Energy meters - BasicLine

EM120-RTU-2P-MID	**3099200000**
EM120-TCP-2P-MID	**3141000000**
EM120-MBUS-2P-MID	**3141010000**

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Content

1 About this documentation

This document is intended for all persons handling the product during its life cycle.

► Read this document completely before you install and start using the product.

► Keep this document after reading.

1.1 Applicable documents

– Installation instructions

All documents can be downloaded from the Weidmüller website www.weidmueller.com.

1.2 Illustrations and icons

► Action step

– Numbered lists

Sections of text next to this arrow contain notices which are not related to safety, but which provide important information regarding correct and effective work.

⚠ WARNING!

A note with the signal word “**WARNING!**” warns against a danger that can result in serious injury or death if it is not avoided.

⚠ CAUTION!

A note with the signal word “**CAUTION!**” warns against a danger that can result in injuries if it is not avoided.

ATTENTION!

A note with the signal word “**ATTENTION!**” warns against a danger that can result in damage to property or malfunctions of the product if it is not avoided.

Note for an electrician

Note referring to further documentation

Note for required tool

2 For your safety

2.1 Intended use

The device measures and displays the voltage, current, power, frequency, power factor and energy of three phase applications (1P2W, 3P3W, 3P4W). The device provides two pulse outputs and a remote communication function. The device is operated with a current transformer and can be configured to work with a wide range of CTs. The product may only be used in industrial environments within the technical specifications provided.

2.2 Personnel

The product must only be installed, put into operation, removed and maintained by qualified electricians who are familiar with national and international laws, provisions and standards.

2.3 Safety information

- Until the device is installed, do not connect hazardous voltages to the device.
- In applications where hazardous voltage is connected to in-/outputs of the device, sufficient spacing or isolation from wires, terminals and enclosure to surroundings (incl. neighbouring devices), must be ensured to maintain protection against electric shock.
- The device must not be repaired or modified.
- The device must not be opened, modified or converted.
- If the device is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.
- Only install and operate the device on a mounting rail inside a suitable, lockable enclosure, cabinet or electrical service room.
- Avoid direct sunlight, dust, high temperatures, mechanical vibrations and shock as well as rain and heavy moisture.
- The devices can be used for Measurement Category II and Pollution Degree 2. The devices are designed to be safe when used in an altitude up to 2000 m.
- The connections of measuring voltage and operating voltage to the device must be equipped with a disconnecting device (switch or power switch) and with an overcurrent protection fuse. The disconnecting device must be placed near the device and be easily accessible.
- Ensure that the conductors used are suitable for the maximum current of the device.
- Ensure that the protective cover is fitted after installation.
- When de-energised, the device may be cleaned with a damp cloth.
- Appropriate safety measures against electrostatic discharge (ESD) are be considered when handling the devices.

3 Product description

The device measures and displays the characteristics of single phase two wires (1p2w), single phase three wire (1p3w), three phase three wires (3p3w,) and three phase four wires(3p4w) supplies, including voltage, frequency, current, power, active and reactive energy, imported or exported. Energy is measured in kWh, kVArh. Maximum demand current can be measured over preset periods of up to 60 minutes. In order to measure energy, the device requires voltage and current inputs in addition to the supply required to power the device. The requisite current inputs are obtained via current transformers (CT). The device can be configured to work with a wide range of CTs and three types of communication port are available for remote data transmission:

Product variant	Current transformer	Remote communication
EM120-RTU-2P-MID	5 A	RS485 port with Modbus RTU
EM120-TCP-2P-MID	1 A / 5 A	Ethernet RJ45 port with Modbus TCP
EM120-MBUS-2P-MID	5 A	M-Bus

4 Installation

The installation is described in the installation instructions, document no. 2711330000. You can find the document on the Weidmüller website.

The product must only be installed, put into operation, removed and maintained by qualified electricians who are familiar with national and international laws, provisions and standards.

5 Operating the Modbus RTU / TCP variant

5.1 Initialising the device

When the device is powered on, it initializes a self-check.

Screen	Description
	Start display shows full screen
	Second and third screen shows software version.
	
	Device performs a self-check and shows the result if the check is passed.

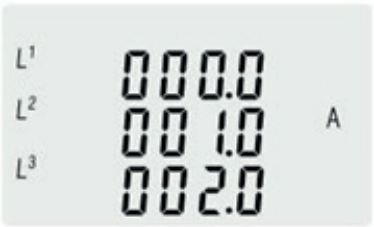
5.2 Button functions

Button	Short press		Long press (3 s)	
	Display mode	Set-up mode	Display mode	Set-up mode
	V1 V2 V3 V1-2 V2-3 V3-1 I1 I2 I3 IN V %THD I %THD	Return to previous menu		
	Hz PF PF1 PF2 PF3 MD of I1 I2 I3 MD of Power	Previous page or increase value (up)		
	P1 P2 P3 Q1 Q2 Q3 S1 S2 S3 P-t Q-t S-t	Next page or decrease value (down)		
	Active E-t Reactive E-t Imp Active E Exp Active E Imp Reactive E Exp Reactive E	Move to right side	Enter set-up mode	Confirm setting

5.3 Screen overview

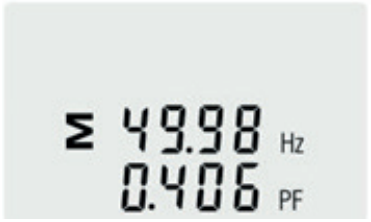
Voltage and current

Each successive pressing of the button shows a new screen.

Screen	Description
	Phase to neutral voltage
	Phase to phase voltage
	Current on each phase
	Neutral current
	Phase to neutral voltage THD%
	Phase to neutral current THD%

Frequency, power factor and demand

Each successive pressing of the button shows a new screen.

	Frequency and power factor (total)
	Power factor of each phase
	Maximum current demand on each phase
	Maximum total power demand

Power

Each successive pressing of the button shows a new screen.

	Instantaneous active power in kW
	Instantaneous reactive power in kVAr
	Instantaneous Volt-amps in kVA
	Total W, VAr, VA

Energy

Each successive pressing of the button shows a new screen.

	Total active energy in kWh
	Total reactive energy in kVArh
	Imported active energy in kWh
	Exported active energy in kWh

	Imported reactive energy in kVArh
	Exported reactive energy in kVArh
	Carbon emissions per kWh of electricity

5.4 Set-up mode

The device's settable parameters are password protected.

► To enter the setup-mode, keep pressing the button for 3 seconds.

► Enter the password.

Screen menu	Button	Description
		► Use the buttons to enter the password. Default: 1000
		► Press and hold the button to confirm the password. If the password is correct, the display shows the set-up menu. If the password is incorrect, the screen shows “Err”.

5.5 Communication address

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up.
	 	► Use the buttons to enter the address. Address range 001 ... 247
		► Press and hold the button to confirm the setting.

5.6 Baud rate (only Modbus RTU)

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	 	► Use the buttons to enter the baud rate. 2.4k. 4.8k, 9.6k, 19.2k, 38.4k
		► Press and hold the button to confirm the setting.

5.7 Parity (only Modbus RTU)

Screen menu	Button	Description
	E	► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the parity. EVEN / ODD / NONE
	E	► Press and hold the button to confirm the setting.

5.8 Stop bits (only Modbus RTU)

Screen menu	Button	Description
	E	► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the stop bit. 2 or 1
	E	► Press and hold the button to confirm the setting.

5.9 CT

Screen menu	Button	Description
	E	CT secondary current ► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value. 5 A /1 A
	E	► Press and hold the button to confirm the setting.
	E	CT ratio ► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value. 0001 ... 9999
	E	► Press and hold the button to confirm the setting.

5.10 PT

Screen menu	Button	Description
	E	PT secondary voltage ► In this menu, press and hold the button to enter the set-up. The current setting flashes. The default value is 400V.
	M P	► Use the buttons to choose the value. 100 ... 500 V
	E	► Press and hold the button to confirm the setting.
	E	PT ratio ► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value. 0001 ... 9999
	E	► Press and hold the button to confirm the setting.

5.11 Pulse rate (only Modbus RTU)

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	 	► Use the buttons to choose the value. Rate can be set to 1 pulse per 0.01/0.1/1/10/100/1000kWh/ kVArh.
		► Press and hold the button to confirm the setting.

5.12 Pulse duration (only Modbus RTU)

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	 	The energy monitored can be active or reactive. ► Use the buttons to choose the value. 200, 100 or 60 ms.
		► Press and hold the button to confirm the setting.

5.13 Demand interval time

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
		► Use the buttons to choose the value: 0, 5, 8, 10, 15, 20, 30, 60 (default) min.
		► Press and hold the button to confirm the setting.

5.14 Backlit power time

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
		► Use the buttons to choose the value: ON: backlit always on OFF: backlit always off 5, 10, 30, 60 (default), 120 min.
		► Press and hold the button to confirm the setting.

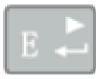
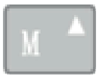
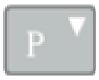
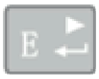
5.15 System type

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
		► Use the buttons to choose the system: 3P4W (default), 3P3W, 1P2W
		► Press and hold the button to confirm the setting.

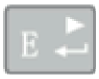
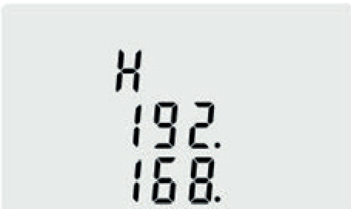
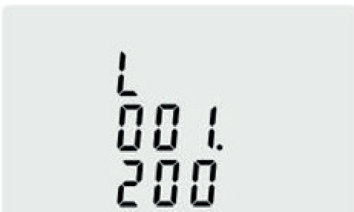
5.16 CO2

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
		► Use the buttons to choose the value: Default 0.5703
		► Press and hold the button to confirm the setting.

5.17 DHCP (only Modbus TCP)

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	 	► Use the buttons to choose the value: ON OFF (default)
		► Press and hold the button to confirm the setting.

5.18 TCP IP address (only Modbus TCP)

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up.
		IP-High 192.168 (default)
		IP-Low 001.200 (default)

5.19 Subnet mask (only Modbus TCP)

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up.
		Subnet mask-High 255.255 (default)
		Subnet mask-Low 255.0 (default)

5.20 TCP gateway address (only Modbus TCP)

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up.
		TCP gateway address - High: 192.168 (default)
		TCP gateway address - Low: 001.001 (default)

5.21 TCP IP port (only Modbus TCP)

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up.
		TCP IP port: 502 (default)

5.22 CLR

Display menu	Button	
		► In the set-up menu, use the buttons to select the reset option.
		► Press the button to enter the set-up mode. The MD will flash.

5.23 Changing the password

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
		► Use the buttons to enter the new password: 0000 ... 9999 Default: 1000
		► Press and hold the button to confirm the setting.

5.24 Current direction

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up.
		► Press the button to enter Phase A. The current setting flashes.
		► Use the buttons to choose the value. Default: Frd (forward)
		► Press and hold the button to confirm the setting.

		► Press the button to enter Phase B. The current setting flashes.
		► Use the buttons to choose the value. Default: Frd (forward)
		► Press and hold the button to confirm the setting.
		► Press the button to enter Phase C. The current setting flashes.
		► Use the buttons to choose the value. Default: Frd (forward)
		► Press and hold the button to confirm the setting.

6 Operating the M-Bus variant

6.1 Initialising the device

When the device is powered on, it initializes a self-check.

Screen	Description
	Start display shows full screen
	Second and third screen shows software version.
	
	Device performs a self-check and shows the result if the check is passed.

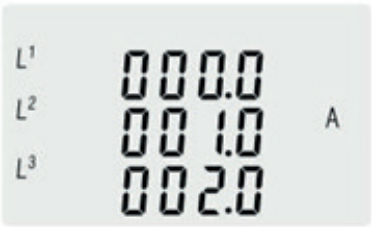
6.2 Button functions

Button	Short press		Long press (3 s)	
	Display mode	Set-up mode	Display mode	Set-up mode
	V1 V2 V3 V1-2 V2-3 V3-1 I1 I2 I3 IN V %THD I %THD	Return to previous menu (left/back)		
	Hz PF PF1 PF2 PF3 MD of I1 I2 I3 MD of Power	Previous page or increase value (up)		
	P1 P2 P3 Q1 Q2 Q3 S1 S2 S3 P-t Q-t S-t	Next page or decrease value (down)		
	Active E-t Reactive E-t Imp Active E Exp Active E Imp Reactive E Exp Reactive E	Move to right side	Enter set-up mode	Confirm setting

6.3 Screen overview

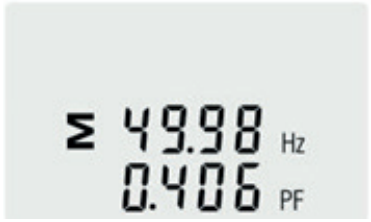
Voltage and current

Each successive pressing of the button shows a new screen.

Screen	Description
	Phase to neutral voltage
	Phase to phase voltage
	Current on each phase
	Neutral current
	Phase to neutral voltage THD%
	Phase to neutral current THD%

Frequency, power factor and demand

Each successive pressing of the button shows a new screen.

	Frequency and power factor (total)
	Power factor of each phase
	Maximum current demand on each phase
	Maximum total power demand

Power

Each successive pressing of the button shows a new screen.

	Instantaneous active power in kW
	Instantaneous reactive power in kVAr
	Instantaneous Volt-amps in kVA
	Total W, VAr, VA

Energy

Each successive pressing of the button shows a new screen.

	Total active energy in kWh
	Total reactive energy in kVArh
	Imported active energy in kWh
	Exported active energy in kWh
	Imported reactive energy in kVArh
	Exported reactive energy in kVArh

	Carbon emissions per kWh of electricity
	Mbus secondary address 00 00 00 01 ... 99 99 99 99

6.4 Set-up mode

The device's settable parameters are password protected.

► To enter the setup-mode, keep pressing the button for 3 seconds.

► Enter the password.

Screen menu	Button	Description
		► Use the buttons to enter the password. Default: 1000
		► Press and hold the button to confirm the password. If the password is correct, the display shows the set-up menu. If the password is incorrect, the screen shows "Err".

6.5 Communication address

Screen menu	Button	Description
	E	► In this menu, press and hold the button to enter the set-up.
	M P	► Use the buttons to enter the address. Address range 001 ... 250
	E	► Press and hold the button to confirm the setting.

6.6 M-Bus secondary address

Display menu	Button	
	E	► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to set the secondary address: 00000001 ... 99999999
	E	► Press and hold the button to confirm the setting.

6.7 Baud rate

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	 	► Use the buttons to choose value: 0.3k, 0.6k, 2.4k, 4.8k, 9.6k.
		► Press and hold the button to confirm the setting.

6.8 Parity

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	 	► Use the buttons to choose the parity. EVEN / ODD / NONE
		► Press and hold the button to confirm the setting.

6.9 Stop bits

Display menu	Button	
	E	► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the stop bit. 2 or 1
	E	► Press and hold the button to confirm the setting.

6.10 CT

Screen menu	Button	Description
	E	CT secondary current ► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value. 5 A /1 A
	E	► Press and hold the button to confirm the setting.
	E	CT ratio ► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value. 0001 ... 9999
	E	► Press and hold the button to confirm the setting.

6.11 PT

Screen menu	Button	Description
	E	PT secondary voltage ► In this menu, press and hold the button to enter the set-up. The current setting flashes. The default value is 400V.
	M P	► Use the buttons to choose the value. 100 ... 500 V
	E	► Press and hold the button to confirm the setting.
	E	PT ratio ► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value. 0001 ... 9999
	E	► Press and hold the button to confirm the setting.

6.12 Pulse output

Screen menu	Button	Description
	E	► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value. kWh or kVArh
	E	► Press and hold the button to confirm the setting.

6.13 Pulse rate

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	 	► Use the buttons to choose the value. Rate can be set to 1 pulse per 0.01/0.1/1/10/100/1000kWh/ kVArh.
		► Press and hold the button to confirm the setting.

6.14 Pulse duration

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	 	The energy monitored can be active or reactive. ► Use the buttons to choose the value. 200, 100 or 60 ms.
		► Press and hold the button to confirm the setting.

6.15 Demand interval time

Screen menu	Button	Description
	E	► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value: 0, 5, 8, 10, 15, 20, 30, 60 (default) min.
	E	► Press and hold the button to confirm the setting.

6.16 Backlit power time

Display menu	Button	
	E	► In this menu, press and hold the button to enter the set-up. The current setting flashes.
	M P	► Use the buttons to choose the value: ON: backlit always on OFF: backlit always off 5, 10, 30, 60 (default), 120 min.
	E	► Press and hold the button to confirm the setting.

6.17 System type

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
		► Use the buttons to choose the system: 3P4W (default), 3P3W, 1P2W
		► Press and hold the button to confirm the setting.

6.18 CO2

Screen menu	Button	Description
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
		► Use the buttons to choose the value: Default 0.5703
		► Press and hold the button to confirm the setting.

6.19 CLR

Display menu	Button	
		► In the set-up menu, use the buttons to select the reset option.
		► Press the button to enter the set-up mode. The MD will flash.

6.20 Changing the password

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up. The current setting flashes.
		► Use the buttons to enter the new password: 0000 ... 9999 Default: 1000
		► Press and hold the button to confirm the setting.

6.21 Current direction

Display menu	Button	
		► In this menu, press and hold the button to enter the set-up.
		► Press the button to enter Phase A. The current setting flashes.
	 	► Use the buttons to choose the value. Default: Frd (forward) ► Press and hold the button to confirm the setting.
		► Press the button to enter Phase B. The current setting flashes.
	 	► Use the buttons to choose the value. Default: Frd (forward) ► Press and hold the button to confirm the setting.

		► Press the button to enter Phase C. The current setting flashes.
		► Use the buttons to choose the value. Default: Frd (forward)
		► Press and hold the button to confirm the setting.

7 Disposal

The product contains substances that may be harmful to the environment and human health. In addition, it also contains substances that can be reused through targeted recycling.

Observe the instructions for proper disposal of the product. The instructions can be found at www.weidmueller.com/disposal.