L&T Electrical & Automation

Energy Management Solutions


Smart is in Energy Management

About Us

L&T Electrical & Automation (E&A) offers products and solutions in low and medium voltage categories. Committed to sustainable business growth through energy efficient processes and the optimized use of resources, E&A charts and pursues its business goals and environmental responsibilities in the same spirit.

Our Green Factory at Vadodara and 3 Green Buildings stand testimony to this commitment. We are passionate about safe, reliable and efficient use of electrical energy. Our factory at Mahape has been declared a 4-star energy efficient facility by the Bureau of Energy Efficiency. All our switchgear factories are compliant to ISO 50001 standard. These facilities inspire us to translate our knowledge into products like meters, power factor improvement capacitors, drives and solutions in energy management and plant automation that help improve productivity and reduce energy consumption in buildings and industry.

We believe in thought leadership and through our Switchgear Training Centres, we have trained a number of budding electrical professionals, promoting good electrical practices in the country.


LARSEN & TOUBRO
ELECTRICAL & AUTOMATION
ISO 50001:2011
MANUFACTURING & DISPATCH OF ELECTRICAL STANDARD PRODUCTS


LARSEN & TOUBRO
ELECTRICAL & AUTOMATION
ISO 50001:2011

Energy Management

The world is seeking smarter solutions with optimized utilization of resources to reduce cost and thereby achieve savings.

L&T Electrical & Automation offers a range of ecofriendly products, systems, services and software for industrial, commercial and residential applications. We offer products and solutions that saves energy like AC drives, Power factor improvement capacitors, Detuned and Active Harmonic filters, Industrial and Building management systems. We also offer products that assists energy savings like Lighting controls, Metering systems. Our Green product portfolio helps our customers to meet energy efficiency.

At E&A, we have been constantly integrating more sustainable ways of working across our business - from design to production to logistics. While offering the best in class products we are limiting our ecological footprints.

Manufacturers, corporations, utilities, energy service companies, and other organizations are using ISO 50001 to reduce costs and carbon emissions.

The purpose of ISO 50001 is to enable organizations to establish the systems and process necessary to improve energy performance including energy efficiency, use and consumption. Implementation of this standard is intended to lead in reductions in greenhouse gas emissions and other related environmental impact and energy cost through systematic management of energy. This standard is applicable to all types and sizes of organizations, irrespective of geographical, cultural or social conditions. Successful implementation depends on commitment from all level and functions of the organization and especially from top management.

L&T Electrical & Automation LEED Rated Green Buildings

Green Factory, Vadodara

Administrative Building, Vadodara

Unnati building at C&A Mahape (Navi Mumbai)

This standard specifies energy management system requirements, upon which an organization can 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.

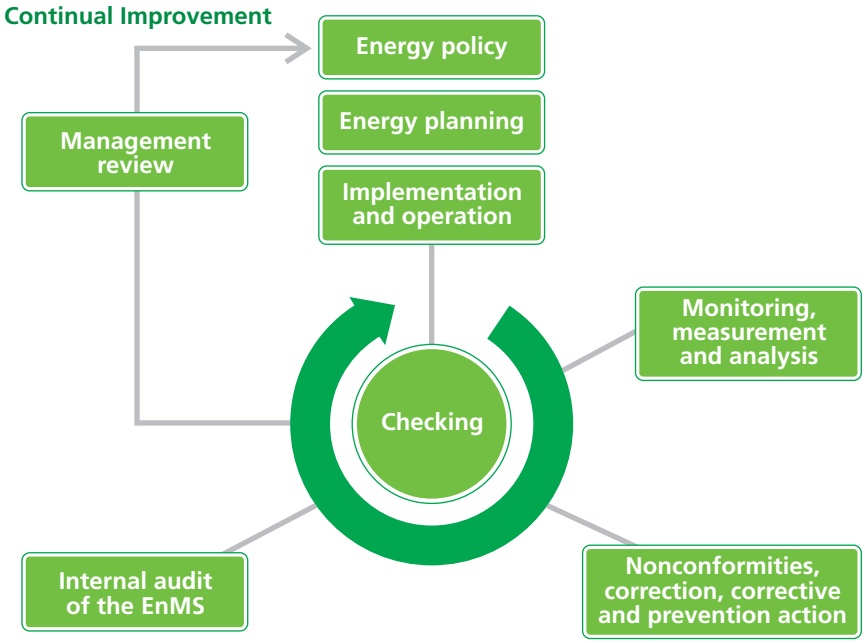


Figure1 - Energy management system model for this international standard

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.

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

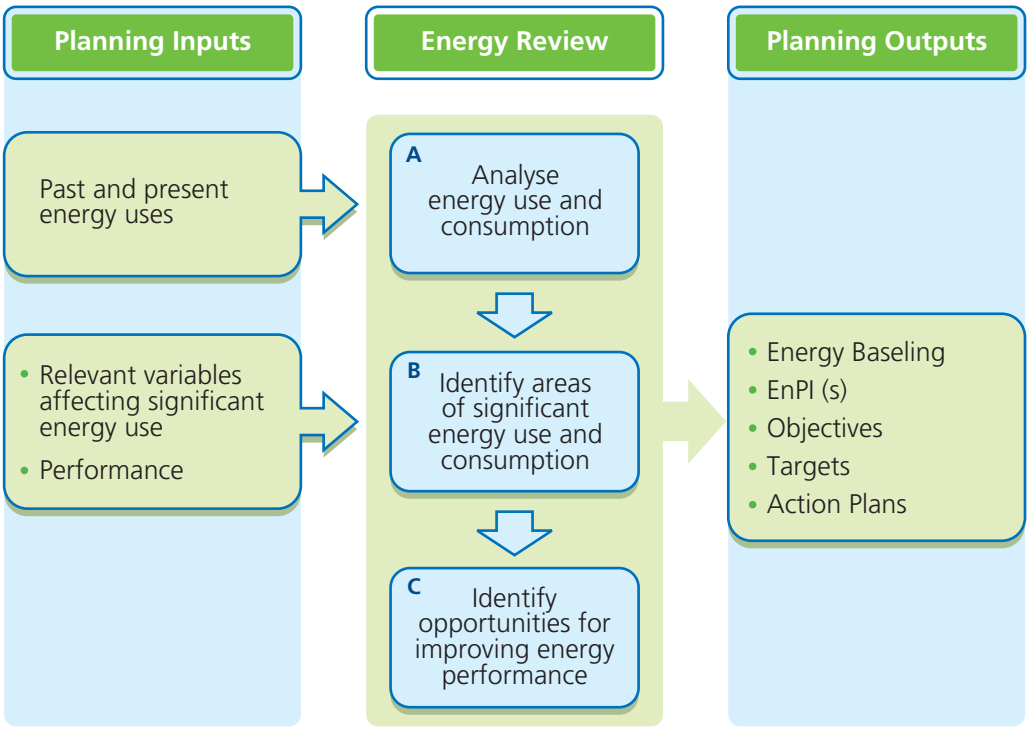


Figure 2 - Energy planning process concept diagram

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.

Contents

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 V_{LL}, 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 V_{LL} 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	80 - 300VAC/DC
	Aux burden	<5VA
	Freq range	40-70 Hz
Power Details	Test of power consumption	as per IEC 62053-21
	Voltage dips and interrupts	as per IEC 62053-21
	Short time over current protection	10A max continuous, 20 times of In for 3 sec
Electro-Magnetic Compatibility (EMC)	Fast transients burst test	±4 kV as per IEC 61000-4-4
	Immunity to electrostatic discharge	±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2
	Radiated, radio-frequency, electromagnetic field immunity test	10 V/m as per 61000-4-3
	Immunity to electromagnetic HF fields through conducted lines	10 V/m as per IEC 61000-4-6
	Surge immunity test	±6 kV as per IEC 61000-4-5
	Rated power frequency magnetic fields	1 A/m as per IEC 61000-4-8
	Emission	Class B as per CISPR 22
Insulation Properties	Impulse voltage test	±6 kV as per IEC 62052-11
	AC voltage test	4 kV double insulation as per IEC 62053-21
Operating Conditions	Operating temperature	-10°C to +55°C
	Storage temperature	-25°C to +70°C
	Humidity	5% to 95% relative humidity non-condensing
	Recommended connecting wire	12 to 14 SWG with U type lug of max 6.75mm width
Mechanical Conditions	Shock	As per standard IEC 60068-2
	Vibration	10 to 55 Hz, 0.15 mm amplitude
	Casing	Plastic mould protected to IP51 from front side
Safety	Measurement category	CAT III
	Pollution degree	2
	Protection	IP20 at terminals, IP 51 when mounted on panel
Weight and Dimensions	Product weight	300 gms
	Bezel dimension (W X H X D)	96 X 96 X 58 mm
	Panel cutout	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	RS485 port Modbus RTU, Ethernet (optional)
	Baud rate	2400, 4800, 9600, 19200, 38400* bps (preferred 9600)
	Parity	Odd, Even, None
	Slave id	1 to 247 (programmable)
	Isolation	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

Parameter List

		Basic MFM	MFM				Advanced MFM	
	Parameters	4400/ 4405	4410	4420	4430	4440	5010	5000
Instantaneous Parameters	V1, V2, V3, V12, V23, V31, Avg (V_{LN}, V_{LL})	✓	✓	✓	✓	✓	✓	✓
	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	V_{LL}, V_{LN}, 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)

Description	CAT No.
4400 Series	
LED meter Cl 1	WL4400100000
LED meter Cl 1 with RS485	WL4400110000
LED meter Cl 0.5 with RS485	WL4400210000
LED meter Cl 0.5S with RS485	WL4400310000
LCD meter Cl 1	WC4400100000
LCD meter Cl 1 with RS485	WC4400110000
4405 Series	
LED meter Cl 1	WL4405100000
LED meter Cl 1 with RS485	WL4405110000
LED meter Cl 0.5 with RS485	WL4405210000
LED meter Cl 0.5 with RS485	WL4405210000

4410

Basic + Power, Energy + THD%

Description	CAT No.
4410 Series	
LED meter Cl 1	WL4410100000
LED meter Cl 1 with RS485	WL4410110000
LED meter Cl 0.5 with RS485	WL4410210000
LED meter Cl 0.5 with RS485 and 1 Pulse o/p	WL441021C000
LED meter Cl 0.5S with RS485	WL4410310000
LED meter Cl 0.2 with RS485	WL4410410000
LED meter Cl 0.2S with RS485	WL4410510000
LCD meter Cl 1	WC4410100000
LCD meter Cl 1 with RS485	WC4410110000
LCD meter Cl 0.5 with RS485	WC4410210000
LCD meter Cl 0.5S with RS485	WC4410310000
LCD meter Cl 0.2 with RS485	WC4410410000
LCD meter Cl 0.2S with RS485	WC4410510000

4420

4410 + MD

Description	CAT No.
4420 Series	
LED meter Cl 1	WL4420100000
LED meter Cl 1 with RS485	WL4420110000
LED meter Cl 0.5 with RS485	WL4420210000
LED meter Cl 0.5S with RS485	WL4420310000
LED meter Cl 0.2 with RS485	WL4420410000
LED meter Cl 0.2S with RS485	WL4420510000
LCD meter Cl 1	WC4420100000
LCD meter Cl 1 with RS485	WC4420110000
LCD meter Cl 0.5 with RS485	WC4420210000
LCD meter Cl 0.5S with RS485	WC4420310000
LCD meter Cl 0.2 with RS485	WC4420410000
LCD meter Cl 0.2S with RS485	WC4420510000

4430

4420 + IE

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

4440

4410 + MD (RTC) + Events

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

5000, 5010

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

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
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	WL500021000D
LED meter CL 1 RS485 2 Analog o/p	WL500011OBOO
LED meter Cl0.5RS485 2 Digital i/p	WL500021OOBO
LCD meter Cl0.5 RS485 4 Digital o/p	WC500021000D
LCD meter Cl 1 RS485 2 Analog o/p	WC500011OBOO
LCD meter Cl 0.5 RS485 2 Digital i/p	WC500021OOBO
LED meter Cl0.5 RS485 2 Analog i/p 2 Digital o/p	WL500021BOOB
LCD meter Cl0.5 RS485 2 Analog i/p 2 Digital o/p	WC500021BOOB

*Only in 5000 series

Maximum Demand Controller

6000 Series

- Accuracy Class 1 as per IEC 62053-21
- 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
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 V_{LL} 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	80 - 300VAC/DC
	Aux burden	<5VA
	Freq range	40-70 Hz
Power Details	Test of power consumption	as per IEC 62053-21
	Voltage dips and interrupts	as per IEC 62053-21
	Short time over current protection	10A max continuous, 20 times of In for 3 sec
Electro-Magnetic Compatibility (EMC)	Fast transients burst test	±4 kV as per IEC 61000-4-4
	Immunity to electrostatic discharge	±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2
	Radiated, radio-frequency, electromagnetic field immunity test	10 V/m as per 61000-4-3
	Immunity to electromagnetic HF fields through conducted lines	10 V/m as per IEC 61000-4-6
	Surge immunity test	±6 kV as per IEC 61000-4-5
	Rated power frequency magnetic fields	1 A/m as per IEC 61000-4-8
	Emission	Class B as per CISPR 22
Insulation Properties	Impulse voltage test	±6 kV as per IEC 62052-11
	AC voltage test	4 kV double insulation as per IEC 62053-21
Operating Conditions	Operating temperature	-10°C to +55°C
	Storage temperature	-25°C to +70°C
	Humidity	5% to 95% relative humidity non-condensing
	Recommended connecting wire	12 to 14 SWG with U type lug of max 6.75mm width
Mechanical Conditions	Shock	As per standard IEC 60068-2
	Vibration	10 to 55 Hz, 0.15 mm amplitude
	Casing	Plastic mould protected to IP51 from front side
Safety	Measurement category	CAT III
	Pollution degree	2
	Protection	IP20 at terminals, IP 51 when mounted on panel
Weight and Dimensions	Product weight	300 gms
	Bezel dimension (W X H X D)	96 X 96 X 58 mm
	Panel cutout	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	RS485 port Modbus RTU
	Baud rate	2400, 4800, 9600, 19200, 38400 bps (preferred 9600)
	Parity	Odd, Even, None
	Slave id	1 to 247 (programmable)
	Isolation	2 kVAC isolation for 1 minute between communication and other circuits
Certifications		CE, RoHS

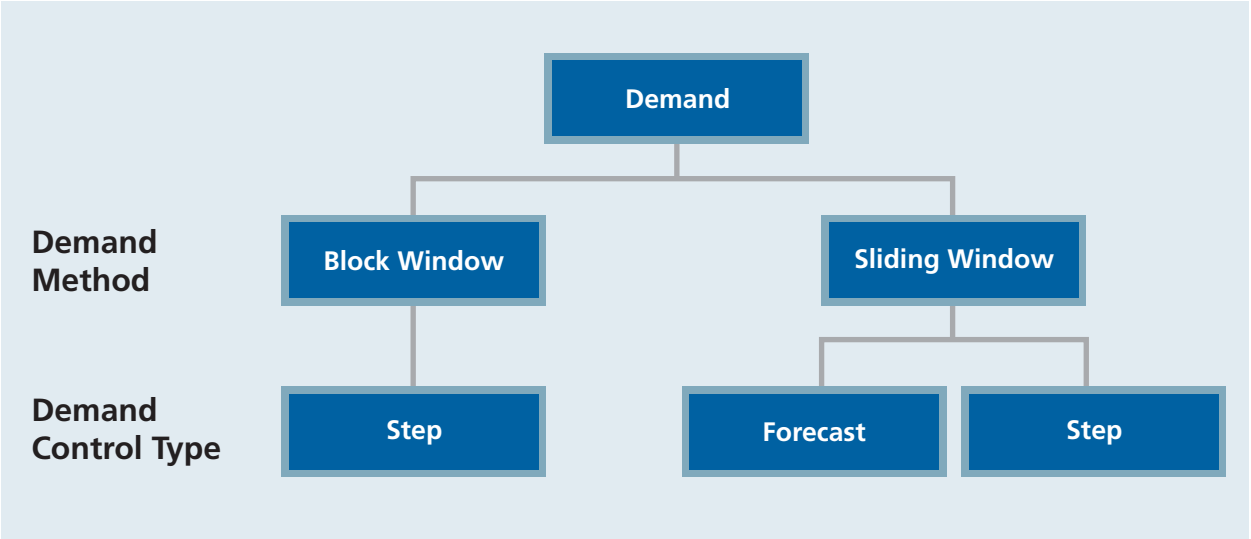
Parameter List

	Parameters	6000
Instantaneous parameters	V1, V2, V3, V12, V23, V31, Avg (V_{LN}, V_{LL})	✓
	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	V_{LL}, V_{LN}, 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

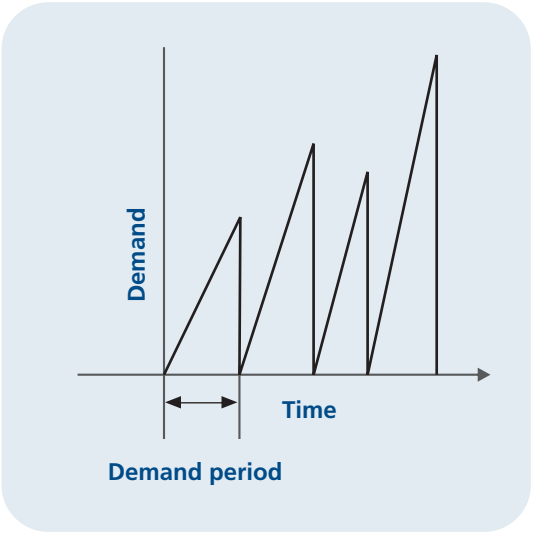
MD controller enables the user to program the threshold values of maximum demand and initiate actions i.e alarm or cut off load when maximum demand / forecast demand / present demand crosses the threshold values. This helps the user to ensure that user doesn't exceed the sanctioned demand and avoid paying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



Methods of calculating Max demand

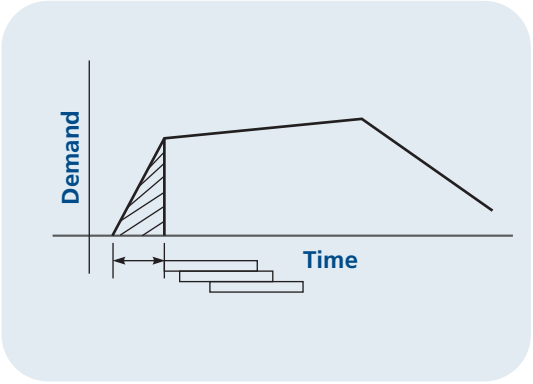
A. Block Window

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.

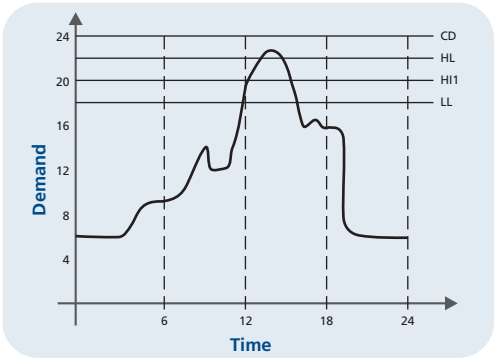


The demand value at which tripping /alarm is desired has to be programmed in absolute value terms. It can be programmed from 0.5% to 100% of full scale where full scale is $\frac{\sqrt{3} \times PT_{py} \times CT_{py}}{1000}$

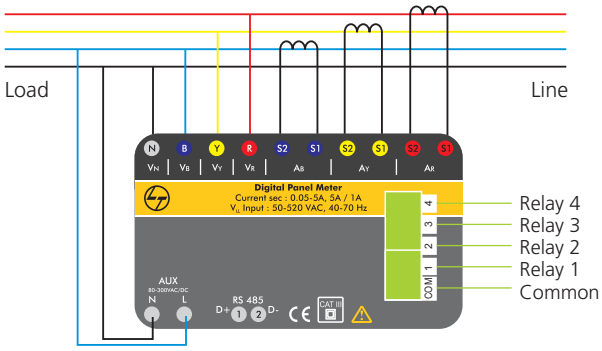
1. Forecast demand

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 V_{LL} 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 51 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	as per IEC 62053-21
	Voltage dips and interrupts	as per IEC 61326-1
Electro-Magnetic Compatibility (EMC)	Fast transients burst test	±4 kV as per IEC 61000-4-4
	Immunity to electrostatic discharge	±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2
	Surge immunity test	±4 kV as per IEC 61000-4-5
	Emission	Class B as per CISPR 22
Operating Conditions	Operating temperature	-10°C to +55°C
	Storage temperature	-25°C to +70°C
	Humidity	5% to 95% relative humidity non-condensing
	Recommended wire	2.5 sq mm
Mechanical Conditions	Shock	40 g in 3 planes (Double insulation)
	Vibration	10 to 55 Hz, 0.15 mm amplitude
	Casing	Plastic mould protected to IP51 from front side
Weight and Dimensions	Product weight	600 gms
	Bezel dimension (W X H X D)	96 X 96 X 97 mm
	Panel cutout	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

4000 Series

- Accuracy Class 1 as per IEC 62053-21
- LCD display for clear display of parameter values
- Whole current operated. 5-40A for Single Phase and 10-60A for Three Phase
- Displays Push-to-Push consumption, Daily, Weekly, Monthly consumption
- Push button for parameter scrolling
- Terminal covers to avoid direct contact of the supply terminals along with sealing provision
- Energy recording at low currents
- Pulse output LED available
- Reverse current indication for three phase
- Compact size and easy mounting
- Additional RS485 module for communication over RS485 modbus RTU protocol
- Additional Wi-Fi module for communication over IEEE 802.11b standard
- These can be mounted inside distribution boxes to monitor electric consumption of identified loads, circuits and areas.

Technical Chart

Type of measurement	Type	3 Phase 4 Wire, 1 Phase 1 sec update time
Measurement Accuracy		Class 1 as per IEC 62053-21
Display type and resolution	LCD	6 digit LCD
Measuring circuit	Input voltage	Rated voltage: 240 V -30% to +20% of rated voltage Burden: <8VA max per phase Voltage range for accuracy: -30% to +20% of rated voltage
	Input current	Whole current operated 1P: 5-40A, 3P: 10-60A Starting current: 1 Phase: 20 mA, 3 Phase: 40 mA Current range for class of accuracy: 5% I to Ib max
	Frequency	50 Hz ±5%
Power Details	Test of power consumption	as per IEC 62053-21
	Voltage dips and interrupts	as per IEC 62052-11
	Short time over current protection	20 times of I for half a second
Electro-Magnetic Compatibility (EMC)	Fast transients burst test	±4 kV as per IEC 61000-4-4
	Immunity to electrostatic discharge	±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2
	Radiated, radio-frequency, electromagnetic field immunity test	10 V/m as per 61000-4-3
	Immunity to electromagnetic HF fields through conducted lines	10 V as per IEC 61000-4-6
	Surge immunity test	±4 kV as per IEC 61000-4-5
	Emission	Class B as per CISPR 22
Insulation Properties	Impulse voltage test	±6 kV as per IEC 62052-11
	AC voltage test	4 kV double insulation as per IEC 62053-21
	Insulation resistance	500 V DC as per IS 13779
Operating Conditions	Operating temperature	-10°C to +55°C
	Storage temperature	-20°C to +70°C
	Humidity	5% to 95% relative humidity non-condensing
	Recommended wire	2.5 sq mm
Mechanical Conditions	Shock	40 g in 3 planes (Double insulation)
	Vibration	10 to 55 Hz, 0.15 mm amplitude
	Casing	Plastic mould protected to IP51 from front side
Weight and Dimensions	Product weight	1 Phase, Wi-Fi, RS 485 module:132 gms 3 Phase: 460 gms
	Bezel dimension (W X H X D)	1 Phase: 36 mm x 83 mm x 67 mm 3 phase: 125 mm x 83 mm x 64 mm (approx.) RS485 module: 36 mm x 83 mm x 67 mm Wi-Fi module: 36 mm x 83 mm x 67 mm
Outputs		Meter constant 3 Ph : 450, 1 Ph : 3200
Communication	Type	RS485 port Modbus RTU (separate module)
	Baud rate	2400, 4800, 9600, bps (preferred 9600)
	Parity	Odd, Even, None
	Slave id	1 to 247 (programmable)
	Isolation	2 kVAC, double insulated

Ordering Information

Description	CAT No.
4000 Series	
Energy meter 1P 5-40A Cl 1 DIN	WD4000101OOO
Energy meter 3P 10-60A Cl 1 DIN	WD4000103OOO
Energy meter RS485 module	WD400010RSOO
Energy meter Wi-Fi module	WD400010WFOO

The Energy Monitor

DIN energy meter is a small energy monitoring device that helps in increasing awareness of energy consumption at the point of installation. It helps in monitoring of energy guzzling devices to take corrective actions. It shows the amount of money spent in consuming energy.

Ideal applications include residential buildings, shopping malls, factories, etc.

An energy monitor alone can't save any energy - but it makes one aware of level of energy consumption. Therefore it's a great tool to help bring a change in user behavior and cut electricity bills.

It is good to remember that in most cases one is likely to get a return on investment if one reduce their energy usage as a result of buying these meters.

The device has a LCD screen to display the readings. Also when used along with Wi-Fi module, the entire data can be viewed on laptop, tablet or smart phones in real time.

Some of the most convenient features and benefits of DIN meters include:

- A display that shows current energy use
- Wireless connectivity so that it can be viewed anywhere in the hotspot range
- Ease of historical data availability including daily, weekly and monthly usage

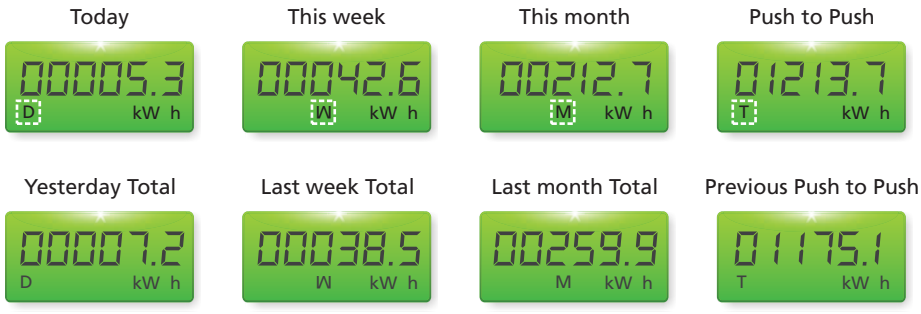
Push to Push consumption: The push button is used for measuring kWh consumption from one push of the button to next time push i.e from one period to another period.

To achieve this scroll through the parameters until kWh is displayed. Press and hold the push button, it shall reset to zero.

Energy recording starts in display. To stop the push to push consumption press and hold the push button in kWh display. Check kWh display to get the energy consumed value between the start and stop operations.

Parameters		3-Phase Meter	1-Phase Meter
Instantaneous Parameters	Phase voltage	✓	✓
	Phase current	✓	✓
	Power factor	✓	
	Active power	✓	✓
	Reactive power	✓	
	Apparent power	✓	
	Frequency	✓	
Maximum Demand	Present month	✓	
	Previous month	✓	
kWh Consumption	Total	✓	✓
	Present day	✓	✓
	Present week	✓	✓
	Present month	✓	✓
	Push-to-push	✓	✓
	Previous day	✓	✓
	Previous week	✓	✓
	Previous month	✓	✓

Quick monitoring of daily, weekly & monthly consumption compared to previous period.



···· Dotted line indicates blinking

Dual Source 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
	LCD	4 digit for instantaneous and 7 digits for cummulative
Measuring circuit	Input voltage	UL: 50 - 520 V_{LL} 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: 230VAC
	Frequency	40-70 Hz
Auxilliary circuit	Aux voltage	80 - 300VAC/DC
	Aux burden	<5VA
	Freq range	40-70 Hz
Power Details	Test of power consumption	as per IEC 62053-21
	Voltage dips and interrupts	as per IEC 62053-21
	Short time over current protection	10A max continuous, 20 times of In for 3 sec
Electro-Magnetic Compatibility (EMC)	Fast transients burst test	±4 kV as per IEC 61000-4-4
	Immunity to electrostatic discharge	±8 kV air discharge, ±6 kV contact discharge as per IEC 61000-4-2
	Radiated, radio-frequency, electromagnetic field immunity test	10 V/m as per 61000-4-3
	Immunity to electromagnetic HF fields through conducted lines	10 V/m as per IEC 61000-4-6
	Surge immunity test	±6 kV as per IEC 61000-4-5
	Rated power frequency magnetic fields	1 A/m as per IEC 61000-4-8
	Emission	Class B as per CISPR 22
Insulation Properties	Impulse voltage test	±6 kV as per IEC 62052-11
	AC voltage test	4 kV double insulation as per IEC 62053-21
Operating Conditions	Operating temperature	-10°C to +55°C
	Storage temperature	-25°C to +70°C
	Humidity	5% to 95% relative humidity non-condensing
	Recommended connecting wire	12 to 14 SWG with U type lug of max 6.75mm width
Mechanical Conditions	Shock	As per standard IEC 60068-2
	Vibration	10 to 55 Hz, 0.15 mm amplitude
	Casing	Plastic mould protected to IP51 from front side
Safety	Measurement category	CAT III
	Pollution degree	2
	Protection	IP20 at terminals, IP51 when mounted on panel
Weight and Dimensions	Product weight	300 gms
	Bezel dimension (W X H X D)	96 X 96 X 58 mm
	Panel cutout	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	RS485 port Modbus RTU
	Baud rate	2400, 4800, 9600, 19200 bps (preferred 9600)
	Parity	Odd, Even, None
	Slave id	1 to 247 (programmable)
	Isolation	2 kVAC isolation for 1 minute between communication and other circuits
Certifications		CE, RoHS

Dual Energy Registers:

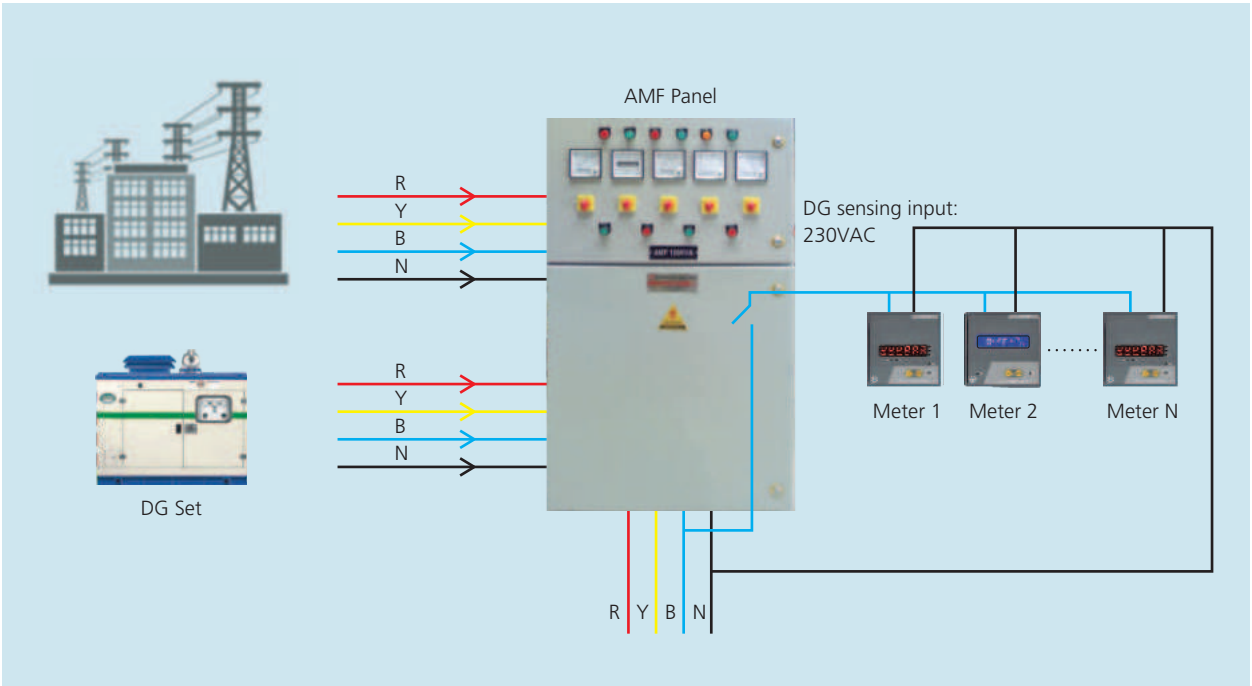
Two separate energy registers are provided, one for EB (Electricity Board supply) and another for DG (Generator Supply). Normally meter accumulates energy in EB register. Whenever the DG sensing signal (230 V AC) is present, meter accumulates energy in DG register.

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 CI1	WL404010OOOO
Dualsource LED meter CI1 with RS485	WL404011OOOO
Dualsource LED meter CI0.5	WL404020OOOO
Dualsource LED meter CI0.5 with RS485	WL404021OOOO
Dualsource LCD meter CI1	WC404010OOOO
Dualsource LCD meter CI1 with RS485	WC404011OOOO
Dualsource LCDmeter CI0.5	WC404020OOOO
Dualsource LCDmeter CI0.5 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	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 Class 0.2 for frequency meter
Display type and resolution	LED	4 digit
Measuring circuit	Input voltage	50 - 520 V_{LL} 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 51 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_{LN} (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
3Ph Voltmeter Cl 0.5	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

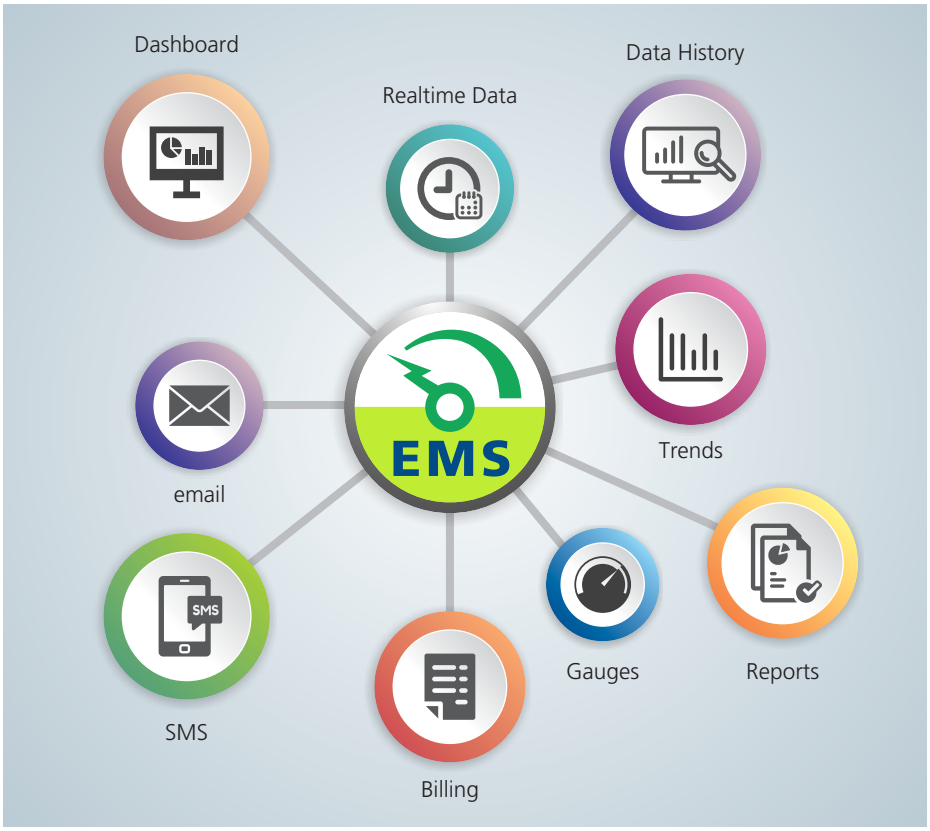
Display parameter list		1 Phase Voltmeter	3 Phase Voltmeter	1 Phase Ammeter	3 Phase Ammeter	Frequency Meter	VAF Meter
Voltage	R Phase	✓	✓				✓
	Y Phase		✓				✓
	B Phase		✓				✓
	Line Voltage		✓				✓
	Average		✓				✓
Current	R Phase			✓	✓		✓
	Y Phase				✓		✓
	B Phase				✓		✓
	Average				✓		✓
	A Peak	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

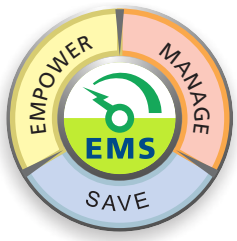

Real Time

SmartComm EMS

SmartComm
Energy Management System

SmartComm EMS, a simple and powerful energy monitoring software with multiple benefits that empowers the customer to save money.





Empowers the user to take corrective actions in areas of energy wastage

Management of energy for optimal utilization

Save money by identifying energy guzzlers for corrective actions to conserve energy.

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
- L&T meters preconfigured in the software

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

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

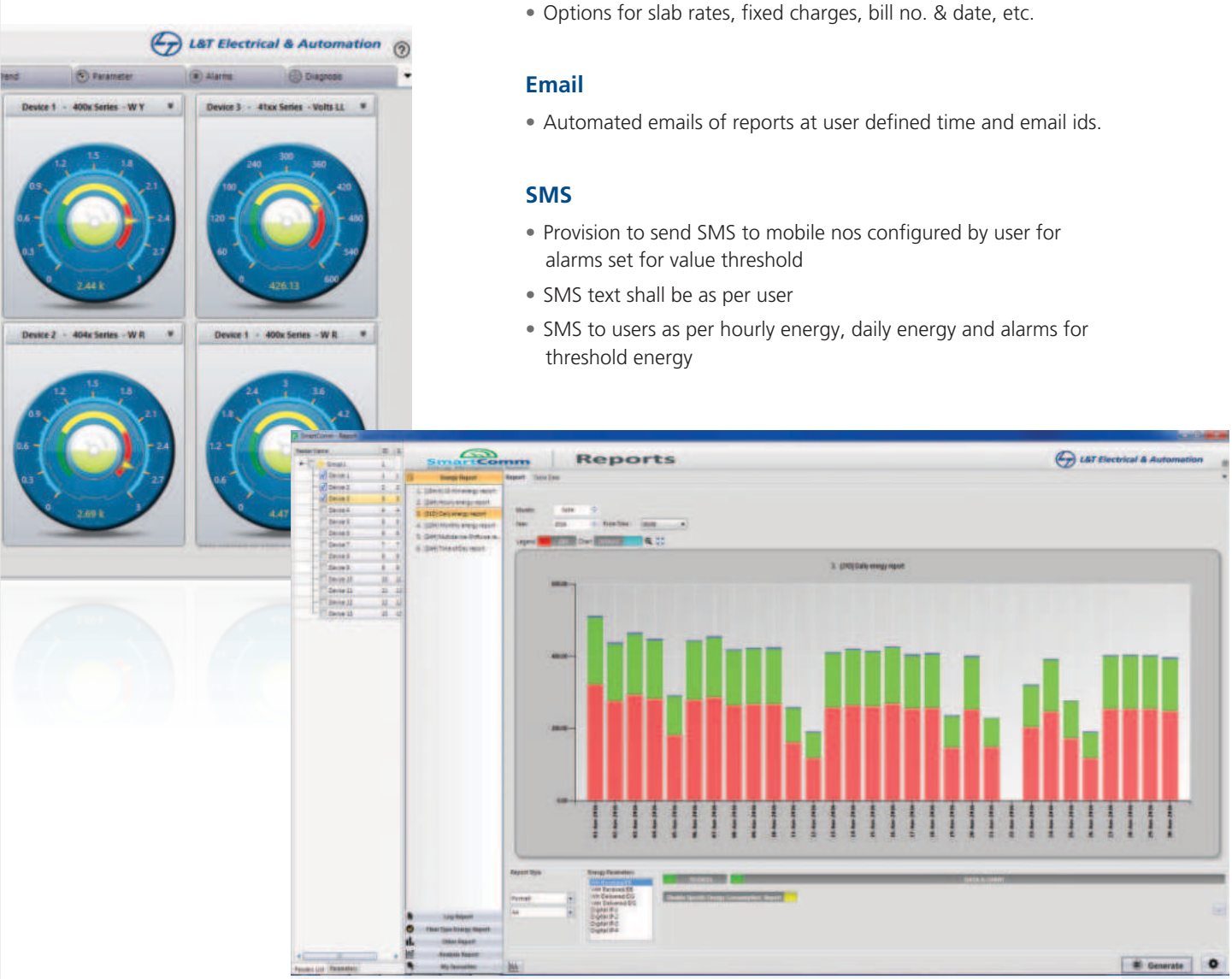
- Provision to generate bills for commercial complexes
- Options for slab rates, fixed charges, bill no. & date, etc.

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



SmartComm EMS for Cloud applications

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

On-Premise

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 Cloud

Private servers maintained by respective organisations

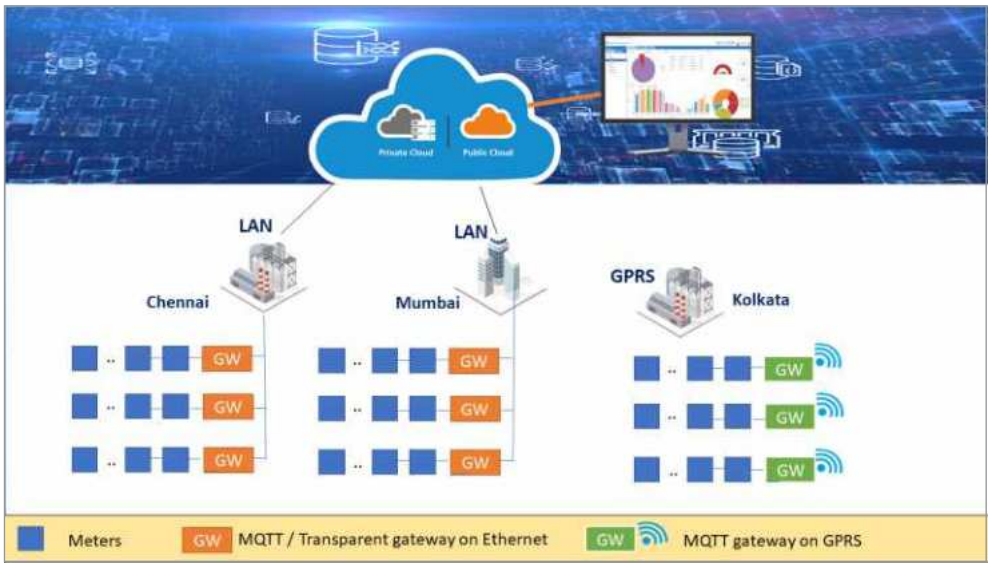
User can monitor using Web View in the same organisation or outside

Public Cloud

Cloud service provides
eg: AWS (Amazon), Azure (Microsoft), Google Cloud, etc

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.

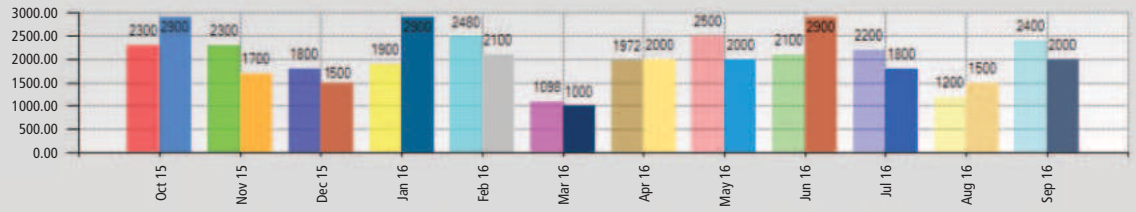



L&T Electrical & Automation
SmartComm
Admin
Dash Board
Online
Data Log
Reports
Feeder List
List of Device
Parameter
Incomer
Distribution
Wh Rec.
W Total
W Y
VAr Y
P.F
P.F B
VA Y
Volts LL
Volts YB
Volts R
4.69
189.50
23.62
Hourly
Last 31 Days
Last 12 Months

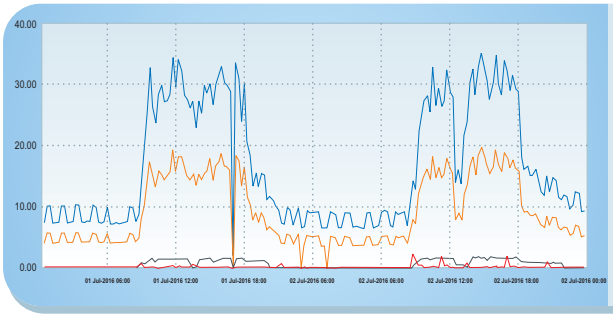

L&T Electrical & Automation
SmartComm
Admin
Dash Board
Online
Data Log
Reports
Battery Charger-1
103.29
W Total
Battery Charger-1
350.17
Amps Ave
Battery Charger-1
-0.414
P.F
MCC-4B Panel
298.89
W Total
Battery Charger-2
518.73
W Total
Battery Charger-2
-0.624
P.F
Battery Charger-2A
238.49
Volts LN
Final Assembly Incomer
-298.18
VAr Total


L&T Electrical & Automation
SmartComm
Admin
Dash Board
Online
Data Log
Reports
Feeder List
List of Device
Parameter
kW Total
09:31:53
kW Total 103.18

SmartComm EMS



- Year on Year energy consumption at facility / individual feeder level at click of a button



- Trend plot for users analytic requirement

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

Today
From 7AM till now

29.52

kWh

82 %

compared to yesterday

This month
Till now

1596.54

kWh

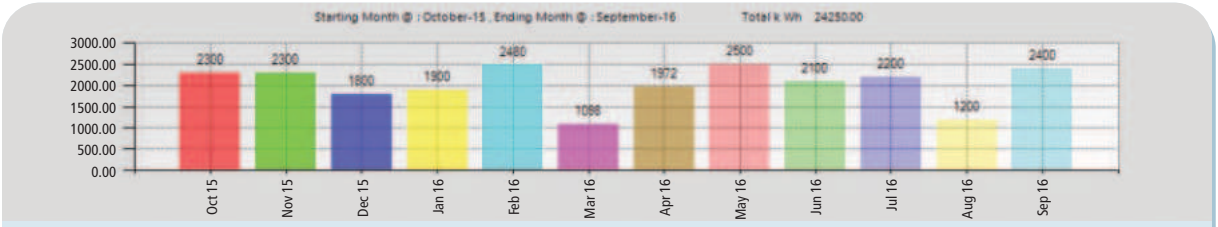
12.5 %

compared to same

- Messages at your fingertips based on alarms / events immediately

- User management at different access levels for security

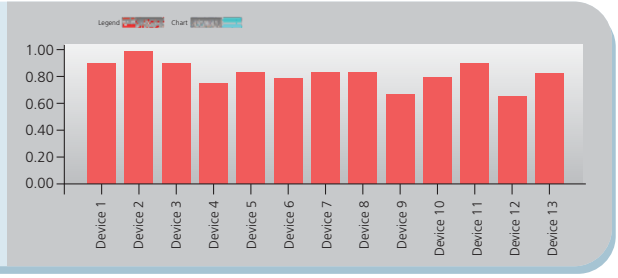
SmartComm EMS



- Monthly energy consumption of last 12 months

- Daily energy consumption report

- Average PF report



- My Favourite report section to bookmark 5 most frequently used reports

- Time stamped alarms / events

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

SmartComm EMS

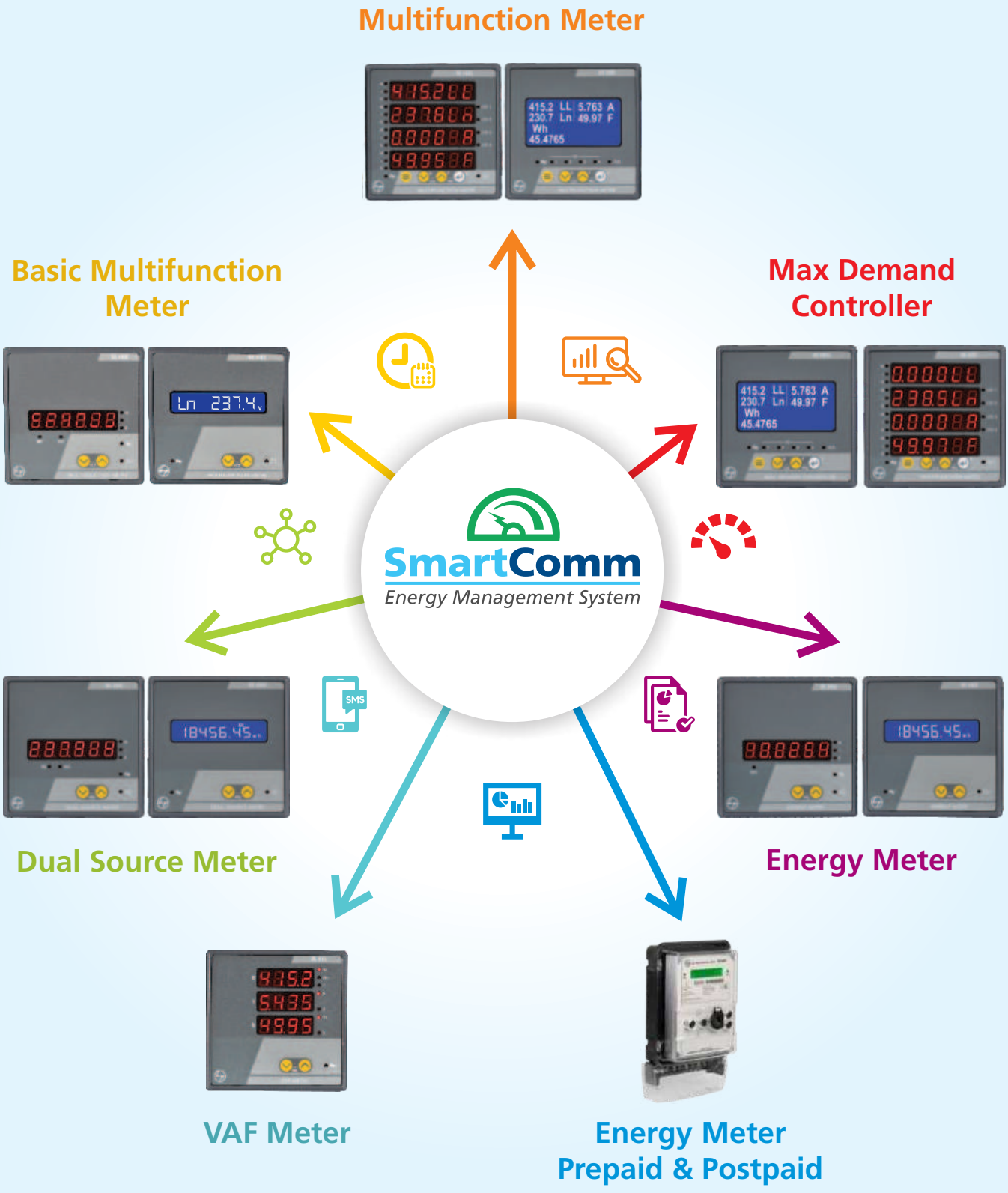
- Area wise report generation facility

HVAC	Utility
Lighting	Emergency Lighting
DG	Compressor

Typical Application Areas

Steps to be followed while implementing Energy Monitoring System

- List down meters that needs to be brought under the ambit of Energy Management system.
- Check whether these devices are communication compatible. If not plan for replacement with communication capable meters.
- Whether communication cables are laid for meters. If no scope of work to be finalized.
- Identify persons who will monitor SmartComm EMS.
- Plan for the administrative rights to be given to respective users.
- Plan for a dedicated computer for EMS.
- Decide the reports required and frequency of reports.
- Decide whether SMS alert is required, if yes for which alerts.
- Decide whether email facility is required. If yes list of email ids.
- Enquiry for SmartComm EMS to be sent to nearest L&T branch office.


Multifunction Meter
Basic Multifunction Meter
Max Demand Controller
SmartComm
Energy Management System
SMS
Dual Source Meter
Energy Meter
VAF Meter
Energy Meter
Prepaid & Postpaid

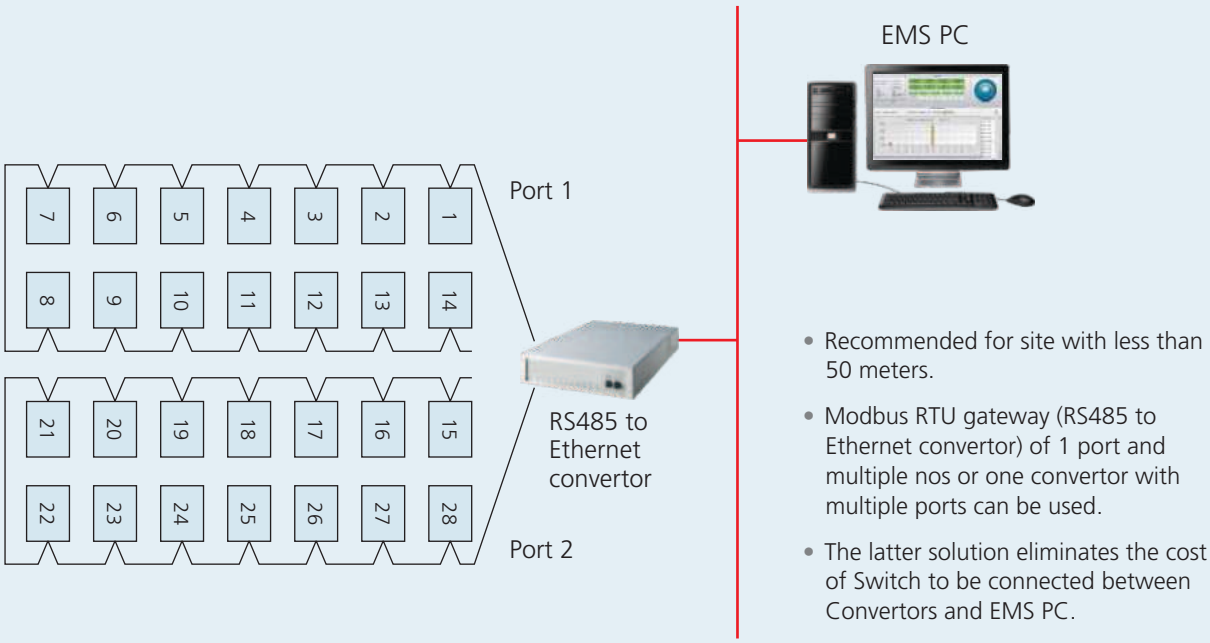
Architecture

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 120Ω, 0.5W resistor can be used. Termination resistor has to be connected at the convertor end as well as at the last meter end.

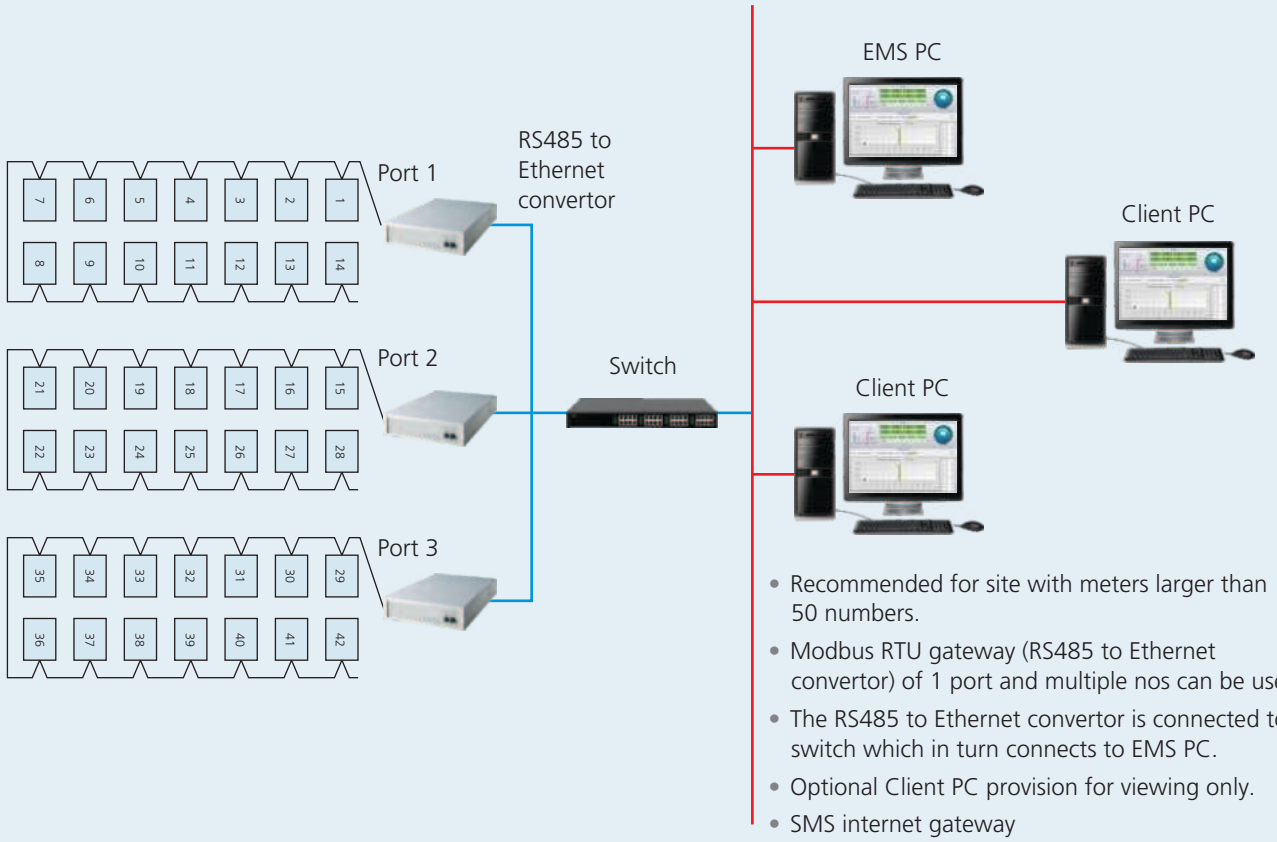
Typical Architecture are as follows:

Method 1 - Architecture for basic requirement



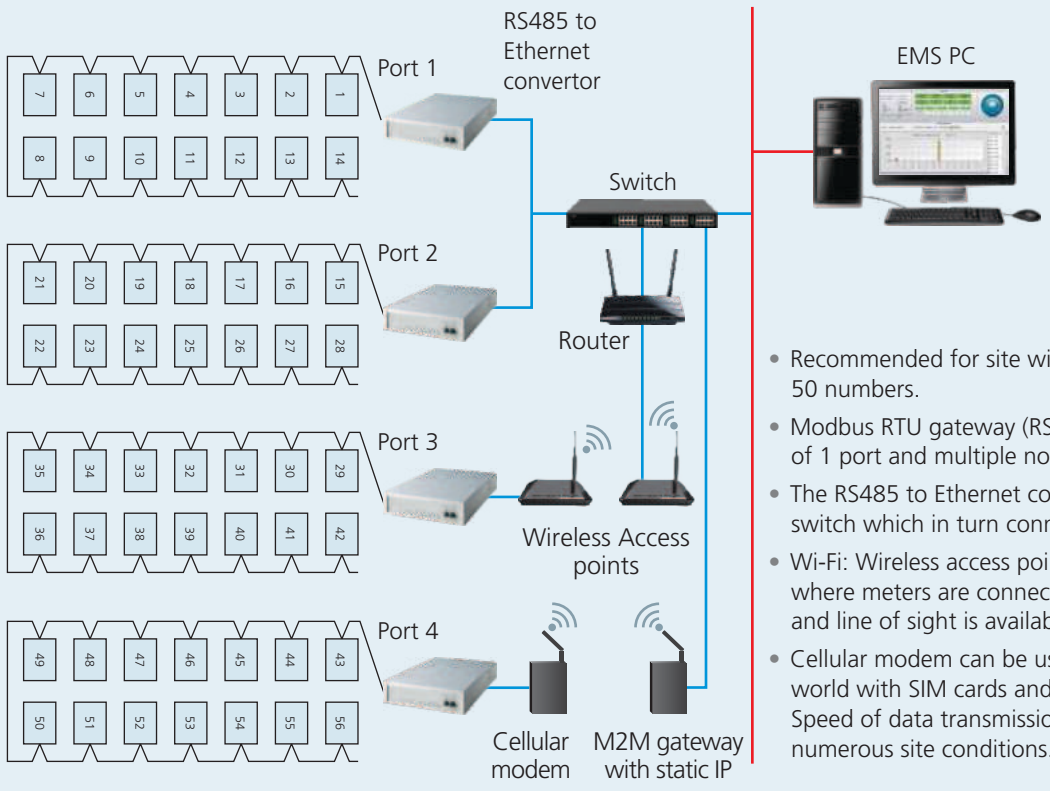
- Recommended for site with less than 50 meters.
- Modbus RTU gateway (RS485 to Ethernet convertor) of 1 port and multiple nos or one convertor with multiple ports can be used.
- The latter solution eliminates the cost of Switch to be connected between Convertors and EMS PC.

Method 2 - Architecture with client PC



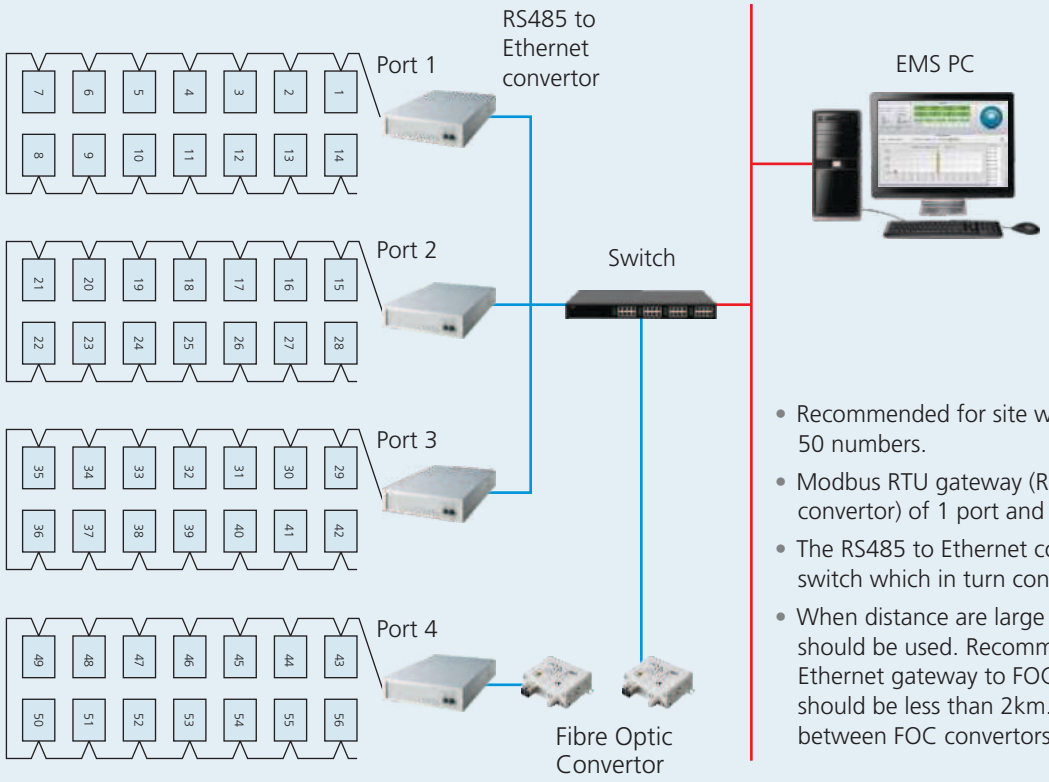
- Recommended for site with meters larger than 50 numbers.
- Modbus RTU gateway (RS485 to Ethernet convertor) of 1 port and multiple nos can be used.
- The RS485 to Ethernet convertor is connected to switch which in turn connects to EMS PC.
- Optional Client PC provision for viewing only.
- SMS internet gateway

Method 3 - Architecture with wireless connectivity



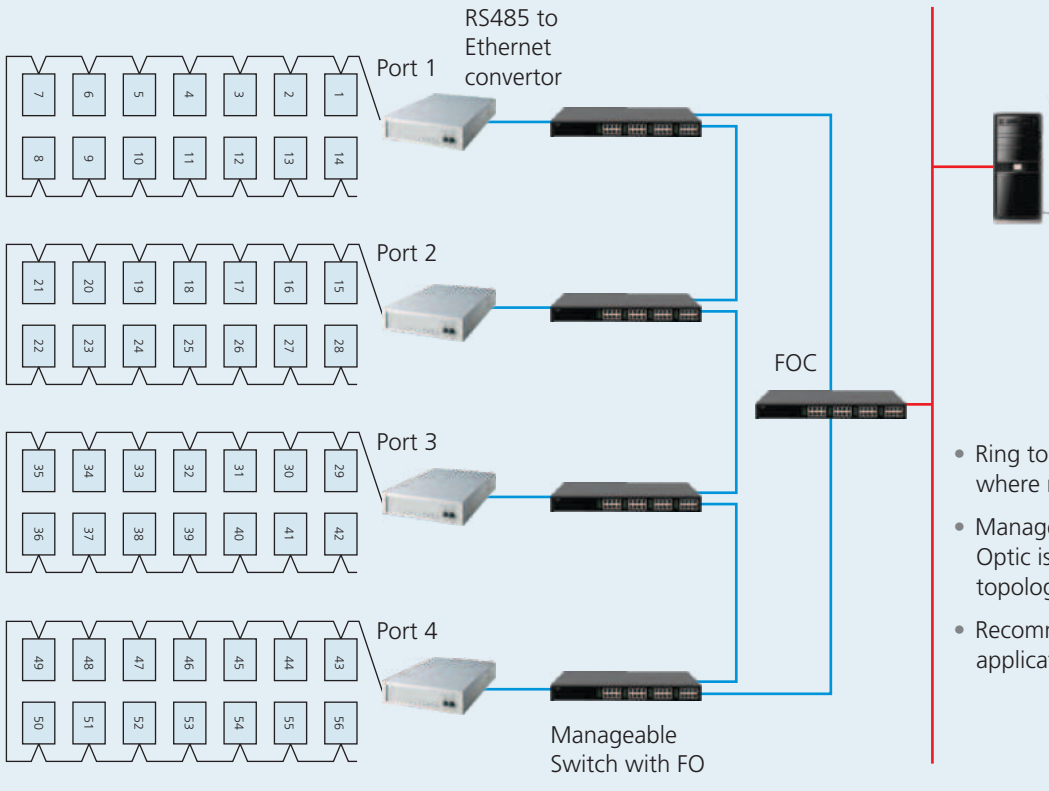
- Recommended for site with meters larger than 50 numbers.
- Modbus RTU gateway (RS485 to Ethernet convertor) of 1 port and multiple nos can be used.
- The RS485 to Ethernet convertor is connected to switch which in turn connects to EMS PC.
- Wi-Fi: Wireless access points and router can be used where 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



- 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



- 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.

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.

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.

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.

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 Proof

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.

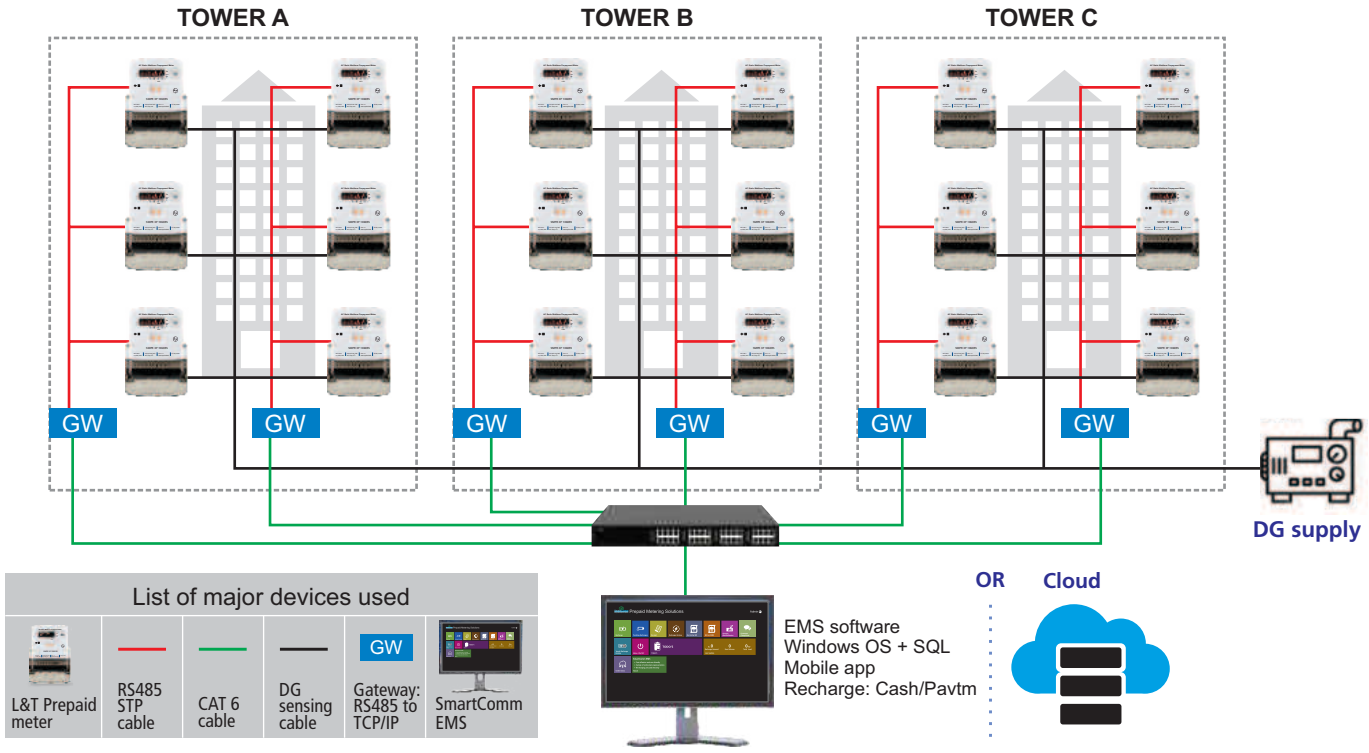
Billing Provision

- 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

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.

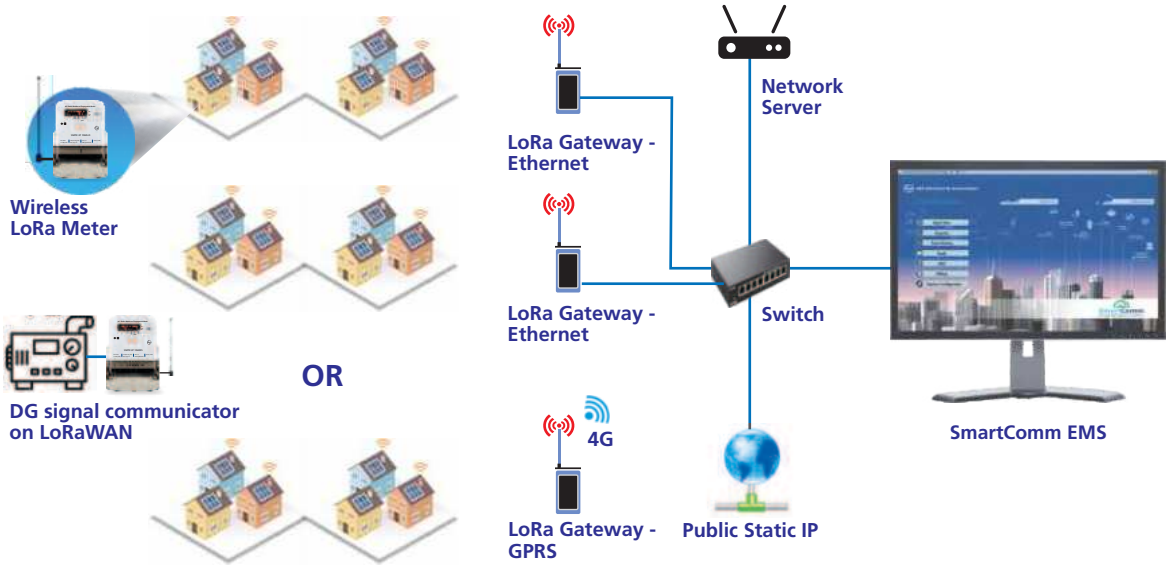
Prepaid Solution Architecture - Wired Solution



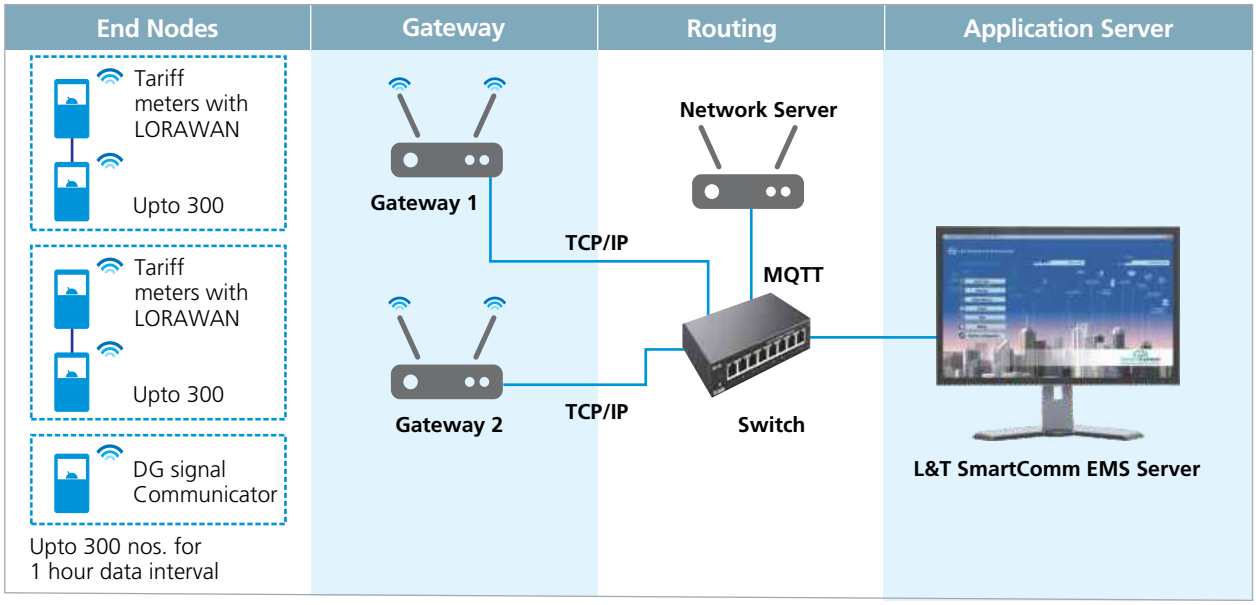
Wireless Metering Solutions - LoRaWAN

- **LoRa** stands for **Lo**ng **Ra**nge
- 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



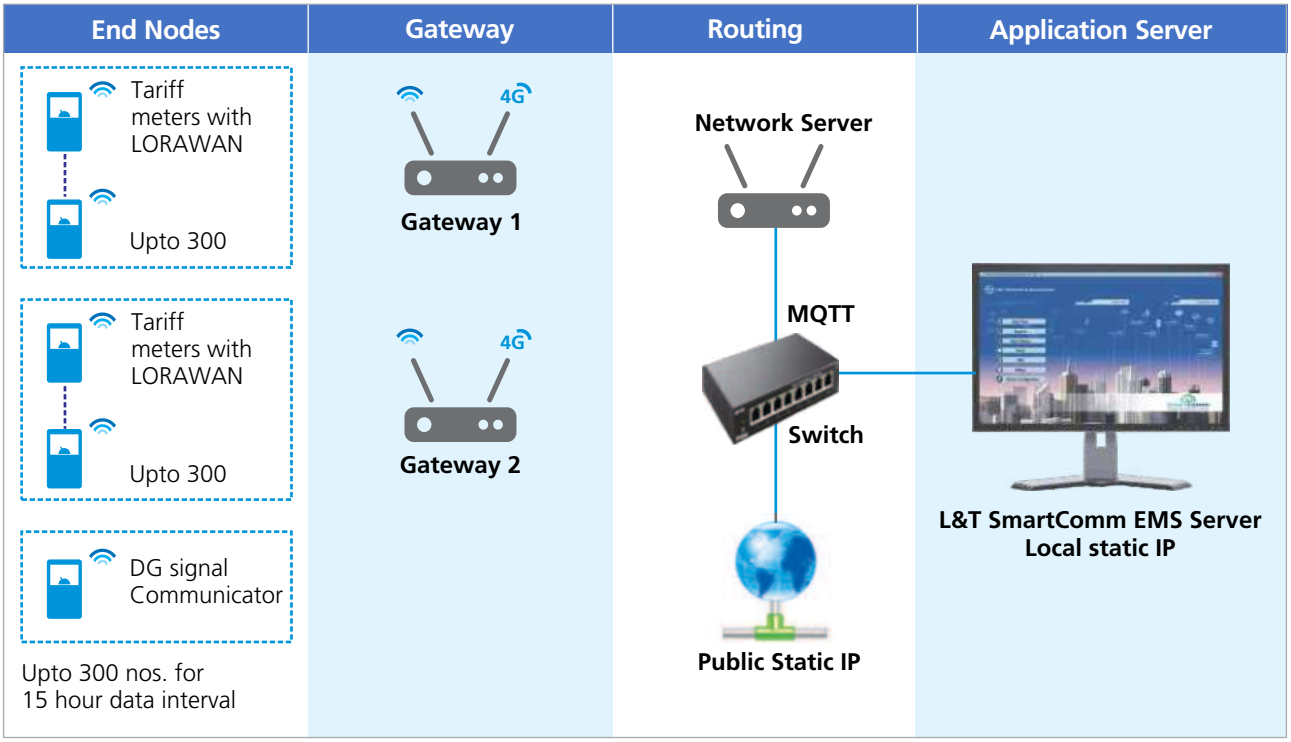
Network Architecture Solution 1: LORAWAN Private network



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



Private Network:

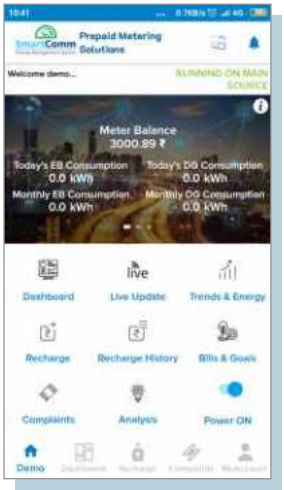
- When cluster of meters are spread out, gateways with 4G connectivity to be used.
- Each meters will have barcode. These are scanned with help of LoRa Config app that links the meters scanned with a particular gateway. So communication will be done only with the gateways and meter that are linked.
- 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.

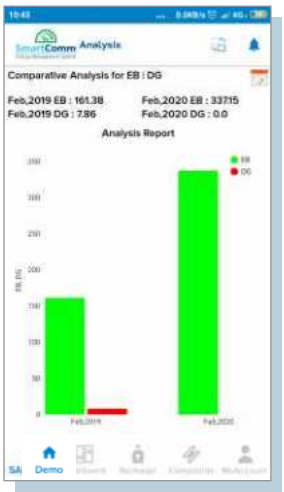
Prepaid Metering Solutions

Admin

User / Tenants

User app Interface





Advantages over conventional token based system

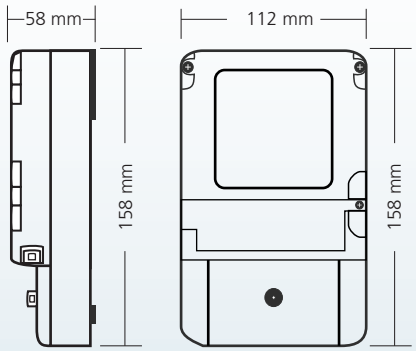
- Software is available at customer premises. Hence no deduction for token generation commission fee
- Software license is perpetual
- Analytics available compared to reducing balance information
- DG sensing is wireless leading to additional savings
- Easy configuration through barcode and mobile app
- Instant recharge through Paytm

Technical Chart

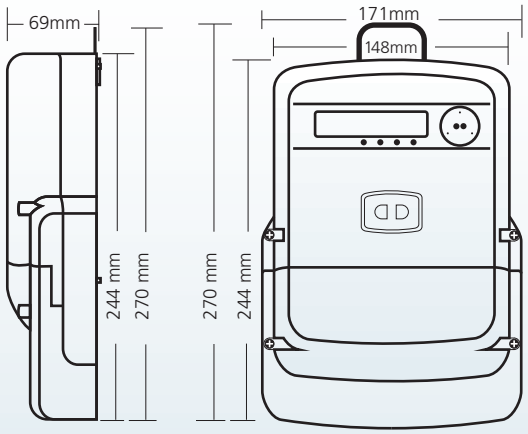
Type of measurement	Type	3 Phase 4 Wire, 1 Phase 2 Wire Whole Current True RMS, 1 sec update time, 2 Quadrant Power & Energy
Measurement Accuracy		Class 1 as per IS 15884, IS 13779
Display type and resolution	LED	4 digit for instantaneous and 6 digits for cummulative
Parameters		V1, V2, V3, V12, V23, V31, Avg (VLN, VLL)
		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°C
	Storage temperature	-25°C to +70°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
Communication	Type	RS485 port Modbus RTU or LoRa
	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

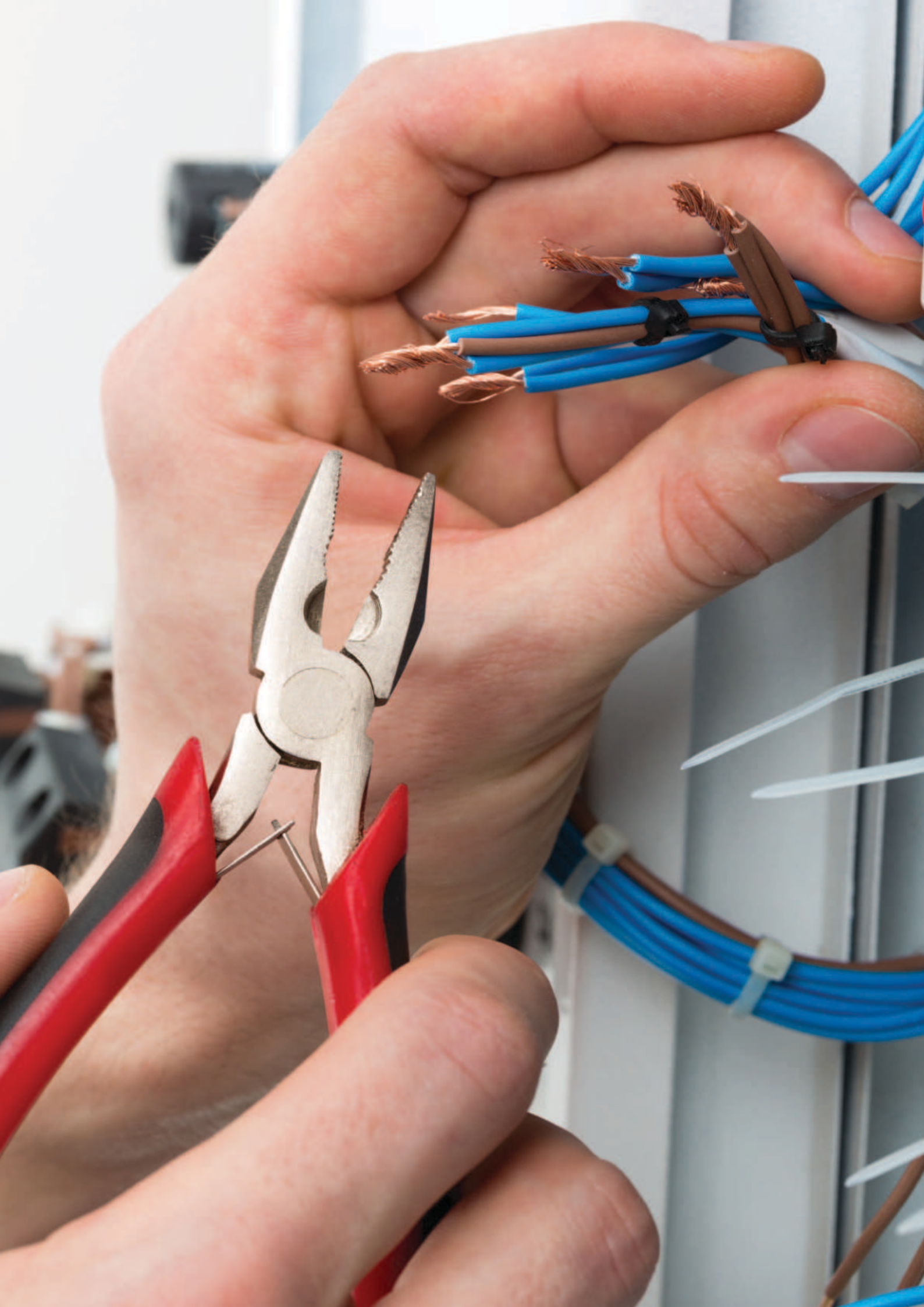
Single phase: Dimension Bezel:
158 x 112mm (Depth 58 mm)



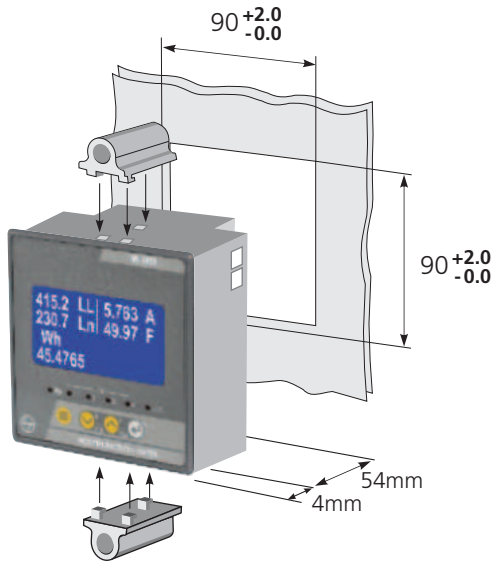
Three phase: Dimension Bezel:
270 x 171 mm (Depth 69 mm)



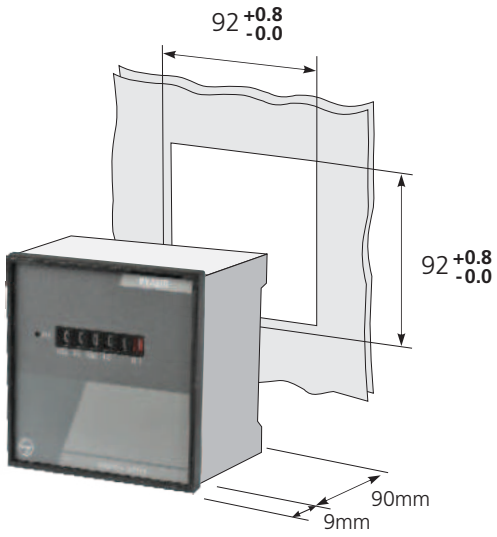
Description	CAT No.
Smart Prepaid meter 1P 10/60A with RS485	SMPR1P1060RS
Smart Prepaid meter 3P 10/60A with RS485	SMPR3P1060RS
Smart Prepaid meter 3P 20/80A with RS485	SMPR3P2080RS
Smart Prepaid meter 3P CT operated RS485	SMPR3PLTCTRS
Prepaid meter in house display unit	SMPRIDU
Smart Postpaid meter 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



Dimension and Connection Diagrams



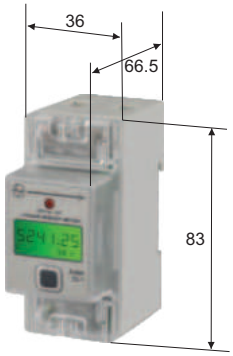
96 X 96: 11XX,13XX, 4000, 4040,
41XX, 44XX, 50XX, 60XX
(in case of meters with ethernet module the depth is 86mm)



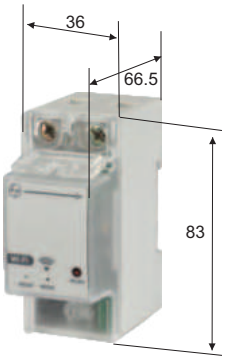
96 X 96: 4030

DIN Meter: 4000

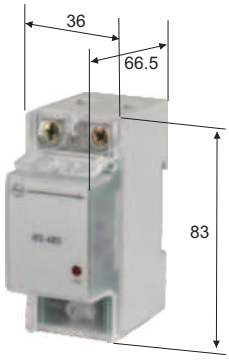
3-Phase



1-Phase



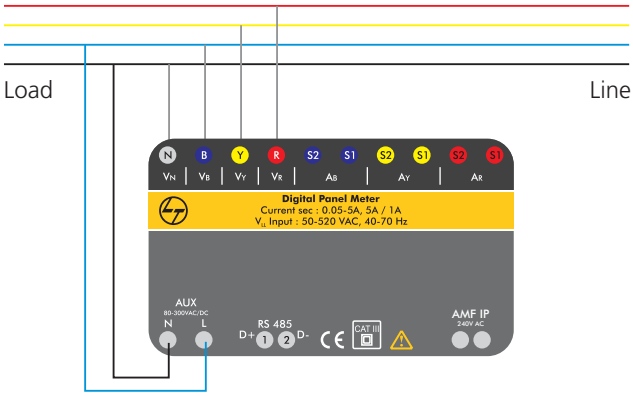
Wi-Fi Module



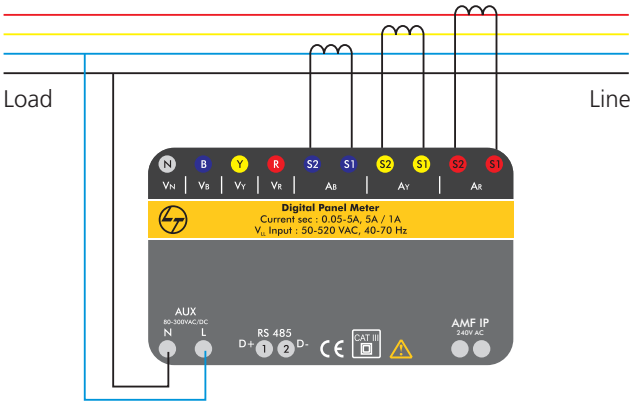
RS485 Module

All Dimensions in mm

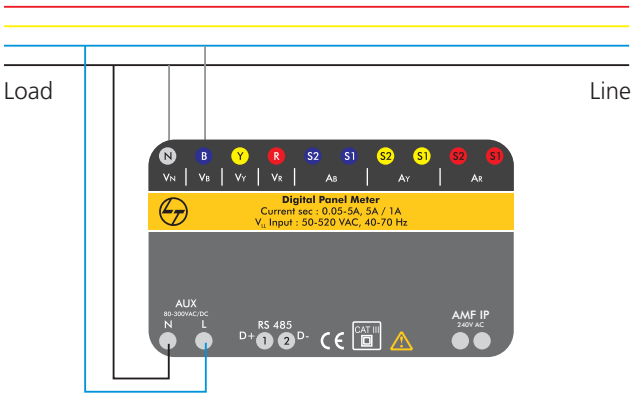
Connection Diagrams



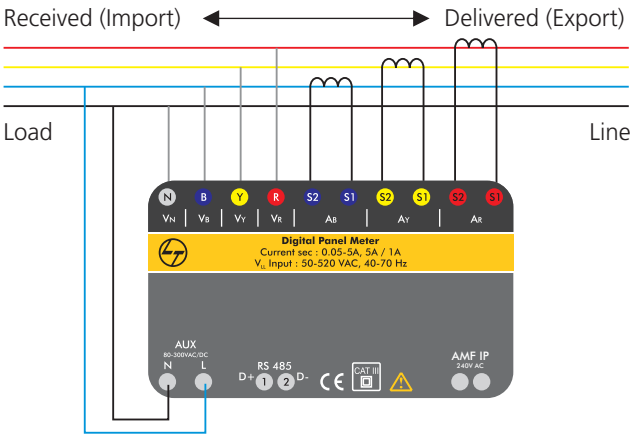
Voltmeter
(For 1 Phase connect in R Phase)



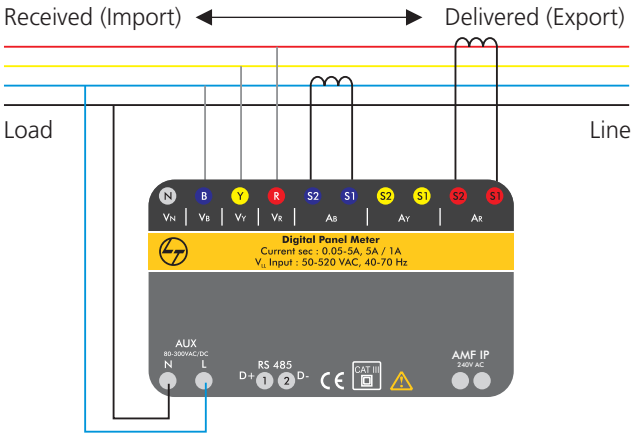
Ammeter
(For 1 Phase connect in R Phase)



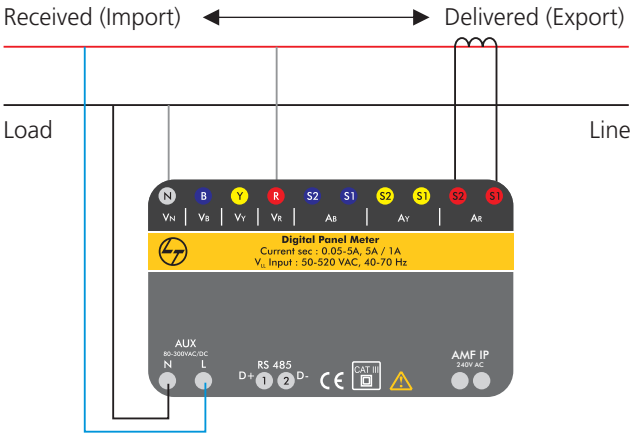
Frequency Meters



3 Phase 4 Wire System

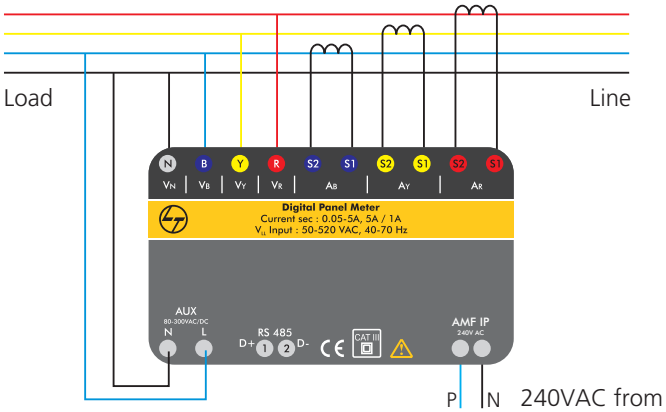


3 Phase 3 Wire System

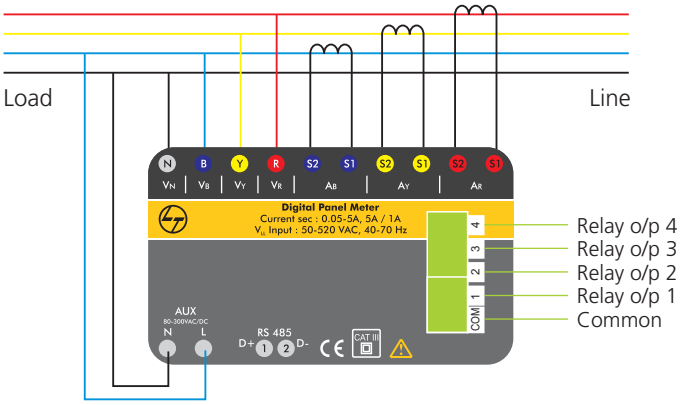


Single Phase System

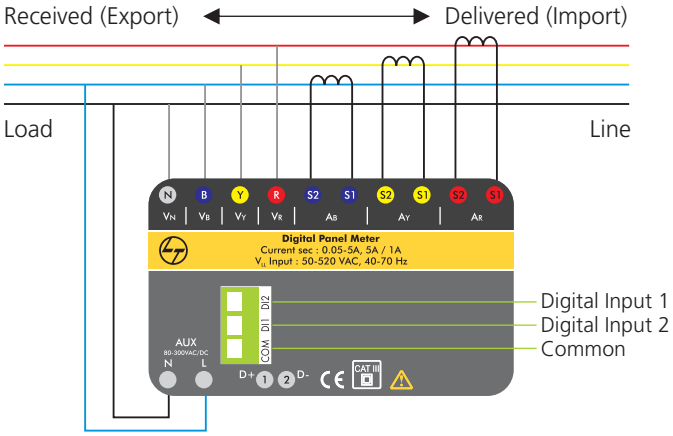
Connection Diagrams



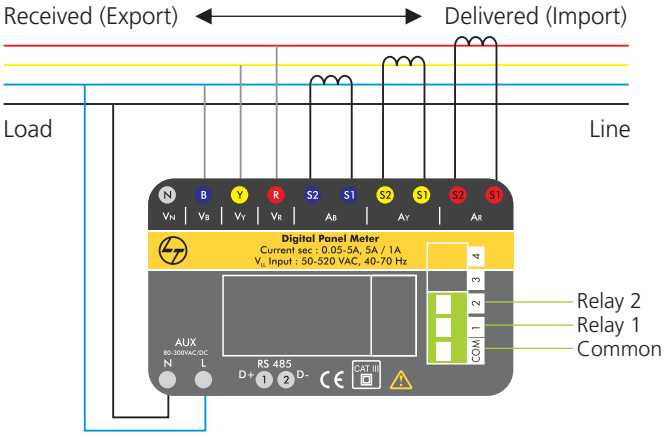
Dual Source Meter Wiring



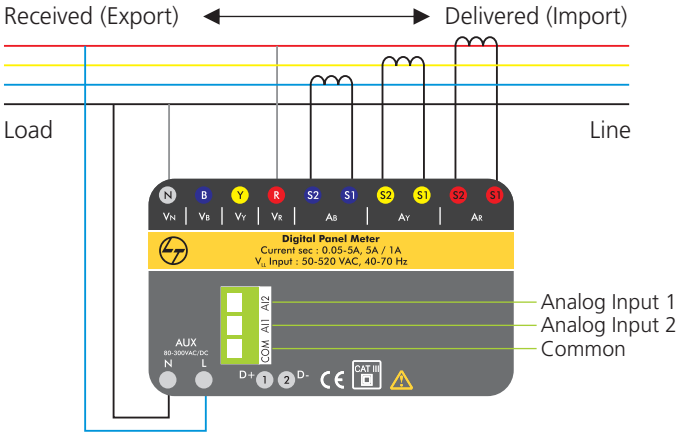
MD Controller



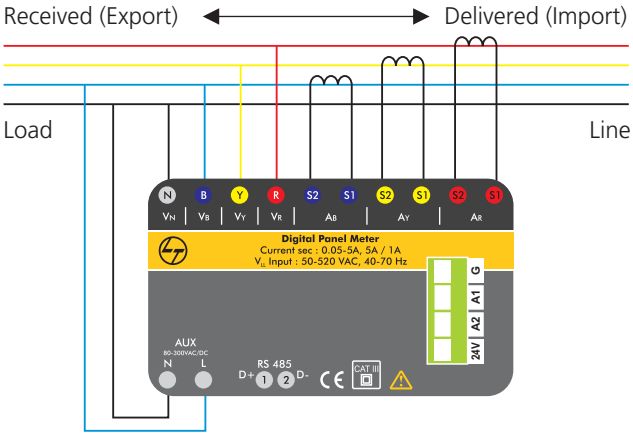
Meter with 2 Digital Inputs in 3P 4W configuration



4420 and 4430 series meter with 2 digital / relay output in 3P 4W configuration

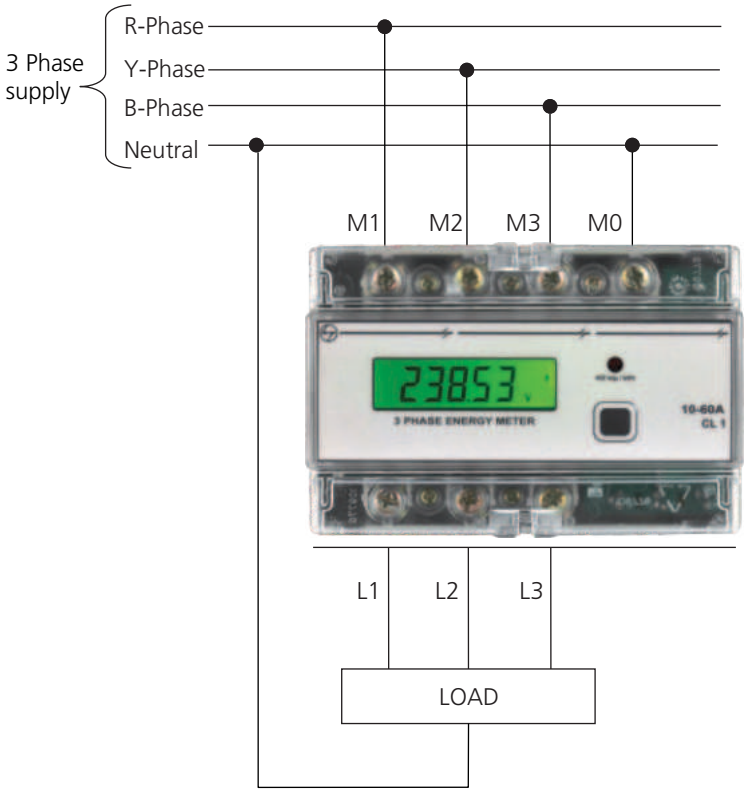


Meter with 2 Analog Inputs in 3P 4W configuration

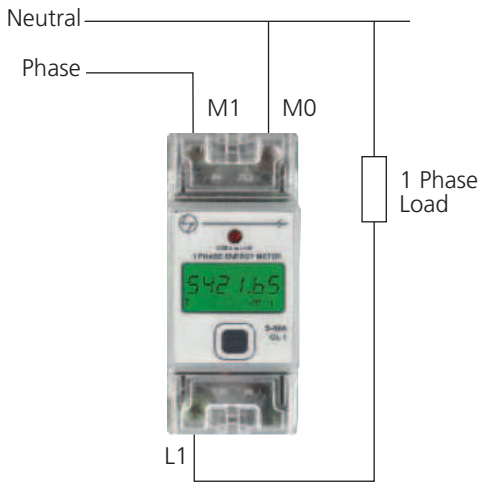


Meter with 2 Analog output in 3P 4W configuration

3-Phase

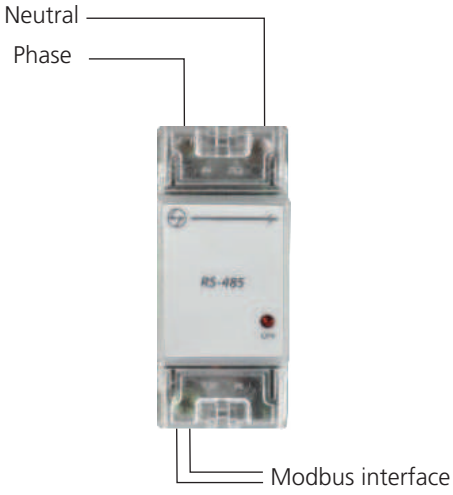


1-Phase



Wi-Fi Module

RS 485 Module



RS 485 & Wi-Fi Module should be mounted on the left side of 1Ph, 3Ph DIN Energy Meter.

Communication Register Map

Sl. No.	Parameter	Data Type	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	True PF Avg (inst)	float	40117	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	✓
10	True PF R phase	float	40119	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	✓
11	True PF Y phase	float	40121	✓	✓	✓	✓	✓	✓	✓	✓	✓Prog	✓	✓
12	True 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		✓	✓		✓					✓Prog	
35	VAh Delivered	float	40169		✓	✓		✓					✓Prog	
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	✓	✓	✓	✓	✓	✓	✓				✓Apeak
43	THD% Voltage R	float	40185	✓	✓	✓	✓	✓	✓	✓				
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	Displacement PF (Avg)	float	40203	✓	✓	✓	✓	✓	✓	✓				
53	Displacement PF R phase	float	40205	✓	✓	✓	✓	✓	✓	✓				
54	Displacement PF Y phase	float	40207	✓	✓	✓	✓	✓	✓	✓				
55	Displacement PF B phase	float	40209	✓	✓	✓	✓	✓	✓	✓				
56	RPM	float	40215	✓	✓	✓	✓	✓	✓	✓				✓
57	Load Hours Received	Unsigned long	40217	✓	✓	✓	✓	✓	✓	✓	✓		✓	
58	Load Hours Delivered	Unsigned long	40219		✓	✓		✓					✓	
59	No of interruptions	Unsigned long	40221	✓	✓	✓	✓	✓	✓	✓				
60	MD Occurrence time	Unsigned long	40223	✓	✓	✓	✓							
61	ON hours (in seconds)	Unsigned long	40231	✓	✓	✓	✓	✓	✓	✓				
62	Voltage R phase angle	float	40233	✓	✓	✓	✓	✓	✓	✓				
63	Voltage Y phase angle	float	40235	✓	✓	✓	✓	✓	✓	✓				
64	Voltage B phase angle	float	40237	✓	✓	✓	✓	✓	✓	✓				

Note: Prog means user can access any one parameter (Wh or VAh) through communication as per the programming done in meter setup.
For meters upto 4405 series PF can be selected as True PF (Default) or Displacement PF. The values will get updated in 40117 - 40123 registers.

Communication Register Map

Sl. No.	Parameter	Data Type	Address	WC6000/ WL6000	WL5010	WC5000/ WL5000	WC4440/ WL4440	WC4430/ WL4430	WC4420/ WL4420	WC4410/ WL4410	WC4400/ WL4400/ WL4405	WC4000/ WL4000	WC4040/ WL4040	WL4110
65	Current R phase angle	float	40239	✓	✓	✓	✓	✓	✓	✓				
66	Current Y phase angle	float	40241	✓	✓	✓	✓	✓	✓	✓				
67	Current B phase angle	float	40243	✓	✓	✓	✓	✓	✓	✓				
68	Energy TOD Slot-1	float	40245	✓										
69	Energy TOD Slot-2	float	40247	✓										
70	Energy TOD Slot-3	float	40249	✓										
71	Energy TOD Slot-4	float	40251	✓										
72	Energy TOD Slot-5	float	40253	✓										
73	Energy TOD Slot-6	float	40255	✓										
74	Reserved	float	40257											
75	Voltage Unbal R Phase	float	40259	✓	✓	✓	✓	✓	✓	✓				
76	Voltage Unbal Y Phase	float	40261	✓	✓	✓	✓	✓	✓	✓				
77	Voltage Unbal B Phase	float	40263	✓	✓	✓	✓	✓	✓	✓				
78	Current Unbal R Phase	float	40265	✓	✓	✓	✓	✓	✓	✓				
79	Current Unbal Y Phase	float	40267	✓	✓	✓	✓	✓	✓	✓				
80	Current Unbal B Phase	float	40269	✓	✓	✓	✓	✓	✓	✓				
81	Additional Load	float	40271	✓										
82	Analog input 1	float	40273			✓#				✓#				
83	Analog input 2	float	40275			✓#				✓#				
84	Digital input 1	Unsigned long	40277			✓#								
85	Digital input 2	Unsigned long	40279			✓#								
86	Digital input 3	Unsigned long	40281											
87	Digital input 4	Unsigned long	40283											
88	V_{LL} Max	float	40285	✓	✓	✓	✓	✓	✓	✓				
89	V_{LL} Min	float	40287	✓	✓	✓	✓	✓	✓	✓				
90	V_{LN} Max	float	40289	✓	✓	✓	✓	✓	✓	✓				
91	V_{LN} Min	float	40291	✓	✓	✓	✓	✓	✓	✓				
92	Amps Max	float	40293	✓	✓	✓	✓	✓	✓	✓				
93	Amps Min	float	40295	✓	✓	✓	✓	✓	✓	✓				
94	Frequency Max	float	40297	✓	✓	✓	✓	✓	✓	✓				
95	Frequency Min	float	40299	✓	✓	✓	✓	✓	✓	✓				
96	Watts Max	float	40301	✓	✓	✓	✓	✓	✓	✓				
97	Watts Min	float	40303	✓	✓	✓	✓	✓	✓	✓				
98	VAr max (absolute max)	float	40305	✓	✓	✓	✓	✓	✓	✓				
99	VAr min (absolute min)	float	40307	✓	✓	✓	✓	✓	✓	✓				
100	VA max	float	40309	✓	✓	✓	✓	✓	✓	✓				
101	VA min	float	40311	✓	✓	✓	✓	✓	✓	✓				
102	PF max (absolute max)	float	40313	✓	✓	✓	✓	✓	✓	✓				
103	PF min (absolute min)	float	40315	✓	✓	✓	✓	✓	✓	✓				
104	Analog input 1 max	float	40317							✓#				
105	Analog input 1 Min	float	40319							✓#				
106	Analog input 2 Max	float	40321							✓#				
107	Analog input 2 min	float	40323							✓#				
108	Maximum demand TOD slot 1	float	40325	✓										
109	Maximum demand TOD slot 2	float	40327	✓										
110	Maximum demand TOD slot 3	float	40329	✓										
111	Maximum demand TOD slot 4	float	40331	✓										
112	Maximum demand TOD slot 5	float	40333	✓										
113	Maximum demand TOD slot 6	float	40335	✓										
114	Maximum demand TOD slot 1 occ Time	Unsigned long	40337	✓										
115	Maximum demand TOD slot 1 occ Date	Unsigned long	40339	✓										
116	Maximum demand TOD slot 2 occ Time	Unsigned long	40341	✓										
117	Maximum demand TOD slot 2 occ Date	Unsigned long	40343	✓										
118	Maximum demand TOD slot 3 occ Time	Unsigned long	40345	✓										
119	Maximum demand TOD slot 3 occ Date	Unsigned long	40347	✓										
120	Maximum demand TOD slot 4 occ Time	Unsigned long	40349	✓										
121	Maximum demand TOD slot 4 occ Date	Unsigned long	40351	✓										
122	Maximum demand TOD slot 5 occ Time	Unsigned long	40353	✓										
123	Maximum demand TOD slot 5 occ Date	Unsigned long	40355	✓										
124	Maximum demand TOD slot 6 occ Time	Unsigned long	40357	✓										
125	Maximum demand TOD slot 6 occ Date	Unsigned long	40359	✓										
126	THD% Voltage R	float	40479	✓	✓	✓	✓	✓	✓	✓				
127	THD% Voltage Y	float	40481	✓	✓	✓	✓	✓	✓	✓				

Available in select models

Communication Register Map

Sl. No.	Parameter	Data Type	Address	WC6000/ WL6000	WL5010	WC5000/ WL5000	WC4440/ WL4440	WC4430/ WL4430	WC4420/ WL4420	WC4410/ WL4410	WC4400/ WL4400/ WL4405	WC4000/ WL4000	WC4040/ WL4040	WL4110
128	THD% Voltage B	float	40483	✓	✓	✓	✓	✓	✓	✓				
129	THD% Current R	float	40485	✓	✓	✓	✓	✓	✓	✓				
130	THD% Current Y	float	40487	✓	✓	✓	✓	✓	✓	✓				
131	THD% Current B	float	40489	✓	✓	✓	✓	✓	✓	✓				
132	K factor Voltage R phase	float	40491	✓	✓	✓	✓	✓	✓	✓				
133	K factor Voltage Y phase	float	40493	✓	✓	✓	✓	✓	✓	✓				
134	K factor Voltage B phase	float	40495	✓	✓	✓	✓	✓	✓	✓				
135	K factor Current R phase	float	40497	✓	✓	✓	✓	✓	✓	✓				
136	K factor Current Y phase	float	40499	✓	✓	✓	✓	✓	✓	✓				
137	K factor Current B phase	float	40501	✓	✓	✓	✓	✓	✓	✓				
138	3rd harmonics Voltage R phase	float	40503	✓	✓	✓								
139	3rd harmonics Voltage Y phase	float	40505	✓	✓	✓								
140	3rd harmonics Voltage B phase	float	40507	✓	✓	✓								
141	3rd harmonics Current R phase	float	40509	✓	✓	✓								
142	3rd harmonics Current Y phase	float	40511	✓	✓	✓								
143	3rd harmonics Current B phase	float	40513	✓	✓	✓								
144	5th harmonics Voltage R phase	float	40515	✓	✓	✓								
145	5th harmonics Voltage Y phase	float	40517	✓	✓	✓								
146	5th harmonics Voltage B phase	float	40519	✓	✓	✓								
147	5th harmonics Current R phase	float	40521	✓	✓	✓								
148	5th harmonics Current Y phase	float	40523	✓	✓	✓								
149	5th harmonics Current B phase	float	40525	✓	✓	✓								
150	7th harmonics Voltage R phase	float	40527	✓	✓	✓								
151	7th harmonics Voltage Y phase	float	40529	✓	✓	✓								
152	7th harmonics Voltage B phase	float	40531	✓	✓	✓								
153	7th harmonics Current R phase	float	40533	✓	✓	✓								
154	7th harmonics Current Y phase	float	40535	✓	✓	✓								
155	7th harmonics Current B phase	float	40537	✓	✓	✓								
156	9th harmonics Voltage R phase	float	40539	✓	✓	✓								
157	9th harmonics Voltage Y phase	float	40541	✓	✓	✓								
158	9th harmonics Voltage B phase	float	40543	✓	✓	✓								
159	9th harmonics Current R phase	float	40545	✓	✓	✓								
160	9th harmonics Current Y phase	float	40547	✓	✓	✓								
161	9th harmonics Current B phase	float	40549	✓	✓	✓								
162	11th harmonics Voltage R phase	float	40551	✓	✓	✓								
163	11th harmonics Voltage Y phase	float	40553	✓	✓	✓								
164	11th harmonics Voltage B phase	float	40555	✓	✓	✓								
165	11th harmonics Current R phase	float	40557	✓	✓	✓								
166	11th harmonics Current Y phase	float	40559	✓	✓	✓								
167	11th harmonics Current B phase	float	40561	✓	✓	✓								
168	13th harmonics Voltage R phase	float	40563	✓	✓	✓								
169	13th harmonics Voltage Y phase	float	40565	✓	✓	✓								
170	13th harmonics Voltage B phase	float	40567	✓	✓	✓								
171	13th harmonics Current R phase	float	40569	✓	✓	✓								
172	13th harmonics Current Y phase	float	40571	✓	✓	✓								
173	13th harmonics Current B phase	float	40573	✓	✓	✓								
174	15th harmonics Voltage R phase	float	40575	✓	✓	✓								
175	15th harmonics Voltage Y phase	float	40577	✓	✓	✓								
176	15th harmonics Voltage B phase	float	40579	✓	✓	✓								
177	15th harmonics Current R phase	float	40581	✓	✓	✓								
178	15th harmonics Current Y phase	float	40583	✓	✓	✓								
179	15th harmonics Current B phase	float	40585	✓	✓	✓								
180	17th harmonics Voltage R phase	float	40587	✓	✓	✓								
181	17th harmonics Voltage Y phase	float	40589	✓	✓	✓								
182	17th harmonics Voltage B phase	float	40591	✓	✓	✓								
183	17th harmonics Current R phase	float	40593	✓	✓	✓								
184	17th harmonics Current Y phase	float	40595	✓	✓	✓								
185	17th harmonics Current B phase	float	40597	✓	✓	✓								
186	19th harmonics Voltage R phase	float	40599	✓	✓	✓								
187	19th harmonics Voltage Y phase	float	40601	✓	✓	✓								
188	19th harmonics Voltage B phase	float	40603	✓	✓	✓								
189	19th harmonics Current R phase	float	40605	✓	✓	✓								
190	19th harmonics Current Y phase	float	40607	✓	✓	✓								

Communication Register Map

Sl. No.	Parameter	Data Type	Address	WL6000/ WC6000	WL5010	WC5000/ WL5000
191	19th harmonics Current B phase	float	40609	✓	✓	✓
192	21st harmonics Voltage R phase	float	40611	✓	✓	✓
193	21st harmonics Voltage Y phase	float	40613	✓	✓	✓
194	21st harmonics Voltage B phase	float	40615	✓	✓	✓
195	21st harmonics Current R phase	float	40617	✓	✓	✓
196	21st harmonics Current Y phase	float	40619	✓	✓	✓
197	21st harmonics Current B phase	float	40621	✓	✓	✓
198	23rd harmonics Voltage R phase	float	40623	✓	✓	✓
199	23rd harmonics Voltage Y phase	float	40625	✓	✓	✓
200	23rd harmonics Voltage B phase	float	40627	✓	✓	✓
201	23rd harmonics Current R phase	float	40629	✓	✓	✓
202	23rd harmonics Current Y phase	float	40631	✓	✓	✓
203	23rd harmonics Current B phase	float	40633	✓	✓	✓
204	25th harmonics Voltage R phase	float	40635	✓	✓	✓
205	25th harmonics Voltage Y phase	float	40637	✓	✓	✓
206	25th harmonics Voltage B phase	float	40639	✓	✓	✓
207	25th harmonics Current R phase	float	40641	✓	✓	✓
208	25th harmonics Current Y phase	float	40643	✓	✓	✓
209	25th harmonics Current B phase	float	40645	✓	✓	✓
210	27th harmonics Voltage R phase	float	40647	✓	✓	✓
211	27th harmonics Voltage Y phase	float	40649	✓	✓	✓
212	27th harmonics Voltage B phase	float	40651	✓	✓	✓
213	27th harmonics Current R phase	float	40653	✓	✓	✓
214	27th harmonics Current Y phase	float	40655	✓	✓	✓
215	27th harmonics Current B phase	float	40657	✓	✓	✓
216	29th harmonics Voltage R phase	float	40659	✓	✓	✓
217	29th harmonics Voltage Y phase	float	40661	✓	✓	✓
218	29th harmonics Voltage B phase	float	40663	✓	✓	✓
219	29th harmonics Current R phase	float	40665	✓	✓	✓
220	29th harmonics Current Y phase	float	40667	✓	✓	✓
221	29th harmonics Current B phase	float	40669	✓	✓	✓
222	31st harmonics Voltage R phase	float	40671	✓	✓	✓
223	31st harmonics Voltage Y phase	float	40673	✓	✓	✓
224	31st harmonics Voltage B phase	float	40675	✓	✓	✓
225	31st harmonics Current R phase	float	40677	✓	✓	✓
226	31st harmonics Current Y phase	float	40679	✓	✓	✓
227	31st harmonics Current B phase	float	40681	✓	✓	✓
228	2nd harmonics Voltage R phase	float	40683	✓	✓	✓
229	2nd harmonics Voltage Y phase	float	40685	✓	✓	✓
230	2nd harmonics Voltage B phase	float	40687	✓	✓	✓
231	2nd harmonics Current R phase	float	40689	✓	✓	✓
232	2nd harmonics Current Y phase	float	40691	✓	✓	✓
233	2nd harmonics Current B phase	float	40693	✓	✓	✓
234	4th harmonics Voltage R phase	float	40695	✓	✓	✓
235	4th harmonics Voltage Y phase	float	40697	✓	✓	✓
236	4th harmonics Voltage B phase	float	40699	✓	✓	✓
237	4th harmonics Current R phase	float	40701	✓	✓	✓
238	4th harmonics Current Y phase	float	40703	✓	✓	✓
239	4th harmonics Current B phase	float	40705	✓	✓	✓
240	6th harmonics Voltage R phase	float	40707	✓	✓	✓
241	6th harmonics Voltage Y phase	float	40709	✓	✓	✓
242	6th harmonics Voltage B phase	float	40711	✓	✓	✓
243	6th harmonics Current R phase	float	40713	✓	✓	✓
244	6th harmonics Current Y phase	float	40715	✓	✓	✓
245	6th harmonics Current B phase	float	40717	✓	✓	✓
246	8th harmonics Voltage R phase	float	40719	✓	✓	✓
247	8th harmonics Voltage Y phase	float	40721	✓	✓	✓
248	8th harmonics Voltage B phase	float	40723	✓	✓	✓
249	8th harmonics Current R phase	float	40725	✓	✓	✓
250	8th harmonics Current Y phase	float	40727	✓	✓	✓
251	8th harmonics Current B phase	float	40729	✓	✓	✓
252	10th harmonics Voltage R phase	float	40731	✓	✓	✓
253	10th harmonics Voltage Y phase	float	40733	✓	✓	✓
254	10th harmonics Voltage B phase	float	40735	✓	✓	✓
255	10th harmonics Current R phase	float	40737	✓	✓	✓
256	10th harmonics Current Y phase	float	40739	✓	✓	✓
257	10th harmonics Current B phase	float	40741	✓	✓	✓
258	12th harmonics Voltage R phase	float	40743	✓	✓	✓
259	12th harmonics Voltage Y phase	float	40745	✓	✓	✓
260	12th harmonics Voltage B phase	float	40747	✓	✓	✓
261	12th harmonics Current R phase	float	40749	✓	✓	✓
262	12th harmonics Current Y phase	float	40751	✓	✓	✓
263	12th harmonics Current B phase	float	40753	✓	✓	✓
264	14th harmonics Voltage R phase	float	40755	✓	✓	✓
265	14th harmonics Voltage Y phase	float	40757	✓	✓	✓
266	14th harmonics Voltage B phase	float	40759	✓	✓	✓
267	14th harmonics Current R phase	float	40761	✓	✓	✓
268	14th harmonics Current Y phase	float	40763	✓	✓	✓
269	14th harmonics Current B phase	float	40765	✓	✓	✓
270	16th harmonics Voltage R phase	float	40767	✓	✓	✓
271	16th harmonics Voltage Y phase	float	40769	✓	✓	✓
272	16th harmonics Voltage B phase	float	40771	✓	✓	✓
273	16th harmonics Current R phase	float	40773	✓	✓	✓
274	16th harmonics Current Y phase	float	40775	✓	✓	✓
275	16th harmonics Current B phase	float	40777	✓	✓	✓
276	18th harmonics Voltage R phase	float	40779	✓	✓	✓
277	18th harmonics Voltage Y phase	float	40781	✓	✓	✓
278	18th harmonics Voltage B phase	float	40783	✓	✓	✓
279	18th harmonics Current R phase	float	40785	✓	✓	✓
280	18th harmonics Current Y phase	float	40787	✓	✓	✓
281	18th harmonics Current B phase	float	40789	✓	✓	✓
282	20th harmonics Voltage R phase	float	40791	✓	✓	✓
283	20th harmonics Voltage Y phase	float	40793	✓	✓	✓
284	20th harmonics Voltage B phase	float	40795	✓	✓	✓
285	20th harmonics Current R phase	float	40797	✓	✓	✓
286	20th harmonics Current Y phase	float	40799	✓	✓	✓
287	20th harmonics Current B phase	float	40801	✓	✓	✓
288	22th harmonics Voltage R phase	float	40803	✓	✓	✓
289	22th harmonics Voltage Y phase	float	40805	✓	✓	✓
290	22th harmonics Voltage B phase	float	40807	✓	✓	✓
291	22th harmonics Current R phase	float	40809	✓	✓	✓
292	22th harmonics Current Y phase	float	40811	✓	✓	✓
293	22th harmonics Current B phase	float	40813	✓	✓	✓
294	24th harmonics Voltage R phase	float	40815	✓	✓	✓
295	24th harmonics Voltage Y phase	float	40817	✓	✓	✓
296	24th harmonics Voltage B phase	float	40819	✓	✓	✓
297	24th harmonics Current R phase	float	40821	✓	✓	✓
298	24th harmonics Current Y phase	float	40823	✓	✓	✓
299	24th harmonics Current B phase	float	40825	✓	✓	✓
300	26th harmonics Voltage R phase	float	40827	✓	✓	✓
301	26th harmonics Voltage Y phase	float	40829	✓	✓	✓
302	26th harmonics Voltage B phase	float	40831	✓	✓	✓
303	26th harmonics Current R phase	float	40833	✓	✓	✓
304	26th harmonics Current Y phase	float	40835	✓	✓	✓
305	26th harmonics Current B phase	float	40837	✓	✓	✓
306	28th harmonics Voltage R phase	float	40839	✓	✓	✓
307	28th harmonics Voltage Y phase	float	40841	✓	✓	✓
308	28th harmonics Voltage B phase	float	40843	✓	✓	✓
309	28th harmonics Current R phase	float	40845	✓	✓	✓
310	28th harmonics Current Y phase	float	40847	✓	✓	✓
311	28th harmonics Current B phase	float	40849	✓	✓	✓
312	30th harmonics Voltage R phase	float	40851	✓	✓	✓
313	30th harmonics Voltage Y phase	float	40853	✓	✓	✓
314	30th harmonics Voltage B phase	float	40855	✓	✓	✓
315	30th harmonics Current R phase	float	40857	✓	✓	✓
316	30th harmonics Current Y phase	float	40859	✓	✓	✓
317	30th harmonics Current B phase	float	40861	✓	✓	✓

Digital Panel Meter Range - Series Configuration

Digit 1	Digit 2	Digit 3,4,5,6		Digit 7	Digit 8	Digit 9	Digit 10	Digit 11	Digit 12
W	**L**	**1110**	Single function Ammeter 1P	**1**	**0**	**O**	**O**	**O**	**O**
DPM	LED (96 X 96)	**1120**	Single function Voltmeter 1P	Class 1	NO port	Nil	Nil	Nil	Nil
	C	**1130**	Single function Freq meter 1P	**2**	**1**	**A**	**A**	**A**	**A**
	LCD (96 X 96)	**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
	D	**1320**	Single function Voltmeter 3P	**3**	**2**	**B**	**B**	**B**	**B**
	DIN meter	**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.

	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.

   $$\text{Displacement PF} = \frac{P}{V_1 I_1}$$

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

   $$\text{Distortion PF} = \frac{1}{\sqrt{1 + (\%\, i\text{THD}/100)^2}} \; x \; \frac{1}{\sqrt{1 + (\%\, v\text{THD}/100)^2}}$$

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.

   $$\text{True PF} = \frac{P}{V_{rms} I_{rms}}$$

   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.

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.xxkWh it scales to 10.xxxxMWh, 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:

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

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

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, V_{LL}, VA, PF along with constant Wh.

This screen can also be freezed if required.

6. Continuous Energy display

LCD Multifunction Meter 44XX, 50XX Series

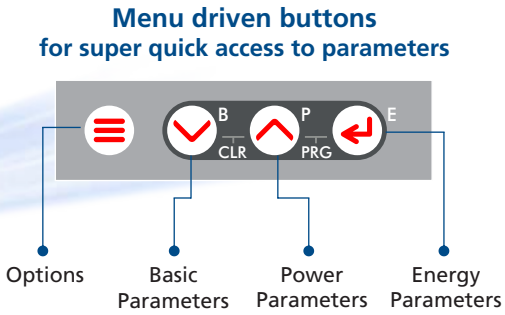
Continuous Energy Monitoring

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.

7. Menu driven parameters

44XX, 50XX Series



Parameters will be available on screen based on respective meter model

Options	Basic	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 - Avg 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

Meter with Ethernet port

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

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).

9. Parameter display on LED meter

Display	Meaning
y	Watts
UA	Total VA
Ur	Total VAR
PF	Power Factor
yh	Active Energy EB
UAh	Apparent Energy
UArh.L	Reactive Inductive Energy
UArh.C	Reactive Capacitive Energy
AVG	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
F.FACt.U.	K-Factor V

Display	Meaning
A	Current Average
F	Frequency
An	Neutral Current
rPn	Revolution Per Minute (RPM)
U.Ph.ANG	Voltage Phase Angle
A.Ph.ANG	Current Phase Angle
Un.bAL.U	Unbalance Voltage
Un.bAL.A	Unbalance Current
On.Hr	On Hour
O	Old
CLr	Clear
rd	Rising Demand
Fd	Forecast Demand
nd	Maximum Demand
AL	Additional Load
Et	Elapse Time
F.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.

Digital output

Digital outputs are possible for A THD, V THD, VA, W, under PF, under/over (V_{LL}, 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

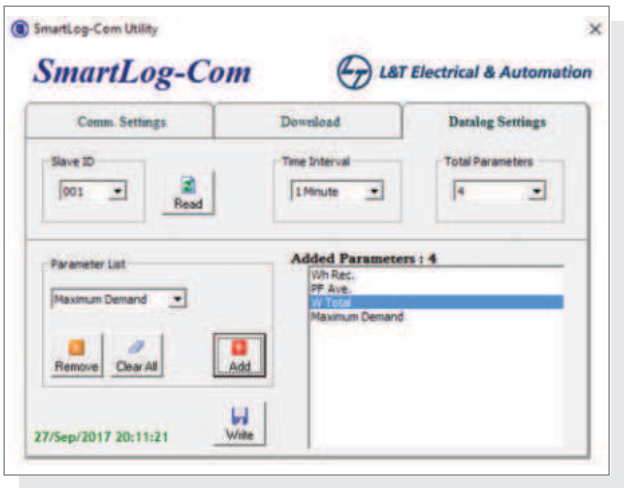
Datalog with time stamp provision is available in 5000 series meter. The information can be used for all types of businesses to determine performance, quality, energy consumption patterns, fuel consumption monitoring and many other critical parameters available in the meter. The data can be stored and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

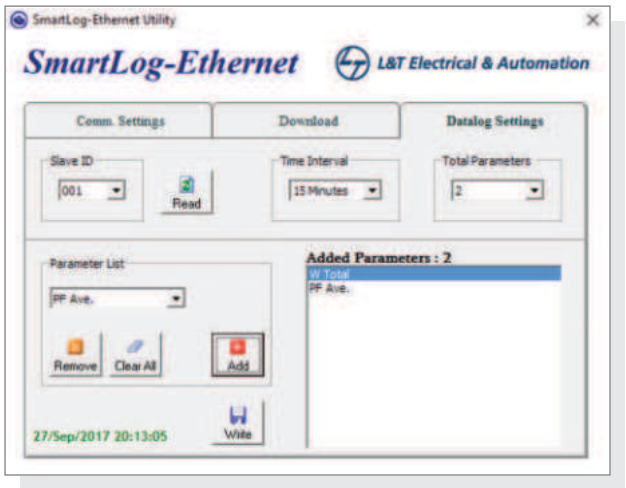
Sample table is shown below for data storage interpretation for number of days storage.

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

L&T SmartLog Software for meters with RS485 port



L&T 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.

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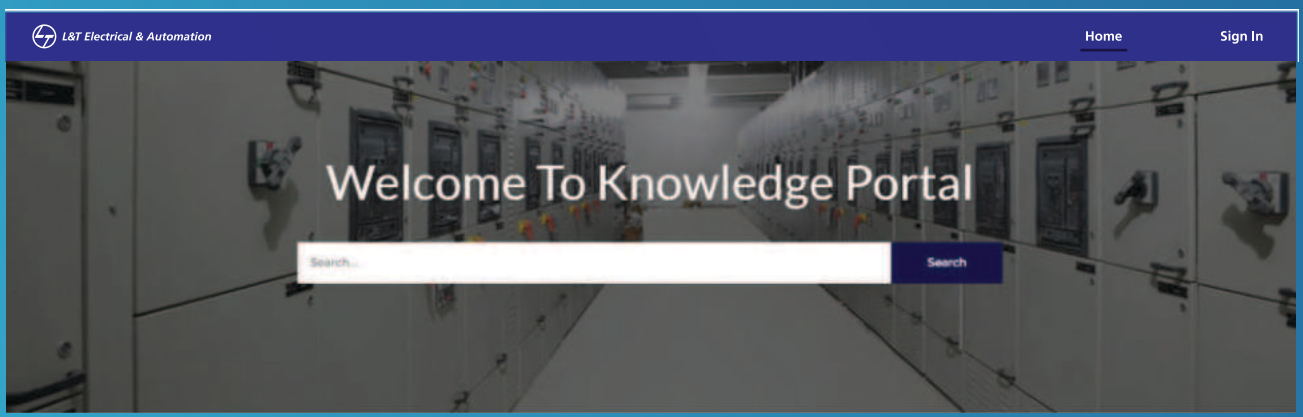

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L&T Electrical & Automation
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Opp. Gandhigram Rly. Station
Ashram Road
Ahmedabad 380 009
Tel: 079 4900 4000 / 4010
e-mail: esp-ahm@LNTEBG.com

L&T Electrical & Automation
No 38, Cubbon Road
Bengaluru 560 001
Tel: 080-46136103 / 100
e-mail: esp-blr@LNTEBG.com

L&T Electrical & Automation
131/1, Zone II, Maharana Pratap Nagar
Bhopal 462 011
e-mail: esp-bho@LNTEBG.com

L&T Electrical & Automation
Plot No. 559, Annapurna Complex, 2nd Floor
Lewis Road
Bhubaneswar 751 014
Tel: 0674-2436690 / 9437453579 / 9437284376
e-mail: esp-bsr@LNTEBG.com

L&T Electrical & Automation
Aspire Towers, 4th Floor
Plot No. 55, Phase-I
Industrial & Business Park
Chandigarh 160 002
Tel: 0172-4646840 / 41 / 42 / 44 / 53
e-mail: esp-chd@LNTEBG.COM

L&T Electrical & Automation
L&T Construction Campus
TC-1 Building, II Floor
Mount-Poonamallee Road
Manapakkam
Chennai 600 089
Tel: 044-2270 6800
e-mail: esp-maa1@LNTEBG.com

L&T Electrical & Automation
Electrical Standard Products
Manufacturing Facility
L&T Bypass Road, Malumichampatti
Coimbatore 641 050
Tel: 0422-6683031
e-mail: esp-cbe@LNTEBG.com

L&T Electrical & Automation
3rd Floor, 1&2 Vijay Park,
Main Chakrata road
Ballupur Chowk
Dehradun 248001
Tel: +91 9582252411

L&T Electrical & Automation
Khairasol, Degaul Avenue
Durgapur 713 212
Tel: 0343-2540448 / 2540449 / 2540443
e-mail: esp-dgp@LNTEBG.com

L&T Electrical & Automation
5, Milanpur Road, Bamuni Maidan
Guwahati 781 021
Tel: +91 8876554417
e-mail: esp-ghy@LNTEBG.com

L&T Electrical & Automation
2nd Floor, Vasantha Chambers
5-10-173, Fateh Maidan Road
Hyderabad 500 004
Tel: 040-67015052
e-mail: esp-hyd@LNTEBG.com

L&T Electrical & Automation
Monarch Building, 1st Floor
D-236 & 237, Amrapali Marg
Vaishali Nagar
Jaipur 302 021
Tel: 0141-4385914 to 18
e-mail: esp-jai@LNTEBG.com

L&T Electrical & Automation
Akashdeep Plaza, 2nd Floor
P. O. Golmuri
Jamshedpur 831 003
Jharkhand
Tel: 0657-2340502 / 08
e-mail: esp-jam@LNTEBG.com

L&T Electrical & Automation
Skybright Bldg; M. G. Road
Ravipuram Junction, Ernakulam
Kochi 682 016
Tel: 0484-4409420 / 4 / 5 / 7
e-mail: esp-cok@LNTEBG.com

L&T Electrical & Automation
3-B, Shakespeare Sarani
Kolkata 700 071
Tel: 033-48006001
e-mail: esp-kol@LNTEBG.com

L&T Electrical & Automation
No. 10, Fortuna Tower, 2nd Floor
Rana Pratap Marg, Near NBRI
Lucknow 226001
e-mail: esp-Lko@LNTEBG.com

L&T Electrical & Automation
No: 73, Karpaga Nagar, 8th Street
K. Pudur
Madurai 625007
Tel: 0452-2567405 / 2561068 / 2561657
e-mail: esp-mdu@LNTEBG.com

L&T Electrical & Automation
L&T Business Park, TC 2, Tower 'B'
3rd Floor , Gate No 5
Saki Vihar Road, Powai
Mumbai 400 072
Tel: 022-67052874 / 2737 / 1156
e-mail: esp-bom@LNTEBG.com

L&T Electrical & Automation
Unnati Building, 2nd Floor
Automation Campus
A-600, TTC Industrial area
Shil-Mahape road, Mahape
Navi Mumbai 400710
Tel: +91 22 67226502 / 67226300

L&T Electrical & Automation
12, Shivaji Nagar
North Ambajhari Road
Nagpur 440 010
Tel: 0712-2260012 / 6606421
e-mail: esp-nag@LNTEBG.com

L&T Electrical & Automation
A-25, Imperia Complex, First Floor,
Mohan Cooperative Industrial Estate,
Near Sarita Vihar Metro Station,
Mathura Road
New Delhi 110 044
Tel: 011-41419514 / 5 / 6
e-mail: esp-del@LNTEBG.com

L&T Electrical & Automation
Grand Chandra, 2nd Floor
Fraser Road
Opposite Doordarshan Kendra
Patna 800001
e-mail: esp-patna@LNTEBG.com

L&T Electrical & Automation
L&T House
P. O. Box 119
191/1, Dhole Patil Road
Pune 411 001
Tel: 020-48544395 / 48544279
e-mail: esp.pnq@LNTEBG.com

L&T Electrical & Automation
Crystal Tower,
4th Floor, G. E. Road
Telibandha
Raipur 492 006
Tel: +91 9755508228
e-mail: esp-raipur@LNTEBG.com

L&T Electrical & Automation
3rd Floor
Vishwakarma Chambers
Majura Gate, Ring Road
Surat 395 002
Tel: 0261-2473726
e-mail: esp-sur@LNTEBG.com

L&T Electrical & Automation
Radhadaya Complex
Old Padra Road
Near Charotar Society
Vadodara 390 007
Tel: 0265-6613610 / 1 / 2
e-mail: esp-bar@LNTEBG.com

L&T Electrical & Automation
Door No. 49-38-14/3/2, 1st floor,
NGGO's Colony, Akkayyapalem,
Visakhapatnam 530 016
Tel: 0891-2791126 / 2711125
e-mail: esp-viz@LNTEBG.com

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L&T Electrical & Automation, Electrical Standard Products
L&T Business Park, TC-2, Tower B, 3rd Floor, Gate No. 5, Saki Vihar Road, Powai, Mumbai - 400 072, INDIA www.Lntebg.com

Customer Interaction Center (CIC)
BSNL / MTNL (toll-free): 1800 233 5858 Reliance (toll-free): 1800 200 5858
Tel: 022 6774 5858 Email: cic@Lntebg.com Web: www.Lntebg.com

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