

Modbus RTU Energy Meter

Energy Monitoring in Building
and Industrial Applications



Modbus RTU Energy Meter

The METZ CONNECT MR-(F-)SM4i and MR-(F-)SM4u energy meters enable the precise measurement of energy data for up to 3 phases plus neutral (L1, L2, L3, N) using transformers.

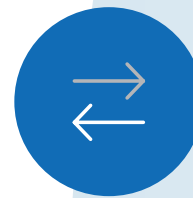
Data is transmitted via the standardized Modbus RTU protocol. When used in conjunction with the METZ CONNECT Modbus RTU Gateway MR-(F-)GW or the METZ CONNECT EWIO2-M(-BM) data loggers, the recorded measurement data is seamlessly integrated into IP-based network infrastructures. Alternatively, data transmission is also possible via Modbus gateways from third-party manufacturers. The advantage of the METZ CONNECT system solution lies in the pre-integrated templates for convenient commissioning and operation of the energy meters.

The meters measure current, voltage, active power, reactive power, apparent power, and other relevant energy parameters.

The compact DIN-rail modules offer Class B measurement accuracy and can be integrated into existing systems without tools thanks to the proven METZ CONNECT bridge connector technology.

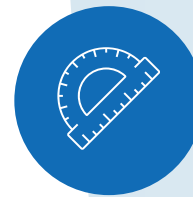
Two device variants cover different current ranges and transformer types: The MR-SM4i is suitable for conventional current transformers with 1 A/5 A secondary current, while the MR-SM4u is designed for current transformers with a 333 mV voltage output and Rogowski coils with a 50 mV output signal.

Both meters are available with either screw terminals or spring-loaded terminals (push-in technology). The spring-loaded terminal version allows for quick, tool-free wiring and significantly reduces installation time.



Precise Energy Measurement

- › Measurement accuracy in accordance with Class B



Multiphase measurement

- › Measurement of up to 3 phases plus neutral conductor



Bridge Connector System

- › Bus and power transmission from device to device without additional wiring



Device Variants

- › For current transformers with secondary current (1 A, 5 A), as well as current transformers and Rogowski coils with secondary voltage (22.5 mV/50 mV/225 mV/250 mV/333 mV)



Modbus RTU via RS485 interface

- › Easy integration with the EWIO₂-M(-BM) data logger and MR-(F-)GW Modbus gateway, as well as existing automation systems



Compact design

- › Space-saving, only 50 mm (3 TE) wide

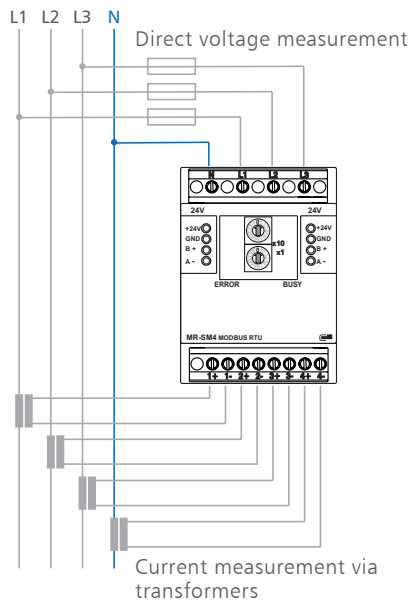
Application Example

The Challenge

In Germany and Europe, numerous companies are legally required to systematically track and optimize their energy consumption. In addition, some consumers rely on professional energy management even without legal requirements—to reduce energy costs, identify savings potential, and actively contribute to climate protection. Precise energy measurement is the foundation for legally compliant documentation and successful optimization.

The Scenario

A manufacturing company operates multiple machines and production lines. To meet legal requirements, make energy costs transparent, and identify potential savings (e.g., energy management according to ISO 50001 or energy audits according to DIN EN 16247), an intelligent energy measurement system is required.

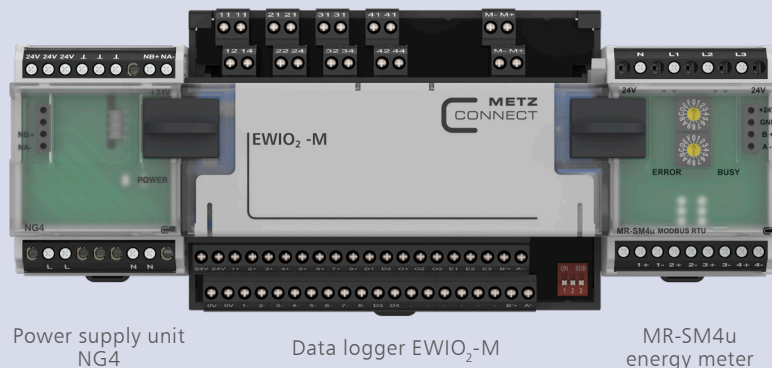


The Solution

This is where the system solution from METZ CONNECT comes into play. With a smart combination of the NG4 power supply unit, the web-based EWIO₂-M data logger, and the MR-(F-)SM4x energy meter with current transformers, energy data can be recorded with precision.

The stored energy data can be analyzed and visualized directly using the EWIO₂-M(-BM)'s integrated Node-RED. Integration into higher-level systems is achieved either via Modbus TCP using the Modbus gateway or via Modbus RTU with third-party systems.

A detailed overview of all system components can be found on pages 10 and 11 of this brochure.



Your benefits

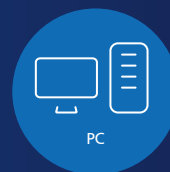
- › Compatible with MR-(F-)GW, EWIO₂-M(-BM), and third-party systems via Modbus RTU
- › Measurement accuracy according to Class B
- › Seamless energy data acquisition from machines and systems through to central evaluation
- › Flexible thanks to various transformer types and current ranges
- › Retrofittable without downtime thanks to folding transformer
- › Measurement of up to 3 phases plus neutral conductor
- › Recording of current, voltage, active power, reactive power, apparent power, and other relevant energy parameters



System Overview



Ethernet



Modbus TCP



We realize ideas

Overview

System ✓

I/O Input/Output

Functional modules

Settings

Energy meter 1

Application

Links

Metering

Data Server

Node-RED

Logout

Settings

Baud rate 19200

Parity and stop bits even, 1 stop bit

Change settings

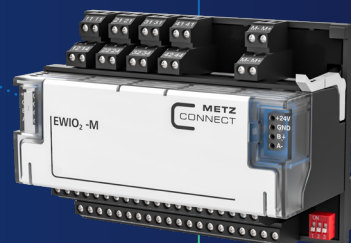
Functional modules

To activate the current settings for functional modules, search must be started.
The table shows configured functional modules. Unattainable functional modules are marked by a red cross and may be deleted.

Address	Name	Variant	Conversion ratio	
1	MR-SM4i	Current	Please select here	✓

Search for Functional Modules

Data logger
EWIO₂-M (-BM)



Modbus RTU

MR-SM4i



x4

Transducers 100/1 A

MR-F-SM4i



x4

Transducers 100/5 A

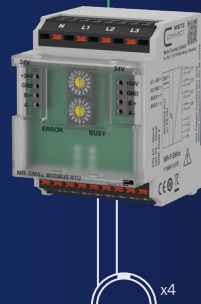
MR-SM4u



x4

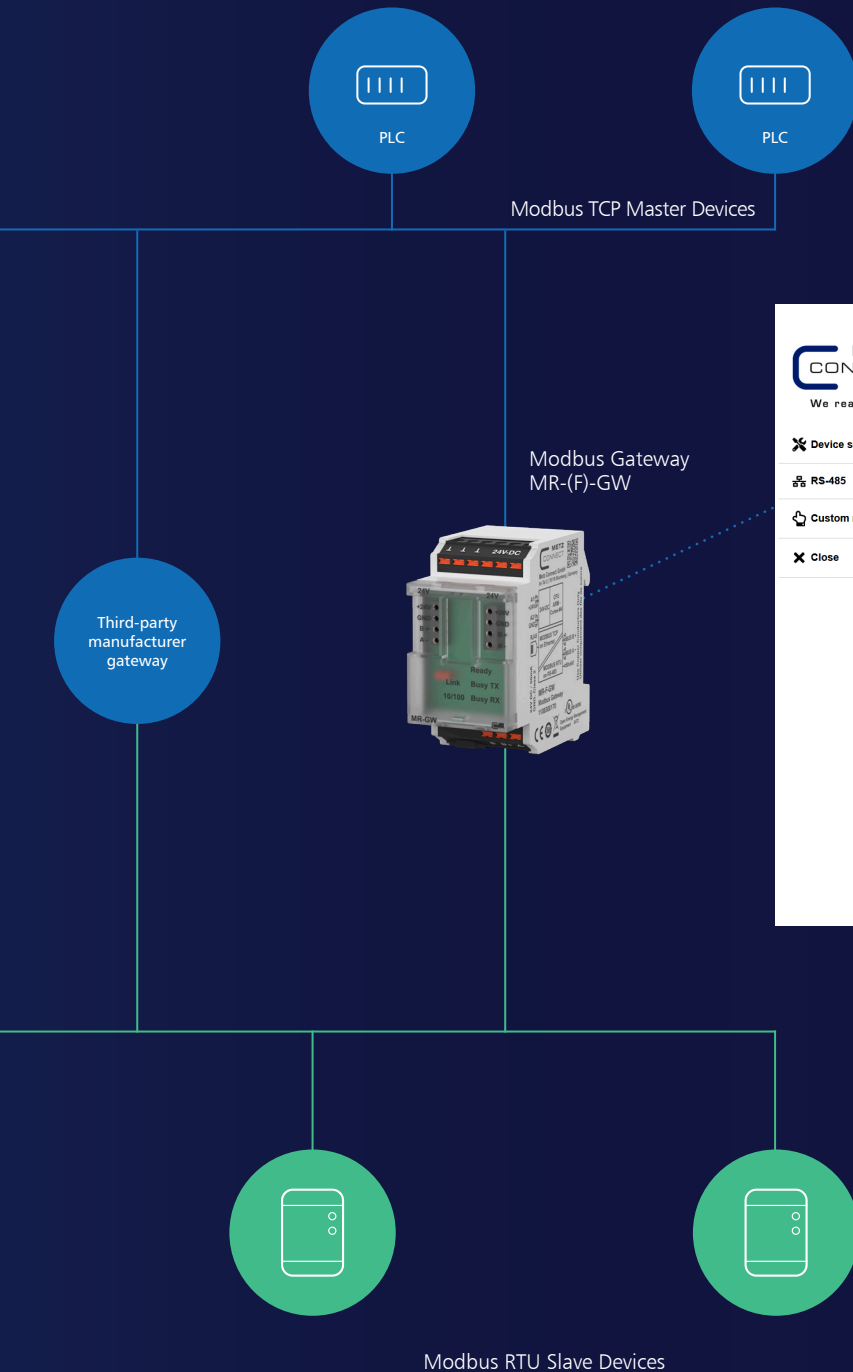
Transducers 100/333 mV

MR-F-SM4u



x4

Rogowski Coil
1000 A/50 mV



We realize ideas

- Device settings
- RS-485
- Custom request
- Close

MR-SM4i: Device settings

Settings

Variant	Conversion Ratio	
Current	Please select here	
Reset active energy L1-L3 positive		
Reset reactive energy L1-L3 positive		
Reset apparent energy L1-L3 positive		

Holding-Register values

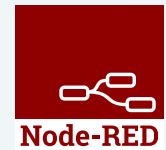
Address	Value	Unit	Description	Access
0	0.00	kWh	Active energy L1 positive	r
4	0.00	kWh	Active energy L2 positive	r
8	0.00	kWh	Active energy L3 positive	r
12	0.00	kWh	Active energy three phase positive	r
34	0.00	V	RMS star voltage L1-N	r
36	0.00	V	RMS star voltage L2-N	r
38	0.01	V	RMS star voltage L3-N	r
40	0.01	V	RMS star avg voltage	r
42	0.00	V	RMS line voltage L1-L2	r
44	0.00	V	RMS line voltage L2-L3	r
46	0.00	V	RMS line voltage L3-L1	r
48	0.00	V	RMS line avg value voltage	r
50	0.00	A	RMS line current L1	r
52	0.00	A	RMS line current L2	r
54	0.00	A	RMS line current L3	r
56	0.00	A	RMS line current N	r

Energy meters can be accessed via the IP network using the integrated web server of the MR-(F)-GW Modbus gateways and the EWIO₂-M(-BM) data logger.

The energy meters are conveniently configured via a user-friendly web interface. Preconfigured templates for the energy meters in the MR-(F)-GW and EWIO₂-M(-BM) enable quick and easy commissioning.

When integrating into third-party Modbus systems, configuration is performed directly via standardized Modbus registers.

Integrated Node-RED Environment



The EWIO2-M(-BM) data logger features an integrated Node-RED environment. Node-RED is a graphical development environment that allows the collected energy data to be processed, analyzed, and visualized directly – simply via drag-and-drop in a web browser.

The energy measurement values from the connected energy meters are available in Node-RED. For example, you can detect load peaks, calculate energy costs, or perform efficien-

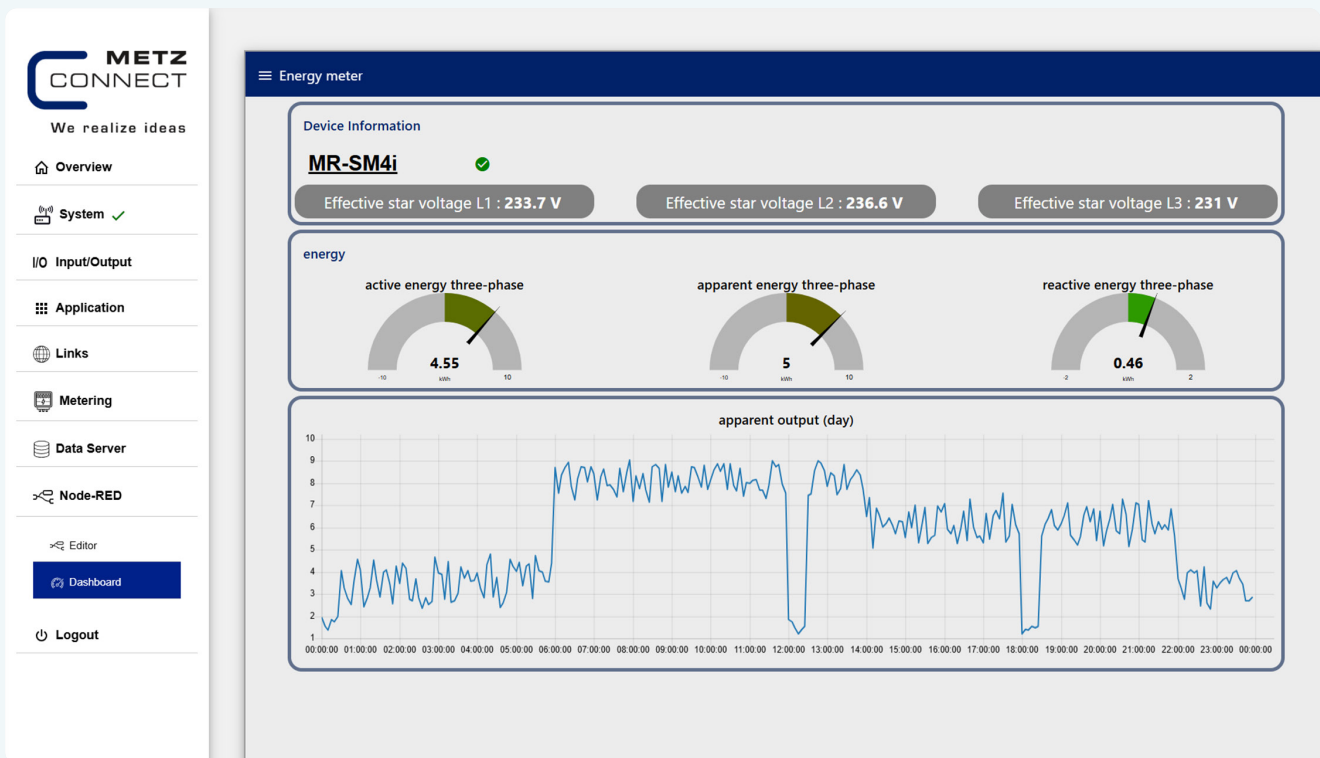
cy analyses. If power limits are exceeded, email notifications can be sent automatically. Custom energy dashboards with real-time displays, consumption charts, and historical evaluations can be created.

Flow Example

The screenshot displays the Node-RED web interface. On the left is a sidebar for 'METZ CONNECT' with navigation links: Overview, System (checked), Input/Output, Application, Links, Metering, Data Server, Node-RED, Editor (highlighted), Dashboard, and Logout. The main workspace shows a flow titled 'Energimetering'. The flow starts with a 'common' tab containing 'Inject', 'debug', 'complete', 'catch', 'status', 'link in', 'link call', 'link out', and 'comment'. The 'function' tab contains various utility nodes like 'function', 'switch', 'change', 'range', 'template', 'delay', 'trigger', 'exec', 'filter', and 'toggle'. The 'network' tab is also visible. The flow itself consists of several sections: 'Device Information' with 'EWIO2 - Metering' nodes connected to 'Device name' and 'status'; 'Power' with 'EWIO2 - Metering' nodes connected to 'active energy', 'reactive energy', 'apparent energy', and 'apparent energy (chart)'; and 'extra Information' with 'EWIO2 - Metering' nodes connected to 'Peak value average active energy', 'crest faktor', and 'frequency'. An 'alarm msg' node is connected to the 'apparent energy' and 'apparent energy (chart)' nodes. The right panel shows the 'info' tab with a search bar and a list of flows, including 'Energimetering' and 'Flow 1'. Below this, the 'Energimetering' flow is selected, showing its ID '7a09f05cb67822f3'.

The flow example demonstrates energy monitoring: Measurement values are retrieved, checked against power limits, and an alarm is sent if limits are exceeded; simultaneously, the data is visualized in the dashboard.

Energy Dashboard



The energy dashboard displays all key metrics: current power, energy consumption, and historical trends.

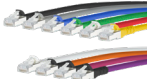
Product Overview

				
	11084114	1108411470	11084115	1108411570
	MR-SM4i	MR-F-SM4i	MR-SM4u	MR-F-SM4u
	Modbus RTU Meter, via current transformer (secondary 1A/5A)	Modbus RTU Meter, via current transformer (secondary 1A/5A)	Modbus RTU meter, via current transformer (333 mV) / Rogowski coil (50 mV)	Modbus RTU meter, via current transformer (333 mV) / Rogowski coil (50 mV)
	Screw terminal	Spring-loaded terminal (push-in)	Screw terminal	Spring-loaded terminal (push-in)
Compatible current transfor- mers				
Current transformers with secondary current of 1 A and 5 A	X	X		
Current transformers and Rogowski coils with secondary voltage: 22.5 mV/50 mV/225 mV/250 mV/333 mV			X	X

Detailed information and additional system components can be found on our website:
www.metz-connect.com



System components & accessories

	Description	Type	P/N
	Modbus RTU / Modbus TCP Gateway Modbus RTU / Modbus TCP Gateway	MR-GW MR-F-GW	11083001 1108300170
			
	M-Bus data logger M-Bus / BACnet / Modbus data logger	EWIO ₂ -M EWIO ₂ -M-BM	110930 110935
	Power supply 24 VDC Power supply 24 VDC	NG4 NG4-F	110561 11056170
	Patch cable Cat6A AWG 26	RJ45 Patch cable	130845xyyy-E
	Current transformer TAmmini 50/5 A Current transformer TAmmini 100/5 A	Current transformer	1101810507 1101810508
	Folding transformer current 100/1A	Folding transformer	1101810509
	Folding transformer current 100/5A	Folding transformer	1101810510
	Folding transformer current 50A/333mV	Folding transformer	1101810511
	Folding transformer current 100A/333mV	Folding transformer	1101810512

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