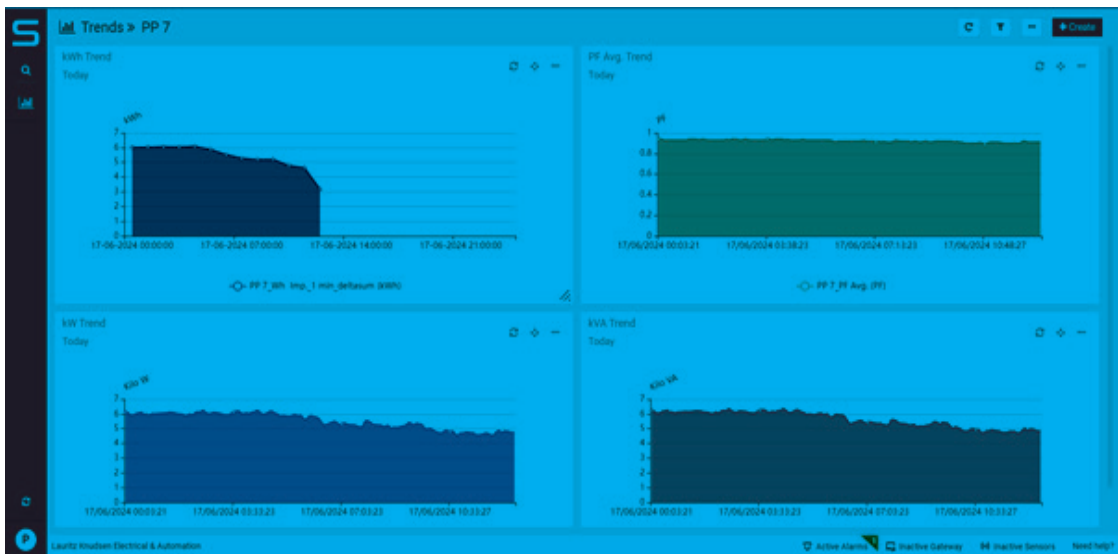
Features

Mobile / On-the-Go Monitoring:

Access your energy management system from anywhere, at any time, using your mobile device. Stay connected and make informed decisions even while on the move.
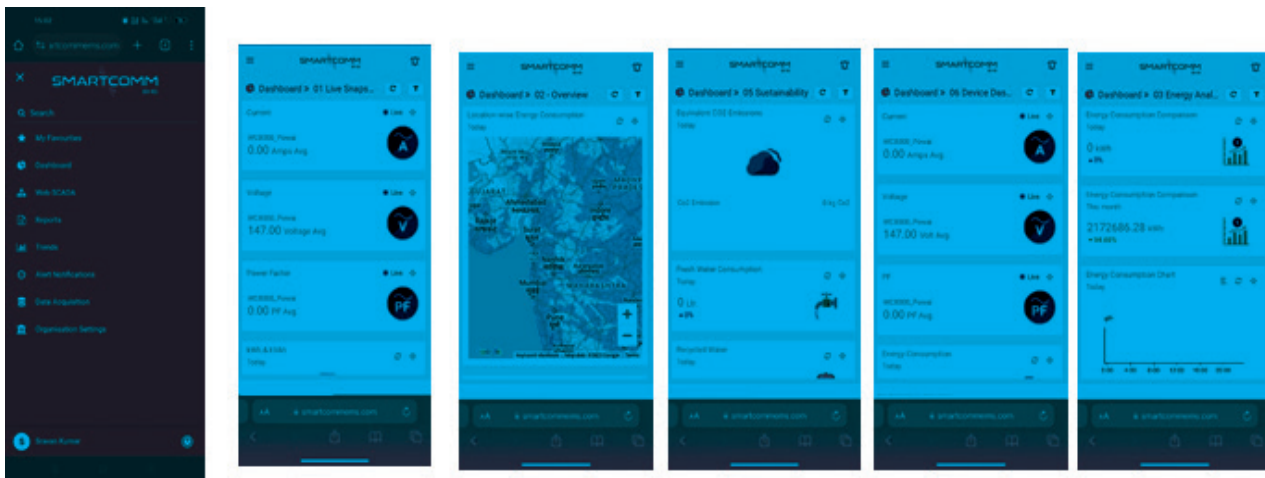
Multi-tenant-based monitoring:

In SmartComm EMS, Multi-Tenant based monitoring streamlines energy management for multiple users or organizations, offering cost-sharing benefits, centralized control, and enhanced collaboration. It optimizes resource allocation, promotes efficient energy use, and facilitates data-driven decisions.

Features

Billing Module:

SmartComm EMS Cloud

Applications

Buildings – Energy Performance Index

In large commercial buildings, optimising energy usage is getting tedious because of lack of proper indicators/tracking. Energy Performance Index (EPI) is the key metric used for benchmarking energy usage in commercial building. Tracking EPI with SmartComm EMS Cloud will lead to

› Improved efficiency
› Cost savings in a traditional grid and even better in a smart/intelligent grid
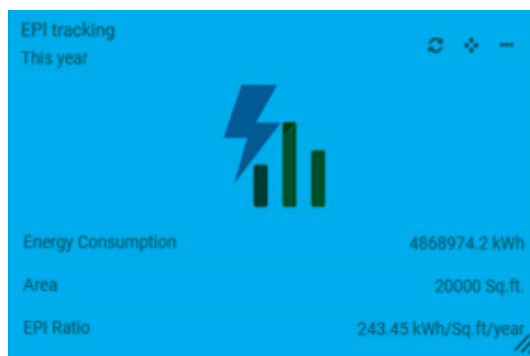
Large-scale industries - Distribution losses tracking

Control wiring become a pain-point when it comes to large organisations. This will not be a problem when we are using MQTT gateways to connect wirelessly to the cloud over internet. Distribution losses are well-pronounced when it comes to large-scale industries and Process industries where cable losses cannot be neglected. SmartComm EMS enables monitoring and tracking of the difference between Incoming and Outgoing feeders, which will give a very good estimate and an idea about the distribution losses in the system which will be invaluable when it comes to taking proper action to cut down costs.

Distribution Loss...
Last 15 minutes

Incoming Feeder	19662.3 KWh
Outgoing Feeder 1	9830.4 KWh
Outgoing Feeder 2	9830.4 KWh
Outgoing Total	19660.8 KWh
Distribution loss	1.5 KWh
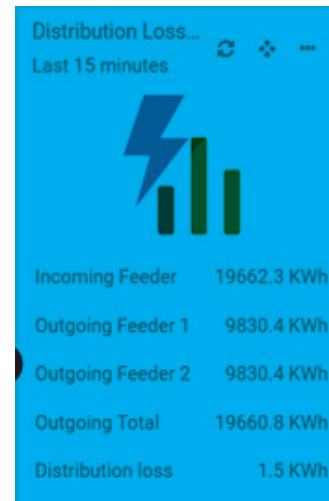
OEMs – Equipment/Tool Optimization

SmartComm EMS Cloud will help to come up with a strategy to identify and address inefficiency should be made and the best possible plan would be Equipment/Tool Optimization through real-time monitoring of identical machines for any discrepancy in operation and implementing a fix.

Equipment Efficiency
Today

| Total Energy Consumed | 1.5 | kWh |
| Energy efficiency | 0.8 | |
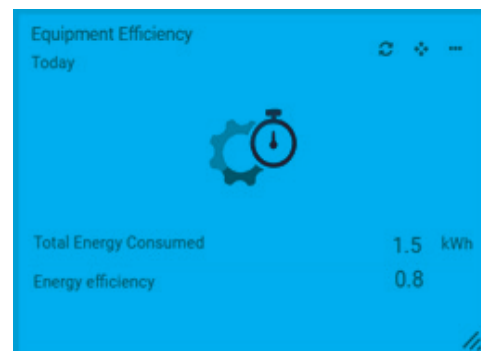
Renewable Energy Integration

SmartComm EMS Cloud will help

IT and Data Centers – Power Usage Effectiveness

Data centers are driven constantly by the need to store data in a smaller space with less energy requirements day-by-day as the quantity of data to be stored is rising in humongous amounts. With SmartComm EMS Cloud, we can calculate the efficiency by tracking a parameter called Power Usage Effectiveness PUE which is a direct measure of how well the energy is used to store and transfer data.
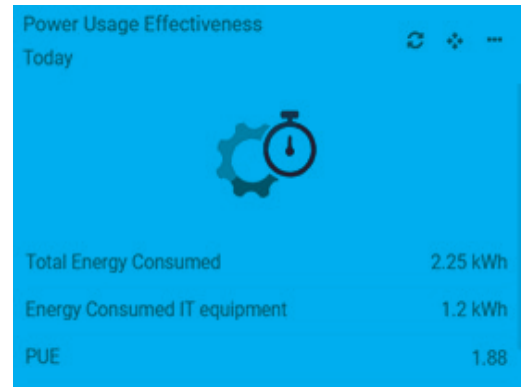
Peak Demand Management

Live tracking of maximum demand will be helpful for the operators and supervisors to take immediate action to keep things under their control. When this is combined with Alert notifications through E-mail and SMS, things get easier and error-free, resulting in a better scenario for everyone. Benchmarking based on priority makes it easier to track data seamlessly.

With the help of SmartComm EMS Cloud, we will be able to act smart by implementing:

MDI tracking: To control Maximum demand, we must measure and monitor systematically first.

Peak Demand Strategy: Once MDI data is there, we can make plans to control peak demand. We will get a clear idea about the load profiles of all the loads on the premises that we can profitably change to fit in with the system.

Planning for Load Scheduling: ToD based tariff can become very profitable when load profiles, individual consumptions are known, and Load is scheduled after data analysis.
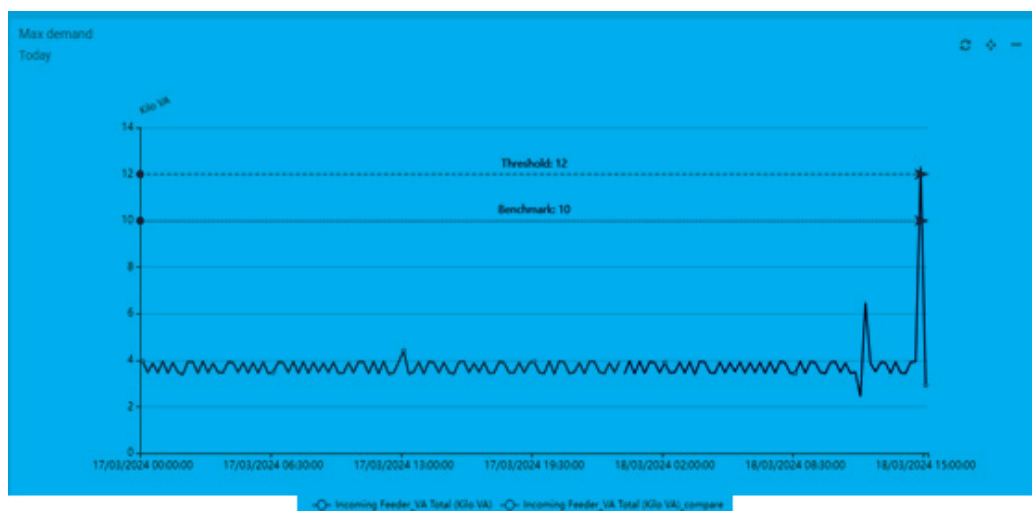
Reactive Power & Power Factor Management

PF tracking is important because it gives a very good idea of useful power, reactive power, and Apparent power in the system. Transformers draw in large magnetizing current (inrush) on charging and Induction motors consume a decent amount of reactive power for operation. Apart from these, due to reactance in the circuit, Reactive power consumption turns out to be a reasonable amount and affects costs and performance.

› PF Chart is available by default. This helps with long-term analysis and helps us to manage reactive power in the long run.

› Alerts can be set for effective monitoring of PF so that you would never need to pay a penalty again.
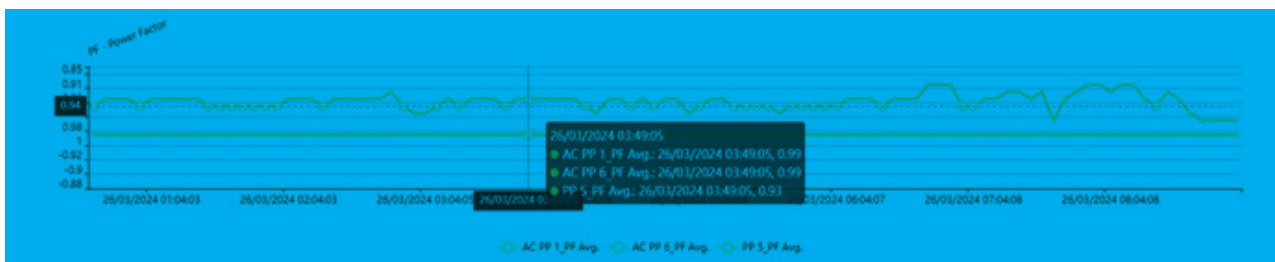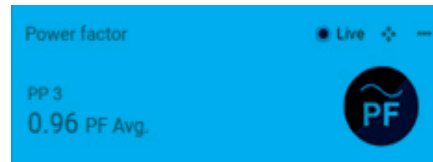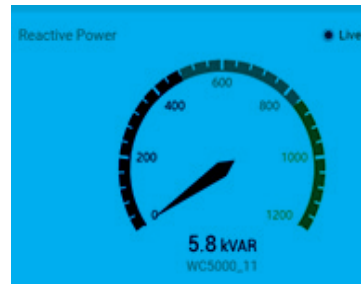
Power Quality

Power Quality dashboard prevents sensitive equipment damage by identifying harmful harmonics that can damage sensitive equipment, saving you costly repairs and downtime. SmartComm EMS Cloud will help safeguard your investments by protecting your electrical infrastructure and investments by proactively identifying and resolving harmonics-related issues before they escalate.
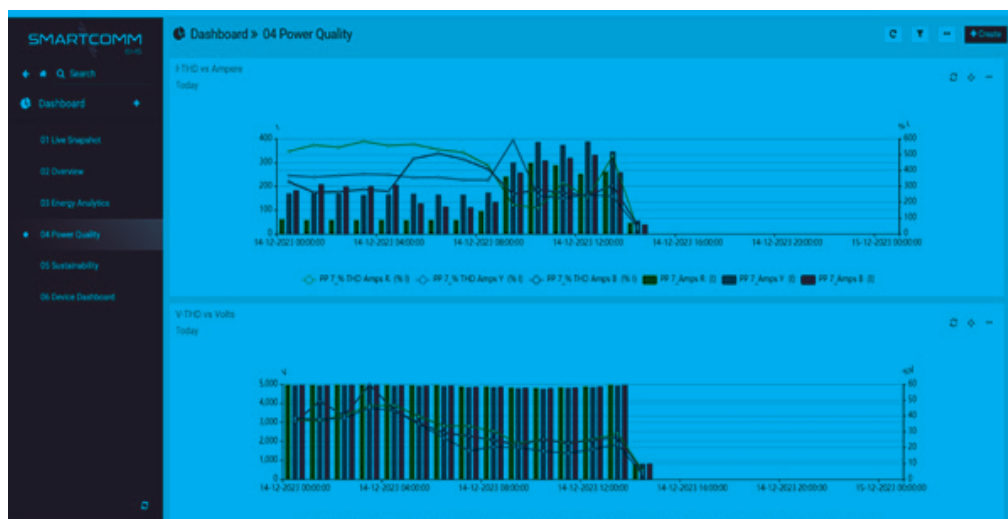
Architecture

The MQTT gateways allows us to seamlessly connect our communication-capable field devices with SmartComm EMS Cloud. It's important to note that the specific architecture of EMS Cloud can vary depending on the different devices locations, customer requirements, and the complexity of the energy management needs. Architecture can be tailored to meet specific organizational requirements.
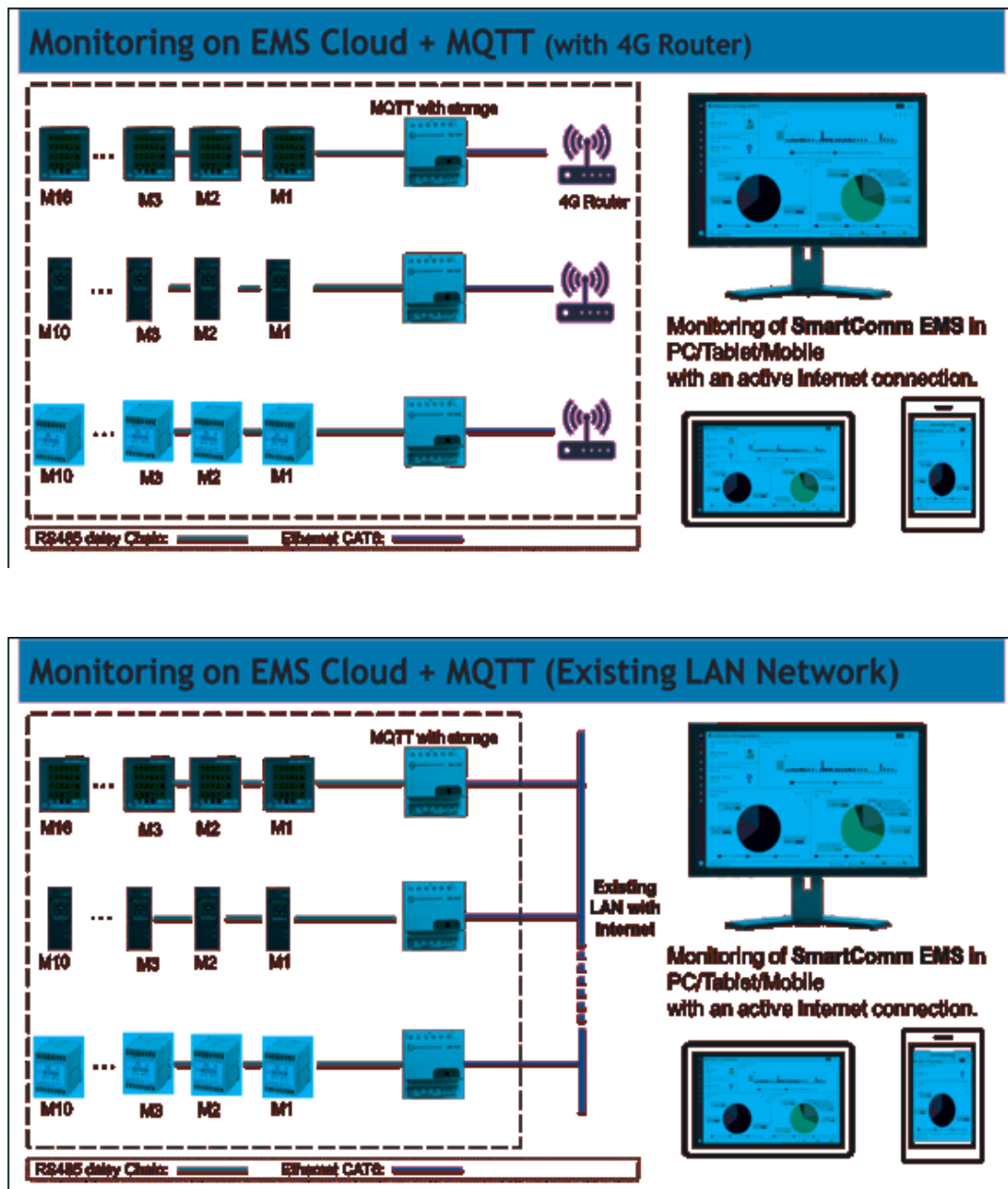
MQ 1000

MQ1000 is an IoT Gateway that converts MODBUS RTU to MQTT (Message Queuing Telemetry Transport) protocol. It bridges the communication-capable products with RS485 port with Smartcomm EMS Cloud that can drive Industry 5.0 which includes Cloud and Big Data processing installed in a remote powerful cloud server and thereby leading to connected and super- intelligent field devices.

Salient Features

› Plug and play with Smartcomm EMS/PMS Cloud since the default settings is good to go with.

› Secure Connection with Smartcomm Cloud.

› Completely isolated in both RS485 and RJ45 side

› Web browser-based configuration.

› Completely field configurable like device addition, baud rate, parity, slave id can be configured as required.

Datasheet

MQ1000OOOO	MQTT Gateway with ethernet port	
Power Supply	230V AC, -10% to +25%	
Protocol	MODBUS RTU, MQTT Client	
Supports MQTT-TLS	Yes, PEM formatted certificate only.	
Configuration Management	Web Server based configuration	
Serial Interface	Number of Serial Ports	1
	Serial Port RS485	D+, D-; 2 pin male & female Connector
	Serial Communication Parameters	Baud Rate: 2400 to 921 Kbps
		Parity: Odd, Even, None
		Stop Bits: 1, 2
	Terminating Resistor	Connect externally if required
LAN Interface	Port	1 RJ45, Ethernet 10/100 Mbps
Environmental Characteristics	Operating Temperature	0° to +60°C
	Storage Temperature	-25 to +70 °C
	Degree of Protection	IP20 for Terminals
	Protection	RS 485-with Surge protection of 15 kV ESD. Ethernet - RJ45 with magnetic protection up to 1.5KV
Mechanical Specifications	Mounting	DIN Rail
	Dimensions	90 x 72 x 67 mm
	Weight (Unpacked)	350 g
Certifications	CE, RoHS	

MQ 1000

Wiring Diagram

› The RS485 devices are looped and connected to the D+, D- terminal of the MQ1000 device.

› MQ1000 is connected to an Internet router/Internal LAN network having Internet connection, using CAT6 cable.
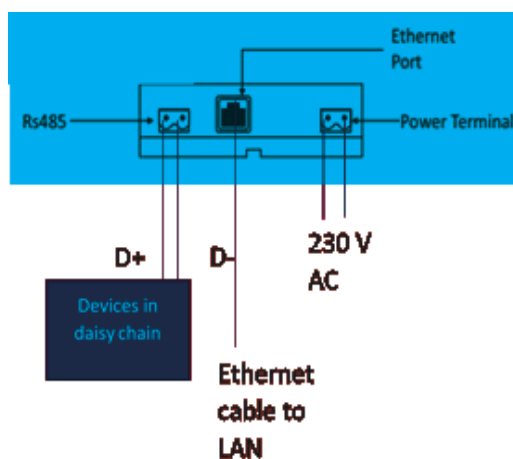
Mechanical Dimensions
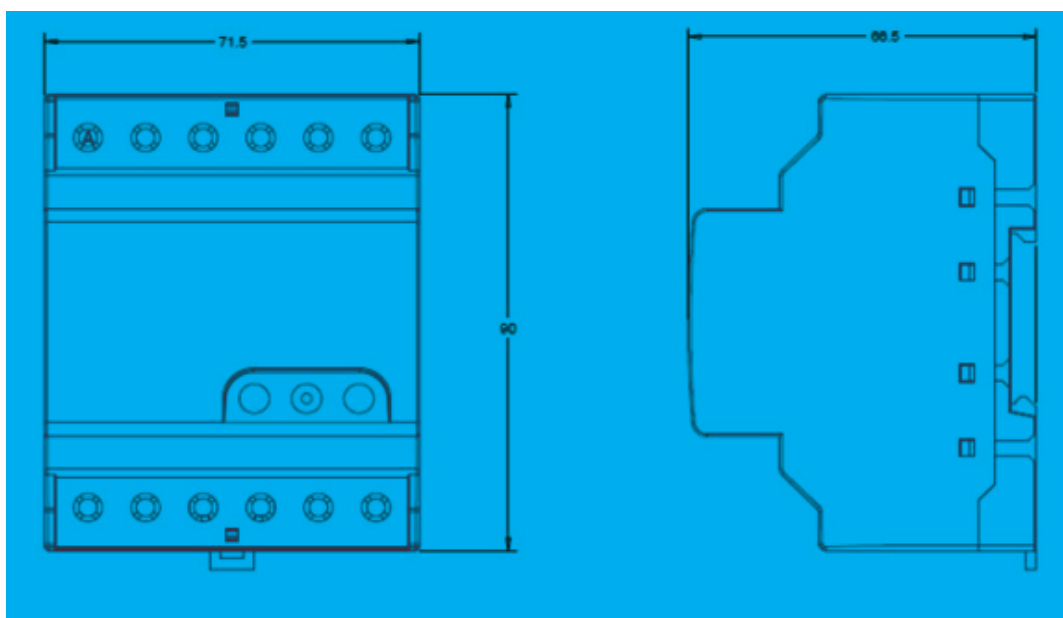
Dimension and Connection Diagrams

96 X 96: 11XX,13XX, 4000, 4040, 41XX, 44XX, 50XX, 60XX
(in case of meters with ethernet module the depth is 86mm)

$92 \, {}^{+0.8}_{-0.0}$

$92 \, {}^{+0.8}_{-0.0}$

90mm

9mm
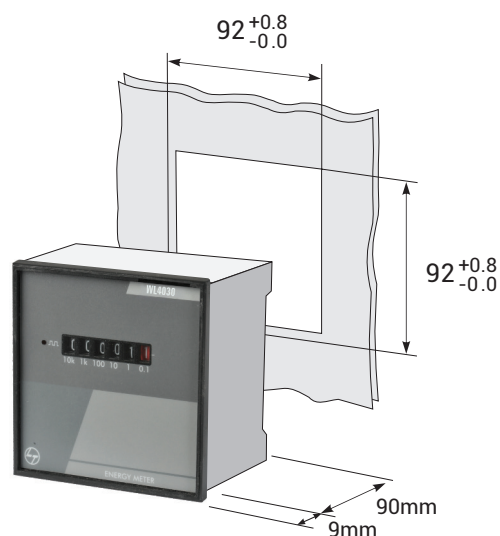
96 X 96: 4030

DIN Meter: 4010, 4020

67   36   90   35   45   49

WD4010

67   90   45   9   49
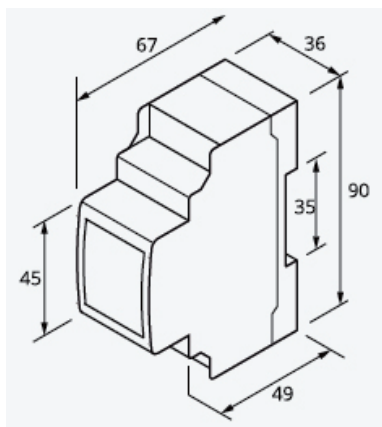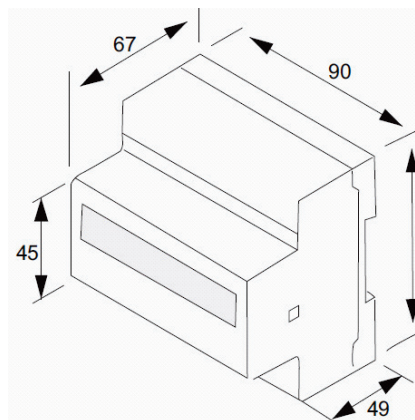
WD4020

Connection Diagrams

Load   Line
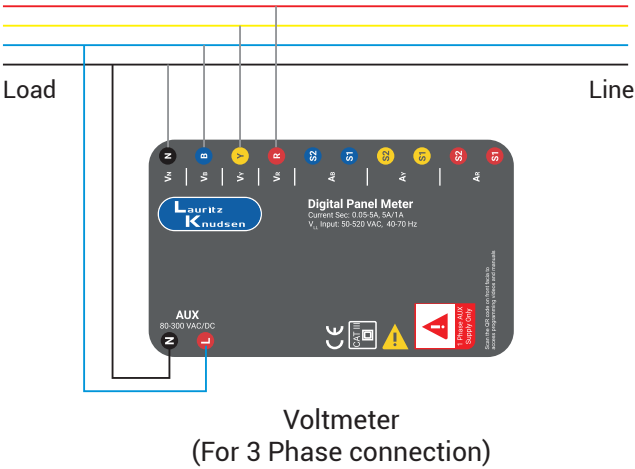
Voltmeter
(For 3 Phase connection)
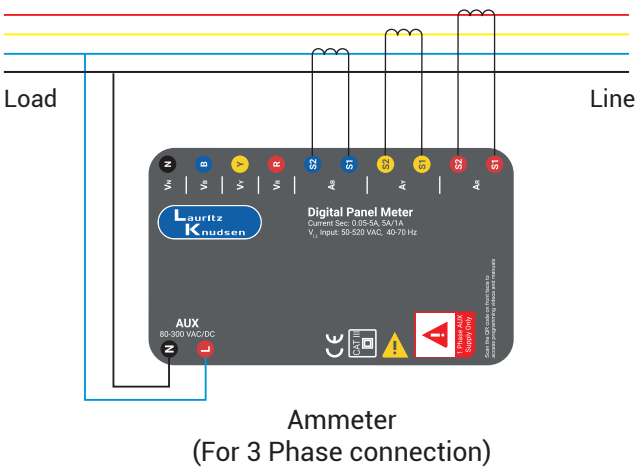
Load   Line

Ammeter
(For 3 Phase connection)

Load   Line

Frequency Meters

Received (Import) ⬌ Delivered (Export)

Load   Line

3 Phase 4 Wire System

Received (Import) ⬌ Delivered (Export)

Load   Line

3 Phase 3 Wire System

Received (Import) ⬌ Delivered (Export)

Load   Line
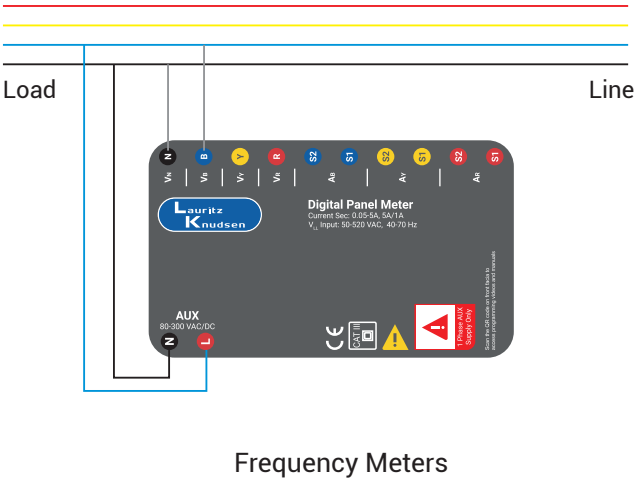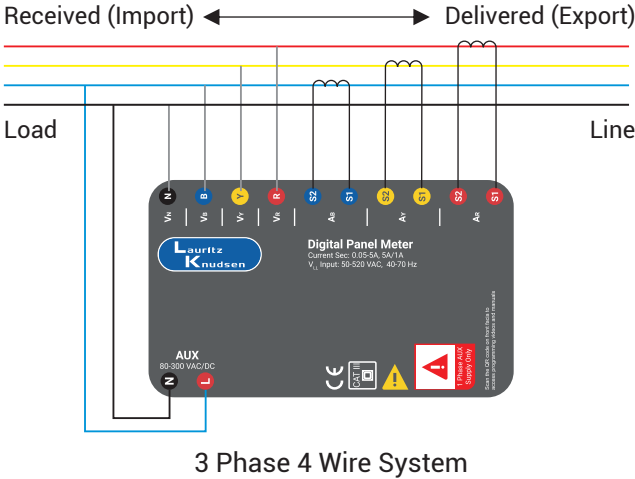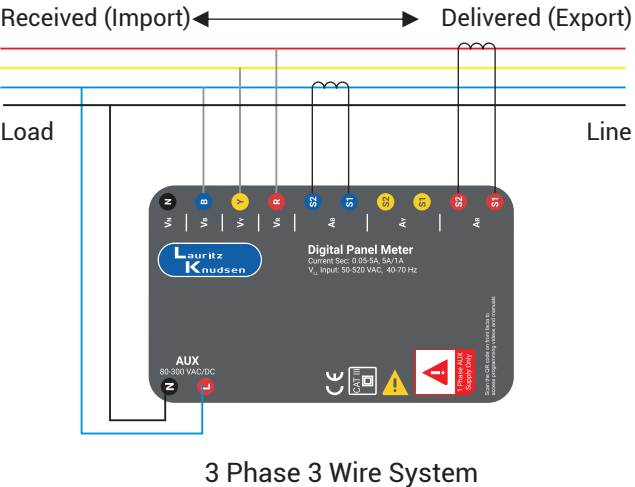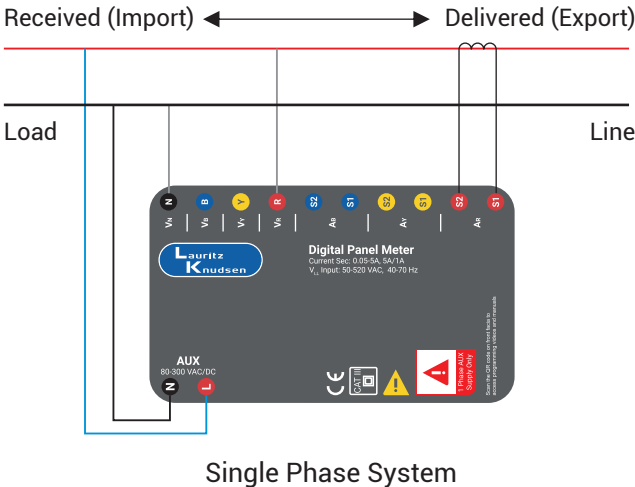
Single Phase System

Connection Diagrams

Dual Source Meter Wiring

MD Controller

Meter with 2 Digital Inputs in
3P 4W configuration

44xx series meter with 2 digital/
relay output in 3P 4W configuration

Meter with 2 Analog Inputs in
3P 4W configuration

Meter with 2 Analog outputs in
3P 4W configuration
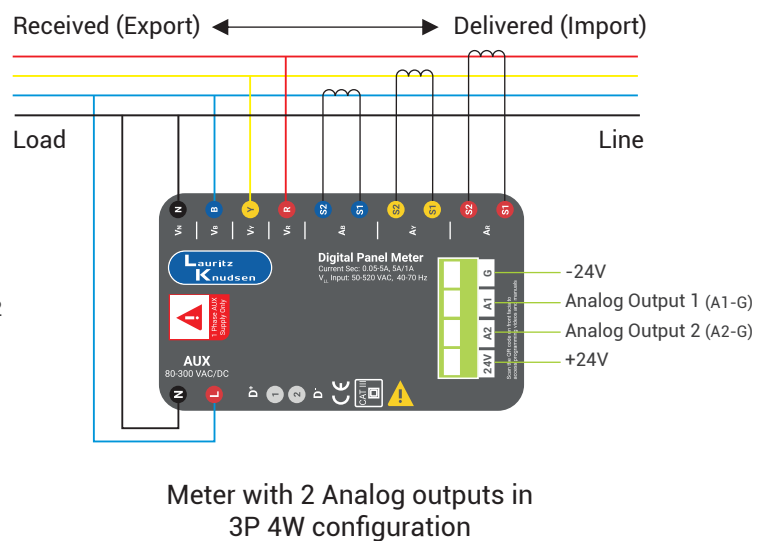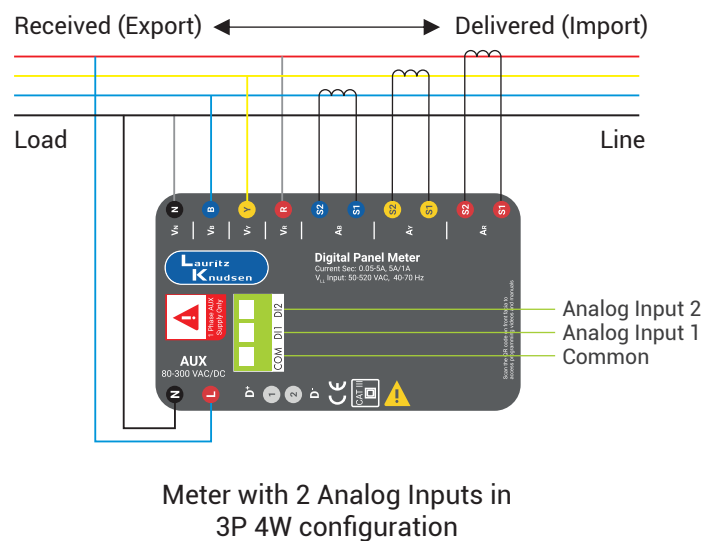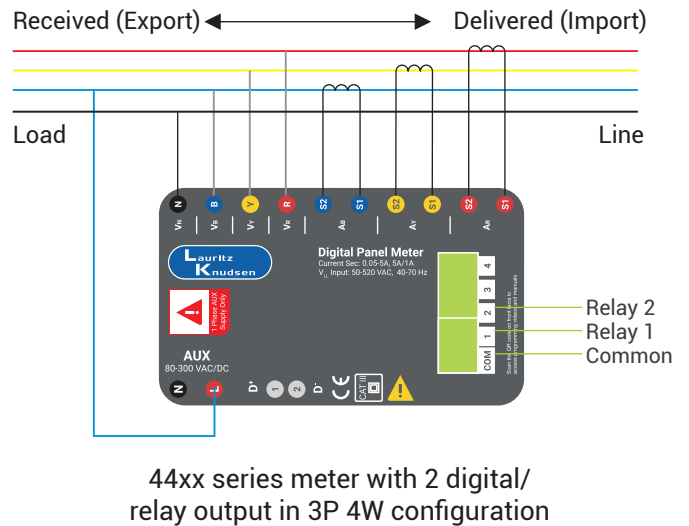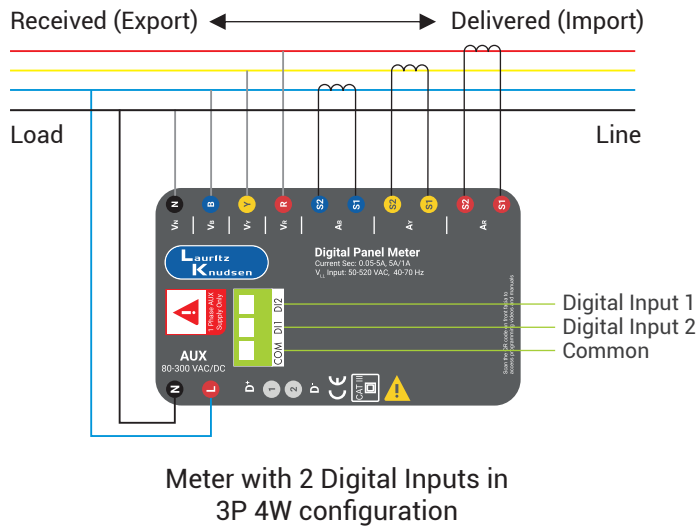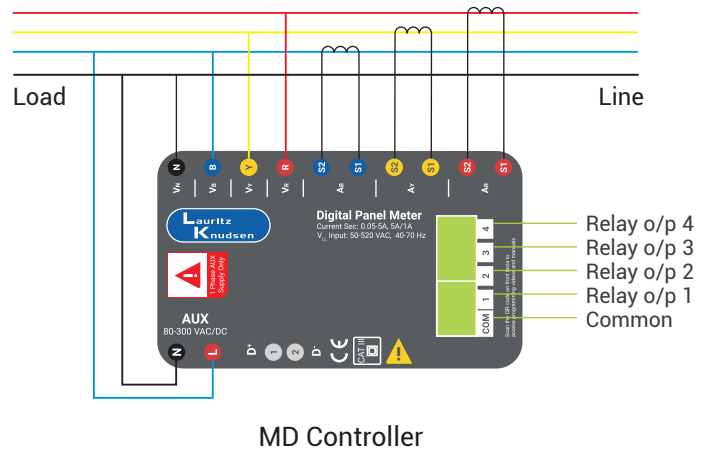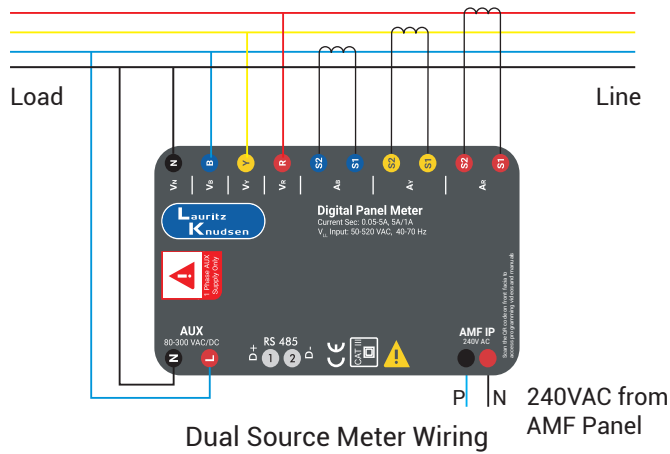
Communication Register Map

Sl. No.	Parameter		Address	WC6000/ WL6000	WL5010	WC5000/ WL5000	WC4440/ WL4440	WC4430/ WL4430	WC4420/ WL4420	WC4410/ WL4410	WC4400/ WL4400/ WL4405	WC4000/ WL4000	WC4040/ WL4040	WL4110
1	Watts Total	float	40101	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	
2	Watts R phase	float	40103	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	
3	Watts Y phase	float	40105	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	
4	Watts B phase	float	40107	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	
5	VAr Total	float	40109	✓	✓	✓	✓	✓	✓	✓				
6	VAr R phase	float	40111	✓	✓	✓	✓	✓	✓	✓				
7	VAr Y phase	float	40113	✓	✓	✓	✓	✓	✓	✓				
8	VAr B phase	float	40115	✓	✓	✓	✓	✓	✓	✓				
9	PF Avg (inst)	float	40117	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	✓
10	PF R phase	float	40119	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	✓
11	PF Y phase	float	40121	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	✓
12	PF B phase	float	40123	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	✓
13	VA Total	float	40125	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	
14	VA R phase	float	40127	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	
15	VA Y phase	float	40129	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	
16	VA B phase	float	40131	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	
17	VLL average	float	40133	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
18	Vry phase	float	40135	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
19	Vyb phase	float	40137	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
20	Vbr phase	float	40139	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
21	VLN average	float	40141	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
22	V R phase	float	40143	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
23	V Y phase	float	40145	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
24	V B phase	float	40147	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
25	Current Total	float	40149	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
26	Current R phase	float	40151	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
27	Current Y phase	float	40153	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
28	Current B phase	float	40155	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
29	Frequency	float	40157	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
30	Wh received [Active energy]	float	40159	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓Prog	✓Prog	
31	VAh received	float	40161	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓Prog	✓Prog	
32	VArh Ind. Received	float	40163	✓	✓	✓	✓	✓	✓	✓				
33	VArh Cap. Received	float	40165	✓	✓	✓	✓	✓	✓	✓				
34	Wh Delivered	float	40167		✓	✓	✓				✓			
35	VAh Delivered	float	40169		✓	✓	✓				✓			
36	VArh Ind. Delivered	float	40171		✓	✓	✓				✓			
37	VArh Cap. Delivered	float	40173		✓	✓	✓				✓			
38	PF Average Received	float	40175	✓	✓	✓	✓	✓	✓	✓				
39	Amps hours Received	float	40177	✓	✓	✓	✓	✓	✓	✓				
40	PF Average Delivered	float	40179		✓	✓	✓				✓			
41	Amps hours Delivered	float	40181		✓	✓	✓				✓			
42	Neutral Current	float	40183	✓	✓	✓	✓	✓	✓	✓				
43	THD% Voltage R	float	40185	✓	✓	✓	✓	✓	✓	✓				

No.	Parameter	Type	Register															
44	THD% Voltage Y	float	40187	✓	✓	✓	✓	✓	✓	✓							
45	THD% Voltage B	float	40189	✓	✓	✓	✓	✓	✓	✓							
46	THD% Current R	float	40191	✓	✓	✓	✓	✓	✓	✓							
47	THD% Current Y	float	40193	✓	✓	✓	✓	✓	✓	✓							
48	THD% Current B	float	40195	✓	✓	✓	✓	✓	✓	✓							
49	Rising Demand	float	40197	✓	✓	✓	✓	✓	✓								
50	Forecast Demand	float	40199	✓	✓												
51	Maximum Demand	float	40201	✓	✓	✓	✓	✓	✓								
52	Reserved	float	40203														
53	Reserved	float	40205														
54	Reserved	float	40207														
55	RPM	float	40215	✓	✓	✓	✓	✓	✓	✓							✓
56	Load Hours Received	Un-signed long	40217	✓	✓	✓	✓	✓	✓	✓	✓		✓				
57	Load Hours Delivered	Un-signed long	40219		✓	✓		✓					✓				
58	No of interruptions	Un-signed long	40221	✓	✓	✓	✓	✓	✓	✓							
59	MD Occurrence time	Un-signed long	40223	✓	✓	✓	✓										
60	ON hours (in seconds)	Un-signed long	40231	✓	✓	✓	✓	✓	✓	✓							
61	Voltage R phase angle	float	40233	✓	✓	✓	✓	✓	✓	✓							
62	Voltage Y phase angle	float	40235	✓	✓	✓	✓	✓	✓	✓							
63	Voltage B phase angle	float	40237	✓	✓	✓	✓	✓	✓	✓							
64	Current R phase angle	float	40239	✓	✓	✓	✓	✓	✓	✓							
65	Current Y phase angle	float	40241	✓	✓	✓	✓	✓	✓	✓							
66	Current B phase angle	float	40243	✓	✓	✓	✓	✓	✓	✓							
67	Energy TOD Slot-1	float	40245	✓													
68	Energy TOD Slot-2	float	40247	✓													
69	Energy TOD Slot-3	float	40249	✓													
70	Energy TOD Slot-4	float	40251	✓													
71	Energy TOD Slot-5	float	40253	✓													
72	Energy TOD Slot-6	float	40255	✓													
73	Reserved	float	40257														
74	Voltage Unbal R Phase	float	40259	✓	✓	✓	✓	✓	✓	✓							
75	Voltage Unbal Y Phase	float	40261	✓	✓	✓	✓	✓	✓	✓							
76	Voltage Unbal B Phase	float	40263	✓	✓	✓	✓	✓	✓	✓							
77	Current Unbal R Phase	float	40265	✓	✓	✓	✓	✓	✓	✓							
78	Current Unbal Y Phase	float	40267	✓	✓	✓	✓	✓	✓	✓							
79	Current Unbal B Phase	float	40269	✓	✓	✓	✓	✓	✓	✓							
80	Additional Load	float	40271	✓													
81	Analog input 1	float	40273			✓#				✓#							
82	Analog input 2	float	40275			✓#				✓#							
83	Digital input 1	float	40277			✓#											
84	Digital input 2	Un-signed long	40279			✓#											
85	Digital input 3	Un-signed long	40281														

#	Parameter	Type	Register														
86	Digital input 4	Un-signed long	40283														
87	VLL Max	Un-signed long	40285	✓	✓	✓	✓	✓	✓	✓							
88	VLL Min	float	40287	✓	✓	✓	✓	✓	✓	✓							
89	VLN Max	float	40289	✓	✓	✓	✓	✓	✓	✓							
90	VLN Min	float	40291	✓	✓	✓	✓	✓	✓	✓							
91	Amps Max	float	40293	✓	✓	✓	✓	✓	✓	✓							
92	Amps Min	float	40295	✓	✓	✓	✓	✓	✓	✓							
93	Frequency Max	float	40297	✓	✓	✓	✓	✓	✓	✓							
94	Frequency Min	float	40299	✓	✓	✓	✓	✓	✓	✓							
95	Watts Max	float	40301	✓	✓	✓	✓	✓	✓	✓							
96	Watts Min	float	40303	✓	✓	✓	✓	✓	✓	✓							
97	VAr max (absolute max)	float	40305	✓	✓	✓	✓	✓	✓	✓							
98	VAr min (absolute min)	float	40307	✓	✓	✓	✓	✓	✓	✓							
99	VA max	float	40309	✓	✓	✓	✓	✓	✓	✓							
100	VA min	float	40311	✓	✓	✓	✓	✓	✓	✓							
101	PF max (absolute max)	float	40313	✓	✓	✓	✓	✓	✓	✓							
102	PF min (absolute min)	float	40315	✓	✓	✓	✓	✓	✓	✓							
103	Analog input 1 max	float	40317							✓#							
104	Analog input 1 Min	float	40319							✓#							
105	Analog input 2 Max	float	40321							✓#							
106	Analog input 2 min	float	40323							✓#							
107	Maximum demand TOD slot 1	float	40325	✓													
108	Maximum demand TOD slot 2	float	40327	✓													
109	Maximum demand TOD slot 3	float	40329	✓													
110	Maximum demand TOD slot 4	float	40331	✓													
111	Maximum demand TOD slot 5	float	40333	✓													
112	Maximum demand TOD slot 6	float	40335	✓													
113	Maximum demand TOD slot 1 occ Time	Un-signed long	40337	✓													
114	Maximum demand TOD slot 1 occ Date	Un-signed long	40339	✓													
115	Maximum demand TOD slot 2 occ Time	Un-signed long	40341	✓													
116	Maximum demand TOD slot 2 occ Date	Un-signed long	40343	✓													
117	Maximum demand TOD slot 3 occ Time	Un-signed long	40345	✓													
118	Maximum demand TOD slot 3 occ Date	Un-signed long	40347	✓													
119	Maximum demand TOD slot 4 occ Time	Un-signed long	40349	✓													
120	Maximum demand TOD slot 4 occ Date	Un-signed long	40351	✓													
121	Maximum demand TOD slot 5 occ Time	Un-signed long	40353	✓													
122	Maximum demand TOD slot 5 occ Date	Un-signed long	40355	✓													

No	Parameter	Type	Register													
123	Maximum demand TOD slot 6 occ Time	Un-signed long	40357	✓												
124	Maximum demand TOD slot 6 occ Date	Un-signed long	40359	✓												
125	THD% Voltage R	float	40479	✓	✓	✓	✓	✓	✓	✓						
126	THD% Voltage Y	float	40481	✓	✓	✓	✓	✓	✓	✓						
127	THD% Voltage B	float	40483	✓	✓	✓	✓	✓	✓	✓						
128	THD% Current R	float	40485	✓	✓	✓	✓	✓	✓	✓						
129	THD% Current Y	float	40487	✓	✓	✓	✓	✓	✓	✓						
130	THD% Current B	float	40489	✓	✓	✓	✓	✓	✓	✓						
131	K factor Voltage R phase	float	40491	✓	✓	✓	✓	✓	✓	✓						
132	K factor Voltage Y phase	float	40493	✓	✓	✓	✓	✓	✓	✓						
133	K factor Voltage B phase	float	40495	✓	✓	✓	✓	✓	✓	✓						
134	K factor Current R phase	float	40497	✓	✓	✓	✓	✓	✓	✓						
135	K factor Current Y phase	float	40499	✓	✓	✓	✓	✓	✓	✓						
136	K factor Current B phase	float	40501	✓	✓	✓	✓	✓	✓	✓						
137	3rd harmonics Voltage R phase	float	40503		✓	✓										
138	3rd harmonics Voltage Y phase	float	40505		✓	✓										
139	3rd harmonics Voltage B phase	float	40507		✓	✓										
140	3rd harmonics Current R phase	float	40509		✓	✓										
141	3rd harmonics Current Y phase	float	40511		✓	✓										
142	3rd harmonics Current B phase	float	40513		✓	✓										
143	5th harmonics Voltage R phase	float	40515		✓	✓										
144	5th harmonics Voltage Y phase	float	40517		✓	✓										
145	5th harmonics Voltage B phase	float	40519		✓	✓										
146	5th harmonics Current R phase	float	40521		✓	✓										
147	5th harmonics Current Y phase	float	40523		✓	✓										
148	5th harmonics Current B phase	float	40525		✓	✓										
149	7th harmonics Voltage R phase	float	40527		✓	✓										
150	7th harmonics Voltage Y phase	float	40529		✓	✓										
151	7th harmonics Voltage B phase	float	40531		✓	✓										
152	7th harmonics Current R phase	float	40533		✓	✓										
153	7th harmonics Current Y phase	float	40535		✓	✓										
154	7th harmonics Current B phase	float	40537		✓	✓										
155	9th harmonics Voltage R phase	float	40539		✓	✓										
156	9th harmonics Voltage Y phase	float	40541		✓	✓										
157	9th harmonics Voltage B phase	float	40543		✓	✓										
158	9th harmonics Current R phase	float	40545		✓	✓										

159	9th harmonics Current Y phase	float	40547		✓	✓									
160	9th harmonics Current B phase	float	40549		✓	✓									
161	11th harmonics Voltage R phase	float	40551		✓	✓									
162	11th harmonics Voltage Y phase	float	40553		✓	✓									
163	11th harmonics Voltage B phase	float	40555		✓	✓									
164	11th harmonics Current R phase	float	40557		✓	✓									
165	11th harmonics Current Y phase	float	40559		✓	✓									
166	11th harmonics Current B phase	float	40561		✓	✓									
167	13th harmonics Voltage R phase	float	40563		✓	✓									
168	13th harmonics Voltage Y phase	float	40565		✓	✓									
169	13th harmonics Voltage B phase	float	40567		✓	✓									
170	13th harmonics Current R phase	float	40569		✓	✓									
171	13th harmonics Current Y phase	float	40571		✓	✓									
172	13th harmonics Current B phase	float	40573		✓	✓									
173	15th harmonics Voltage R phase	float	40575		✓	✓									
174	15th harmonics Voltage Y phase	float	40577		✓	✓									
175	15th harmonics Voltage B phase	float	40579		✓	✓									
176	15th harmonics Current R phase	float	40581		✓	✓									
177	15th harmonics Current Y phase	float	40583		✓	✓									
178	15th harmonics Current B phase	float	40585		✓	✓									
179	17th harmonics Voltage R phase	float	40587		✓	✓									
180	17th harmonics Voltage Y phase	float	40589		✓	✓									
181	17th harmonics Voltage B phase	float	40591		✓	✓									
182	17th harmonics Current R phase	float	40593		✓	✓									
183	17th harmonics Current Y phase	float	40595		✓	✓									
184	17th harmonics Current B phase	float	40597		✓	✓									
185	19th harmonics Voltage R phase	float	40599		✓	✓									
186	19th harmonics Voltage Y phase	float	40601		✓	✓									
187	19th harmonics Voltage B phase	float	40603		✓	✓									
188	19th harmonics Current R phase	float	40605		✓	✓									
189	19th harmonics Current Y phase	float	40607		✓	✓									

Address	Parameter	Parameter
10401	Watts	Float
40117	PF. (Instantaneous)	Float
40125	VA	Float
40141	VLN	Float
40149	Current	FloatFloat
40157	Frequency	Float
40159	Wh	Float
40161	VAh received	Float
40215	RPM	Float
40217	Load Hours	Long Inverse
40221	No of Interruptions	Long Inverse

Address	Parameter
Import Load Hour	40217
ON hours	40227
Import Energy [Wh] R phase	40243
Import Energy [Wh] Y phase	40245
Import Energy [Wh] B phase	40247
Import Energy [VAh] R phase	40249
Import Energy [VAh] Y phase	40251
Import Energy [VAh] B phase	40253
Import Load hours R phase	40315
Import Load hours Y phase	40317
Import Load hours B phase	40319
True PF Average	40353
True PF Rph	40355
True PF Yph	40357
True PF Bph	40359
Old Import Wh	40449
Old Import VAh	40451
Old Import Ld.hrs	40457

Digit 1	Digit 2	4040	Digit 3,4,5,6	Digit 7	Digit 8	Digit 9	Digit 10	Digit 11	Digit 12
W	LED (96 X 96)	1110	Single function Ammeter 1P	1	0	O	O	O	O
DPM	MD	1120	Single function Voltmeter 1P	Class 1	NO port	Nil	Nil	Nil	Nil
	High-Low values	1130	Single function Freq meter 1P	2	1	A	A	A	A
		1310	Single function Ammeter 3P	Class 0.5	RS485 port	1 A i/p	1 A o/p	1 D i/p	1 D o/p
		1320	Single function Voltmeter 3P	3	2	B	B	B	B
		4000	kWh meter	Class 0.5S	Ethernet	2 A i/p	2 A o/p	2 D i/p	2 D o/p
		4030	kWh Counter type meter	4	3	C			C
		4040	Dual source meter	Class 0.2	Ethernet & RS485 port	Pulse o/p			3 D o/p
		4110	VAF + PF meter	5					D
		4400	MFM Basic with 1 line display	Class 0.2S					4 D o/p
		4405	MFM Basic with 3 line display						
		4410	MFM Basic + THD						
		4420	MFM Basic + THD + MD without RTC						
		4430	MFM Basic + THD + MD + IE						
		4440	MFM Basic + THD + MD RTC						
		5000	MFM Basic + THD + MD + Ind Harmonics + Data log + RTC						
		5010	MFM Basic + THD + MD + Ind Harmonics + RTC						
		6000	Maximum Demand Controller						

* Same four digit will apply for LED and LCD meter
* Digit 7 to 12 - selected combinations available

Essentials

User interface information

1. Reset Values

This is snapshot of kWh values taken at the time of the resetting the values. This energy value is stored in Wh.O (Old energy) register. The last reset energy value can be stored accessed.

This can be achieved by clearing the parameter values by pressing up and down buttons simultaneously and entering the programming password in 44XX series and above. In Basic meters this can be achieved by going to programming mode.

Description	Parameters cleared	4040	4000	4400 and 4405	4410	4420	4430	4440	5000 and 5010	6000
Integrator values	Energy, Load hrs, No. of interruptions, Ah, PF Avg	Yes (DG register also)	Yes	Yes	Yes	Yes	Yes (Export also)	Yes	Yes (Export also)	Yes (all slots)
Max Demand	MD	-	-	-	-	Yes	Yes	Yes	Yes	Yes (all slots)
Events	High-Low values	-	-	-	Yes	Yes	Yes	Yes	Yes	Yes

2. Freeze mode

Parameters shown on the display page auto scroll every 5 secs (programmable from 1 to 10 sec). Any page can be freezed by pressing the down button for 6 secs, go to page which has to be freezed and leave it. The last seen page would be the freezed page.

3. Monitoring True Power factor using DPM

1. Displacement PF - The power factor which is due to the phase shift between voltage and current at the fundamental frequency is known as displacement power factor.

Displacement PF = $\dfrac{P}{V_1 I_1}$

2. Distortion PF - The power factor which includes the effect of harmonics present in the system is called distortion power factor.

Displacement PF = $\dfrac{1}{\sqrt{1 + (\% \text{ iTHD}/100)^2}}$ X $\dfrac{1}{\sqrt{1 + (\% \text{ vTHD}/100)^2}}$

Digital Panel meters offers selection of PF types by means of VA selection methods. To achieve this, enter in programming mode of DPM and drill down to VA selection option.

1. Displacement PF : To display Displacement PF, select Vector Harmonics VA.

2. True PF : To display True PF, select Arithmetic VA.

3. True PF - It is defined as the ratio of average power to apparent power. Both the above power factors together combine to form the True power factor.

Displacement PF = $\dfrac{P}{V_{ms} I_{ms}}$

4. Energy display

Active energy display is available in resolution mode (default) or counter mode.

In Resolution mode when energy reading reaches 9999.xx Wh it will next scale to 10.xxxx kWh, once it reaches 9999.xx kWh it scales to 10.xxxx MWh, once it reaches to 9999.xx MWh it scales to 10.xxxx GWh.

In Counter mode, the energy reading will be fixed at kWh or MWh or GWh. It depends on the CT primary and PT primary values. Following table denotes the same:

Wh or VAh Monitoring

The meter is site selectable for kWh or kVAh monitoring. Helps in reduced inventory as well as flexibility to select any one energy parameter.

Energy selection either as Wh or VAh is available in 4000, 4400 and 4405 series

Full Scale (√3 X PT pri X CT pri) / 1000	Fixed unit of display
0.4 - 400	kWh
400.1 - 400M	MWh
400M - 4000M	GWh

5. Favourite screen
LCD Multifunction Meter 44XX, 50XX Series

My Favourite Screen

Customer can customise display page with 3 parameters. Select from W, F, A, VLL, VA, PF along with constant Wh. This screen can also be freezed if required.

6. Continuous Energy display
LCD Multifunction Meter 44XX, 50XX Series

Continuous Energy Monitoring

In auto scroll mode, the parameters in first two rows will keep on scrolling but Wh can be continuously seen.

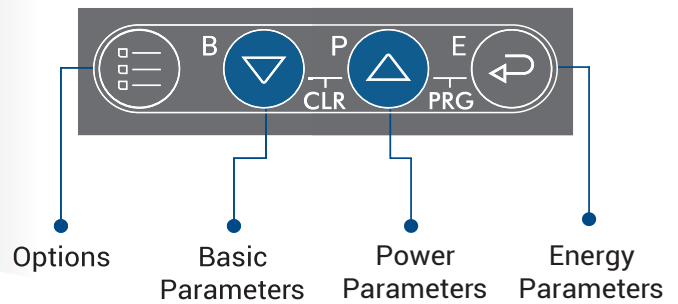With this customer can monitor other parameters with continuous eye on energy.

Menu driven buttons
for super quick access to parameters

Options · Basic Parameters · Power Parameters · Energy Parameters

Parameters will be available on screen based on respective meter model

Options	Fixed unit of display	Power	Energy
Running demand (Rd), Maximum demand (Md), Forecast demand (Fd), Additional load (AL)$	LL, LN, A, F - avg	W, VA, VAr, PF - avg	kWh, kVAh
Maximum demand - date and time with MD value	LL, LN, A - wAvg and Individual phases	W, VA, VAr, PF - Avg and Individual phases	kVArh - Lag and Lead
RTC date and time	V and A Phase angle - Avg and Individual phases		PF avg, Ah
Baud rate, Parity, Slave id	An, RPM		Load hours in xxxxxx hours, xx min, xx sec
My Favourite screen$$	V and A for Phase unbalance - Avg and Individual phases		Interrupts
High - Low for VLL, VLn, A, F, W, VA, VAr, PF with date and time$$$	THD for V, I - Individual phases		On hours in xxxxxx hours, xx min, xx sec
Waveform - V, A - all 3 phases individually	V and A for K factor - Individual phases Individual harmonics upto 31st for V, I - Individual phases		Old energy - kWh, KVAh, kVArh - Lag, Lead Old - PF Avg, Ah, Load hours

$ - in a single screen
$$ - only in LCD meters of 4410,4420,4430,4440, 5000 and 6000 series.
$$$ - for meters with Real time clock

Run hours: Meter records the time during which load is connected.
ON hours: Meter records the number of hours the time period for which the auxiliary supply is ON.
Interrupt: Meter records the number of times, the meter sensed an auxiliary supply restart.

8. Meter with Ethernet port

Advanced Multifunction Meter WC5000 Series

To access or modify the settings, ip address has to be typed in url of browser (default 192.168.5.175) with user name as admin and password as 12345 (default).

Meter with Ethernet port

Powerful meter with Ethernet port can be site configured as Modbus TCP or Modbus RTU

9. Parameter display on LED meter

Display	Meaning
ᵕ	Watts
UA	Total VA
Ur	Total VAR
PF	Power Factor
ᵞh	Active Energy EB
UAh	Apparent Energy
UArh.L	Reactive Inductive Energy
UArh.C	Reactive Capacitive Energy
AUG	Average
Ld.Hr	Load Hour
L	Lagging Power Factor
LL	Voltage Line to Line
Ln	Voltage Line to Neutral
rY	Voltage RY Phase
Yb	Voltage YB Phase
br	Voltage BR Phase
HI	High Level of Parameter
Lo	Low Level of Parameter
U.thd	Voltage THD
Ah	Amps hour
A.thd	Amps THD
A.thd31	Amps THD Phasewise upto 31st level
K.FACt.U.	K-Factor V

Display	Meaning
A	Current Average
F	Frequency
An	Neutral Current
rPm	Revolution Per Minute (RPM)
U.Ph.ANG	Voltage Phase Angle
A.Ph.ANG	Current Phase Angle
Un.bAL.U	Unbalance Voltage
Un.bHL.H	Unbalance Current
On.Hr	On Hour
O	Old
CLr	Clear
rd	Rising Demand
Fd	Forecast Demand
md	Maximum Demand
AL	Additional Load
Et	Elapse Time
K.FACt.A.	K-Factor A
Intr	Number of Interrupts
U.thd03	Voltage THD Phasewise upto 31st level
b	Baud Rate
d	Delivered
c	Leading Power Factor

Process Integration

Integration of process parameters such as temperature, oil level, RPM, Pressure etc gives greater flexibility to monitor them along with electrical parameters.

Analog input

Analog input is the process of converting analog signal to the digital for the purpose of analyzing and data logging. Analog input is mainly 0-20mA / 4-20mA (field programmable) for process data monitoring.

The direct relationship between electrical and process parameter and integrating process into the electrical meter provides lots of flexibility for analysis. For eg: temperature of heating coil is directly related to current flowing through coil. Incase if there is any problem in the heating of the coil the current flow through the coil changes will change considerably.

So if analog input full scale value is programmed to 200 and the transducer output is 20mA, the meter will display as 200. The meter displays and communicates to EMS software with the scaled value. For example 0-20mA is the signal and programmed for 1000 degree temperature, at 10mA meter displays 500. The same will be reflected in EMS software also

Analog input provision is applicable in 5000 series of meter

› Field programmable 0 to 20mA or 4 to 20mA inputs.

› Analog input can be programmed to any full scale value by the user. (Range: 0.001 to 9999 M).

› Combination of analog input and digital output provides flexibility for any kind of controlling (Pressure, Low oil, low fuel etc.,)

› Analog input data can be logged along with electrical parameters in case of 5000 series with data logging option.

› Analog input value can be communicated to L&T SmartComm EMS software for further analysis

Analog output

Analog outputs are possible for VLL/ A/ Freq/Watts/PF/VA.

Analog output

Digital outputs are possible for A THD, V THD, VA, W, under PF, under/over (VLL, A, F, Analog input) with programmable trip time (1 to 180 sec) to protect the equipments from electrical abnormalities.

Digital output can be used to initiate alarm when the avg PF crosses the user programmed threshold values (Lead/Lag). Rating of output relays is NO SPST 2A 250VAC/30VDC.

Datalog

Datalog with time stamp provision is available in 5000 series meter. The information can be used for all types of businesses to determine performance, quality, energy consumption patterns, fuel consumption monitoring and many other critical parameters available in the meter. The data can be stored and retrieved through RS485 or Ethernet port.

To select these parameters for data storage in the meter, L&T Smart Log software is required. Time interval to save data is 1m, 5m,10m,15m, 30m, 1h, 2h, 5h, 8h,12 h.

Sample table is shown below for data storage interpretation for number of days storage.

Parameters	Data Log Interval			
	15 Min	30 Min	45 Min	60 Min
	No. of Days			
1	10230	20460	30690	40920
2	6820	13640	20460	27280
4	4092	8184	12276	16368
9	2046	4092	6138	8184
14	1364	2728	4092	5456
29	682	1364	2046	2728

LK SmartLog Software for meters with RS485 port
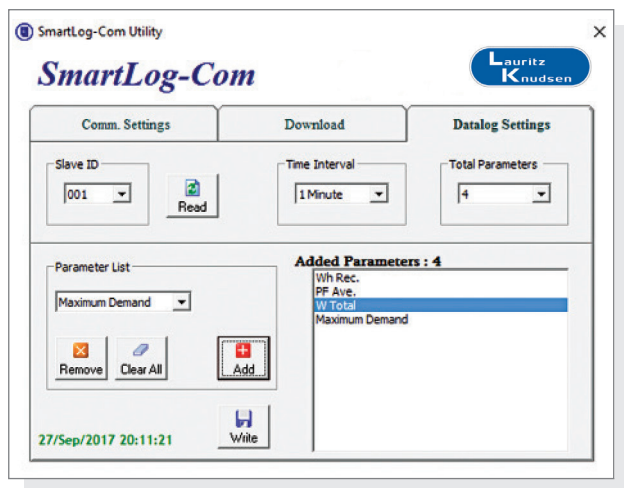
LK SmartLog software for meters with Ethernet port
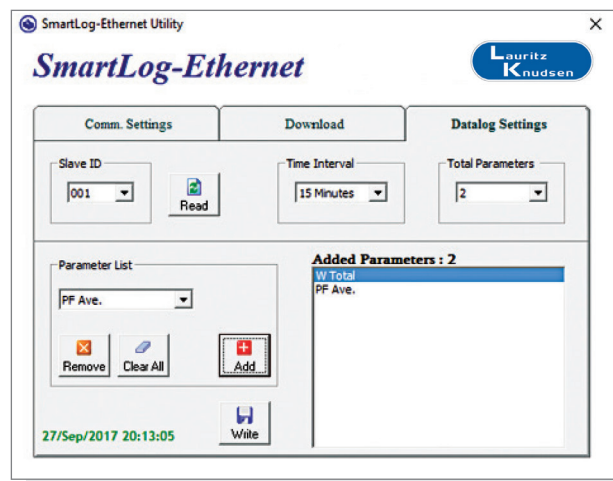
Recommended Practices for Reliable communications from DPM

1. Number of devices to be connected

Industry recommended practice is to use 16 meters in a single loop without a repeater for Transparent gateway.

2. Cable usage

a. Cable type:

Industry used communication cable is a STP (Shielded Twisted Pair). It is recommend to use Belden make 3105A due to its inherent stability. The size of the cable that is recommended is 0.5 / 0.75 sqmm cable.

b. Method of cabling:

There should be at least 1 feet distance of the communication cable from any power cable to avoid electrical noise interference.

c. Termination at gateway

It is recommended to terminate the cables using a DB9 female to terminal block adapter for reliable communication.

d. Shielding

STP cables contains a foil wrapping or copper braid jacket to help shield the cable signals from interference. This must be grounded properly.

e. Length of cable without repeaters.

It is recommended to connect the meters upto 800m distance.

3. Termination resistors
a. Line Termination / termination resistor

A reflection in a transmission line is the result of an impedance discontinuity that a travelling wave sees as it propagates down the line. To minimize the reflections from the end of the RS485-cable it is required to place a line termination near each of the 2 ends of the bus or atleast at the end of nodes with a 120 ohm, 0.5W resistor. The resistors are connected on the D+ and D- terminals of the last meter.

b. Pull up/Pull down resistors

In some critical RS-485 environments, you may need to add termination resistors to prevent the reflection of serial signals. When using termination resistors, it is important to set the pull high/low resistors correctly so that the electrical signal is not corrupted. For each serial port, DIP switches or jumper settings are used to set the pull high/low resistor values.

Gateways like MOXA have inbuilt pull up/pull down in M Gate series. In case of non-consistent communication, termination resistor of pull high /low resistor should be enabled.

These help in maintaining proper level of voltages across the communication bus.

4. Polling speed

The polling speed is dependent on many scenarios based on number of parameters, number of devices in loop, cable used, length of the cable, etc. Although the meter updates the data at an interval of 1 sec, it is recommended for 5 sec for stable communication.

Electrical Standard Products (ESP) Offices

HEAD OFFICE

Lauritz Knudsen Electrical & Automation, A/600, Shil-Mahape Road, TTC Industrial Area, MIDC Thane, Navi Mumbai, 400 710, Maharashtra.
Tel: 022-6722 6300 | **Fax:** 022-6705 1112 | **e-mail:** CIC@LK-EA.com

BRANCH OFFICES

Lauritz Knudsen Electrical & Automation
C-201, The First Commercial Complex,
B/S Keshavbaug Party Plot, Vastrapur,
Ahmedabad - 380 015
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Shri Daneshwari, 1st Floor,
Plot No. 17, 2nd Cross, Near Old Income
Tax Office Road, Vidyanagar,
Hubballi - 580 021
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
No.10, Fortuna Towers, 2nd Floor,
Rana Pratap Marg, Near NBRI,
Lucknow - 226 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
A06/A07, Second Floor,
Grand Chandra Complex, Frazer Road
Patna - 800 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Wework Central, #36 Infantry Road,
Bengaluru - 560 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
AWFIS Space Solutions, Prestige Phoenix,
4th floor, 1405, Umanagar, Begumpet,
Hyderabad - 500 016
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
El Dorado Building, 3rd Floor, 6,
Venkatraman Street, Chinna Chokkikulam,
Madurai - 625 002
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
UrbanWrk, 5th Floor, Sai Radhe,
Raja Bahadur Mill Road, Behind Hotel
Grand Sheraton, Sangamwadi
Pune - 411 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Under O Launchpad, 4th Floor,
Unit-434, Esplanade 1, Rasulgarh,
Bhubaneswar - 751 010
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Workie, 214 - 2nd Floor,
Apollo Premier, PU-4,
Scheme No. 54, Vijay Nagar Square,
Indore - 452 010
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Bestech Business Park,
Tower - A, 2nd floor, Sector - 66
Mohali - 160059
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Office No. 211 & 212, Pithalia Plaza,
KK Road, Near Fafadih Chowk,
Raipur - 492 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation,
801 Word Level-8, No. 28,
SIDCO Industrial Estate, Guindy,
Chennai - 600 032
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Office No. 430, 4th Floor,
Jaipur Electronic Market, Riddhi Siddhi,
Gopalpura Bypass,
Jaipur - 302 018
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
TC II, Tower B, PRIMA BAY Gate No. 5,
Saki Vihar Road Powai,
Mumbai - 400 072
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation,
DevX 4th Floor, A Wing, Om 9 Square,
150 Ft Ring Road, Near Nana Mava Circle,
Opp Silver Heights,
Rajkot - 360 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Playworkz Coworking Space
43 & 44, 3rd Cross,
Bharathy Colony, Peelamedu,
Coimbatore - 641 004
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
GDR Siddha, Ground Floor, N Road
Bistupur, Opposite St. Mary's Church,
Jamshedpur - 831 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Unnati Building, 2nd Floor,
Automation Campus, A-600, TTC Industrial
Area Shil-Mahape Road, Mahape,
Navi Mumbai - 400 710
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
10th Floor, Titaanium Business,
Bhimrad Road, Althan
Surat - 395 017
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
3rd Floor, 1&2 Vijay Park,
Main Chakrata Road, Opp. Anandam,
Near Ballupur chowk,
Dehradun - 248 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Business Communication Centre
2nd Floor, Chiramel Chambers,
Kurisupally Road, Ravipuram,
Kochi - 682 015
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
M1 & M2, Mezzanine Floor,
Himalaya Excellency,
Plot No. C-47, Pratap Nagar Square,
Nagpur - 440 022
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
11th Floor, Block-D, Notus IT Park,
Sarabhai Campus, Bhailal Amin Marg,
Vadodara - 390 023
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Ground Floor, B-27,
Biplab Rashbihari Sarani,
Sector 2A, Bidhan Nagar,
Durgapur - 713 212
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz & Knudsen Electrical & Automation,
207, 2nd floor, Revolution Complex,
Station Road, E Ward,
Next to Pedestrian Bridge,
Kolhapur - 416 001
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation,
3rd floor,
Uttam Tower by Viraj Estate ,
Sharanpur Road,
Nasik - 422 002
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
Naga Chambers, 3rd Floor, D/No. 12-1-16,
Plot No. 49, Survey No. 1051, Waltair Main Road,
Visakhapatnam - 530 002
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
6th Floor, Exotica Greens, A Block, 191,
R G Baruah Road, Guwahati Central,
Guwahati - 781 005
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
2nd Floor, BN3, Salt Lake, Sector-V,
Kolkata - 700 091
Phone No: 022-6932 7800
e-mail: CIC@LK-EA.com

Lauritz Knudsen Electrical & Automation
A-25, 1st Floor, Imperia Complex,
Mohan Corporative Industrial Estate,
Near Sarita Vihar Metro Station,
Mathura Road,
New Delhi - 110 044
Phone no: 022-6932 7800
e-mail: CIC@LK-EA.com

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Lauritz **K**nudsen
Electrical & Automation

Lauritz Knudsen Electrical & Automation, Electrical Standard Product
A/600, Shil-Mahape Road, TTC Industrial Area, MIDC Thane, Navi Mumbai, 400 710,
Maharashtra, Phone No: 022-6722 6300 | Web: www.LK-EA.com

Customer Interaction Center (CIC)
Phone no: 022-6932 7800
Web: www.LK-EA.com | e-mail: CIC@LK-EA.com