



EM120-RTU-2P

Manual

## Revision History

Version	Date	Change
0	2021.3.9	First edition
1	2022.4.1	Correction menu display content

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# General

This manual applies to the products:  
7760051004 Energy Meter EM120-RTU-2P

## Copyright

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## Trademarks




All trademarks and the rights resulting from them remain the property of the trademark holder of these rights.

## Disclaimer

Weidmüller assumes no responsibility for errors or omissions in this manual and assumes no obligation to keep the contents of this manual up to date.

## Meaning of the symbols

The following pictograms are used in this manual:

	<b>Dangerous voltage!</b> Risk of death or serious injury. Disconnect the power before working on the system and device.
	<b>Attention!</b> Please refer to the documentation. This symbol will warn you of possible dangers that could occur during assembly, commissioning and operation.
	Note!

## Application notes

Please read these operating instructions and all other publications that must be consulted in order to work with this product (particularly for installation, operation or maintenance).

Please observe all safety regulations and warnings. Non-compliance with the instructions can lead to personal injury and/or damage to the product.





Any unauthorized alteration or use of this device which exceeds the specified mechanical, electrical or other operational limits can cause personal injury and/or damage to the product.

Any such unauthorized alterations are grounds for "abuse" and/ or "negligence" in terms of the product's guarantee and thus excludes the warranty for covering any possible resulting damages.

This device must only be operated and maintained by qualified personnel.

Qualified personnel are persons who, due to their respective training and experience, are able to recognize risks and avoid potential hazards that can be caused by operation or maintenance of the device.

When using the device, the legal and safety regulations required for the respective application must also be observed.

	Safety is no longer guaranteed and the device may be dangerous if the device is not operated according to the operating instructions.		Only screw terminals with the same number of poles and the same type may be plugged together.
	All signals connected with the device's SELV circuit must also conform with the SELV provisions.		Conductors consisting of single wires must be provided with ferrules.

## About these operating instructions

These operating instructions are part of the product.

- Read the operating instructions prior to using the device.
- Keep the operating instructions at hand throughout the entire service life of the product and keep ready for referencing.
- Hand over the operating instructions to each subsequent owner or user of the product.

# Incoming goods inspection

The proper and safe operation of this device requires appropriate transport, proper storage, installation and assembly as well as careful operation and maintenance. When it is assumed that safe operation is no longer possible, the device must immediately be taken out of operation and secured against accidental start-up. Unpacking and packing must be carried out with the usual care, without the use of force and only with the use of suitable tools. The devices must be visually inspected for proper mechanical condition. It can be assumed that safe operation is no longer possible if the device, e.g.

- shows visible damage;
- does not work despite intact power supply;
- and was exposed to unfavorable conditions (e.g. storage outside of the permissible climatic limits without adaptation to the ambient climate, condensation, etc.) or transport stresses (e.g. falling from a great height even without exterior visible damage, etc.) for prolonged periods;
- Please check that the is complete before you begin with installation of the device.

## Scope of delivery

Quantity	Designation
1	Energy Meter 120
1	Quick guide



# Product description

## Intended use

The Energy Meter 120 measures and displays the characteristics of 1P2W, 3P3W, 3P4W's applications. The unit provides voltage, current, power, frequency, power-factor, and energy etc.

The Energy Meter 120 is permanently installed in control cabinets or small distribution boards. It can be installed in any position.

Measurement voltages and measurement currents must originate from the same grid.

The measurement results can be displayed and can be read and processed over the RS485 interface.

The Energy Meter 120 designed for mounting in low voltage distributions, containing overvoltage in measurement category III.

The unit current measurements inputs are connected via external  $\cdots/1A$  or  $\cdots/5A$  current transformers and can be configured to work with a wide range of CTs

Measurements in medium and high voltage systems generally use current and voltage transformers.

EM120 series have one RS485 remote communication port.

## Specifications

Electrical characteristics			
Type of measurement		RMS including harmonics on three phase AC system (3P, 3P+N)	
Measurement accuracy	Voltage		0.5%
	Current		0.5%
	Frequency		0.2%
	Power Factor		±0.01
	Active Power		1%
	Reactive Power		2%
	Apparent Power		2%
	Active Energy		IEC 62053-21 Class 0.5
	Reactive Energy		2%
Input-Voltage	VT Primary		50 ~ 600000 Vac
	Un		230 V L-N
	Measured Voltage with Over-range and Crest Factor		60%-120% of Un
	Frequency Range		45~65Hz
Input- Current	CT Ratings	Primary	1~9999A
		Secondary	1A / 5A
	Measurement current with range		0.25A~6A
	Withstand		20 x Imax 0.5s
	Frequency Range		45~65Hz

Auxiliary Power Supply	Operating Range	85~275V AC / 100~380V DC
	Power Consumption	<2W/10VA
	Frequency	50/60 Hz
Digital output	Pulse output 1	0.001/0.01/0.1/kWh/kVarh(configurable)
	Pulse output 2	3200imp/kWh(non-configurable)
Mechanical Characteristics		
Weight		240g
IP Degree of Protection (IEC 60529)		IP51 for front display; IP20 for others
Dimensions (WxHxD)		72x94.5x65mm
Material of meter case		UL 94-V0
Environmental Characteristics		
Operating Temperature		-25 ~ 55°C
Storage Temperature		-40 ~ 70°C
Humidity Rating		0 to 90%, non-condensing
Pollution Degree		2
Altitude		<2000m
EMC		
Electrostatic Discharge		IEC 61000-4-2
Immunity to Radiated Fields		IEC 61000-4-3
Immunity to Fast Transients		IEC 61000-4-4
Immunity to Impulse Waves		IEC 61000-4-5
Conducted Immunity		IEC 61000-4-6
Immunity to Magnetic Fields		IEC 61000-4-8
Immunity to Voltage Dips		IEC 61000-4-11
Radiated Emissions		CISPR 11 Class B
Conducted Emissions		CISPR 11 Class B
Harmonics		IEC 61000-3-2
Safety		
Measurement Category		Per IEC61010-1 CAT III
Current Inputs		Require external Current Transformer for Insulation
Over voltage Category		CAT III

Communications	
Interface standard and protocol	RS485 and MODBUS RTU
Communication address	1~247
Transmission mode	Half duplex
Transmission distance	1000m Maximum
Transmission speed	2400bps~38400bps
Parity	None (default), Odd, Even
Stop bits	1 or 2
Connection capacity of the terminals	
Single-wire, multi-wire, finely stranded conductor	0.5-1.5mm <sup>2</sup>
Pin terminals,ferrules	0.5-1.5mm <sup>2</sup>
Tightening torque	0.2-0.25 Nm
Stripping length	7mm

## Operating concept

There are several ways to program the Energy Meter 120 and retrieve measured values.

- Directly on the device using four buttons.
- Via the programming software of the EM configuration tools.
- Via the RS485 interface with the Modbus protocol. Data can be changed and retrieved with the help of the Modbus address list (stored on the accompanying data carrier).

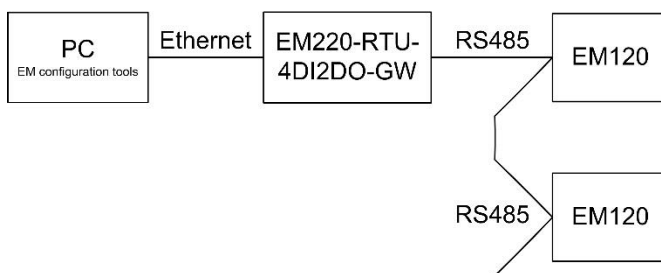
These operating instructions only describe the operation of the Energy Meter 120 using the 4 buttons. The programming software of the EM configuration tools has its own “on- line help”.

## EM configuration tools

The Energy Meter 120 can be programmed and read with the EM configuration tools software. For this, a PC must be connected to the RS485 interface of the Energy Meter 120 via an RS485 Modbus to TCP/IP gateway.

## Connection options

Connection of Energy Meter 120 to PC via an EM220-RTU-4DI2DO-GW as a gateway:



# Assembly

## Installation location

The Energy Meter 120 can be installed in control cabinets or in small distribution boards according to DIN 43880. It is mounted on a 35 mm mounting rail according to DIN EN 60715. It can be installed in any position.

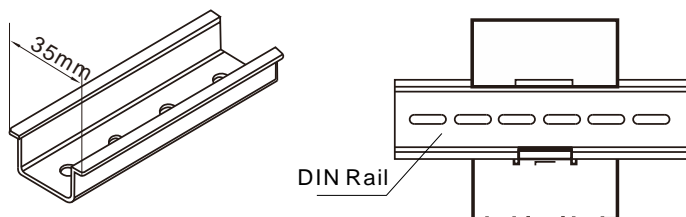


Fig.: Energy Meter 120 on mounting rail according to DIN EN 60715

## Power supply

A supply voltage is required to operate the Energy Meter 120. The voltage supply is connected via plug-in terminals on the back of the device.

Before applying the supply voltage, ensure that the voltage and frequency correspond with the details on the nameplate!

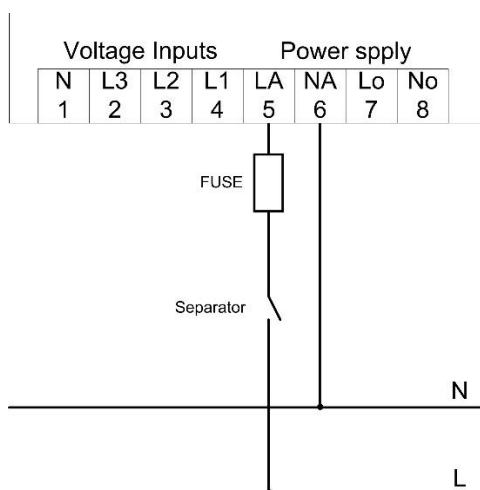


Fig.: Connection example of the supply voltage to the Energy Meter 120



- The supply voltage must be connected through a fuse according to the technical data.
- In building installations, the supply voltage must be provided with a disconnect switch or circuit breaker.
- The disconnect switch must be attached near the device and must be easily accessible by the user.
- The switch must be labelled as a separator for this device.
- Voltages that exceed the permissible voltage range can destroy the device.

## Voltage measurement inputs

When connecting the voltage measurement, the following must be observed:

### Isolation device

- A suitable circuit breaker must be fitted to disconnect and deenergize the Energy Meter 120.
- The circuit breaker must be placed in the vicinity of the Energy Meter 120, be marked for the user and easily accessible.
- The circuit breaker must be UL/IEC certified.

### Overcurrent protection device

- An overcurrent protection device must be used for line protection.
- For line protection, we recommend an overcurrent protection device as per the technical specifications.
- The overcurrent protection device must be suitable for the line cross section used.
- The overcurrent protection device must be UL/IEC certified.

A circuit breaker can be used as an isolating and line protection device. The circuit breaker must be UL/IEC certified.

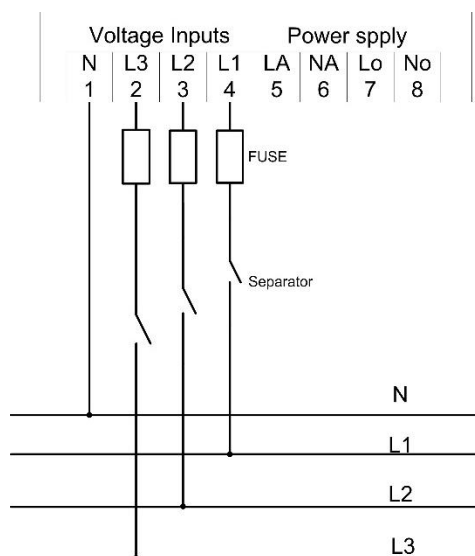





Fig.: Connection example for the voltage measurement

	<b>Attention!</b> Voltages that exceed the permitted rated mains voltages must be connected via voltage transformers.
	<b>Attention!</b> The Energy Meter 120 is not suitable for the measurement of DC voltages.
	<b>Attention!</b> The voltage measurement inputs on the Energy Meter 120 are dangerous to touch!

## Current measurement inputs

The Energy Meter 120 is designed for connecting current trans- formers with secondary currents of  $\pm 1A$  and  $\pm 5A$ . The factory set current transformer ratio is 5/5 A and may need to be adapted to the current transformers.

It is not possible to perform a direct measurement without a current transformer with the Energy Meter 120. Only AC currents (and not DC currents) can be measured.

The test leads must be designed for an operating temperature of at least 80 °C.

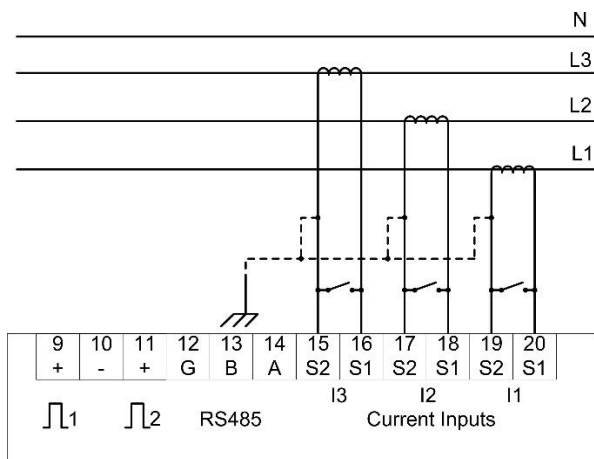






Fig.: Current measurement via current transformer (connection example)



	<b>Caution!</b> The Energy Meter 120 is only approved for a current measurement using the current transformer.
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	<b>Attention!</b> The current measurement inputs are dangerous to touch.
	<b>Attention!</b> The Energy Meter 120 is not suitable for the measurement of DC voltages.
	<b>Earthing current transformers!</b> If a connection is provided for earthing the secondary winding, it must be connected to the earth.
	The attached screw terminal has to be fixed sufficiently with the screws on the device!

## Direction of the current

The current direction can be individually corrected on the device or via the serial interfaces for each phase. In the case of incorrect connection, the current transformer does not need to be subsequently reconnected.

	<b>Current transformer terminals!</b> The secondary terminals of the current transformer must be short-circuited to this before the power supply lines to the Energy Meter 120 are disconnected! If a test switch which automatically short-circuits the current transformer secondary leads is available, it is sufficient to put this into the "test" position provided the short-circuiters have been checked beforehand.
	<b>Open current transformer!</b> High voltage peaks that are dangerous to touch can occur on current transformers that are operated in an open state at the secondary terminals. In "open-safe current transformers", the winding insulation is measured so that the current transformers can operate in an open state. However, these current transformers are also dangerous to touch if they are operated in an open state.

## RS485 interface

The RS485 interface is designed with the Energy Meter 120 as a 3-pole contact and communicates via the Modbus RTU protocol (please see the registers address list of Modbus RTU protocol ).

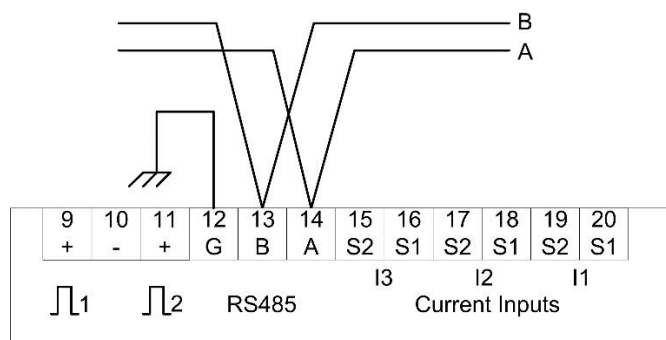


Fig.: RS485 interface, 3-pole contact

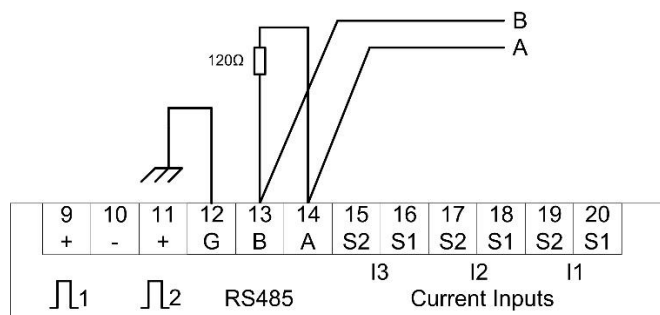
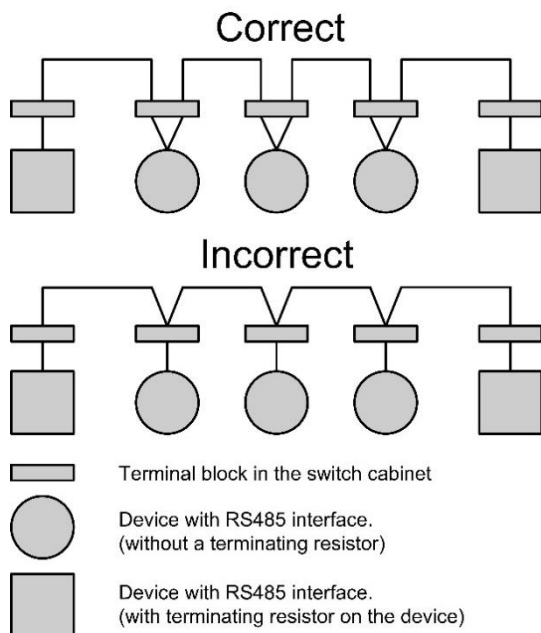


Fig.: RS485 interface, 3-pole contact with terminating resistor

## Terminating resistors

The cable should be terminated with resistors (120 ohm 1/4 W) at the beginning and end of a segment if the communication distance larger than 300m.

The Energy Meter 120 has no terminating resistors.



## Shielding

A twisted and shielded cable must be provided for connections via the RS485 interface.

- Ground the shields of all cables that run into the cabinet at the cabinet entry.
- Connect the shield so it has a large contact area and conductively with a low-noise earth.
- Mechanically trap the cable above the earthing clamp in order to avoid damage from cable movement.
- Use the appropriate cable inlets, e.g. PG screw joints, to insert the cable into the switch cabinet.

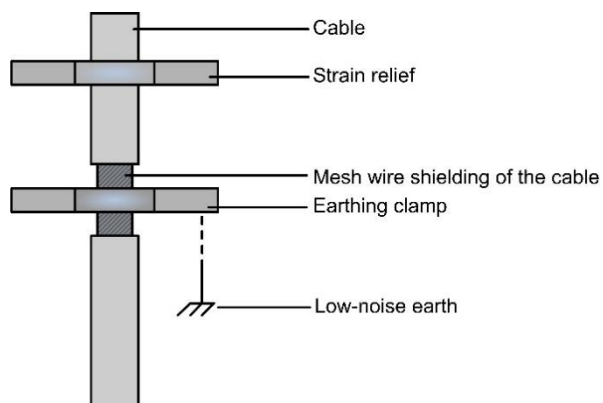



Fig.: Shielding design for cabinet entry

## Cable type

The cable used must be suitable for an ambient temperature of at least 80 °C.

	For the wiring of the Modbus connection, CAT cables are not suitable. Please use the recommended cables.
---	--

## Maximum cable length

Max 1000m.

## Bus structure

- All devices are connected in a bus structure (line) and each device has its own address within the bus (also see programming parameters).
- Up to 32 stations can be interconnected in one segment.
- The cable is terminated with resistors (bus termination, 120 ohm 1/4 W) at the beginning and end of a segment.
- If there are more than 32 stations, repeaters (line amplifiers) must be used in order to connect the individual segments.
- Devices with activated bus termination must be supplied with power.
- It is recommended to set the master at the end of a segment.
- The bus is inoperative if the master is replaced with an activated bus termination.
- The bus can become unstable if the slave is replaced with an activated bus termination or is dead.
- Devices that are not involved in the bus termination can be exchanged without making the bus unstable.
- The shield has to be installed continuously and needs to be broadly and well conducting connected to an external low voltage (or potential) ground at the end.

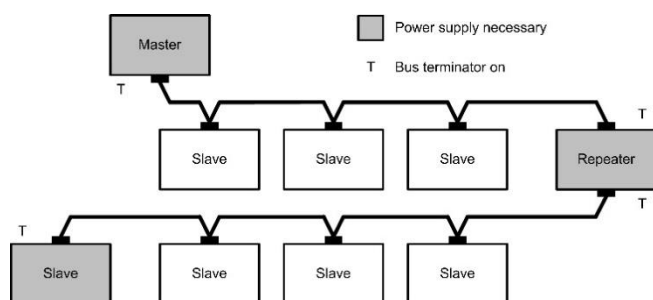


Fig.: Diagram of RS485 bus structure

## Pulse Output

The meter is equipped with 2 pulse outputs, which are fully isolated from the inside circuit:

- That generates pulses in proportion to the measured energy.
- The digital outputs are not short circuit protected.
- An external auxiliary voltage with overcurrent protective device is required, voltage range is 5-27VDC.
- The maximum input current shall be 27mA.
- Connected cables longer than 30 m must be shielded.
- Pulse output 1 is configurable.
- Pulse output 2 is non-configurable. It is fixed up with total kWh. The constant is 3200imp/kWh.

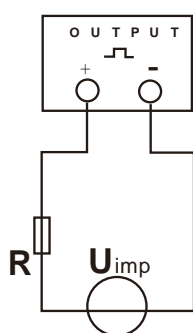
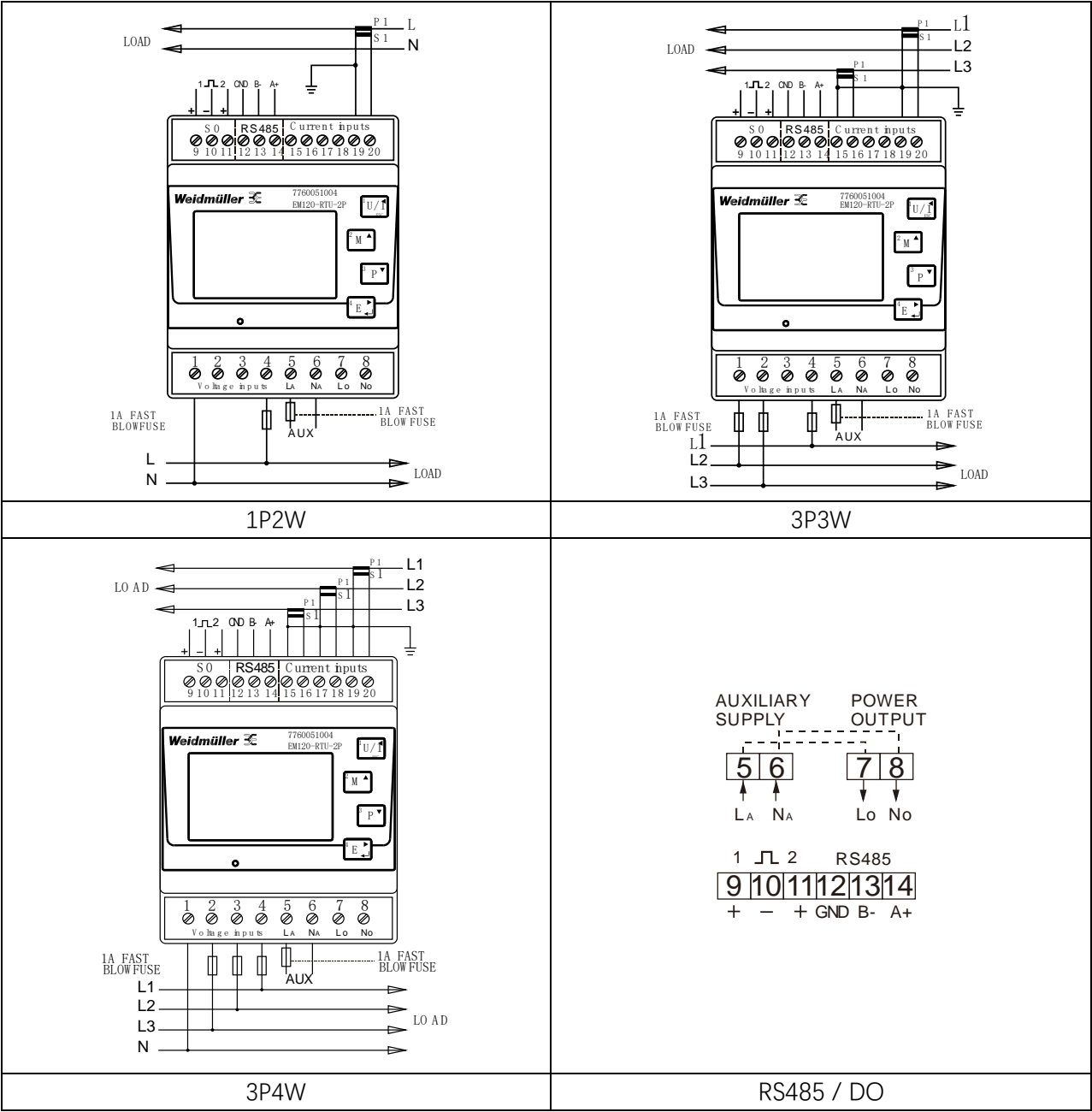


Fig.: Connection of digital outputs



Pulses output must be fed as shown in the wiring diagram. Scrupulously respect polarities and the connection mode.

# Examples of electrical connections






# Configuration and display





## Self-check after power on

When device is power on, the meter will initialize and do self-check:

		
Full screen It will last for 3s	Software version	Self-check passed

	The software version is different according to the actual situation.
	After a short delay, the screen will display active energy measurements.
	Device could not be used if self-check failed.

## Button functions






Buttons	Click	Press 2S
	<ul style="list-style-type: none"> <li>➤ Selects the Voltage and Current display screens</li> <li>➤ In Set-up Mode, this is the “Left” or “Back” button</li> </ul>	
	<ul style="list-style-type: none"> <li>➤ Select the Frequency and Power factor display screen</li> <li>➤ In Set-up Mode, this is the “Up” button</li> </ul>	
	<ul style="list-style-type: none"> <li>➤ Select the Power display screens</li> <li>➤ In Set-up Mode, this is the “Down” button</li> </ul>	
	<ul style="list-style-type: none"> <li>➤ Select the Energy display screens</li> <li>➤ In Set-up mode, this is the “Enter” or “Right” button</li> </ul>	<ul style="list-style-type: none"> <li>➤ Set-up mode entry</li> </ul>




## Overview of measured value displays

### Voltage and Current


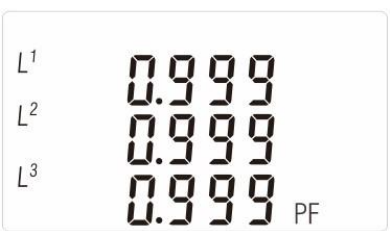

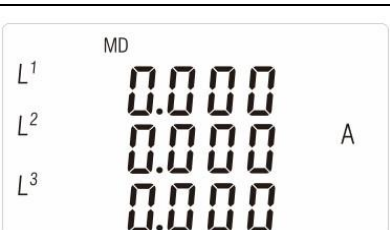
Each successive pressing of the  button selects a new range:

1-1		Phase to neutral voltages(3p4w)
1-2		Phase to phase voltages(3p3w)
2		Current on each phase
3-1		Phase to neutral voltage THD%(3p4w)
3-2		Phase to phase voltage THD%(3p3w)

4		Current THD% for each phase
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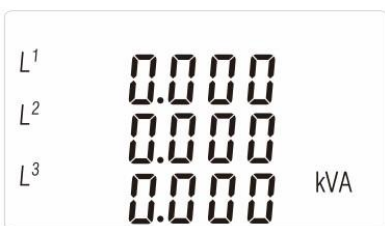
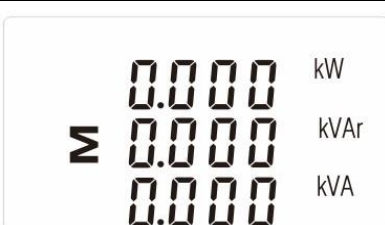
## Frequency and Power Factor and Demand

Each successive pressing of the  button selects a new range:

1		Frequency and Power Factor (total)
2		Power Factor of each phase
3		Maximum Power Demand
4		Maximum Current Demand

## Power

Each successive pressing of the  button select a new range:

1		Instantaneous Active Power in kW
2		Instantaneous Reactive Power in kVAr
3		Instantaneous Apparent Power in KVA
4		Total kW, kVArh, kVA

## Energy Measurement



Each successive pressing of the button selects a new range:

1-1		Imported active energy in kWh
1-2		Exported active energy in kWh
2-1		Imported reactive energy in kVArh
2-2		Exported reactive energy in kVArh
3-1		Total active energy in kWh
3-2		Total reactive energy in kVArh

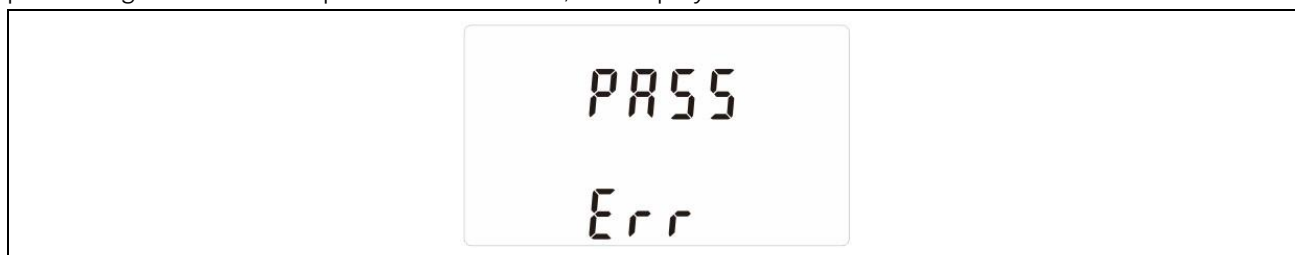
## Configuration menu

### Set-up Mode

To enter set-up mode, pressing the  button for 3 seconds, until the password screen appears.



Setting up is password-protected so you must enter the correct password (default '1000') before processing. If an incorrect password is entered, the display will show: Err













To exit setting-up mode, press  repeatedly until the measurement screen is restored.

### Set-up Entry Methods





Some menu items, such as password, require a four-digit number entry while others, such as supply system, require selection from a number of menu options.

## Menu Option Selection

1. Use the  and  buttons to select the required item from the menu. Selection does not roll over between bottom and top of list.
2. Press  to confirm your selection.
3. If an item flashes, then it can be adjusted by the  and  buttons. If not, there may be a further layer.
4. Having selected an option from the current layer, press  to confirm your selection. The SET indicator will appear.
5. Having completed a parameter setting, press  to return to a higher menu level. The SET indicator will be removed and you will be able to use the  and  buttons for further menu selection.
6. On completion of all set-up, press  repeatedly until the measurement screen is restored.

## Number Entry Procedure

When setting up the unit, some screens require the entering of a number. In particular, on entry to the setting up section, a password must be entered. Digits are set individually, from left to right. The procedure is as follows:












1. The current digit to be set flashes and is set using the  and  buttons
2. Press  to confirm each digit setting. The SET indicator appears after the last digit has been set.
3. After setting the last digit, press  to exit the number setting routine. The SET indicator will be removed.

## Change Password

1		Use the  and  to choose the change password option.
2-1		Press the  to enter the change password routine. The new password screen will appear with the first digit flashing.
2-2		Use  and  to set the first digit and press  to confirm your selection. The next digit will flash.
2-3		Repeat the procedure for the remaining three digits.
2-4		After setting the last digit, SET will show.
Press  to exit the number setting routine and return to the Set-up menu. SET will be removed.		







## DIT Demand Integration Time

This sets the period in minutes over which the current and power readings are integrated for maximum demand measurement. The options are: 0, 5, 8, 10, 15, 20, 30, 60 minutes.

1		From the set-up menu, use  and  buttons to select the DIT option. The screen will show the currently selected integration time.
2-1		Press  to enter the selection routine. The current time interval will flash
2-2		Use  and  buttons to select the time required.
2-3		Press  to confirm the selection. SET indicator will appear.
Press  to exit the DIT selection routine and return to the menu.		














## Backlit Set-up

1		The backlit lasting time is settable Default lasting time is 60minutes For example, if it's set as 5, the backlit will be off in 5minutes from the last time operation on the meter.
2		Press  to enter the selection routine. The current time interval will flash The options can be: 0(always on),5,10,30,60,120minutes.
Use  and  buttons to select the time required. Press  to confirm the set-up.		








## Supply System

Use this section to set the type of power supply being monitored.

1		From the Set-up menu, use  and  buttons to select the system option. The screen will show the currently selected power supply.
2-1		Press  to enter the selection routine. The current selection will flash.
2-2		Use  and  buttons to select the required system option: 1P2(W),3P3(W) ,3P4(W).
2-3		Press  to confirm the selection. SET indicator will appear.
Press  to exit the system selection routine and return to the menu. SET will disappear and you will be returned to the main Set-up Menu		

## CT

The CT option sets the secondary current (CT2 1A or 5A) of the current transformer (CT) that wires to the meter.

1		From the Set-up menu, use  and  buttons to select the CT option.
2		Secondary CT setting Press  to enter the CT secondary current selection routine:5A/1A.
3		Set CT Ratio value Press  to enter the CT Ratio setting screen. The range is from 0001 to 9999.
Example: If set the ratio to be 100, it means the primary current equals secondary currentx100		

## PT

The PT option sets the secondary voltage (PT2 100to 500V) of the Voltage transformer (PT) that wires to the meter.

1		From the Set-up menu, use  and  buttons to select the PT option. The screen will show the voltage PT secondaryvoltage value. The default value is 400V
2		Secondary PT setting Press  to enter the PT secondary voltage selection routine. The range is from 100 to 500V
3		Set PT ratios value Press  to enter the PTratio screen. The range is from 0001 to 9999
For example,if set the ratio to be 100,it means the primary voltage equals secondary voltage $\times$ 100		

## Pulse Output

This option allows you to configure the pulse output 1. The output can be set to provide a pulse for a defined amount of energy active or reactive.

Use this section to set up the pulse output for:

Total kWh/ Total kVArh

Import kWh/Export kWh











Import KVArh/Export KVArh

1		From the Set-up menu, use  and  buttons to select the pulse output option.
2-2		Press  to enter the selection routine. The unit symbol will flash.
2-2		Use  and  buttons to choose kWh or kVArh.
On completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.		

## Pulse Rate











Use this to set the energy represented by each pulse.

Rate can be set to 1 pulse per dFt/0.01/0.1/1/10/100kWh/kVArh.

		(It shows 1 impulse = 10kWh/kVArh)
1		From the Set-up menu, use  and  buttons to select the pulse rate option.
2		Press  to enter the selection routine. The current setting will flash. Note: When it's dFt, it means 2.5Wh/VArh.
Use  and  buttons to choose pulse rate. On completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.		

## Pulse Duration












The energy monitored can be active or reactive and the pulse width can be selected as 200, 100(default) or 60ms.

		(It shows pulse width of 200ms)
1		From the Set-up menu, use  and  buttons to select the pulse width option.
2		Press  to enter the selection routine. The current setting will flash.
Use  and  buttons to choose pulse width. On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.		

## Communication






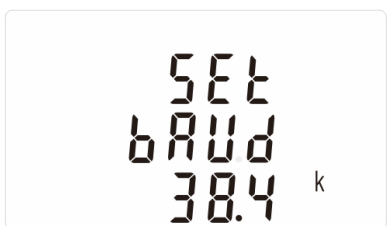




There is a RS485 port can be used for communication using Modbus RTU protocol. For Modbus RTU, parameters are selected from Front panel.

### RS485 Address











		(It shows pulse width of 200ms).
1		From the Set-up menu, use  and  buttons to select the Address ID.
2-1		Press  to enter the selection routine. The current setting will be flashing. The current setting will flash.
2-2		Use  and  buttons to choose Modbus Address(001 to 247).
On completion of the entry procedure, press  button to confirm the setting and press  button to return the main set-up menu.		




## Baud Rate

1		From the Set-up menu, use  and  buttons to select the baud rate option.
2-1		Press  to enter the selection routine. The current setting will flash.
2-2		Use  and  buttons to choose baud rate 2.4k, 4.8k, 9.6k, 19.2k, 38.4k.
On completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.		

## Parity

1		From the Set-up menu, use  and  buttons to select the parity option.
2-1		Press  to enter the selection routine. The current setting will flash.
2-2		Use  and  buttons to choose Parity (EVEN / ODD / NONE).
On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.		

	If parity is set to ODD or EVEN, Stop Bits will be set to 1 and cannot be changed.
---	--

## Stop Bits

1		From the Set-up menu, use  and  buttons to select the stop bit option.
2-1		Press  to enter the selection routine. The current setting will flash.
2-2		Use  and  buttons to choose Stop Bit (2 or 1).
On Completion of the entry procedure, press  to confirm the setting and press  to return to the main set up menu.		









	If parity is set to ODD or EVEN, Stop Bits will be set to 1 and cannot be changed.
--	--

## CLR

The meter provides a function to reset the maximum demand value of current and power.

1		From the Set-up menu, use  and  buttons to select the reset option.
2		Press  to enter the selection routine. The MD will flash.
Press  to confirm the setting and press  to return to the main set up menu.		

## Reverse Connected Current Inputs Correction Set-up

1		Use  and  buttons to select page "SET sys cont".
2-1		Press to  enter Phase A. The default is Frd (forward).
2-2		Use  and  buttons to Phase B or C setting pages.

# Modbus Communication Protocol

## Input Registers, Function code 04

Address (Register)	Input Register Parameter				Modbus Protocol Start Address Hex	
	Description	Length (Byte)	Data Format	Units	Hi Byte	Lo Byte
30001	Phase 1 line to neutral volts	4	Float	V	00	00
30003	Phase 2 line to neutral volts	4	Float	V	00	02
30005	Phase 3 line to neutral volts	4	Float	V	00	04
30007	Phase 1 current	4	Float	A	00	06
30009	Phase 2 current	4	Float	A	00	08
30011	Phase 3 current	4	Float	A	00	0A
30013	Phase 1 active power	4	Float	W	00	0C
30015	Phase 2 active power	4	Float	W	00	0E
30017	Phase 3 active power	4	Float	W	00	10
30019	Phase 1 apparent power	4	Float	VA	00	12
30021	Phase 2 apparent power	4	Float	VA	00	14
30023	Phase 3 apparent power	4	Float	VA	00	16
30025	Phase 1 reactive power	4	Float	VA <sub>r</sub>	00	18
30027	Phase 2 reactive power	4	Float	VA <sub>r</sub>	00	1A
30029	Phase 3 reactive power	4	Float	VA <sub>r</sub>	00	1C
30031	Phase 1 power factor <sup>(1)</sup>	4	Float	None	00	1E
30033	Phase 2 power factor <sup>(1)</sup>	4	Float	None	00	20
30035	Phase 3 power factor <sup>(1)</sup>	4	Float	None	00	22
30037	Phase 1 phase angle	4	Float	Degree s	00	24
30039	Phase 2 phase angle	4	Float	Degree s	00	26
30041	Phase 3 phase angle	4	Float	Degree s	00	28
30043	Average line to neutral volts	4	Float	V	00	2A
30047	Average line current	4	Float	A	00	2E
30049	Sum of line currents	4	Float	A	00	30
30053	Total system power	4	Float	W	00	34
30057	Total system volt amps	4	Float	VA	00	38
30061	Total system VA <sub>r</sub>	4	Float	VA <sub>r</sub>	00	3C
30063	Total system power factor <sup>(1)</sup>	4	Float	None	00	3E
30067	Total system phase angle	4	Float	Degree s	00	42
30071	Frequency of supply voltages	4	Float	Hz	00	46
30073	Total import active energy .	4	Float	kWh	00	48
30075	Total export active energy .	4	Float	kWh	00	4A
30077	Total import reactive energy .	4	Float	kVA <sub>r</sub> h	00	4C
30079	Total export reactive energy .	4	Float	kVA <sub>r</sub> h	00	4E

30081	Total apparent energy	4	Float	kVAh	00	50
30083	Ah	4	Float	Ah	00	52
30085	Total system power demand <sup>(2)</sup>	4	Float	W	00	54
30087	Maximum total system power demand <sup>(2)</sup>	4	Float	W	00	56
30101	Total system VA demand	4	Float	VA	00	64
30103	Maximum total system VA demand	4	Float	VA	00	66
30105	Neutral current demand	4	Float	Amps	00	68
30107	Maximum neutral current demand	4	Float	Amps	00	6A
30109	Total system reactive power demand <sup>(2)</sup>	4	Float	VAr	00	6C
30111	Maximum total system reactive power demand <sup>(2)</sup>	4	Float	VAr	00	6E
30201	Line 1 to Line 2 volts	4	Float	V	00	C8
30203	Line 2 to Line 3 volts	4	Float	V	00	CA
30205	Line 3 to Line 1 volts	4	Float	V	00	CC
30207	Average line to line volts	4	Float	V	00	CE
30225	Neutral current	4	Float	A	00	E0
30235	Phase 1 L/N volts THD	4	Float	%	00	EA
30237	Phase 2 L/N volts THD	4	Float	%	00	EC
30239	Phase 3 L/N volts THD	4	Float	%	00	EE
30241	Phase 1 Current THD	4	Float	%	00	F0
30243	Phase 2 Current THD	4	Float	%	00	F2
30245	Phase 3 Current THD	4	Float	%	00	F4
30249	Average line to neutral volts THD	4	Float	%	00	F8
30251	Average line current THD	4	Float	%	00	FA
30259	Phase 1 current demand	4	Float	A	01	02
30261	Phase 2 current demand	4	Float	A	01	04
30263	Phase 3 current demand	4	Float	A	01	06
30265	Maximum phase 1 current demand	4	Float	A	01	08
30267	Maximum phase 2 current demand	4	Float	A	01	0A
30269	Maximum phase 3 current demand	4	Float	A	01	0C
30335	Line 1 to line 2 volts THD	4	Float	%	01	4E
30337	Line 2 to line 3 volts THD	4	Float	%	01	50
30339	Line 3 to line 1 volts THD	4	Float	%	01	52
30341	Average line to line volts THD	4	Float	%	01	54
30343	Total active Energy <sup>(3)</sup>	4	Float	kWh	01	56
30345	Total reactive Energy <sup>(3)</sup>	4	Float	kVArh	01	58
30347	L1 import active Energy	4	Float	kWh	01	5A
30349	L2 import active Energy	4	Float	kWh	01	5C
30351	L3 import active Energy	4	Float	kWh	01	5E
30353	L1 export active Energy	4	Float	kWh	01	60
30355	L2 export active Energy	4	Float	kWh	01	62
30357	L3 export active Energy	4	Float	kWh	01	64
30359	L1 total active Energy	4	Float	kWh	01	66
30361	L2 total active Energy	4	Float	kWh	01	68
30363	L3 total active Energy	4	Float	kWh	01	6A
30365	L1 import reactive energy	4	Float	kVArh	01	6C
30367	L2 import reactive energy	4	Float	kVArh	01	6E
30369	L3 import reactive energy	4	Float	kVArh	01	70
30371	L1 export reactive energy	4	Float	kVArh	01	72
30373	L2 export reactive energy	4	Float	kVArh	01	74

30375	L3 export reactive energy	4	Float	kVArh	01	76
30377	L1 total reactive energy	4	Float	kVArh	01	78
30379	L2 total reactive energy	4	Float	kVArh	01	7A
30381	L3 total reactive energy	4	Float	kVArh	01	7C

Notes:

1. The power factor has its sign adjusted to indicate the direction of the current. Positive refers to forward current, negative refers to reverse current.
2. The power sum demand calculation is for import – export.
3. Total kWh/kVarh equals to Import + export.



## Holding Register, Function code 03/10

Address Register	Parameter Number	Parameter	Modbus Protocol Start Address Hex		Valid Range	Mode
			Hi Byte	Lo Byte		
40001	1	Demand Time	00	00	Read minutes into first demand calculation. When the demand time reaches the demand Period then the demand values are valid. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	ro
40003	2	Demand Period	00	02	Write demand period: 0, 5, 8, 10, 15, 20, 30 or 60 minutes, default 60. Setting the period to 0 will cause the demand to show the current parameter value, and demand max to show the maximum parameter value since last demand reset. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r/w
40011	6	System Type	00	0A	Write system type: 3p4w = 3, 3p3w = 2 and 1p2w = 1. Requires password, see parameter 13. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r/wp
40013	7	Pulse1 Width	00	0C	Write pulse1 on period in milliseconds: 60, 100 or 200, default 100. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r/w
40015	8	Password Lock	00	0E	Write any value to password lock protected registers. Read password lock status: 0 = locked, 1 = unlocked. Reading will also reset the password timeout back to one minute. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r
40019	10	Parity Stop	00	12	Write the network port parity/stop bits for MODBUS Protocol, where: 0 = One stop bit and no parity, default. 1 = One stop bit and even parity. 2 = One stop bit and odd parity. 3 = Two stop bits and no parity. Requires a restart to become effective. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r/w

40021	11	Modbus Address	00	14	Write the network port node address: 1 to 247 for MODBUS Protocol, default 1. Requires a restart to become effective. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r/w
40023	12	Pulse1 Divisor1	00	16	Write pulse divisor index: n = 0 to 5 0-0.0025 kWh(kVArh)/imp 1-0.01 kWh(kVArh)/imp 2-0.1 kWh(kVArh)/imp 3-1 kWh(kVArh)/imp 4-10 kWh(kVArh)/imp 5-100 kWh(kVArh)/imp 6-1000kWh(kVArh)/imp <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r/w
40025	13	Password	00	18	Write password for access to protected registers. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r/w
40029	15	Network Baud Rate	00	1C	Write the network port baud rate for MODBUS Protocol, where: 0 = 2400 baud 1 = 4800 baud 2 = 9600 baud, default 3 = 19200baud 4 = 38400 baud Requires a restart to become effective <b>Length: 4 bytes</b> <b>Data Format: Float</b>	r/w
40063	32	CT ratio	00	3E	CT Ratio range: 1~2000 CT Ratio = primary current /secondary current <b>Length: 4 bytes</b> <b>Data Format: Float</b> Requires password, see parameter 13 (Non MID)	r/w
40065	33	PT ratio	00	40	PT Ratio range:1~2000 PT ratio= primary voltage /secondary voltage <b>Length: 4 bytes</b> <b>Data Format: Float</b> Requires password, see parameter 13 (Non MID)	r/w
40087	44	Pulse 1	00	56	Write MODBUS Protocol input para-meter for	r/w

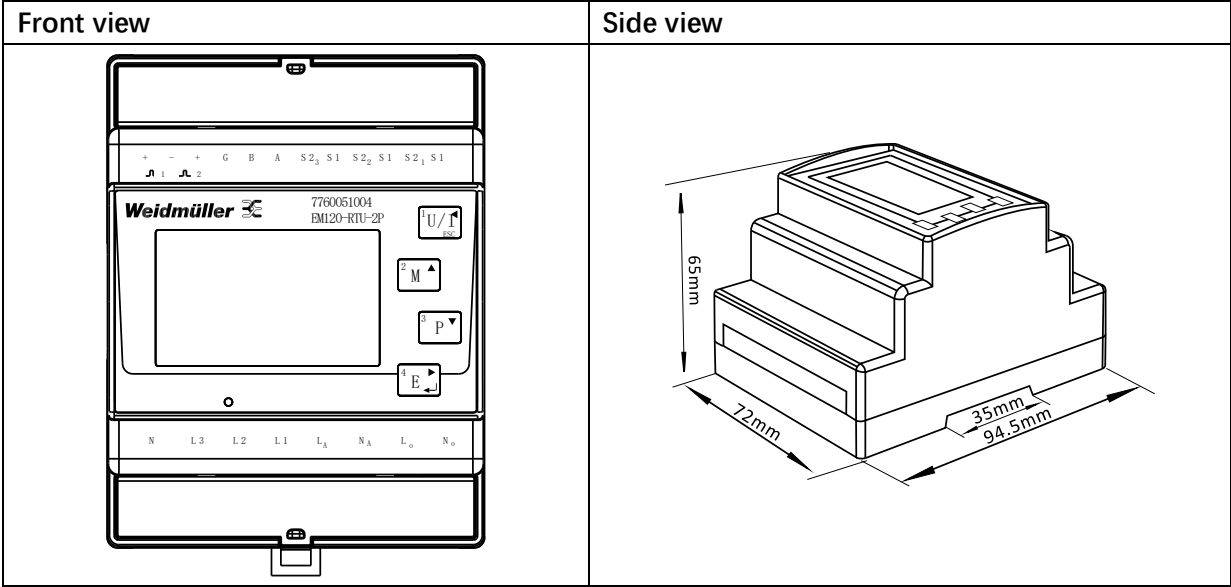
		Energy Type			pulse out 1:37 = total kWh or 39 = total kVarh, default 39. <b>Length: 4 bytes</b> <b>Data Format: Float</b>	
461457	30729	Reset	F0	10	0000: reset the Maximum demand 0003: reset the resettable energy <b>Length: 2 bytes</b> <b>Data Format: Hex</b>	wo
464513	Serial number	Unsigned Int 32	FC	00	Serial number Length: 4 bytes Note: Only read	ro



Some of the parameters described above are password protected and thus require the password to be entered at the Password register before they can be changed. The default password is 0000. When the password has been entered it will timeout in one minute unless the Password or Password Lock register is read to reset the timeout timer. Once the required changes have been made to the protected parameters the password lock should be reapplied by allowing the password to timeout, or writing any value to the Password Lock register, or power cycling the instrument.

# Dimensional drawings

All dimensions in mm.



# Connecting example

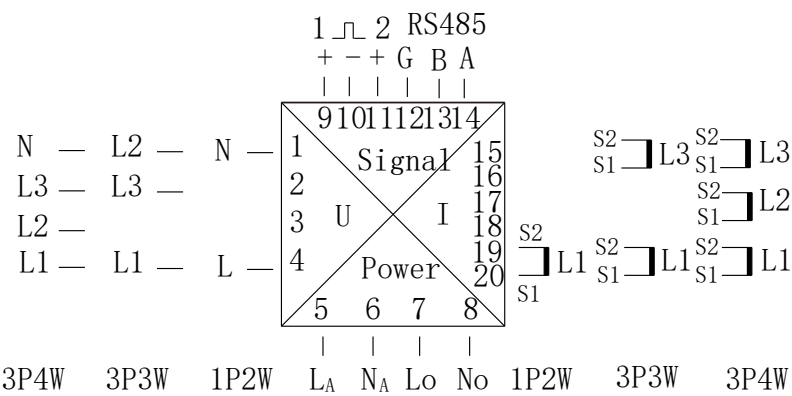



Fig.: Connecting example



The overcurrent protection device must be UL/IEC certified.