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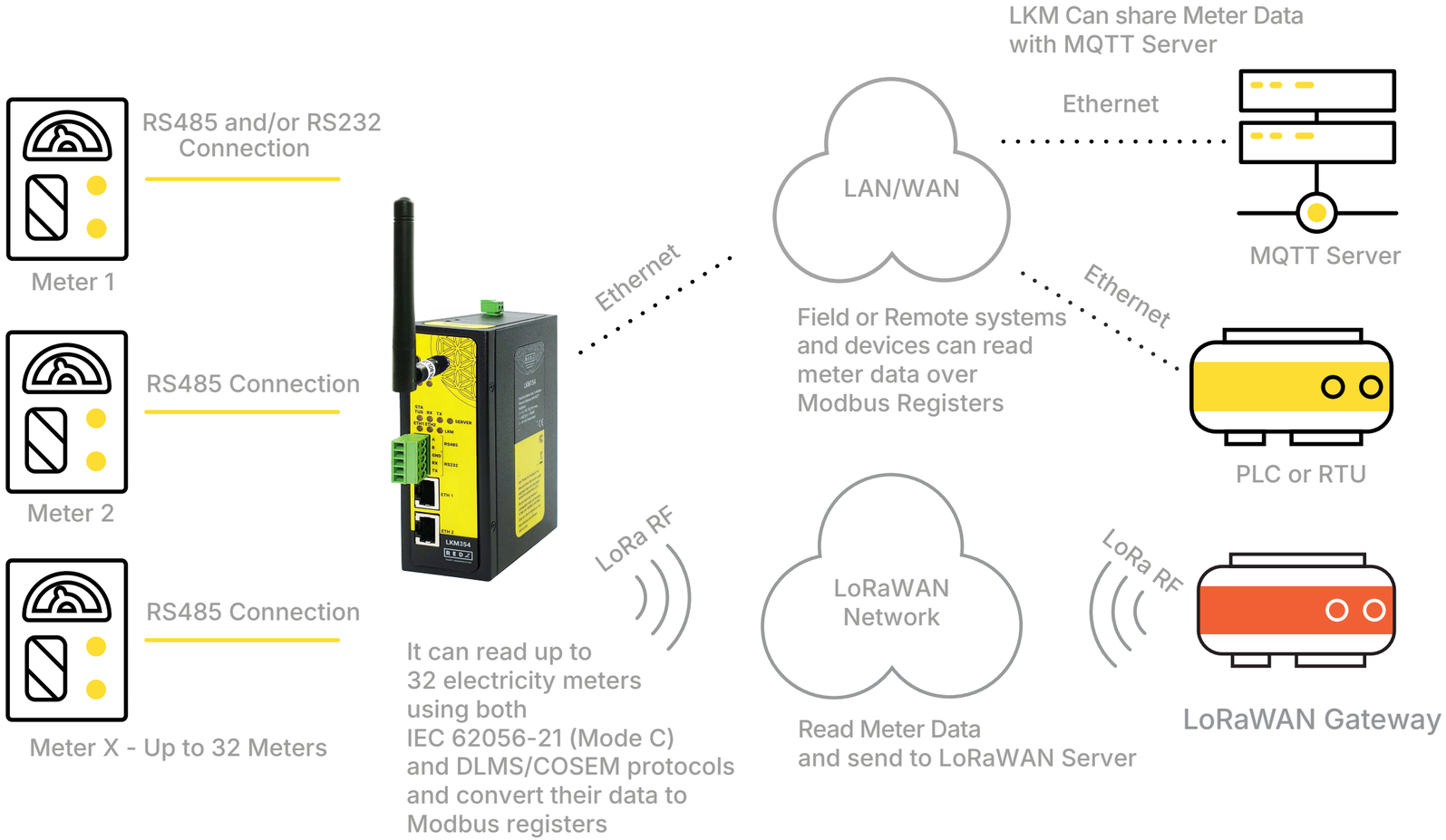
LKM Series 868MHz LoRaWAN Meter Reader and Electricity Meter Protocol to Modbus Protocol Gateways with MQTT

2 x 10/100Base-T(x) Ports,
1 x RS232 and 1 x RS485 Serial Ports
and option for BPL (Broadband Power Line Link)

LKM Series 868MHz LoRaWAN Meter Reader and Electricity Meter Protocol to Modbus Protocol Gateways with MQTT can read up to 32 electricity meters using both IEC 62056-21 (Mode C) and DLMS/COSEM protocols and convert their data to Modbus Registers so that field devices or remote applications can get meter data via Modbus TCP. Meter data will be sent to LoRaWAN Server through LoRaWAN Gateway in user defined periods. Meter data can also be sent to MQTT Server simultaneously. OBIS codes of read meters are fully definable by end user.

REDZ Broadband Power Line (BPL) link option allows device to communicate with full transparent TCP/IP standard over Low Voltage power lines and allows easy connection between TCP/IP based terminals without use of extra cables.

Typical applications: Automated Meter reading, Telemetry, Energy Management...



LKM616 is especially designed for EMH LZQJ-XC meters and it is direct replacement for Variomod XC modules. LKM616 can read EMH LZQJ-XC meters using both IEC 62056-21 (Mode C) and DLMS/COSEM protocols, convert read data to Modbus TCP and send data to LoRaWAN Server as well as MQTT Server.

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Main Features

- Supports 2 x 10/100Base-T(X) ports
- Supports 1 x RS232 and 1 x RS485 Serial Connection up to 115200 Baud
- Embedded web interface for ease of use
- Reads electricity meters using both IEC 62056-21 (Mode C) and DLMS/COSEM protocols
- Radio Band Options:
  868MHz
  EU 868 MHz – Europe, LoRaWAN RF Communication
- LoRaWAN data send interval configurable
- 2 different Device Functions:
  Serial Electricity Meter to Modbus TCP Gateway with MQTT Publisher
  TCP/IP Electricity Meter to Modbus RTU Gateway with MQTT Publisher
- Up to 32 Electricity Meter reading and conversion of their data to Modbus TCP or RTU conversion
- Reading up to 48 OBIS Registers and all user configurable from web interface
- MQTT Publisher with different data transfer options
  OBIS Values as Data Objects
  OBIS Values as Modbus Frame
- Built in LoRaWAN Duty Cycle Check
- Built in LoRaWAN payload size check. User can read data in any interval. LKM will automatically split based on Maximum Payload size allowed and Duty Cycle Block Times
- Activation Over Air (OTAA) or Activation by Personalization (ABP) Selectable
- User defined LoRAWAN Port
- Adaptive Data Rate Functionality
- Selectable Uplink Data Rate
- Selectable Power Level
- LoRaWAN Class C and Class A support
- Selectable Uplink Data Rate
- Selectable Power Level
- LoRaWAN Class C and Class A support
- Easy to follow Device Status on web interface
- Easy to follow LoRaWAN packages on web interface
- Easy to follow Meter Reading and Modbus Communication status from web interface
- Easy to follow OBIS to Modbus mapping status from web interface
- Easy to follow Meter Read Out Data from web interface
- DHCP Server Capability
- White List or Black List based IP filter up to 20 IP Addresses
- Firmware Upgrade over Web
- 2 firmware storage capability on same device (1 active only)
- Wide operating temperature range from -25 to 70 °C AC and -40 to 85 °C DC power input versions
- Rugged Metal IP-40 housing design
- DIN-Rail mounting

Extra Features for Models with BPL (Broadband Powerline)

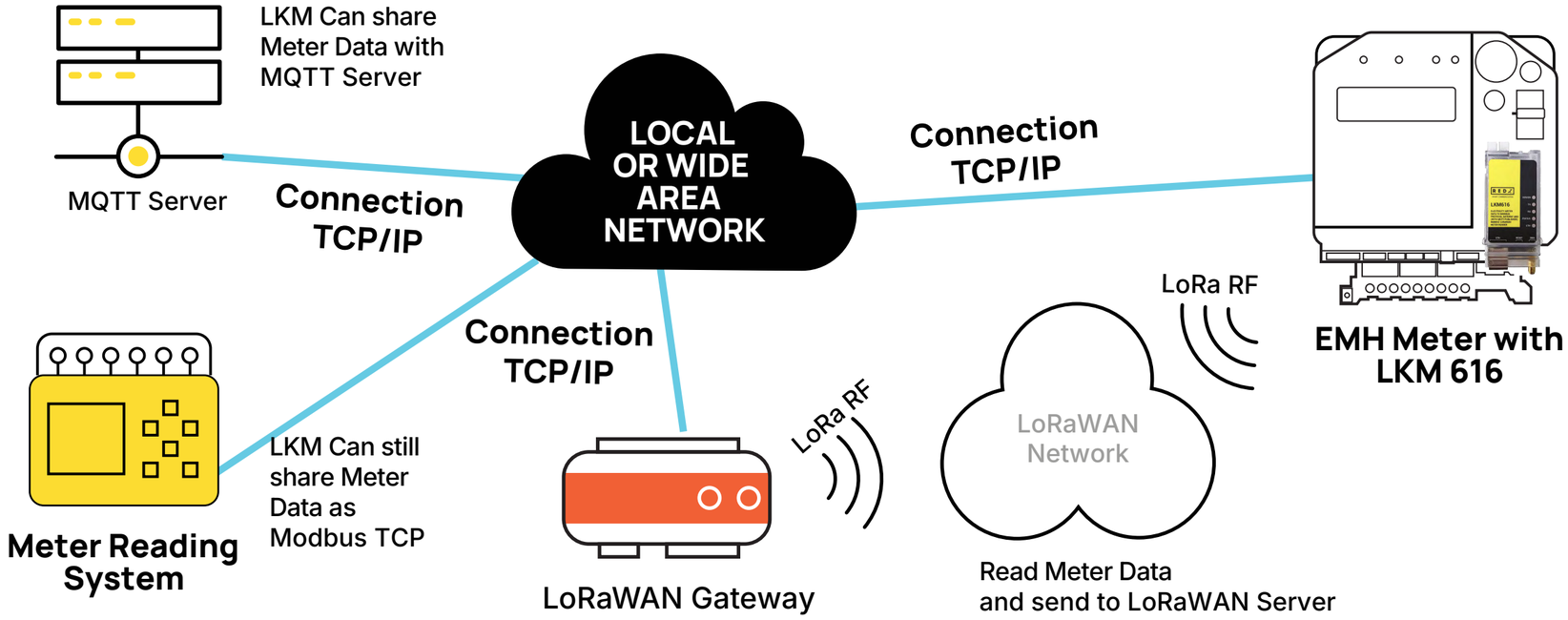
- Supports 2 x 10/100Base-T(X) ports + 1 x BPL link
- Wide range 3 phase AC input
- Supports up to 30Mbps PHY rate on BPL with Up to 10 hops and 1000 nodes
- Up to 432 sub-carriers from 2 to 28MHz analog bandwidth
- Support LDPC-C FEC with 128-bit AES core
- Plug and play with Master/Slave selection via web interface

LKM - Lite Model Differences

- 1 x 10/100 Ethernet Port
- 1 x RS485 Port
- 9-36V DC (max 40V) Power Input
- Console Connection for Logs is not available
  (UDP Log still available)
- Up to 10 Electricity Meter reading and conversion of their data
  to Modbus TCP or RTU

LKM616 Features

- 1 x 10/100 Ethernet Port
- Especially plug and play designed for EMH LZQJ-XC meters
- Direct replacement for Variomod XC modules for EMH meters
- Gets power directly from meter
  (Isolated, Isolation voltage up to 1500 VDC)
- Serial interface directly connected to meter
  (Isolated, Up to 5000 VRMS isolation rating, Up to 10 kVPK surge capability, Overload and Short-Circuit Protection, Thermal Shutdown)



Technical Details

Meter Reading Details

Up to 32 meters (up to 10 meters for Lite Models and 1 meter for direct connected models) can be read and mapped to Modbus Registers

Protocol Settings	IEC6056-21 (Mode C) DLMS/COSEM DLMS/COSEM with IEC62056-21 Opening
Meter Reading Interface	Freely selectable serial interface for each meter in list RS232 RS485 Or LKM can read TCP/IP Meters and Convert their data to Modbus RTU As well
Baud Rate	Freely selectable start baud rate for each meter in list 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
IEC Table Code	Freely selectable reading table code for each meter in list
IEC Init String Count and String Itself	Freely definable init string for each meter in list If meter needs an init string to "wake up", user can define the string itself and number of times that it will be sent
DLMS Meter Type	It is used to automatically apply default settings and reading schema to defined meter. Also it is used for selecting the OBIS profile (defined seperately for each Meter Type). Available options: Standard DLMS, Itron, Landis+Gyr, Iskra, Cewe.
DLMS Address	Physical address of the meter
DLMS Address Size	1, 2 or 4 Bytes based on meter configuration
DLMS Client Type	Depends on meter configuration. Available Options are: Management DataCollection Electricity End Customer Public ManufacturerSpecific_32
DLMS OBIS Reference	Option for how OBIS objects are referenced; Short Names (such as 2 register addresses) or Long Names (such as 1.1.1.8.0.255).
DLMS Authentication	DLMS authentication level; Low Security or No Security
DLMS Password	Password used when Authentication is set to Low Security
Query Interval	Freely selectable query interval for each meter in list That depends on meter reading list, since each meter will be read 1 by 1 over RS485 bus (or directly from RS232), reading interval depends on number of meters in list and read out reading time for each meter (based on its read out list)
Time Out	Freely selectable time out value for each meter in list LKM will continue with next meter in list in case there is no response from meter in predefined time out duration
OBIS Codes	Up to 48 OBIS codes can be defined and enabled to be read from all meters in list User can open 2 web pages side by side and check readout list from meter and simply add OBIS codes to LKM as per need

Ethernet Switch Technology

Ethernet Standards	IEEE 802.3 for 10Base-T IEEE 802.3u for 100Base-T(X) IEEE 802.3x Flow Control
Mac Table	1K MAC address entry
Processing	Store-and-Forward
Memory	448K bits packet buffer memory

BPL (Broadband Powerline) Technology for BPL Models

PHY Data Rate	Up to 240 MHz
MAC Layer Protocol	CSMA/CA
Modulation Technology	OFDM-432
VLAN	IEEE802.1q/ IEEE802.1p/ IEEE802.3d

LoRa Technology

Based on	STM32L151CxU6Axx Pre-Certified according to EN 300 220
Sensitivity	Down to -138 dBm
Link Budget	Up to 156 dB
Communication Distance	Up to 15 km (Line of Sight)
Typical Communication Distance Indoor/Urban	> 2 km

LoRaWAN Activation Options	Activation Over Air (OTAA) Activation by Personalization (ABP) User Selectable
LoRaWAN Port	User Selectable
Adaptive Data Rate	Available
LoraWAN Class	Class A Class C
Tx Power Level	0 to 16dBm Configurable
Sent Data	Sends Status Message, OBIS Details(Optional) and Meter Response
Uplink Data Rate	SF12 / 125 kHz / 250 bps SF11 / 125 kHz / 440 bps SF10 / 125 kHz / 980 bps SF9 / 125 kHz / 1760 bps SF8 / 125 kHz / 3125 bps SF7 / 125 kHz / 5470 bps SF7 / 250 kHz / 11000 bps FSK 50k / NA / 50000 bps

NTP Time Synchronization

NTP is used to synchronize device time after a manual or system triggered restart and it only takes place if NTP time is available and device time difference from NTP time is + or - 24 Hours.

Device synchronize time with LoRaWAN Server as well after first succesfull connection and it has higher priority than NTP time synchronization.

MODBUS Characteristics

Up to 32 meters (up to 10 meters for Lite Models and 1 meter for direct connected models) can be read and mapped to Modbus Registers

Up to 48 OBIS values can be mapped into Modbus Registers

Gateway Modbus Address	Default value is 1 User can change from web interface
Modbus Data and Addresses	Data can be read via Function Code 3 Read Holding Registers (4x) all registers are "long" data

Adress of 1st Meter Data:

Hex: 0x00 00
Decimal: 0
Quantity: 96 (only available if 48 registers are enabled, it changes based on enabled registers quantity)

Adress of 2nd Meter Data:

Hex: 0x01 00
Decimal: 256
Quantity: 96 (only available if 48 registers are enabled, it changes based on enabled registers quantity)

Adress of 3rd Meter Data:

Hex: 0x02 00
Decimal: 512
Quantity: 96 (only available if 48 registers are enabled, it changes based on enabled registers quantity)

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Adress of 32nd Meter Data:

Hex: 0x1F 00
Decimal: 7936
Quantity: 96 (only available if 48 registers are enabled, it changes based on enabled registers quantity)

MQTT Details

MQTT Publisher can be enabled and can be used in parallel with Modbus conversion (or stand alone)

MQTT Connection	Broker IP and Port can be entered Client ID , User name and Password can be set Publish Topic and Subscribe Topic can be defined from web interface
Data Send Interval	User can send Data send interval in seconds Default is 60 seconds and LKM will send meter data to MQTT server in that interval
NTP Server	NTP server time will be added to each MQTT message
Data Format	There are 2 predefined formats OBIS Values As Objects: Sends OBIS values and then mapped values in ASCII readable format OBIS Values as Modbus Frame: Send just like the response of Modbus query as hex data (smaller data size)

WEB Monitoring Details

Meter Communication Status	User can see reading status of each meter in reading list Last Query Time and Last Serial Package also available in this list and the meter's name/serial and protocol (IEC 62056-21 / DLMS/COSEM) are also shown.
Modbus Communication Status	User can see reading status of each Modbus client connected Last Query Time and Last Received and Sent Packages also available in this list
Meter Reading to Modbus Mapping (Gateway) Status	User can see modbus mapping status of each meter in reading list Data can be checked in realtime or status can be set for any specific meter in list Ex: Show mapping status of Meter Number 2 in meter reading list only
Meter Reading Status	User can see meter reading details in real time This data can help to select desired OBIS codes
LoRaWAN Status	User can see LoRaWAN Network Status (Joining or Active) LoRaWAN Tx and Rx Messages Latest sent data package details Number of LoRaWAN Messages sent, pending and lost Duty Cycle Block Time

Connectors and Ports

SMA Antenna Connector for Lora	1 Standard SMA female interface, 50 ohm
Console Port	Micro USB or USB Type-C connection for LOG in 115200 baud
10/100T(X) RJ45 Ports	Ethernet Connection on 2 ports
Serial Ports	5 pin wired Terminal Connection Tx, Rx, GND for RS232 A and B for RS485
Reset Buttons	Reset to Client and Reset to Server Operating modes buttons

LED Indicators

Power indicator	Power LED
10/100T(X) Indicators	Activity LEDs: ETH1, ETH2 and LKM (Activity of device itself)
System Indicators	Status LED, Tx and Rx of data LEDs and Server LED (LED ON: Server Operating Mode, LED OFF: Client Operating Mode)
Console Indicators	Tx and Rx of data LEDs
BPL LEDS (For BPL Models)	BPL Activity BPL Link Master Indication (LED ON: Master, LED OFF: Slave)

Physical & Environmental Characteristics - DC Models

Enclosure	Metal, IP 40
Dimensions	43 x 95 x 124 (w x d x h) mm
Weight	~400gr
Storage Temperature	-65 to 150 °C
Operating Temperature	-40 to 85 °C
Operating Humidity	5% to 95% Non-condensing

Physical And Environmental Characteristics - AC Models

Enclosure	Metal, IP 40
Dimensions	43 x 95 x 124 (w x d x h) mm
Weight	~400gr
Storage Temperature	-40 to 85 °C
Operating Temperature	-25 to 70 °C
Operating Humidity	10% to 95% Non-condensing

Physical And Environmental Characteristics - BPL Models

Enclosure	Metal, IP 40
Dimensions	43 x 95 x 124 (w x d x h) mm
Weight	~400gr
Storage Temperature	-65 to 150 °C
Operating Temperature	-40 to 85 °C
Operating Humidity	10% to 95% Non-condensing

Power - BPL Models

Input Range	3 Phase Input, 110V–240V 50Hz to 60Hz AC input
Power and Data	AC Power supply use L1-N only. Phase 2-3 connections are used for BPL signal transmission.

BPL Models can be purchased in 3 versions:
1. PP Model: Phase to phase model (Standard Model).
Data transmission is only done through terminal pins 3 and 4. AC Phase to phase connection should be done to data transmission pins for better performance.
If phase to phase connection is not available then phase and neutral can still be connected for data transmission over terminal pins 3 and 4.
(Ex: L1-L2, L2-L3, L1-L3 or L1-2-3 to N can be used as data connection)

2. PN Model: Phase to neutral model. That version gets power from terminal pins 1 and 2 from phase and neutral and it can also transmit data from that pins (pins 1 and 2). Remaining (pins 3 and 4) pins usage is optional.
(Ex: Master can be connected to all phases and slaves can be connected to relevant phases)
(Ex: L1-N, L2-N, L3-N or L1-2-3 and N can be used as data connection)

3. DC Model: DC data line model. Uses DC Power Line for data transmission.
(Ex: 24V+ and GND as data connection)

Power - DC Models

Input Range	5-48V DC wide range Power Input (Allows up to 60 V DC)
Reverse Polarity Protection	Available
Thermal Shutdown and Current Limit Protection	Available

Power - AC Models

Input Range	100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC input
Isolation	Fully Isolated >4200Vrms, 5mA 1 Min
Insulation	Class II

LKM - Lite

LKM Lite Models are cost effective solution for 868MHz LoRaWAN Meter Reader and Electricity Meter Protocol to Modbus Protocol Gateway needs.

LKM - Lite model hardware difference:
- 1 x 10/100 Ethernet Port
- 1 x RS485 Port
- 9-36V DC (max 40V) Power Input
- Console Connection for Logs is not available (UDP Log still available)

LKM - Lite model functional difference:
- Up to 10 Electricity Meter reading and conversion of their data to Modbus TCP or RTU

Power - Lite DC Model

Input Range	9-36V DC wide range Power Input (Allows up to 40 V DC)
Reverse Polarity Protection	Available
Insulation Voltage	1500VDC for 1 minute with leakage current <1mA.

Physical And Environmental Characteristics Lite DC Model

Enclosure	Metal, IP 40
Dimensions	43 x 95 x 124 (w x d x h) mm
Weight	~400gr
Storage Temperature	-55 to 125 °C
Operating Temperature	-40 to 85 °C
Operating Humidity	5% to 95% Non-condensing

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Power - LKM616 Model

Connection	Directly Connects to Meter and Get Power From Meter
Insulation Voltage	1500VDC for 1 minute with leakage current <1mA.

Physical And Environmental Characteristics Lite DC Model

Enclosure	ABS, IP 51
Dimensions	105 x 45 x 27 (h x w x d) mm
Weight	~ 200 g
Storage Temperature	-55 to 125 °C
Operating Temperature	-40 to 85 °C
Operating Humidity	5% to 95% Non-condensing

LKM616 is especially designed for EMH LZQJ-XC meters and it is direct replacement for Variomod XC modules. LKM616 can read EMH LZQJ-XC meters, convert read data to Modbus TCP and send data to LoRaWAN Server as well as MQTT Server.

LKM616 model hardware difference:

- 1 x 10/100 Ethernet Port
- Especially plug and play designed for EMH LXQJ-XC meters
- Direct replacement for Variomod XC modules for EMH meters
- Gets power directly from meter (Isolated, Isolation voltage up to 1500 VDC)
- Serial interface directly connected to meter (Isolated, Up to 5000 VRMS isolation rating, Up to 10 kVPK surge capability, Overload and Short-Circuit Protection, Thermal Shutdown)

Ordering Information

LKM154: Electricity Meter Protocol to Modbus Protocol Gateway with MQTT,
2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 5-48V (max. 60V) DC Power Input

LKM254: Electricity Meter Protocol to Modbus Protocol Gateway with MQTT,
2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

LKM655: Electricity Meter Protocol to Modbus Protocol Gateway with MQTT,
2x 10/100 T(x) ETH ports + 1 x BPL (Broadband Power Line) Link, 1 x RS232 & 1 x RS485, 3 Phase AC Power Input, 110V–240V/50-60Hz

LKM154 - Lite: Electricity Meter Protocol to Modbus Protocol Gateway with MQTT, 1x 10/100 T(x) ETH port and 1 x RS485,
5-48V (max. 60V) DC Power Input

LKM354: 868MHz LoRaWAN Meter Reader and Electricity Meter Protocol to Modbus Protocol Gateway with MQTT,
2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 5-48V (max. 60V) DC Power Input

LKM454: 868MHz LoRaWAN Meter Reader and Electricity Meter Protocol to Modbus Protocol Gateway with MQTT
2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

LKM755: 868MHz LoRaWAN Meter Reader and Electricity Meter Protocol to Modbus Protocol Gateway with MQTT,
2x 10/100 T(x) ETH ports + 1 x BPL (Broadband Power Line) Link, 1 x RS232 & 1 x RS485, 3 Phase AC Power Input, 110V–240V/50-60Hz

LKM354 - Lite: 868MHz LoRaWAN Meter Reader and Electricity Meter Protocol to Modbus Protocol Gateway with MQTT,
1x 10/100 T(x) ETH port and 1 x RS485, 5-48V (max. 60V) DC Power Input

LKM615: Electricity Meter Protocol to Modbus Protocol Gateway with MQTT,
1x 10/100 T(x) ETH port, Meter Side is Direct Connection to Meter, Powered from Meter Interface

LKM616: 868MHz LoRaWAN Meter Reader and Electricity Meter Protocol to Modbus Protocol Gateway with MQTT,
1x 10/100 T(x) ETH port, Meter Side is Direct Connection to Meter, Powered from Meter Interface

Product Selection

Model	868MHZ LoRaWAN Meter Reader	Gets Power From Meter Directly (and Isolated)	9-36V (max. 40V) DC Power Input	5-48V (max. 60V) DC Power Input	100 – 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input	3 Phase AC Power input, 110 V – 240 V / 50 – 60 Hz AC Power Input	Directly Connects to Meter. Read 1 Meter and, Convert Data to Modbus and/or Send to MQTT	Read Up to 10 Meters and Convert Data to Modbus and/or Send to MQTT	Read Up to 32 Meters and Convert Data to Modbus and/or Send to MQTT	OBIS Codes to look for can be changed by user	Web Interface for monitoring meter reading status and much more	BPL (Broadband Power Line) Link
LKM154				●					●	●	●	
LKM254					●				●	●	●	
LKM655						●			●	●	●	●
LKM154 - Lite			●					●		●	●	
LKM354	●			●					●	●	●	
LKM454	●				●	●			●	●	●	
LKM755	●								●	●	●	●
LKM354 - Lite	●		●					●		●	●	
LKM615		●					●			●	●	
LKM616	●	●					●			●	●	