REDZ
SMART COMMUNICATION

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LKM RTU Series Electricity Meter to Modbus RTU Gateways

Electricity meter data as Modbus RTU registers, over RS232 or RS485

- Reads electricity meters with IEC 62056-21 (mode C, automatic mode A and B detection, mode D) or the P1 Companion Standard
- Gives the values out as Modbus RTU registers, on an RS232 or RS485 line
- Tells a missing reading from a value of zero: row validity mask and per-meter health



LKM111	LKM114	LKM124	LKM141	LKM614
Meter: RS232	Meter: RS232	Meter: P1	Meter: RS485	In the meter

LKM RTU Series gateways connect electricity meters to a PLC, a SCADA computer or any other Modbus RTU master. The meter is read automatically on its own interface and the values are mapped to fixed Modbus registers, so the master needs no knowledge of the meter protocol. Six models cover RS232, RS485, P1 and in-meter connections.

Highlights

1. **Modbus RTU slave:** address 1 to 247, speed chosen by a switch, 8N1 (8E1 or 8O1 by setting)
2. **Several meters:** up to 10 meters on one RS485 meter line, each with its own register block
3. **Trusted data:** an IEC meter telegram updates the registers only when its checksum is correct, and parity errors are counted
4. **Diagnostics over Modbus:** per-meter read counters and age, a row validity mask and a built-in meter trace, switched on over Modbus
5. **Two register views:** FC03 gives integers, FC04 gives the same values as float64 with the decimal point applied
6. **Firmware update over the serial line:** the new image is verified before it is activated and an interrupted update leaves the old firmware running

Key Figures

10
meters on one RS485 meter line (LKM141, LKM144)

7 - 24 V
DC supply; the LKM614 is powered from the meter

IEC 62056-21 + P1
meter protocols; P1 on LKM124

float64
values on FC04, next to integers on FC03

about 15 ms
Modbus response time at 19200 bit/s (median, bench)

1 - 247
Modbus slave addresses

Main Features

Meter side

- IEC 62056-21 mode C; mode A and mode B meters are detected automatically, mode D is selected by a setting
- P1 Companion Standard on the LKM124: the meter sends its telegram by itself, no request is needed
- Each meter is addressed by a number or an address text of up to 16 characters
- Read period 5 to 254 seconds, set over Modbus

Modbus RTU

- Function codes 03, 04, 06 and 16, up to 124 registers per read
- The high byte of the register address selects the meter (0 to 9)
- Invalid requests are answered with standard Modbus exception replies
- Built-in write lock for settings, table and firmware update commands, switched on over Modbus (factory setting: off)
- A forgotten slave address is recovered with a broadcast read on a line with one device

Register table

- Built-in table of 64 rows: energy with tariff rows, maximum demands, averaged power, current, voltage, power factor and frequency
- The table can be replaced by a user-defined OBIS table, loaded over Modbus

Connections

- RS232: 3-wire terminal (Tx, Rx, GND). RS485: 2-wire terminal (A, B), GND can be used as well
- P1: 3-wire terminal for Data, Data Request and GND; power can be taken from the P1 interface

Models

- LKM111: RS232 modem side, RS232 meter side
- LKM114: RS485 modem side, RS232 meter side
- LKM124: RS485 modem side, P1 meter side
- LKM141: RS232 modem side, RS485 meter side
- LKM144: RS485 modem side, RS485 meter side
- LKM614: RS485 modem side, built into the meter

Power input

- 7 - 24 V DC on the LKM111, LKM114, LKM141 and LKM144
- LKM124: 7 - 24 V DC, or power from the P1 interface
- LKM614: power from the meter

For EMH meters

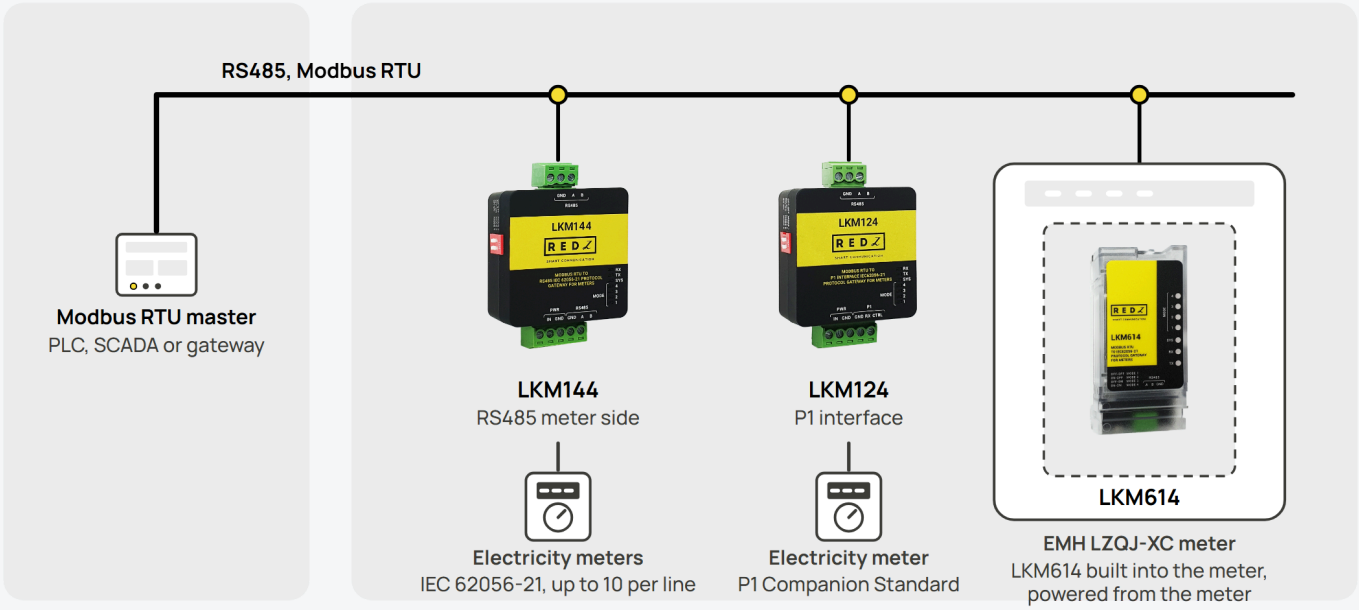
- LKM614 is designed for EMH LZQJ-XC meters and replaces Variomod XC modules directly

Technical Data

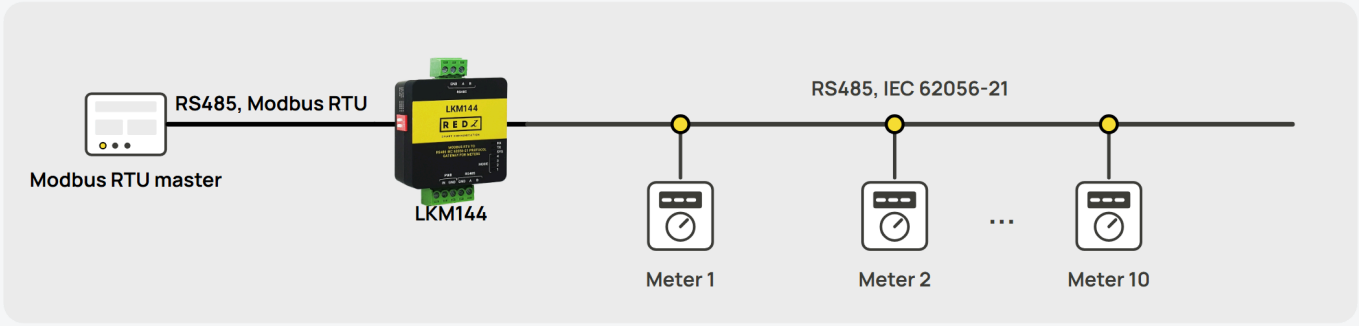
Interfaces and protocols

	LKM111 RS232 / RS232	**LKM114** RS485 / RS232	**LKM124** RS485 / P1	**LKM141** RS232 / RS485	**LKM144** RS485 / RS485	**LKM614** RS485 / in meter
Modem side	RS232	RS485	RS485	RS232	RS485	RS485
Modem side speed	9600 or 19200 bit/s	9600 or 19200 bit/s	9600, 19200, 57600 or 115200 bit/s	9600 or 19200 bit/s	9600 or 19200 bit/s	9600 or 19200 bit/s
Meter side	RS232	RS232	P1 interface	RS485	RS485	In the meter
Meter protocol	IEC 62056-21	IEC 62056-21	P1 Companion Standard	IEC 62056-21	IEC 62056-21	IEC 62056-21
Meter side speed and format	7E1; automatic from 300 bit/s, or fixed	7E1; automatic from 300 bit/s, or fixed	8N1, same speed as the modem side	7E1; automatic from 300 bit/s, or fixed	7E1; automatic from 300 bit/s, or fixed	7E1; automatic from 300 bit/s, or fixed
Meters per device	One meter	One meter	One meter	Up to 10	Up to 10	One meter
Operating modes	Four modes	Four modes	Four modes	Four modes	Four modes	Four modes
Power input	7 - 24 V DC	7 - 24 V DC	7 - 24 V DC or P1 interface	7 - 24 V DC	7 - 24 V DC	From the meter
Indicators	System, Tx, Rx, mode LEDs	System, Tx, Rx, mode LEDs	System, Tx, Rx, mode LEDs	System, Tx, Rx, mode LEDs	System, Tx, Rx, mode LEDs	System, Tx, Rx, mode LEDs

Typical Application



A PLC, RTU or acquisition server reads the meter data over Modbus registers while the gateway reads the meter



The LKM141 and LKM144 read up to 10 meters on one RS485 meter line; each meter has its own address and its own register block

Environment and housing

	LKM111 / 114 / 124 / 141 / 144	LKM614
Operating temperature	-40 to 85 C	-40 to 85 C
Storage temperature	-55 to 125 C	-55 to 125 C
Humidity	5 to 95 %, non-condensing	5 to 95 %, non-condensing
Supply voltage	7 - 24 V DC	From the meter
EMC and ESD	Tested to EN IEC 61326-1; ESD 4 kV contact, 8 kV air	-
Housing	ABS, IP40	ABS, IP51
Dimensions (h x w x d)	21 x 42 x 44 mm	105 x 45 x 27 mm
Weight	approx. 60 g	approx. 60 g

Modbus register blocks

Block	Addresses	Block	Addresses
Meter data (per meter)	0x0000 - 0x007F	**Diagnostics**	0x00C0 - 0x00DF
Settings	0x0080 - 0x0089 and 0x00A0 - 0x00BD	**Firmware update**	0x00E0 - 0x00E3
IEC address text	0x0090 - 0x0098	**Meter health (per meter)**	0x00E4 - 0x00EA
Row validity mask (per meter)	0x0099 - 0x009C	**OBIS table**	0x00F0 - 0x00F9
Meter trace and protocol mode	0x009D - 0x009F		

Registers are 16 bit and big-endian; meter data and the two-register settings are 32-bit values in 2 registers

Product Comparison

LKM RTU	111	114	124	141	144	614
Modem side RS232	●			●		
Modem side RS485		●	●		●	●
Meter side RS232	●	●				
Meter side RS485				●	●	
Meter side P1 Companion Standard			●			
IEC 62056-21 protocol	●	●		●	●	●
7 - 24 V DC power input	●	●	●	●	●	
Plugs into the meter, no external power						●
Firmware update over the serial line	●	●	●	●	●	●
Operating mode selection	●	●	●	●	●	●

Ordering Information

Model	Modem side and meter side	Power
LKM111	Modem side RS232, meter side RS232	7 - 24 V DC
LKM114	Modem side RS485, meter side RS232	7 - 24 V DC
LKM124	Modem side RS485, meter side P1 interface	7 - 24 V DC
LKM141	Modem side RS232, meter side RS485	7 - 24 V DC
LKM144	Modem side RS485, meter side RS485	7 - 24 V DC
LKM614	Modem side RS485, meter side connected directly to the meter	Powered from the meter interface

Configuration and Monitoring Software

ZTerminal for Windows is used with an LKM for the operations that the user manual describes as Modbus requests: reading and changing the settings, reading the meter values and the monitoring values, loading an OBIS table and updating the firmware.

Settings

Reads and changes the settings.

OBIS table

Loads an OBIS table.

Monitoring

Reads the meter values and the monitoring values.

Firmware update

Updates the firmware.

ZTerminal for Windows

- Connects through a serial port of the PC, for example a USB serial adapter.
- Works with the HUR IO modules and other REDZ devices as well.
- User guide: redzsoftware.com/zterminal/windows-manual/