EM220-RTU-4DI2DO
EM220-RTU-4DI2DO-GW

Manual

Revision History

Version	Date	Change
0	2021.3.9	First edition
1	2021.11.30	Corrected the wrong description of password entry
2	2023.6.25	Update Response time

Contents

General

This manual applies to the products:
7760051005 Energy Meter 220-RTU-4DI2DO
7760051006 Energy Meter 220-RTU-4DI2DO-GW

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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:

	**Dangerous voltage!** Risk of death or serious injury. Disconnect the power before working on the system and device.
	**Attention!** 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 out- side 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.

All supplied screw terminals are attached to the device.

Scope of delivery Energy Meter 220

Quantity	Designation
1	Energy Meter 220
1	Quick guide
1	Screw terminal, pluggable, 3-pin (RS 485)
1	Screw terminal, pluggable, 3-pin (auxiliary energy)
1	Screw terminal, pluggable, 4-pin (voltage measurement)
1	Screw terminal, pluggable, 6-pin (current measurement)
1	Screw terminal, pluggable, 10-pin(4 digital input, 2 electromagnetic relay output)

Product description

Intended use

The Energy Meter 220 measures and displays the characteristics of 1P2W, 3P3W, 3P4W's applications. The unit provides voltage, current, power, frequency, power-factor, and energy etc.

The Unit is suitable for Installation in fixed and weather-proof panels. Conducting panels must be earthed. Any mounting position is possible. For mounting on front panels or doors.

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 220 designed for mounting in low voltage distributions, containing overvoltage in measurement category III.

The unit current measurements inputs are connected via external ···/1A or ···/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.

EM220 series have one RS485 remote communication port.

EM220-RTU-4DI2DO-GW has Ethernet port. The meter can also be set as an RS485Modbus to TCP/IP gateway.

Specifications

Electrical characteristics			
Type of measurement			RMS including harmonics on three phase AC system (3P, 3P+N)
Measurement accuracy	Power		IEC 61557-12 Class 0.5
	Active Energy		IEC 62053-22 Class 0.5S, IEC 61557-12 Class 0.5
	Reactive Energy		±1%
	Frequency		±0.1%
	Current		±0.2%
	Voltage		±0.2%
	Power Factor		±0.01
Data Update Rate			1 second nominal
Input-Voltage	VT Primary		50~600000V ac
	Un		230V L-N
	Measured Voltage with Over-range and Crest Factor		50 to 600Vac L-L 50 to 345Vac L-N
	Permanent Overload		600V L-L 345V L-N
	Impedance		1M Ω
	Frequency Range		45~65Hz
Input- Current	CT Ratings	Primary	1~9999A
		Secondary	1A / 5A
	Measured current with Over-range and Crest Factor		0.25~6A
	Withstand		30 x Imax 0.5s
	Impedance		< 1 mΩ
	Frequency Range		45~65Hz
	Burden		<0.036VA at 6A
Auxiliary Power Supply	Operating Range		75~270V AC / 100~380V DC
	Power Consumption		< 7VA/3.5W
	Frequency		50/60 Hz
Digital output	Number/Type		2 - electromagnetic relay
	Output Frequency		1 Hz maximum
	Switching Current		250 Vac at 3.0 Amps
	Isolation		2.5 KVac for 1min
Digital Input	Number		4
	Voltage		⩽24V DC
	Input Resistance		10kΩ
	Isolation		2.5 KVac for 1min
Mechanical Characteristics			

Weight	380g
IP Degree of Protection (IEC 60529)	IP51 for front display; IP20 for others
Dimensions (WxHxD)	96x96x70.3
Mounting Position	Vertical
Panel Thickness	1~3mm
Material of meter case	UL 94 V-0
Environmental Characteristics	
Operating Temperature	-25 to 55°C
Storage Temperature	-40 to 70°C
Humidity Rating	0 to 90%, non-condensing
Pollution Degree	2
Altitude	<2000m
Electromagnetic Compatibility	
Electrostatic Discharge	IEC 61000-4-2
Immunity to Radiated Fields	IEC 61000-4-3
Immunity to Fast Transients	IEC61000-4-4
Immunity to Impulse Waves	IEC61000-4-5
Conducted Immunity	IEC 61000-4-6
Immunity to Magnetic Fields	IEC 61000-4-8
Immunity to Voltage Dips	IEC 61000-4-11
Radiated Emissions	EN55011 Class A
Conducted Emissions	EN55011 Class A
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
Protective Class	II
Communications	
Interface standard and protocol	RS485 and MODBUS RTU Ethernet and MODBUS TCP(only for EM220-RTU-4DI2DO-GW)
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
Response time	1 s
Connection capacity of the terminals(voltage/current measurement and power supply)	
Single-wire, multi-wire, finely stranded conductor	0.5-2.5mm^2
Pin terminals,ferrules	0.5-2.5mm^2
Tightening torque	0.4-0.5 Nm

Stripping length	7mm
Connection capacity of the terminals(RS485 and digital input/output)	
Single-wire, multi-wire, finely stranded conductor	0.2-1.5mm^2
Pin terminals,ferrules	0.2-1.5mm^2
Tightening torque	0.2-0.25 Nm
Stripping length	7mm

Operating concept

There are several ways to program the Energy Meter 220 and retrieve measured values.

- Directly on the device using five 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).

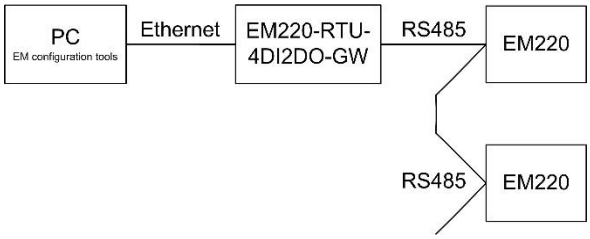
These operating instructions only describe the operation of the Energy Meter 220 using the 5 buttons. The programming software of the EM configuration tools has its own “on- line help”.

EM configuration tools

The Energy Meter 220 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 220 via an RS485 Modbus to TCP/IP gateway.

Connection options

Connection of Energy Meter 220 to PC via an EM220-RTU-4DI2DO-GW as a gateway:



Assembly

Installation location

The Energy Meter 220 is suitable for installation in permanent, weatherproof switchboards. Conducting switchboards must be earthed.

The unit is intended for use in a reasonably stable ambient temperature within the range -25°C to +55°C.

Do not mount the unit where there is excessive vibration or in excessive direct sunlight.

Leave enough space behind the instrument to allow for bends in the connection cables.

Front panel cutout

Cutout dimensions: 92 x 92 mm
Thickness of the panel: 1~3mm

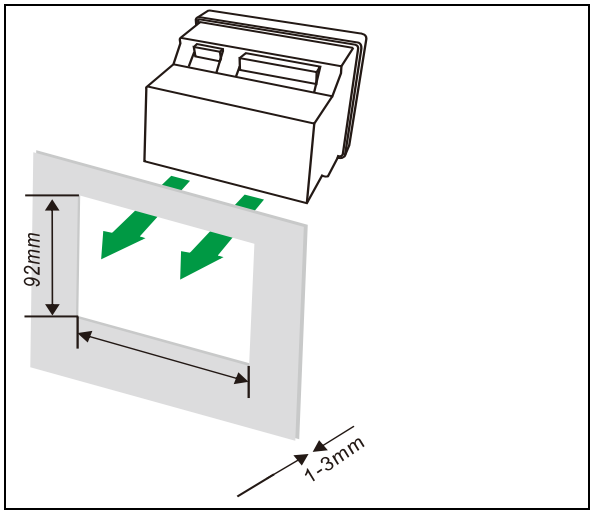


Fig.: Energy Meter 220 installation location (side view)

⚠	Failure to comply with the minimum spacing can destroy the Energy Meter 520 at high ambient temperatures!

Mounting

The Energy Meter 220 is mounted on the switchboard by the side mounting clips. Mounting is carried out by pressing and engaging the clips.

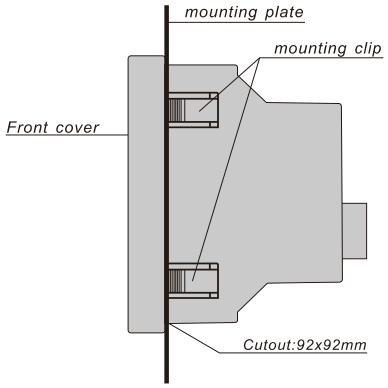


Fig.: Energy Meter 220 mounting clip (side view)

Installation

Power supply

A supply voltage is required to operate the Energy Meter 220. 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!

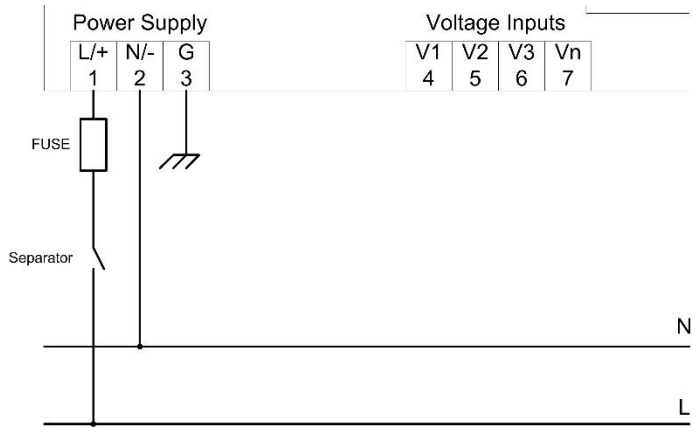


Fig.: Connection example of the supply voltage to the Energy Meter 220

⚠	• 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 220.
- The circuit breaker must be placed in the vicinity of the Energy Meter 220, 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.

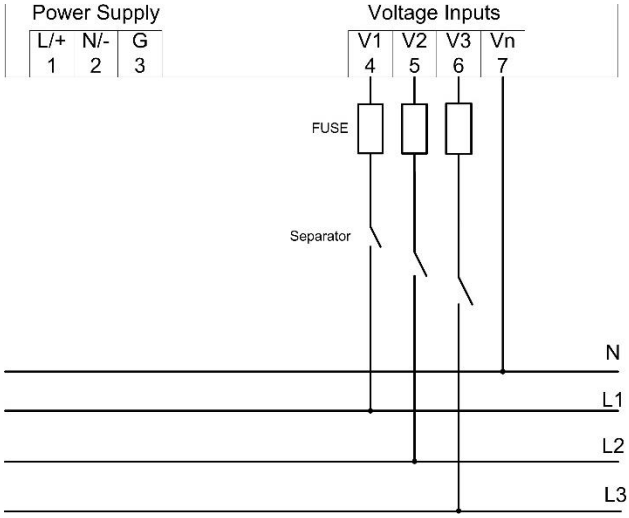


Fig.: Connection example for the voltage measurement

	**Attention!** Voltages that exceed the permitted rated mains voltages must be connected via voltage transformers.
	**Attention!** The Energy Meter 220 is not suitable for the measurement of DC voltages.
	**Attention!** The voltage measurement inputs on the Energy Meter 220 are dangerous to touch!

Current measurement inputs

The Energy Meter 220 is designed for connecting current trans- formers with secondary currents of ../1A and ../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 220.
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.

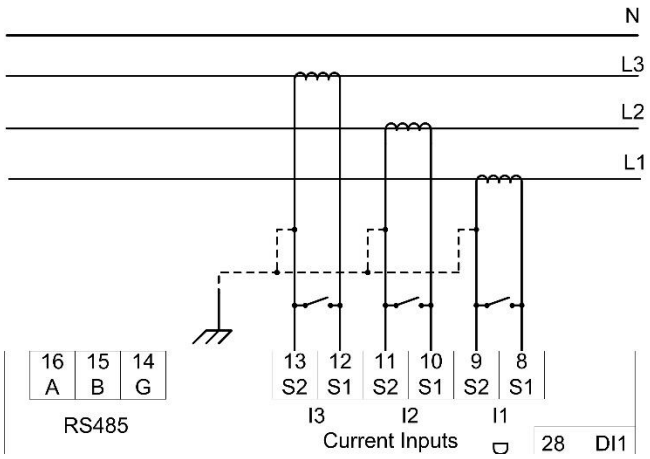


Fig.: Current measurement via current transformer (connection example)

	Caution! The Energy Meter 520 is only approved for a current measurement using the current transformer.
	Attention! The current measurement inputs are dangerous to touch.
	Attention! The Energy Meter 220 is not suitable for the measurement of DC voltages.
	Earthing current transformers! 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 two 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.

	**Current transformer terminals!** The secondary terminals of the current transformer must be short-circuited to this before the power supply lines to the Energy Meter 520 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.
	**Open current transformer!** 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 220 as a 3-pole contact and communicates via the Modbus RTU protocol (please see the registers address list of Modbus RTU protocol).

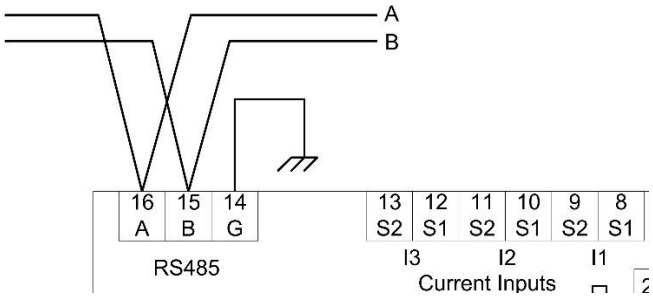


Fig.: RS485 interface, 3-pole contact

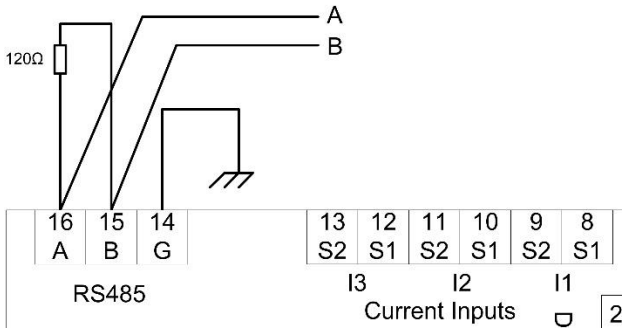
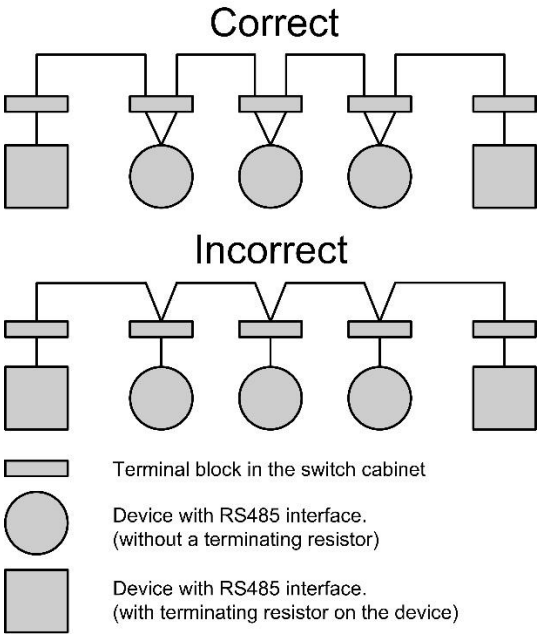


Fig.: RS485 interface, 3-pole contact with terminating resistor

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 220 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.

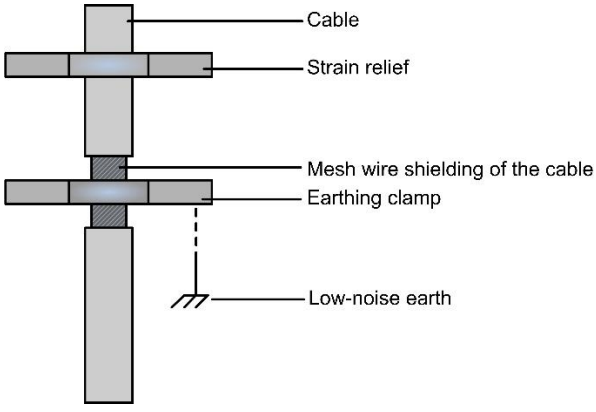


Fig.: Shielding design for cabinet entry

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.

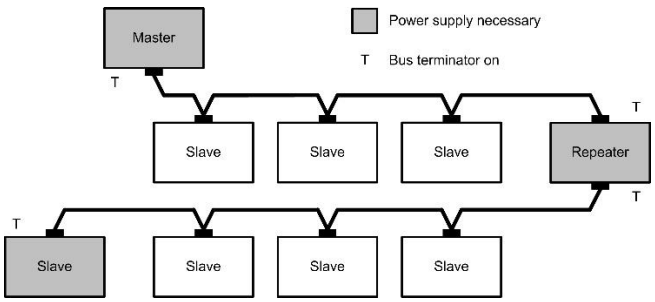


Fig.: Diagram of RS485 bus structure

Digital outputs

The Energy Meter 220 has 2 digital outputs with electromagnetic relay. These digital outputs have a common reference.

- The digital outputs can switch DC and AC loads(250VAC / 3A).
- The digital outputs are not short circuit protected.
- An external auxiliary voltage with overcurrent protective device is required.
- Connected cables longer than 30 m must be shielded.
- The digital outputs can be used as pulse outputs with maximum frequency of 1 Hz.
- The digital outputs can be controlled via the Modbus.
- The digital outputs can output results from comparators.

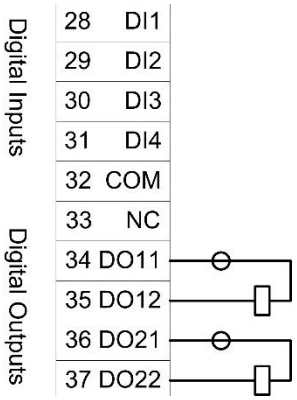


Fig.: Connection of digital outputs

Digital inputs

EM220 has 4 digital inputs:

- Only switch devices need to be connected without additional power supply
- Maximum input frequency is 1KHz
- Input impedance is 10KΩ
- Reponse time is 10ms
- The digital outputs can be read via the Modbus.
- Connected cables longer than 30 m must be shielded.

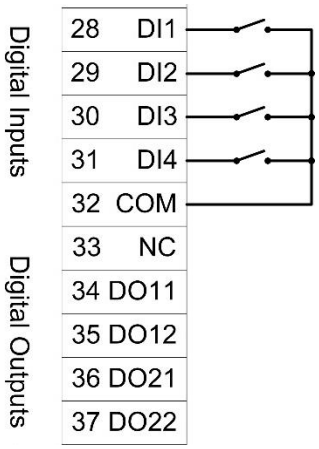


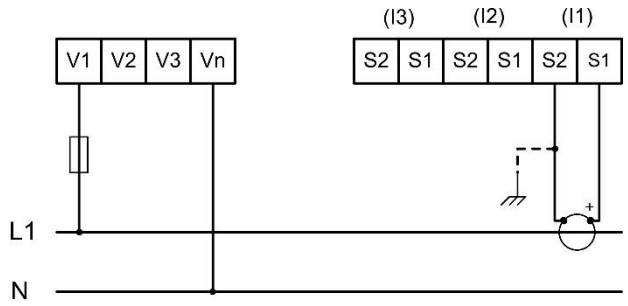
Fig.: Connection of digital inputs

Battery Replacement

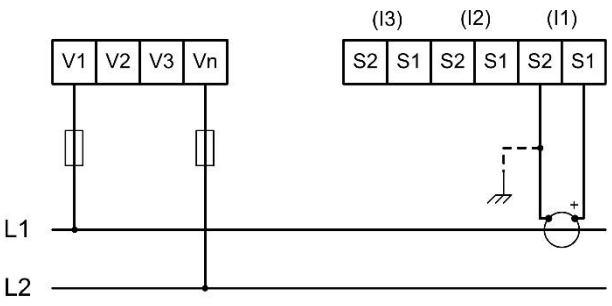
The meter provides multi tariffs and RTC, it has a 3V DC battery as backup power supply.
When the battery voltage is lower than 2.4V DC, the meter LCD will shows warning symbol . The user needs to replace the battery with a new one.

⚠	**Attention!** When replacing the battery, make sure that the meter's voltage inputs and the auxiliary power supply must be disconnected.

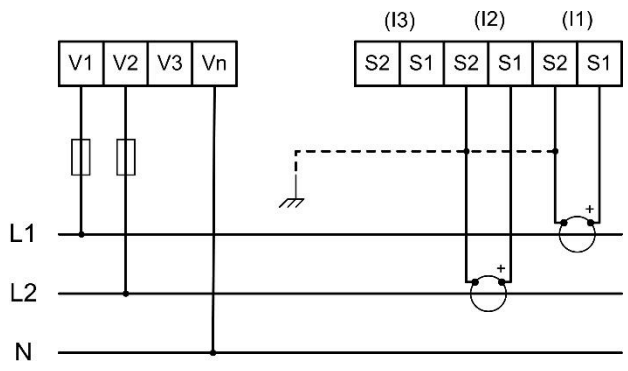
Examples of electrical connections



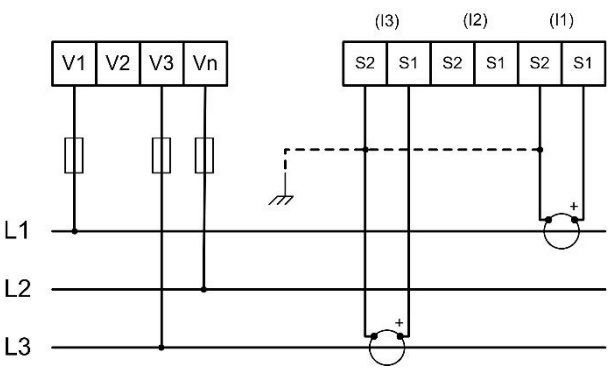
1P2W(L+N) 1CT



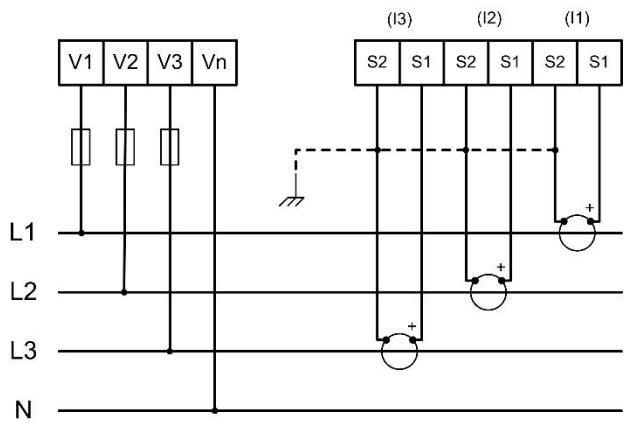
1P2W(L+L) 1CT



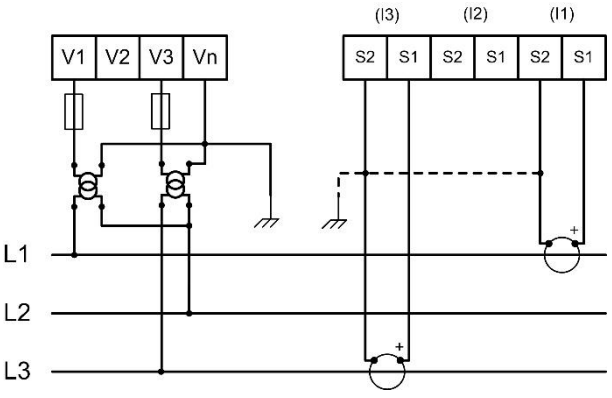
1P3W(L+L+N) 2CTs



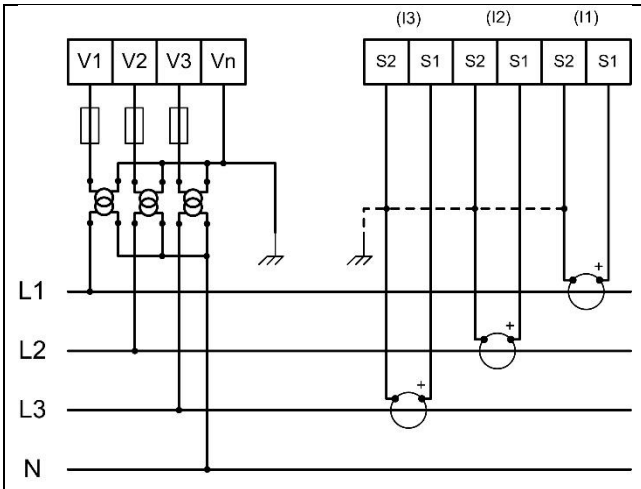
3P3W 2CTs



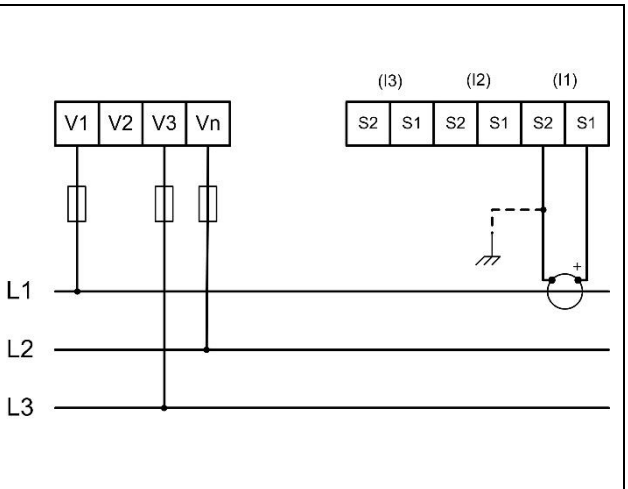
3P4W 3CTs



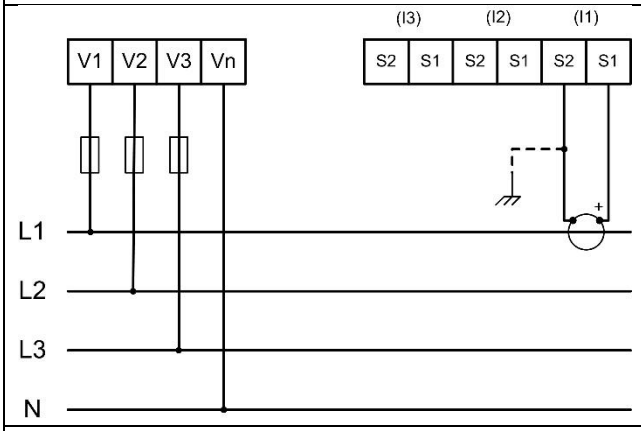
3P3W 2PT 2CTs



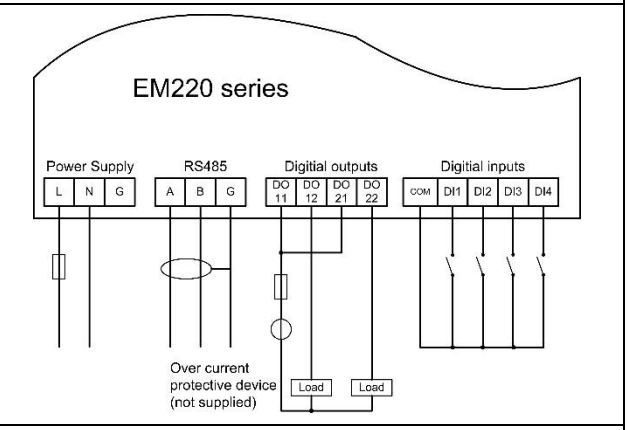
3P4W 3PT 3CTs



3P3W 1CT Balance load



3P4W 1CT Balance load

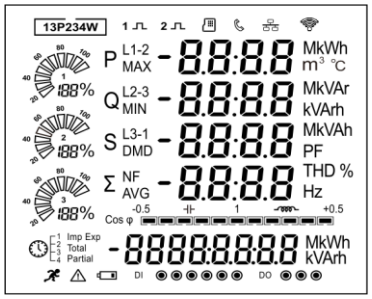
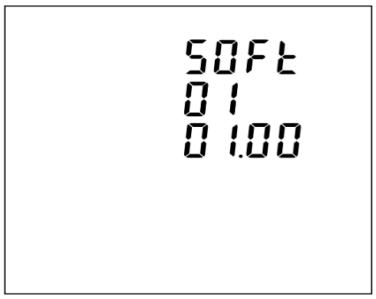
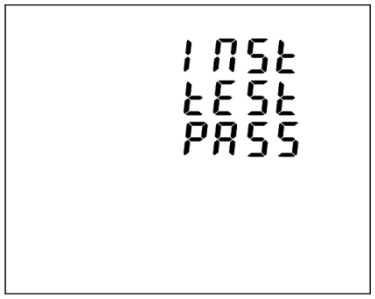


RS485 / DI / DO

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

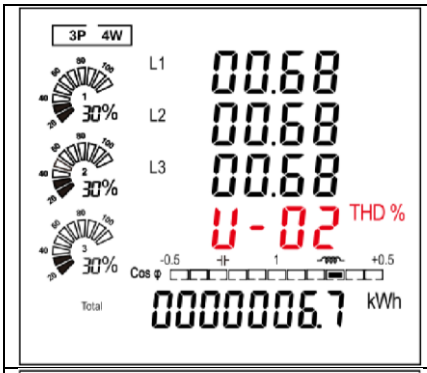
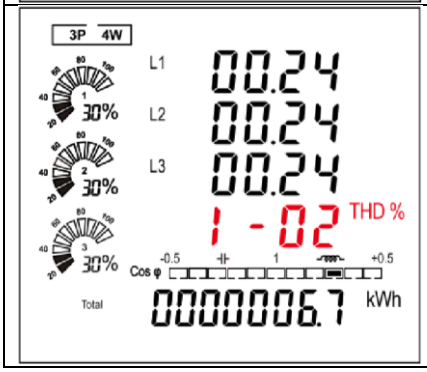
Buttons	Click	Press 2S
	➢ Displays power, voltage, current and energy information of each phase ➢ Exit from the menu	➢ Automatic Scroll display ON / OFF
	➢ Display Voltage and current information of the selected system type. (3p4w, 3p3w and 1p2w) ➢ Phase sequence ➢ Left side move	➢ Individual Harmonic Distortion of Voltage up to 63rd
	➢ Display power factor, frequency, Max. Demand. ➢ Max. and Min. of current and voltage ➢ Up page or add value	➢ Individual Harmonic Distortion of Current up to 63rd
	➢ Display active power, reactive power and apparent power information of the selected system type. ➢ Down page or reduce value	➢ Running hour ➢ Full Screen checking ➢ Modbus / Ethernet setting information ➢ Tariff Information
	➢ Display total / import / export active or reactive energy information of the selected system type. ➢ 4 tariff energy and RTC ➢ Right side move	➢ Set-up mode entry ➢ Confirmation

Overview of measured value displays

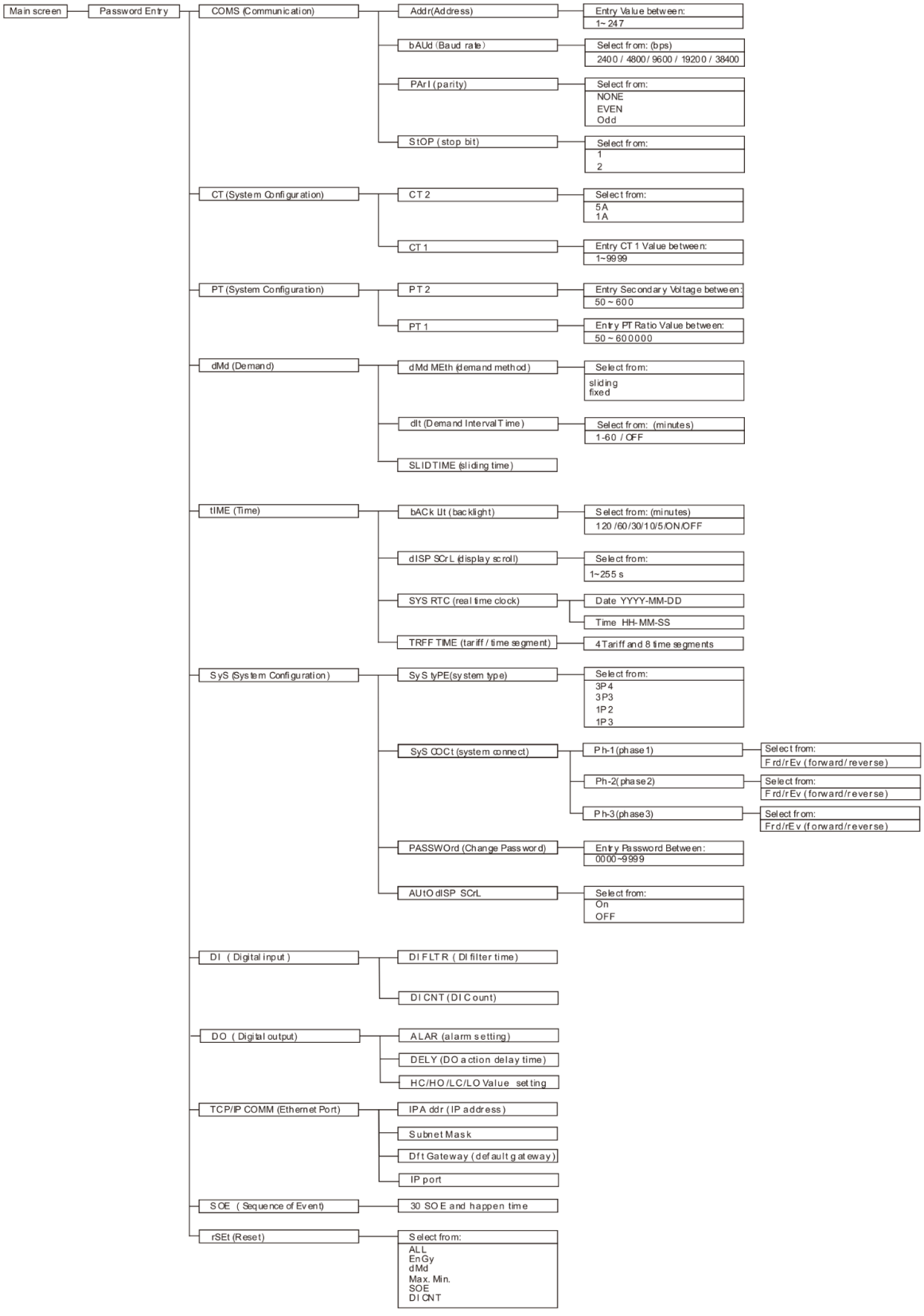
Click button	3 Phase 4 Wire		3 Phase 3 Wire		1 Phase 2 Wire	
	Screen	Parameters	Screen	Parameters	Screen	Parameters
Ph S ESC	1	Phase 1- Power Voltage Current kWh	1	Phase 1 - Power Voltage Current kWh	1	Phase 1 - Power Voltage Current kWh
	2	Phase 2- Power Voltage Current kWh	2	Phase 2- Power Voltage Current kWh		
	3	Phase 3- Power Voltage Current kWh	3	Phase 3- Power Voltage Current kWh		
	4	Phase 1 -Power Voltage Current kVarh	4	Phase 1 -Power Voltage Current kVarh	2	Phase 1 -Power Voltage Current kVarh
	5	Phase 2 -Power Voltage Current kVarh	5	Phase 2 -Power Voltage Current kVarh	5	
	6	Phase 3 -Power Voltage Current kVarh	6	Phase 3 -Power Voltage Current kVarh	6	
V/A	1	Voltage L1-N Voltage L2-N Voltage L3-N			1	Voltage L1-N
	2	Voltage L1-L2 Voltage L2-L3 Voltage L3-L1	1	Voltage L1-L2 Voltage L2-L3 Voltage L3-L1		
	3	Current L1 Current L2 Current L3 Current Neutral	2	Current L1 Current L2 Current L3	2	Current L1
	4	THD% of Voltage L1 THD% of Voltage L2 THD% of Voltage L3	3	THD% of Voltage L1-2 THD% of Voltage L2-3 THD% of Voltage L3-1	3	THD% of Voltage L1
	5	THD% of Current L1 THD% of Current L2 THD% of Current L3	4	THD% of Current L1 THD% of Current L2 THD% of Current L3	4	THD% of Current L1
	6	Phase Sequence	5	Phase Sequence		
MD PF Hz	1	Total Power Factor Frequency	1	Total Power Factor Frequency	1	Total Power Factor Frequency
	2	PF L1 PF L2 PF L3	2	PF L1 PF L2 PF L3		

	3	Max. DMD of Current L1 Max. DMD of Current L2 Max. DMD of Current L3	3	Max. DMD of Current L1 Max. DMD of Current L2 Max. DMD of Current L3	2	Max. DMD of Current L1
	4	Max. DMD of W Max. DMD of Var Max. DMD of VA	4	Max. DMD of W Max. DMD of Var Max. DMD of VA	3	L1 Max. DMD of W L1 Max. DMD of Var L1 Max. DMD of VA
	5	Max. Voltage L1-N Max. Voltage L2-N Max. Voltage L3-N	5	Max. Voltage L1-L2 Max. Voltage L2-L3 Max. Voltage L3-L1	4	Max. Voltage L1-N
	6	Min. Voltage L1-N Min. Voltage L2-N Min. Voltage L3-N	6	Min. Voltage L1-L2 Min. Voltage L2-L3 Min. Voltage L3-L1	5	Min. Voltage L1-N
	7	Max. Current L1 Max. Current L2 Max. Current L3 Max. Current Neutral	7	Max. Current L1 Max. Current L2 Max. Current L3	6	Max. Current L1
	8	Min. Current L1 Min. Current L2 Min. Current L3 Min. Current Neutral	8	Min. Current L1 Min. Current L2 Min. Current L3	7	Min. Current L1
	1	Active Power L1 Active Power L2 Active Power L3	1	Active Power L1 Active Power L2 Active Power L3		
	2	Reactive Power L1 Reactive Power L2 Reactive Power L3	2	Reactive Power L1 Reactive Power L2 Reactive Power L3		
	3	Apparent Power L1 Apparent Power L2 Apparent Power L3	3	Apparent Power L1 Apparent Power L2 Apparent Power L3		
	4	Total Active Power Total Reactive Power Total Apparent Power	4	Total Active Power Total Reactive Power Total Apparent Power	1	L1 Active Power L1 Reactive Power L1 Apparent Power
	1	Total kWh	1	Total kWh	1	Total kWh
	2	Total kVarh	2	Total kVarh	2	Total kVarh
	3	Import kWh	3	Import kWh	3	Import kWh
	4	Export kWh	4	Export kWh	4	Export kWh
	5	Import kVarh	5	Import kVarh	5	Import kVarh
	6	Export KVarh	6	Export KVarh	6	Export KVarh
	7	T1 kWh	7	T1 kWh	7	T1 kWh
	8	T2 kWh	8	T2 kWh	8	T2 kWh
	9	T3 kWh	9	T3 kWh	9	T3 kWh
	10	T4 kWh	10	T4 kWh	10	T4 kWh
	11	Date	11	Date	11	Date
	12	Time	12	Time	12	Time

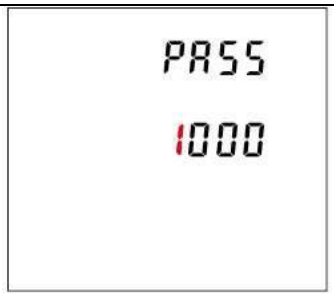
Individual Harmonic Distortion

	Press the button V/A for 2 seconds to check Harmonic distortion of Voltage 2~63rd Harmonic Distortion of Voltage.
	Press the button MD PF Hz for 2 seconds to check Harmonic distortion of Current 2~63rd Harmonic Distortion of Current.

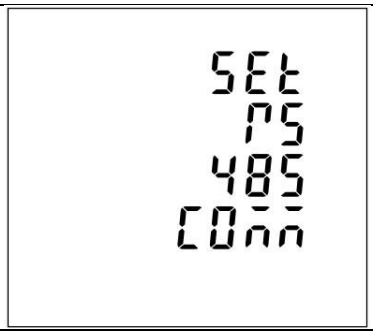
Configuration menu



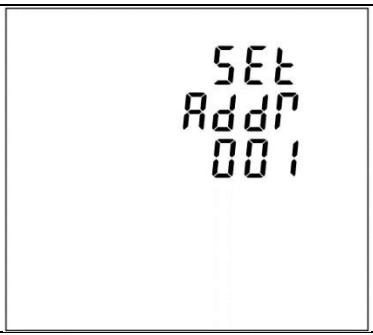
Password Entry

	Setting-up mode is password protected, so you must enter the correct password. By firmly press the button E for 2 seconds, the password screen appears. The default password is 1000. If an incorrect password is entered, the display shows ERR.

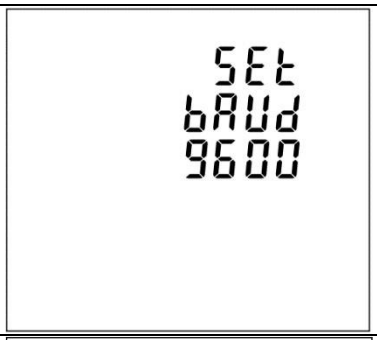
Communication

	The RS485 port can be used for communications using Modbus RTU protocol. Parameters such as Address, Baud rate, Parity, Stop bit can be selected. Long press E to enter the Address option.

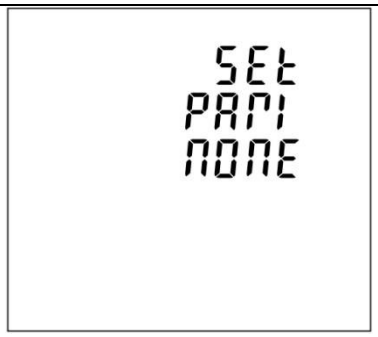
Address

	An RS485 network can accommodate up to 255 different devices, each identified by an address. Modbus address range 001~247 Default 001 Long press E to enter the selection routine, the address setting will flash. Use MD PF Hz, P and E to set the address with the range 001~247. And press E for confirmation.

Baud rate

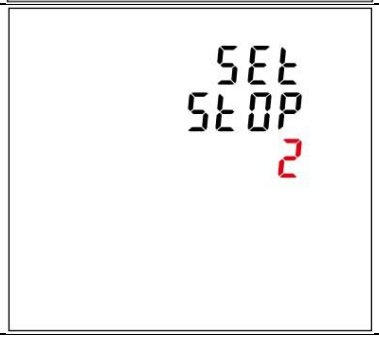
	Baud rate options: 2400 4800 9600 19200 38400 (bps). Default:96000bps From the Set-up menu, use MD PF Hz and P to select the Baud rate options. Long press E to enter the selection routine. The Baud Rate setting will flash. Use MD PF Hz and P to choose Baud Rate.
	Example shows: SET Baud rate 19200 (bps) And long press E for confirmation.

Parity

	Parity Options: NONE, EVEN, ODD. Default Parity: NONE From the Set-up menu, use MD PF Hz and MD PF Hz to select the Parity options. Long press E to enter the selection routine. The Parity setting will flash. Use MD PF Hz and P to choose Parity.
	Example shows: Set Parity: EVEN And long press E for confirmation. Press Ph S ESC to return the main set up menu.
	Example shows: Set Parity: Odd And long press E for confirmation. Press Ph S ESC to return 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 bit

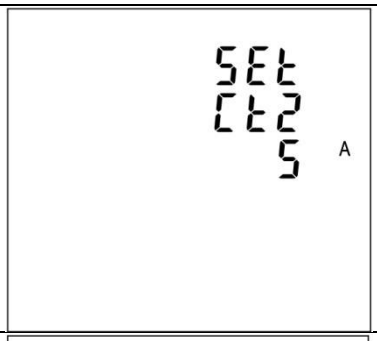
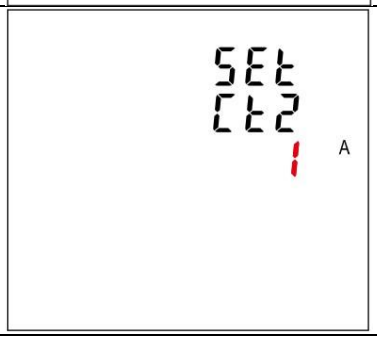
	Stop Bit options: 1 or 2. Default Stop Bit : 1 From the Set-up menu, Use MD PF Hz and P to select the Stop Bit options. Long press E to enter the Stop Bit routine. The Stop Bit setting will flash. Use MD PF Hz and P to choose Stop Bit.
	Example shows Set Stop bit 2 And long press E for confirmation. Press Ph S ESC to return the Communication set up menu.

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

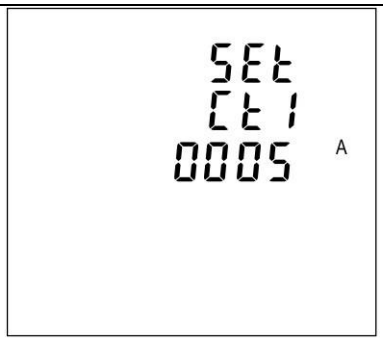
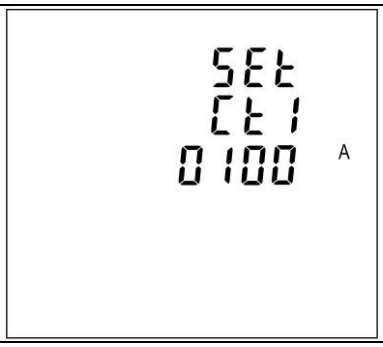
CT

	From the main Set-up menu, Use MD PF Hz and P to select the CT option.

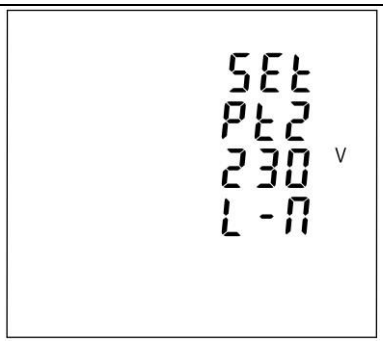
CT2

	Set secondary current input the meter Options: 5A or 1A Default CT2: 5A Long press E to enter the CT2 routine. Press E **for 2s, the** CT2 setting will flash. Use MD PF Hz and P to choose CT2 with 5A or 1A.
	Example shows : Set CT2 1A And long press E for confirmation.

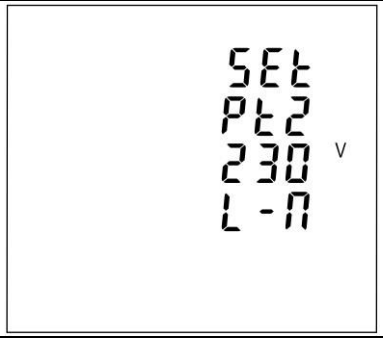
CT1

	Set primary current input the meter Options: 1~9999 Default CT1: 5A Long press E to enter the CT1 routine. Press E for 2s, the CT1 setting will flash. Use MD PF Hz and P to choose CT1 with 1~9999. And long press E for confirmation.
	Example shows : Set CT1 100A And press E for confirmation. Press Ph S esc to return the CT set up menu.

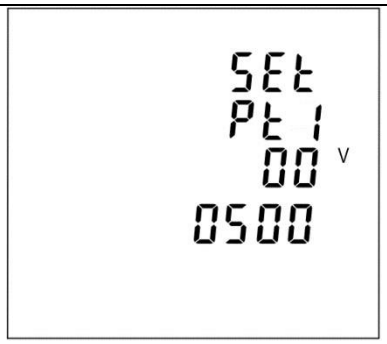
PT

	The PT option sets the secondary voltage of the voltage transformer (PT) that give into the meter and the PT rate between the primary voltage to the secondary voltage. For example: if the PT connect to the meter is 10000/100V (Primary voltage is 10000V, secondary voltage is 100V), then the PT rate is 100. Long press E to enter the PT2 routine. Press E , the PT2 setting will flash. Use MD PF Hz and P , E to choose PT2 with 174~480.

PT2

	Set secondary voltage input the meter Range: 100V ~ 480V Default: 230V And long press E for confirmation.

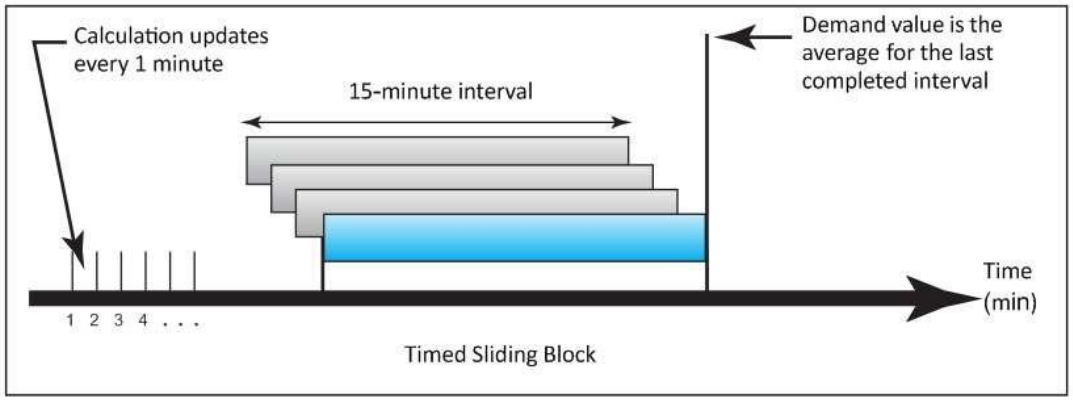
PT1

	Set primary voltage input the meter Range: 100V ~ 500000V Default: 230V Then press P to enter the PT2 routine. Press E for 2s, the PT2 setting will flash. Use MD PF Hz and P , E to select PT2. And long press E for confirmation. Press Ph S ESC to return the PT set up menu.

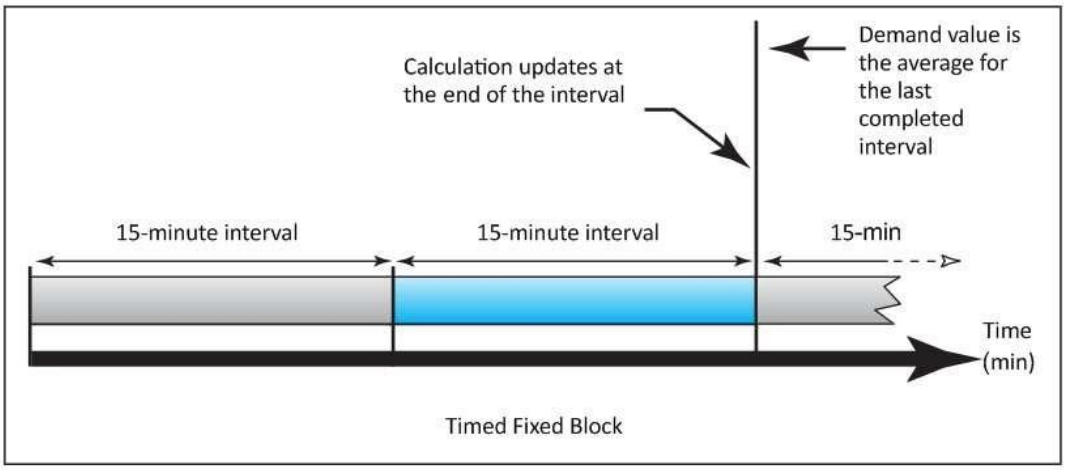
Demand set

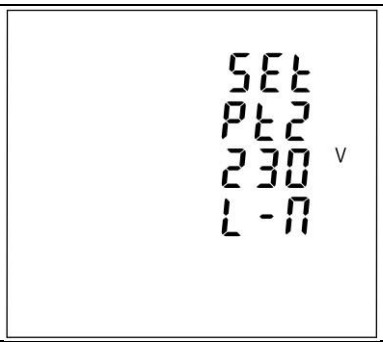
The unit provides block interval demand calculation. In this method, you select a 'block' of time that power meter uses for the demand calculation. You choose how the power meter handles that block of time (interval). Two different modes are optional.

Slide Block: Select a demand interval time (DIT) from 1 to 60 minutes (in 1 minute increments). Set the calculation update time from 1 to 59minutes. The power meter displays the demand value for the last completed interval.

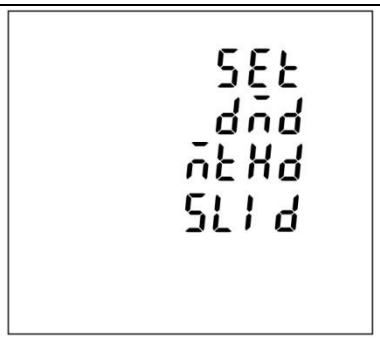
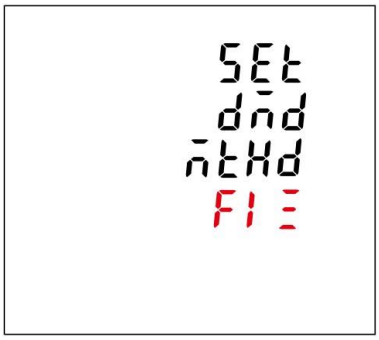


Fixed Block: Select an interval from 1 to 60 minutes (in 1-minute increments). The power meter calculates an update the demand at the end of each interval.

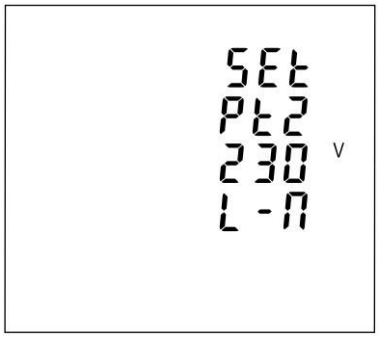


	This sets the period in minutes over which the current and power readings are integrated for maximum demand measurement. The options are: OFF, 5, 8, 10, 15,30, 60 minutes. From the Set-up menu, use MD PF Hz and P to select the Demand option.

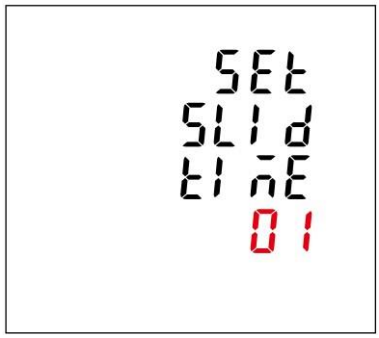
Demand method

	The screen shows the Demand calculation method: Slid Options: Fix and Slid Use MD PF Hz and P to enter Demand calculation method.
	Long press E to enter the routine. The setting will flash. Use MD PF Hz and P to choose Options. And long press E for confirmation. Press Ph S ESC to return the Demand set up menu.

Demand interval time/ Block time(DIT)

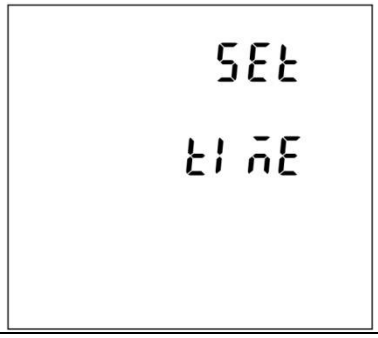
	The screen will show the currently selected integration time. Default is 60 minutes. range from 1 to 60. Off means function closed. Long press E to enter the DIT routine. Press E for 2s, the setting will flash. Use MD PF Hz and P to choose Options. And long press E for confirmation.

Sliding time

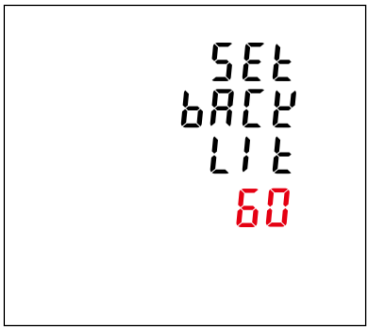
	The screen will show the Sliding time for the sliding mode.

	The sliding time shall be set not bigger than the DIT.

Time set

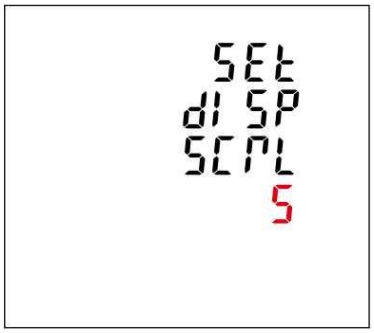
	This option sets the backlight lasting time and display scroll time. From the Set-up menu, use MD PF Hz and P to select the Time option.

Backlight time

	The meter provides a function to set the backlit lasting time. Options: ON/OFF/5/10/30/60/120 minutes. Default: 60 Long press E to enter the Backlit time routine. Press P for 2s, the setting will flash. Use MD PF Hz and P to choose Options. And long press E for confirmation.

	If it is set as ON, the backlit will always be on. If it is seated as 5, the backlit will be off in 5 minutes.

Display scroll time



The meter provides a function to set the Display scroll time.

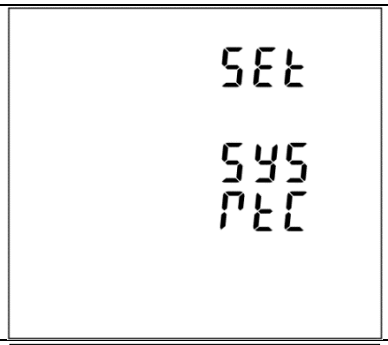
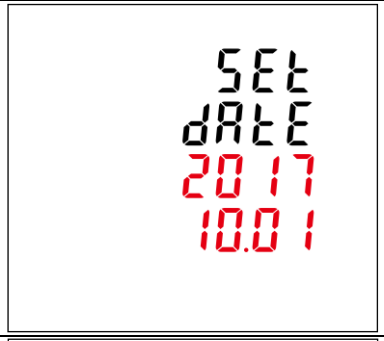
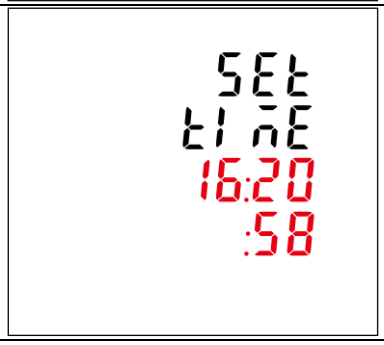
Options: 1~255s

Default: 5

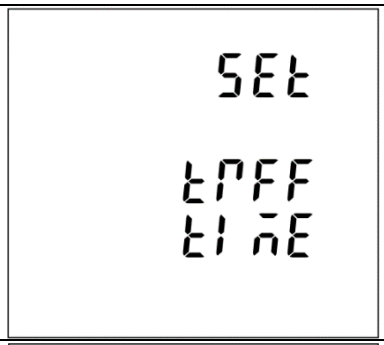
If it is seated as 5, the display will scroll every 5s.

Use MD PF Hz and P to select Display scroll time option. Press E for 2s, the setting will flash. Use MD PF Hz and P to choose Options. And Long press E for confirmation. Press Ph S ESC to return the Time set up menu.

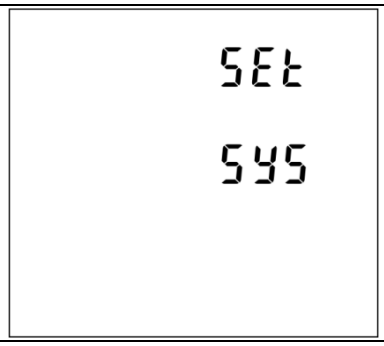
System RTC

	This option is to set the real time clock for the meter. By pressing the E, to get into date and time setting.
	Set the date of RTC. Left picture shows 2017-Otc-1st. The format is YYYY-MM-DD
	Set the time of RTC Left picture shows 16:20:58. The format is HH-MM-SS.

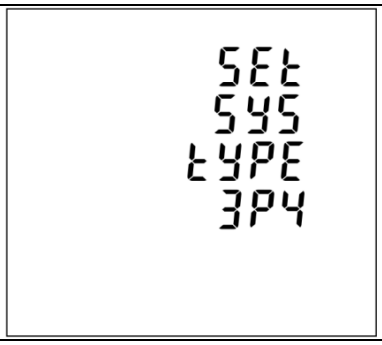
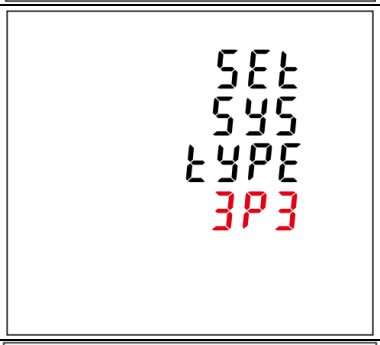
Tariff Time

	This option is to set the time segments with different tariffs. By pressing the E , to get into the time segments and tariffs setting.
	Set the time segments and corresponding tariffs Left pictures shows: Time 01 – time segment number, range from 01 to 08 06:00 – starting time of this time segment, format: HH-MM FEE1 – Tariff 1, range 1~4. By pressing the E , user can set the time segment and tariff information.

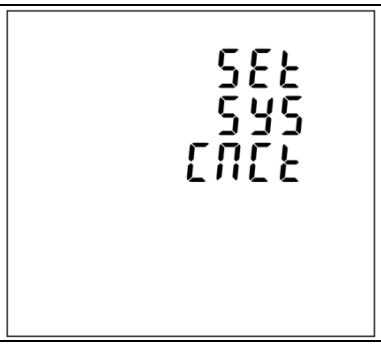
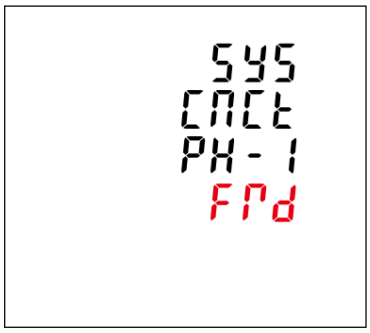
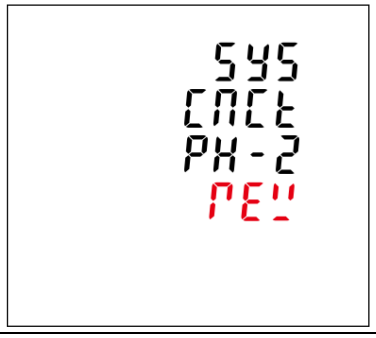
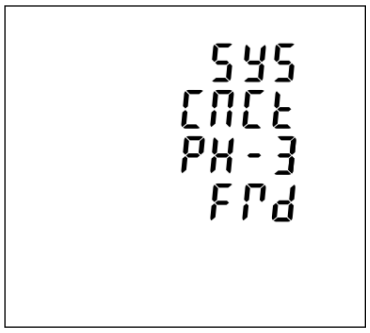
System

	The Unit has a default setting of 3 phase 4 wire (3p4w). Use this section to set the type of electrical system. Options: 3P4W,3P3W,1P2W From the Set-up menu, use MD PF Hz and P to select the System option

System Type

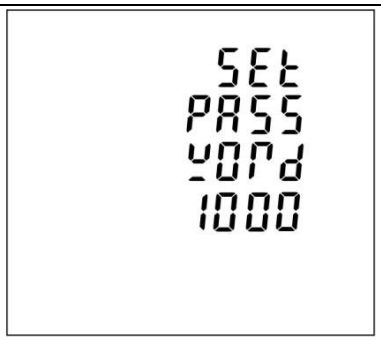
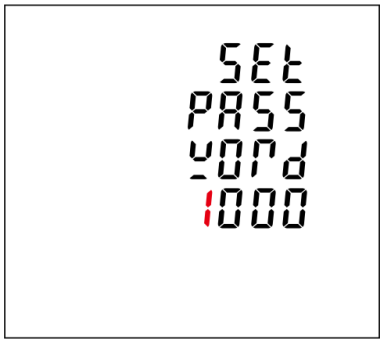
	The Unit has a default setting of 3 phase 4 wire (3p4w). Use this section to set the type of electrical system. Options: 3P34,3P3W,1P2W From the Set-up menu, use MD PF Hz and P to select the System option
	Example shows: The screen shows the currently selected power supply is three phase three wire
	Example shows: The screen shows the currently selected power supply is single phase two wire

System Connnect

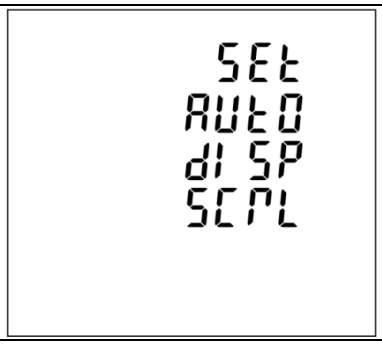
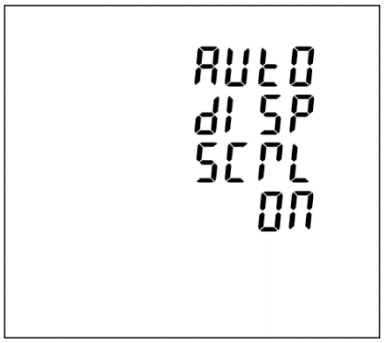
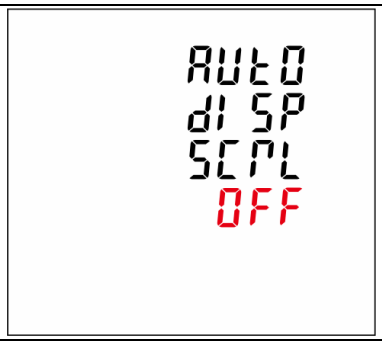
	This unit provides a function with Reverse connected current inputs correction setting. Use MD PF Hz and P to select the correction option.
	Options: FRD (forward) and REV (reverse) The default is F (forward) Long press E to enter the Phase 1 correction. Press E for 2s, the setting will flash. Use MD PF Hz and P to choose Options. And long press E for confirmation.
	Press P enter Phase 2 correction. Press E for 2s, the setting will flash. Use MD PF Hz and P to choose Options. And long press E for confirmation.
	Press P enter Phase 3 correction. Press E for 2s, the setting will flash. Use MD PF Hz and P to choose Options. And long press E for confirmation. Press Ph S ESC to return the System set up menu.

	In the case of incorrect connection, the current transformer does not need to be subsequently reconnected.

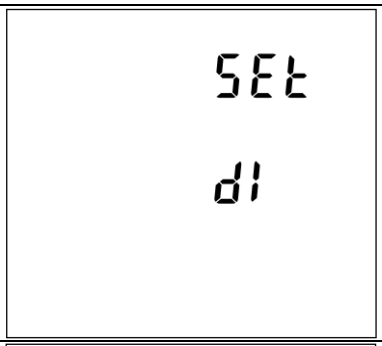
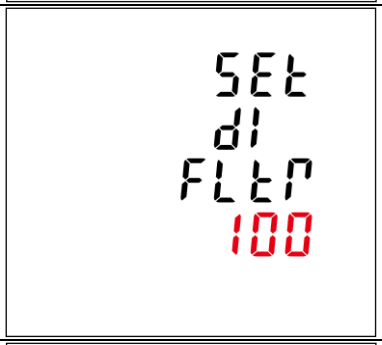
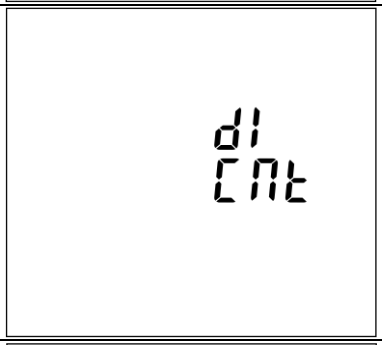
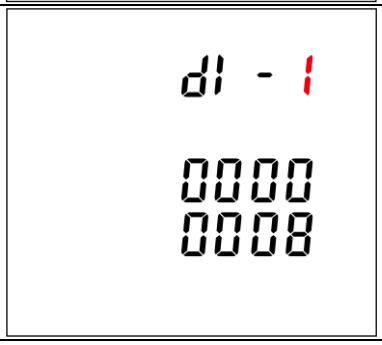
Change Password

	This unit provides a function with password setting. Default: 1000 Options:0000~99999 Use MD PF Hz and P to select the change password option.
	Press E for 2s, the setting will flash. Use MD PF Hz and P, E to choose Options. And long press E for confirmation.

Automatic display scroll

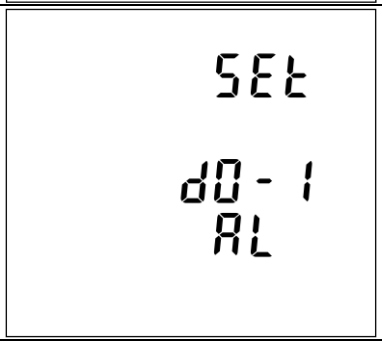
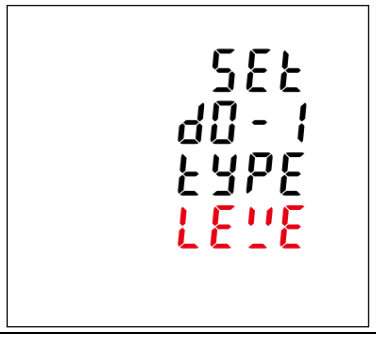
	This unit provides a function with automatic display scroll setting. Options: on and off There are two ways: ① Use MD PF Hz and P to select the automatic display scroll option. Press E for 2s, the setting will flash. Use MD PF Hz and P to choose options “On” or “Off”. And long press E for confirmation.
	② Escape the Setting menu. Long press Ph S ESC for 2 secs. For example, the screen shows the currently selected Automatic Scroll displayON.
	Long press Ph S ESC for 2 secs, then the screen shows the currently selected Automatic Scroll display OFF.

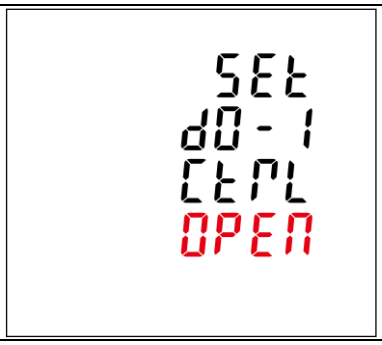
Digital Input(DI)

	This option is to set Digital input parameter. By pressing the E, getting to the sub-menu
	This is to set filtering time for a digital input signal. Left picture shows 100mS
	This screen is to check the counting number of each digital inputs. By pressing the E, the user can see counting numbers.
	Left picture shows Digital input 1, counting number is 8. By pressing MD PF Hz and P, the user can see counting number of different digital inputs.

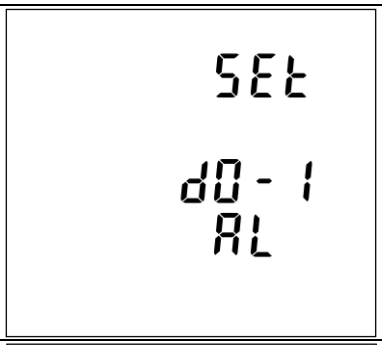
Digital Outputs(DO)

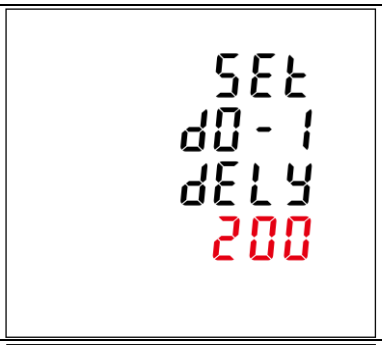
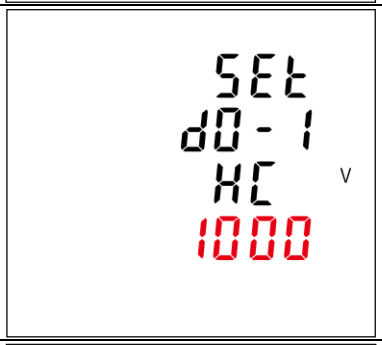
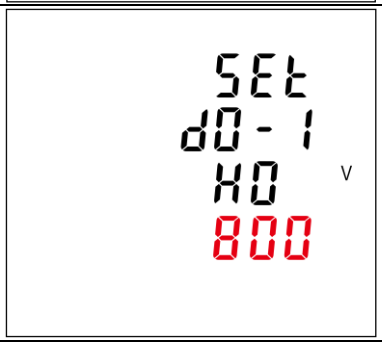
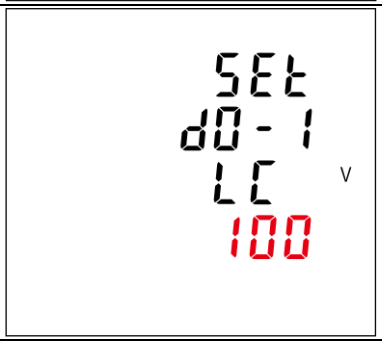
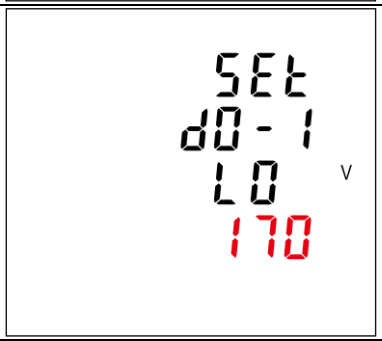
General Settings

	This screen to choose the Digital output number which you want to check. Left picture shows DO-1. By pressing the E, the user can set the parameter and checking the status of DO-1. By click the MD PF Hz and P, the user can choose different Digital Output.
	This screen is to set the alarm information link to DO-1. For details, please refer to part 4.9.2
	This screen is to set the digital output Type for DO-1 Left picture shows LEVE LEVE = Level PULS = Pulse
	This screen is to control the status of DO-1 relay Left picture shows the status is Open

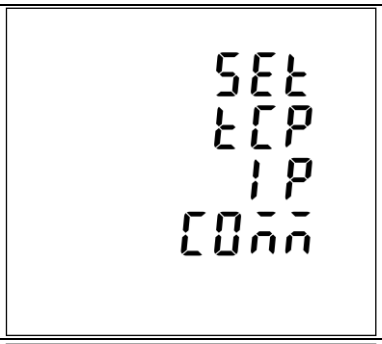
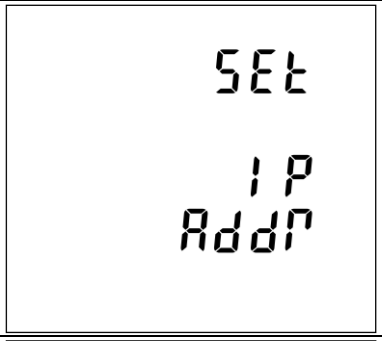
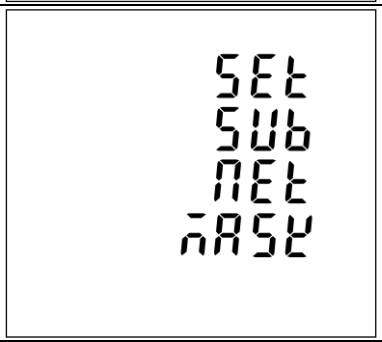
	This screen is to control the status of DO-1 relay Left picture shows the status is Open

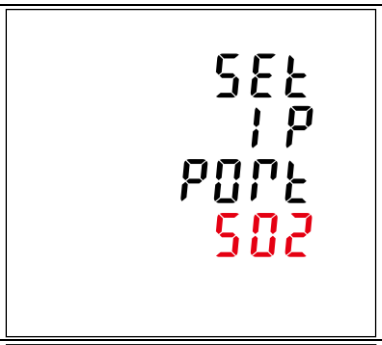
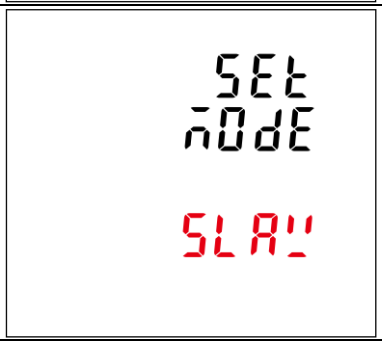
Alarm setting of DO

	This option is to set alarm for DO.
	The Alarm can be linked to the parameters below: U1, U2, U3, Unav (L-N) U12, U23, U31, Uuav (L-L) I1, I2, I3, Iav, In P1, P2, P3, P-total Q1, Q2, Q3, Q-total S1, S2, S3, S-total PF1, PF2, PF3, PF-total F (frequency) Null means the Alarm is not linked to any parameter.

	This option is set the DO action delay time. The unit is mS. Left picture shows 200mS.
	This option is to set the high value for DO-1 close. Left picture shows HC (High value to Close) 1000V, that means when the U1 reaches to 1000V, the DO-1 will close.
	This option is to set the Low value for DO-1 Close. Left picture shows LC (Low value to Close) 100V, that means when the U1 drops to 100V, the DO-1 will open.
	This option is to set the Low value for DO-1 Close. Left picture shows LC (Low value to Close) 100V, that means when the U1 drops to 100V, the DO-1 will open.
	This option is to set the Low value for DO-1 open. Left picture shows LO (Low value to Open) 170V, that means when the U1 returns to 170V, the DO-1 will open.

Ethernet Communication

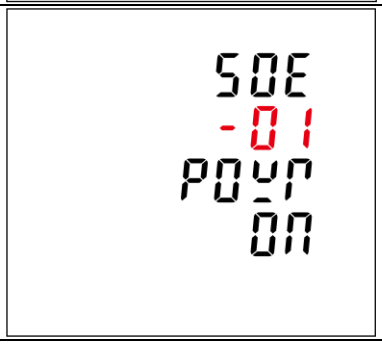
	This menu is to set the parameter for Ethernet communication. By pressing the button E , the user can get into sub-menu.
	This option is to set the IP address.
	This option is to set Subnet Mask
	This option is to set the default Gateway.

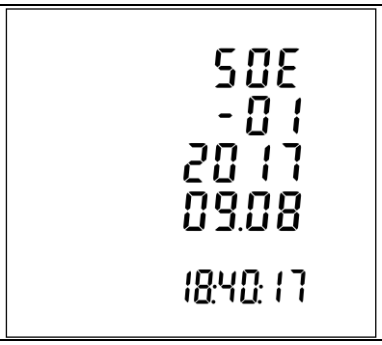
	This option is to set the IP port.
	This option is to set the meter Ethernet mode SLAV = slave MAST = Master When it is set to be Master, it can works as a RS485-TCP/IP convertor. In Master mode, the Modbus ID is fixed as 255.

SOE information

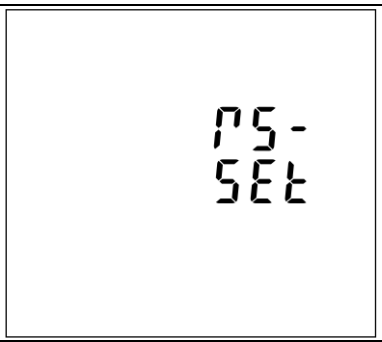
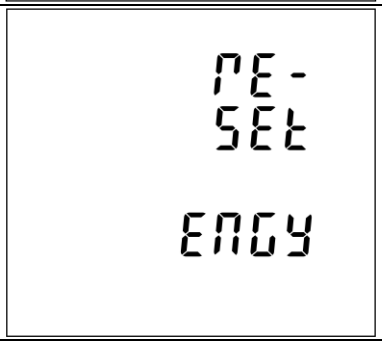
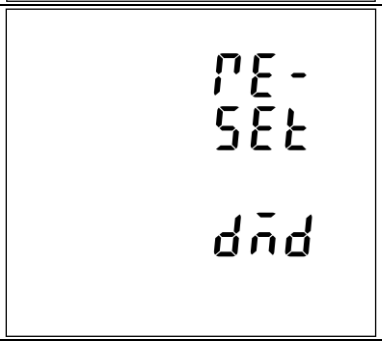
The meterprovides SOE record. 30 events and their happen time will be saved in the SOE. When the following events happen, it would be recorded

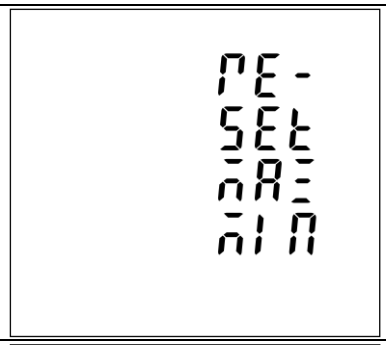
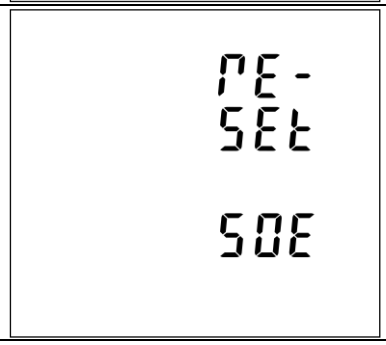
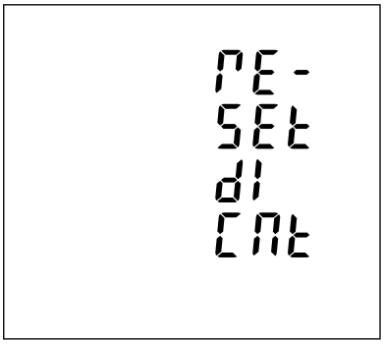
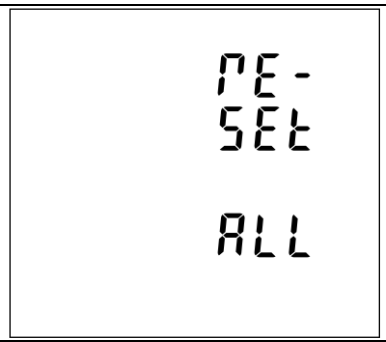
1. Meter power off 2. Meter power on 3. CT2 changed 4. CT1 changed 5. PT2 changed 6. PT1 changed 7. Energy reset 8. Demand reset 9. Alarm happens

	This menu is to check sequence of events (SOE). The meter can record 30 events. By pressing the button E , the user can get into sub-menu.
	Left picture shows No.1 event By click the MD PF Hz and P , the user can check other events.

	By pressing the button E, the user can find the date and time when the event happened.

Reset

	This unit provides a function with reset for different information. By pressing the button E , the user can get into sub-menu. Use MD PF Hz and P to select the Reset option.
	This option is to reset Energy information. It would reset active, reactive, apparent, import, export energy information.
	This option is to reset the demand information. It would reset current and power demand information.

	This option it to reset the Max. and Min. information
	This option is to reset the SOE information.
	This option is to reset Digital input counting.
	This option is to reset all information.

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	VAr	00	18
30027	Phase 2 reactive power	4	Float	VAr	00	1A
30029	Phase 3 reactive power	4	Float	VAr	00	1C
30031	Phase 1 power factor [1]	4	Float	None	00	1E
30033	Phase 2 power factor [1]	4	Float	None	00	20
30035	Phase 3 power factor [1]	4	Float	None	00	22
30037	Phase 1 phase angle	4	Float	Degrees	00	24
30039	Phase 2 phase angle	4	Float	Degree s	00	26
30041	Phase 3 phase angle	4	Float	Degrees	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 VAr	4	Float	VAr	00	3C
30063	Total system power factor [1]	4	Float	None	00	3E
30067	Total system phase angle	4	Float	Degrees	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	kVArh	00	4C
30079	Total export reactive energy .	4	Float	kVArh	00	4E

30081	Total apparent energy	4	Float	kVAh	00	50
30083	Ah	4	Float	Ah	00	52
30085	Total system power demand [2]	4	Float	W	00	54
30087	Maximum total system power demand [2]	4	Float	W	00	56
30089	Import active power demand	4	Float	W	00	58
30091	Import active power max. demand	4	Float	W	00	5A
30093	Export active power demand	4	Float	W	00	5C
30095	Export active power max. demand	4	Float	W	00	5E
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 [2]	4	Float	VAr	00	6C
30111	Maximum total system reactive power demand [2]	4	Float	VAr	00	6E
30161	Voltage phase sequence (normal=1 reverse=2 phase missing=3)	4	Float	None	00	A0
30193	Nature of the load (Resistive=1 inductive=2 capacitive=3)	4	Float	None	00	C0
30195	Nature of L1 load (Resistive=1 inductive=2 capacitive=3)	4	Float	None	00	C2
30197	Nature of L2 load (Resistive=1 inductive=2 capacitive=3)	4	Float	None	00	C4
30199	Nature of L3 load (Resistive=1 inductive=2 capacitive=3)	4	Float	None	00	C6
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 [3]	4	Float	kWh	01	56
30345	Total reactive Energy [3]	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
30403	Voltage 2st~63st Harmonic L1	248	Float	%	01	92
30527	Voltage 2st~63st Harmonic L2	248	Float	%	02	0E
30651	Voltage 2st~63st Harmonic L3	248	Float	%	02	8A
30775	Current 2st~63st Harmonic L1	248	Float	%	03	06
30899	Current 2st~63st Harmonic L2	248	Float	%	03	82
31023	Current 2st~63st Harmonic L3	248	Float	%	03	FE
31147	Voltage Total Harmonic L1	4	Float	%	04	7A
31149	Voltage Total Harmonic L2	4	Float	%	04	7C
31151	Voltage Total Harmonic L3	4	Float	%	04	7E
31153	Current Total Harmonic L1	4	Float	%	04	80
31155	Current Total Harmonic L2	4	Float	%	04	82
31157	Current Total Harmonic L3	4	Float	%	04	84

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 active energy / reactive energy equals to Import + export.

Holding Register, Function code 03/10

Address Register	Parameter	Modbus Protocol Start Address Hex		Valid range	Mode
		High Byte	Low Byte		
40001	Demand Time	00	00	Read minutes into first demand calculation. When the Demand Time reaches the Demand Period then the demand values are valid. Length: 4 byte Data Format: Float	ro
40003	Demand Period	00	02	Write demand period: 0~60 minutes, Default 60. Range: 0~60, 0 means function closed Length: 4 byte Data Format: Float	r/w
40005	Slide time	00	04	Default 1, min. Range ： 1 ~ (Demand Period -1). Length: 4 byte Data Format: Float	r/w
40007	Demand calculation method	00	06	Default 0 0 = sliding block 1 = fixed block Length: 4 byte Data Format: Float	r/w
40011	System Type	00	0A	Write system type: 3p4w = 3,3p3w = 2 & 1p2w= 1,1p3w=4, Balance load = 5 Default, 3 Length: 4 byte Data Format: Float (KPPA is asked)	r/w
40015	Key Parameter Programming Authorization (KPPA)	00	0E	Read: to get the status of the KPPA 0 = not authorized 1 = authorized Write the correct password to get KPPA, enable to program key parameters. Length: 4 byte Data Format: Float	r/w
40019	Parity and stop bit	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. Length: 4 byte Data Format: Float	r/w
40021	Modbus address	00	14	Write the network port node Address: 1 to 247 for MODBUS Protocol, default 1. Length: 4 byte Data Format: Float	r/w

40025	Password	00	18	Read: to get the password of the meter Write: to program the new password of the meter Default 1000 Length : 4 byte Data Format : Float	r/w
40029	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 = 19200 baud. 4 = 38400 baud. Length: 4 byte Data Format: Float	r/w
40047	PT1	00	2E	PT1 Range 100- 500000V, Default 230 Length: 4 byte Data Format: Float (KPPA is asked)	r/w
40049	PT2	00	30	PT2 Range 100- 480V, Default 230 Length: 4 byte Data Format: Float (KPPA is asked)	r/w
40051	CT1	00	32	CT1 Range 1-9999A, Default 5, Length: 4 byte Data Format: Float (KPPA is asked)	r/w
40053	CT2	00	34	CT2 Range: 1A or 5A, Default 5A Length: 4 byte Data Format: Float (KPPA is asked)	r/w
40057	Current Direction correction (when the external CT is connected reversely)	00	38	0 = L1 Frd, L2 Frd, L3 Frd 1 = L1 Rev, L2 Frd, L3 Frd 2 = L1 Frd, L2 Rev, L3 Frd 3 = L1 Rev, L2 Rev, L3 Frd 4 = L1 Frd, L2 Frd, L3 Rev 5 = L1 Rev, L2 Frd, L3 Rev 6 = L1 Frd, L2 Rev, L3 Rev 7 = L1 Rev, L2 Rev, L3 Rev Default 0 Length: 4 byte Data Format: Float (KPPA is asked)	r/w
40059	Automatic Scroll Display Time	00	3A	Default 5, second Range 1~255 Length: 4 byte Data Format: Float	r/w
40061	Backlit time	00	3C	Default 0, min Range 0~120, 0 means backlit always on, 121 means always off Length: 4byte Data Format: Float	r/w
40513	DO-1 mode	02	00	DO-1 output mode 00 00 = level; 00 01 = pulse Length: 2byte Data Format: Hex	r/w

40514	DO-2 mode	02	01	DO-2 output mode 00 00 = level; 00 01 = pulse Length: 2byte Data Format: Hex	r/w
40521	DO-1 pulse duration	02	08	DO-1 pulse duration (1000ms: 50 ~ 3000) Length: 2 byte Data Format: unsigned int16	r/w
40522	DO-2 pulse duration	02	09	DO-2 pulse duration (1000ms: 50 ~ 3000) Length: 2 byte Data Format: unsigned int16	r/w
40769	DI filter time	03	00	DI filter time (0ms: 0~255) , Default 100ms Length: 2 byte Data Format: unsigned int16	r/w
40770	DI-1 count	03	01	DI-1 count Length: 4 byte Data Format: unsigned int32 Write 0 to reset the count. No response if write other value.	r/w
40772	DI-2 count	03	03	DI-2 count Length: 4 byte Data Format: unsigned int32 Write 0 to reset the count. No response if write other value	r/w
40774	DI-3 count	03	05	DI-3 count Length: 4 byte Data Format: unsigned int32 Write 0 to reset the count. No response if write other value	r/w
40776	DI-4 count	03	07	DI-4 count Length: 4 byte Data Format: unsigned int32 Write 0 to reset the count. No response if write other value	r/w
41025	DO-1 Alarm Parameter (1)	04	00	DO-1 Alarm parameter Range: 0~29, and 255; Default: 255 = null Length: 2 byte Data Format: unsigned int16	r/w
41026	DO-1 Action delay time	04	01	DO-1 Action delay time, unit: ms Range:0~9999; default: 200ms Length : 2 byte Data Format: unsigned int16	r/w
41027	DO-1 HC Value (2)	04	02	DO-1 High value to close Length: 4 byte Data Format: Float	r/w
41029	DO-1 HO value (2)	04	04	DO-1 High value to open Length: 4 byte Data Format: Float	r/w
41031	DO-1 LO value (2)	04	06	DO-1 Low value to open Length: 4 byte Data Format: Float	r/w
41033	DO-1 LC value (2)	04	08	DO-1 Low value to close Length: 4 byte Data Format: Float	r/w

41035	DO-2 Alarm Parameter [1]	04	0A	DO-2 Alarm parameter Range: 0~29, and 255; Default: 255 = null Length: 2 byte Data Format: unsigned int16	r/w
41036	DO-2 Action delay time	04	0B	DO-2 Action delay time, unit: ms Range:0~9999; default: 200ms Length: 2 byte Data Format: unsigned int16	r/w
41037	DO-2 HC Value [2]	04	0C	DO-2 High value to close Length: 4 byte Data Format: Float	r/w
41039	DO-2 HO value [2]	04	0E	DO-2 High value to open Length: 4 byte Data Format : Float	r/w
41041	DO-2 LO value [2]	04	10	DO-2 Low value to open Length: 4 byte Data Format: Float	r/w
41043	DO-2 LC value [2]	04	12	DO-2 Low value to close Length: 4 byte Data Format: Float	r/w
41105	DO-1 Status	04	50	DO-1 Status 0 = Open (HO or LO) 1 = HC 2 = LC Length: 2 byte Data Format: unsigned int16	ro
41106	DO-2 Status	04	51	DO-2 Status 0 = Open 1 = HC 2 = LC Length: 2 byte Data Format: unsigned int16	ro
41281	SOE-01 [3]	05	00	SOE-01 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format : BCD	ro
41285	SOE-02 [3]	05	04	SOE-02 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format : BCD	ro
41289	SOE-03 [3]	05	08	SOE-03 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41293	SOE-04 [3]	05	0C	SOE-04 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro

41297	SOE-05[3]	05	10	SOE-05 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41301	SOE-06[3]	05	14	SOE-06 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41305	SOE-07[3]	05	18	SOE-07 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41309	SOE-08[3]	05	1C	SOE-08 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41313	SOE-09[3]	05	20	SOE-09 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41317	SOE-10[3]	05	24	SOE-10 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41321	SOE-11[3]	05	28	SOE-11 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41325	SOE-12[3]	05	2C	SOE-12 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41329	SOE-13[3]	05	30	SOE-13 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41333	SOE-14[3]	05	34	SOE-14 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro

41337	SOE-15[3]	05	38	SOE-15 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41341	SOE-16[3]	05	3C	SOE-16 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41345	SOE-17[3]	05	40	SOE-17 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41349	SOE-18[3]	05	44	SOE-18 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41353	SOE-19[3]	05	48	SOE-19 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41357	SOE-20[3]	05	4C	SOE-20 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41361	SOE-21[3]	05	50	SOE-21 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD:	ro
41365	SOE-22[3]	05	54	SOE-22 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41369	SOE-23[3]	05	58	SOE-23 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41373	SOE-24[3]	05	5C	SOE-24 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro

41377	SOE-25[3]	05	60	SOE-25 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41381	SOE-26[3]	05	64	SOE-26 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41385	SOE-27[3]	05	68	SOE-27 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41389	SOE-28[3]	05	6C	SOE-28 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41393	SOE-29[3]	05	70	SOE-29 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
41397	SOE-30[3]	05	74	SOE-30 information; the format is: type-event cause-year-month-date-hour-min-second Length: 8 byte Data Format: BCD	ro
461441	Time	F0	00	s-min-hour-week-Date-Month-Year-20 Length: 8 byte Data Format: BCD	r/w
461445	Running time	F0	04	Day-hour-minute, day = 2byte; hour = 1byte; minute=1byte Length: 4 byte Data Format: BCD For example: 04 23 21 57 refer to Running time=423 day+21 hour+57 min Write 00 00 00 00 to reset the running hour	r/w
461447	Ethernet communication Parameter	F0	06	Ethernet communication parameter includes: IP address (4byte), subnet mask (4byte), default gateway (4byte), IP port(2 byte) Data format : IP Address-Subnet mask- default gateway- IP port, High byte first. Default: IP Address = 192-168-1-200 Subnet mask = 255-255-255-0 Gate way = 192-168-1-1 IP Port = 502 Length : 14byte Data Format: Hex	r/w

461454	Ethernet TCP/IP working mode	F0	0D	Ethernet TCP/IP working mode 00 00 = slave mode (the Ethernet port is only used for TCP/IP communication for this meter); 00 01 = master mode (the meter can be worked as an RS485-TCP/IP gateway. Via the Ethernet port, it can read the devices connected to its RS485 port on the same Bus line.) Length : 2byte Data Format: Hex (KPPA is asked)	r/w
461457	Reset historical data	F0	10	00 00 = reset demand info 00 03 = reset energy info 00 04 = reset max. and min. data 00 05 = reset SOE info 00 06 = reset DI counts Length : 2 byte Data Format: Hex	wo
461697	Meter Info	F1	00	Meter information ： model and software version Length : 16 byte Data Format : AscII（Character ASCII）	ro
463233	Tariff	F7	00	Tariff number-Min-Hour Tariff number：01，02，03，04 Min：00-59 Hour：00-23 Length : 30 byte Data Format : BCD	r/w
463793	Running time	F9	30	Continuous working period--hour Length : 4 byte Data Format : Float	r/w
464513	Serial number	FC	00	Serial number Length: 4 bytes Note: Only read	ro

Note:

(1) Table-1 Alarm Parameter

Number	Alarm parameter	Number	Alarm parameter	Number	Alarm parameter
0	Phase 1 line to neutral volts.	10	Phase 3 current.	20	Total system VAr.
1	Phase 2 line to neutral volts.	11	Average line current.	21	Phase 1 apparent power.
2	Phase 3 line to neutral volts.	12	Neutral current.	22	Phase 2 apparent power.
3	Average line to neutral volts.	13	Phase 1 active power.	23	Phase 3 apparent power.
4	Line 1 to Line 2 volts.	14	Phase 2 active power.	24	Total system volt amps.
5	Line 2 to Line 3 volts.	15	Phase 3 active power.	25	Phase 1 power factor.

6	Line 3 to Line 1 volts.	16	Total system power.	26	Phase 2 power factor.
7	Average line to line volts.	17	Phase 1 reactive power.	27	Phase 3 power factor .
8	Phase 1 current.	18	Phase 2 reactive power.	28	Total system power factor.
9	Phase 2 current.	19	Phase 3 reactive power.	29	Frequency of supply voltages.

(2) Please make sure during the setting: HC>HO >LO >LC

(3) SOE information format: type-status-year-month-date-hour-min-second;

Type: 0~67 and 99 (4 table-2)
Event cause: 0 = null; 1 and 2 refer to the cause of event. 1 = HC alarm caused event; 2 = LC alarm caused event
Year: the year when event happened. For example: 2017, year=17;
Month: the month when event happened.
Date: the date when event happened.
Hour: the hour when event happened.
Min: The Minute when event happened.
Second: the second when event happened.

(4) Table-2 Event descriptions

Number	Event description	Number	Event description	Number	Event description
0	L1 Voltage alarm	14	L2 active power alarm	28	Total PF alarm
1	L2 Voltage alarm	15	tive power alarm	29	Frequency alarm
2	L3 Voltage alarm	16	Total active power alarm	60	Power on
3	L-N Average voltage alarm	17	L1 reactive power alarm	61	Power off
4	L1-2 Voltage alarm	18	L2reactive power alarm	62	CT2 change
5	L2-3 Voltage alarm	19	L3reactive power alarm	63	CT1change
6	L3-1 Voltage alarm	20	Total reactive power alarm	64	PT2change
7	L-L Average voltage alarm	21	L1apparent power alarm	65	PT1change
8	L1 Current alarm	22	L2 apparent power alarm	66	Energy reset
9	L2Current alarm	23	L3 apparent power alarm	67	Demand info reset
10	L3Current alarm	24	Total apparent power alarm	99	Null
11	Average current alarm	25	L1PF alarm		
12	Neutral current alarm	26	L2 PF alarm		
13	L1 active power alarm	27	L3 PF alarm		

Reading Input Status, Function code 02

Address Register	Parameter Number	Parameter	Modbus Protocol Start Address Hex		Valid range	Mode
			High Byte	Low Byte		
10001	1	DI-1 status	00	00	DI-1 status, 1=ON, 0=OFF Length: 1 bit Data Format: Binary	ro
10002	2	DI-2 status	00	01	DI-2 status, 1=ON, 0=OFF Length: 1 bit Data Format: Binary	ro
10003	3	DI-3 status	00	02	DI-3 status, 1=ON, 0=OFF Length: 1 bit Data Format: Binary	ro
10004	4	DI-4 status	00	03	DI-4 status, 1=ON, 0=OFF Length: 1 bit Data Format: Binary	ro

Read Coll Status, Function cod 01

Address Register	Parameter Number	Parameter	Modbus Protocol Start Address Hex		Valid range	Mode
			High Byte	Low Byte		
00001	1	DO-1 status	00	00	DO-1 status,1=ON, 0=OFF Length: 1 bit Data Format: Binary	ro
00002	2	DO-2 status	00	01	DO-2 status,1=ON, 0=OFF Length: 1 bit Data Format: Binary	ro

Force Single Coil, Function code 05

Parameter Number	Parameter	Modbus Protocol Start Address Hex		Valid range	Mode
		High Byte	Low Byte		
1	Control DO-1	00	00	0xFF00=ON, 0x0000=OFF Length :2 byte Data Format: Hex	w
2	Control DO-2	00	01	0xFF00=ON, 0x0000=OFF Length :2 byte Data Format: Hex	w

Modbus communication Example

1. Read Input Registers

Example: Read “Phase 1 line to neutral volts”

Request: 01 04 00 00 00 02 71 CB

Where,01 = Meter address

04 = Function code

00 = High byte of registers starting address

00 = Low byte of registers starting address

00 =High byte of registers number

02 = Low byte of registers number

71 = CRC Low

CB = CRC High

Response: 01 04 04 43 66 33 34 1B 38

Where,01 = Meter address 04 = Function code

04= Byte count

43 = Data, (High Word, HighByte)

66 = Data, (High Word, LowByte)

33 = Data, (LowWord, HighByte)

34 = Data, (LowWord, LowByte)

1B = CRC Low

38 = CRC High

Note: 43 66 33 34(Hex) = 230.2 (Floating point)

2. Read Holding Registers

Example: Read “Slide time” Request: 01 03 00 04 00 02 85 CA

Where,01 = Meter address

03 = Function code

00 = High byte of registers starting address

04 = Low byte of registers starting address

00 =High byte of registers number

02 = Low byte of registers number 85 = CRC Low

CA = CRC High

Response: 01 03 04 40 A0 00 00 EF D1

Where,01 = Meter address 03 = Function code

04= Byte Count

40 = Data, (High Word, HighByte) A0 = Data, (High Word, LowByte) 00 = Data, (LowWord, HighByte) 00 = Data, (LowWord, LowByte) EF = CRC Low

D1 = CRC High

Note: 40 A0 00 00 (Hex) = 5 (Floating point)

3. Write Holding Registers

Example: Write “System Type” = 4

Request: 01 10 00 0A 00 02 04 40 80 00 00 67 F8

Where,01 = Meter address

10 = Function code

00 = High byte of registers starting address

0A = Low byte of registers starting address

00 = High byte of registers number

02 = Low byte of registers number

04 = Byte Count

40 = Data, (High Word, High Byte)

80 = Data, (High Word, Low Byte)

00 = Data, (Low Word, High Byte)

00 = Data, (Low Word, Low Byte)

67 = CRC Low

F8 = CRC High

Note: 40 80 00 00(Hex) = 4 (Floating point)

Response: 01 10 00 0A 00 02 61 CA

Where,01 = Meter address 10 = Function code

00 = High byte of registers starting address

0A = Low byte of registers starting address

00 =High byte of registers number

02 = Low byte of registers number

61 = CRC Low

CA = CRC High

4. Read Input Status

Example: Read DI-1~4 status Request: 01 02 00 00 00 04 79 C9

Where,01 = Meter address 02 = Function code

00 = High byte of registers starting address

00 = Low byte of registers starting address

00 = High byte of read DI number

04 = Low byte of read DI number

79 = CRC Low

C9 = CRC High

Response: 01 02 01 03 E1 89

Where,01 = Meter address

02 = Function code

01 = Byte Count

03 =Data, (DI status)

E1 = CRC Low

89 = CRC High

Note: Data=0x03 = 0000 0011 (Binary Value).

Bit 0 refers to the status of DI-1. The value is 1, which means DI-1 is on.

Bit 1 refers to the status of DI-2. The value is 1, which means DI-2 is on

Bit 2 refers to the status of DI-3. The value is 0, which means DI-3 is off

Bit 3 refers to the status of DI-4. The value is 0, which means DI-4 is off

5. Read Coil Status

Example: Read DO-1~2 status

Request: 01 01 00 00 00 02 BD CB

Where,01 = Meter address

01 = Function code

00 = High byte of registers starting address

00 = Low byte of registers starting address

00 =High byte of read DO number

02 = Low byte of read DO number BD = CRC Low

CB = CRC High

Response: 01 01 01 02 D0 49

Where,01 = Meter address

01 = Function code

01 = Byte Count

02 =Data, (DO status)

D0 = CRC Low

49 = CRC High

Note: Data=0x02 = 0000 0010 (Binary Value).

Bit 0 refers to DO-1 status. The value is 0, which means DO-1 is open Bit 1 refers to DO-2 status. The value is 1, which means DO-1 is close

6. Force Single Coil

Example: Control DO-1=ON

Request: 01 05 00 00 FF 00 8C 3A

Where,01 = Meter address

05 = Function code

00 = High byte of registers starting address

00 = Low byte of registers starting address

FF =High byte of DO control data

00 = Low byte of DO control data

8C = CRC Low

3A = CRC High

Response: 01 05 00 00 FF 00 8C 3A

Where,01 = Meter address

05 = Function code

00 = High byte of registers starting address

00 = Low byte of registers starting address

FF =High byte of DO control data

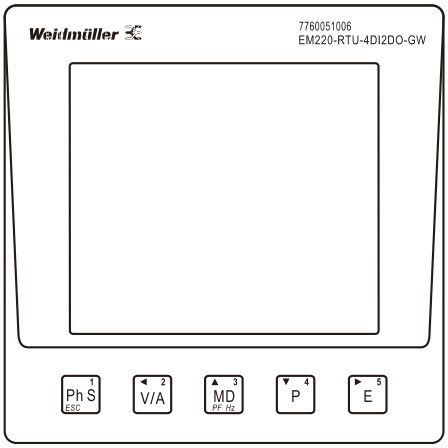
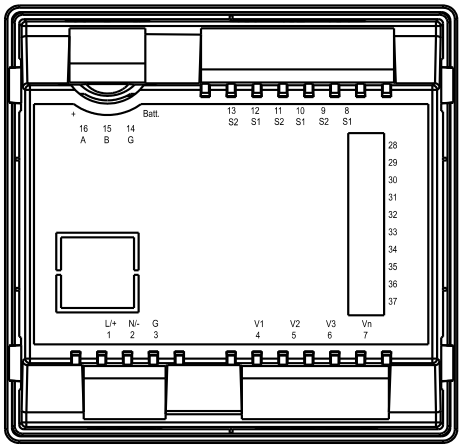
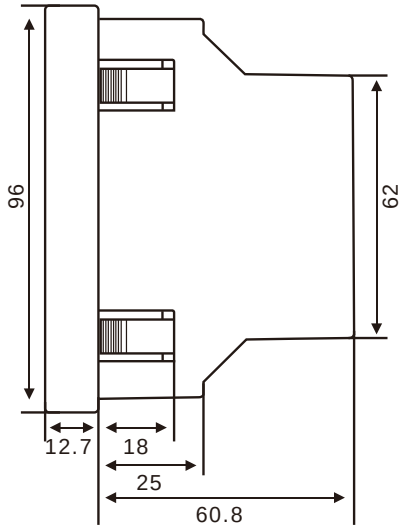
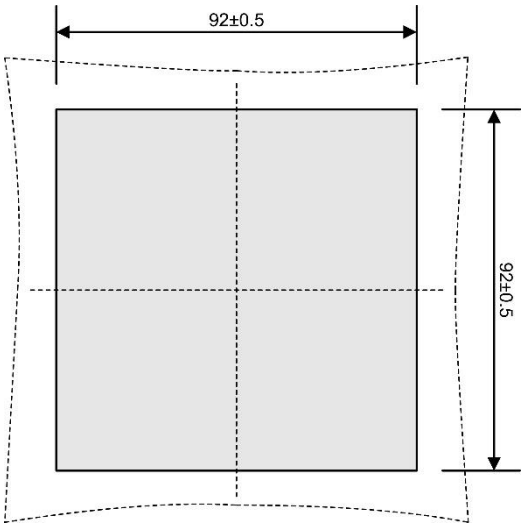
00 = Low byte of DO control data

8C = CRC Low

3A = CRC High

Dimensional drawings

All dimensions in mm.

Front view	Rear view
	
Side view	**Cutout dimensions**
	

Connecting example

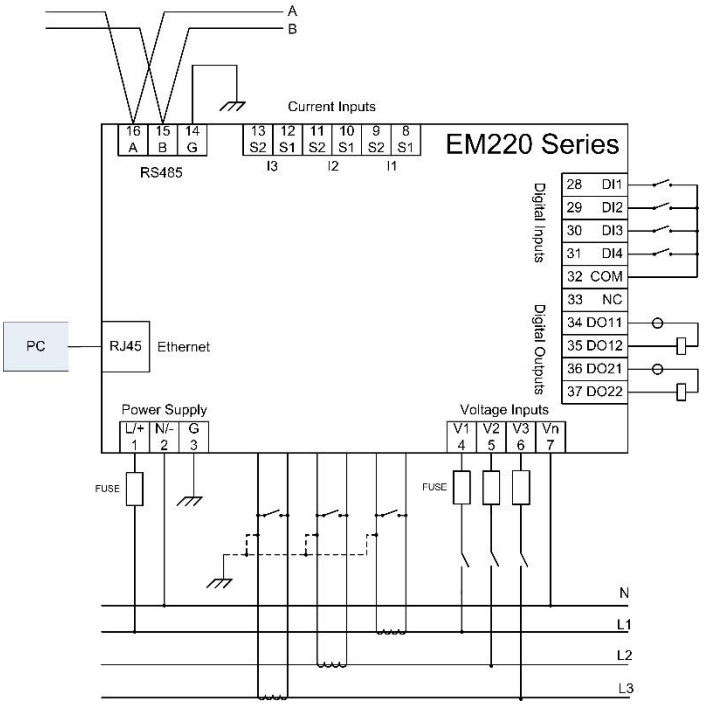


Fig.: Connecting example(rear view)

⚠	The overcurrent protection device (1A) must be UL/IEC certified.