Re.val.co. International s.r.l.

MULTIFUNCTION POWER MONITOR

2RAE96L4C485E

USER MANUAL

1 Introduction

The multifunction panel meter 2RAE96L4C485E series is a top new-generation intelligent panel meter, used not only in the electricity transmission and power distribution system but also in the power consumption measurement and analysis in high voltage intelligent power grid.

This document provides operating, maintenance and installation instructions for the 2RAE96L4C485E series. The unit measures and displays the characteristics of single phase two wires, three phase three wires and three phase four wires supplies, including voltage, frequency, current, power and active and reactive energy, imported or exported, Harmonic, Power factor, Max. Demand etc. Energy is measured in terms of kWh, kVArh. Maximum demand current can be measured over preset periods of up to 60minutes. In order to measure energy, the unit requires voltage and current inputs in addition to the supply required to power the product. The requisite current input(s) are obtained via current transformers The 2RAE96L4C485E can be configured to work with a wide range of CTs, giving the unit a wide range of operation. Built-in interfaces provide pulse and RS485 Modbus RTU outputs. Configuration is password protected.

1.1 Measurement and display parameters

- Line voltage and THD% (total harmonic distortion) of all phases
- Key factor and Crest factor
- Line Frequency
- Currents, Current demands and current THD% of all phases
- Power, maximum power demand and power factor
- Active energy imported and exported
- Reactive energy imported and exported
- Real time date and time

1.2 Pass-word protected set-up

- RS485 Modbus setting
- CT Ratio and secondary current
- PT Ratio and secondary voltage
- Pulse output setting
- Demand Interval time
- Supply system selection 1phase2wire, 3phase 3wires and 3phase 4wires
- Energy and demand information reset
- Changing Password setting
- Auto scroll display interval setting
- Wiring correction configuration
- Date and time setting
- Multi-tariff setting (optional)
- 2~60th Current and Voltage harmonic

1.3 Current Transformer Current ratio

The unit can be configured to operate with CT ratio between primary and secondary current is 1 and 2000. There are two options of secondary current input: 1A or 5A

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1.4 RS485 Serial – Modbus RTU

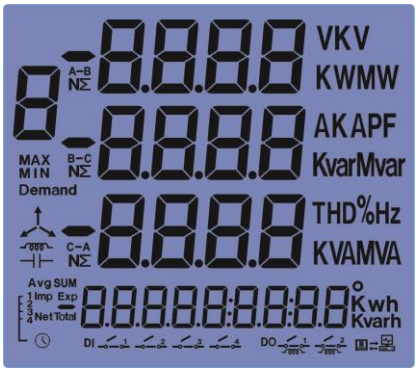
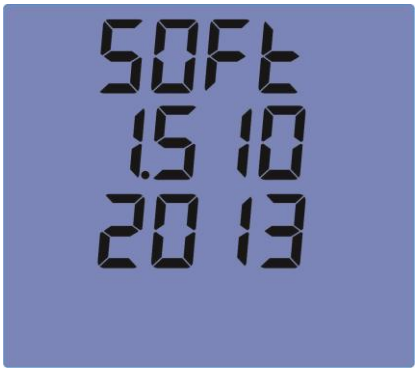
This uses an RS485 serial port with Modbus RTU protocol to provide a means of remotely monitoring and controlling the 2RAE96L4C485E series.

Set-up screens are provided for setting up the RS485 port.

1.5 Pulse output

This provides 2 pulse outputs those clocks up measured active and reactive energy. The constant for both output are configurable.

2. Start-up Screens

	The first screen lights all display segments and can be used as a display check
	The second screen indicates the firmware installed in the unit and its build number.
	Next the unit performs a self-test and indicates if the test passes.

3. Measurements

The buttons operate as follows

	Selects the Voltage and Current display screens In Set-up Mode, this is the “Left” or “Back” button.

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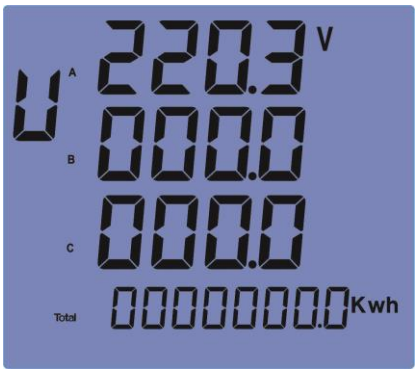
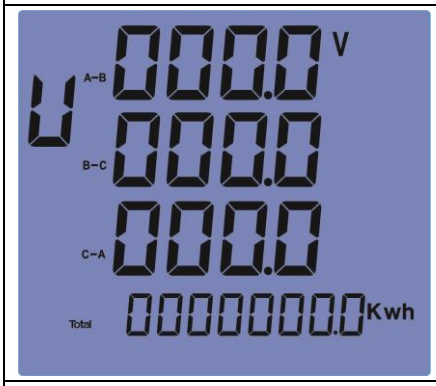
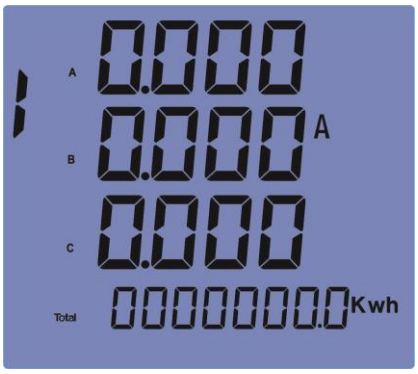
	Select the Frequency and Power factor screens In Set-up Mode, this is the “Up” button
	Select the Power screens In Set-up Mode, this is the “Down” button
	Select the Energy display screens In Set-up mode, this is the “Enter” or “Right” button

3.1 Voltage and Current

Each successive pressing of the  button selects a new range:

	Phase to neutral voltages
	Phase to phase voltages
	Current on each phase

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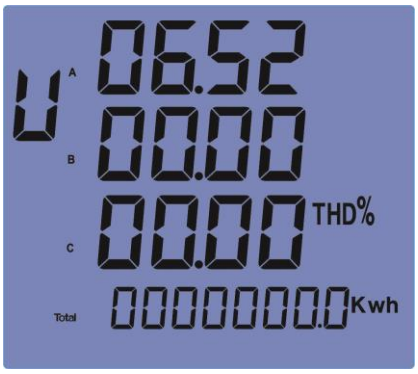
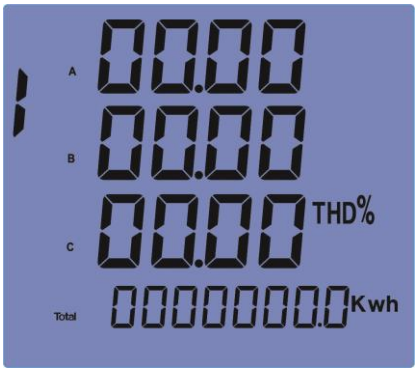
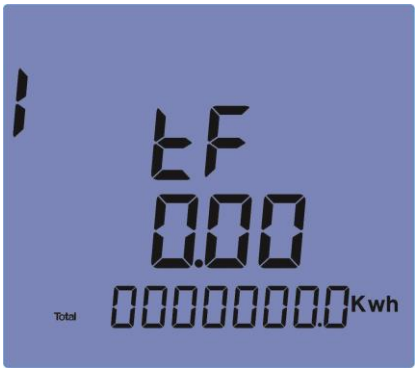
	Phase to neutral voltage THD%
	Current THD% for each phase
	Crest Factor
	Key Factor

3.2 Frequency and Power Factor and Demand

Each successive pressing of the  button selects a new range:

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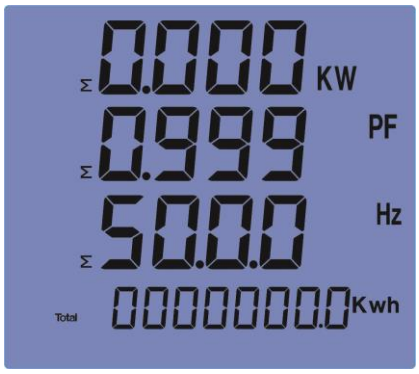
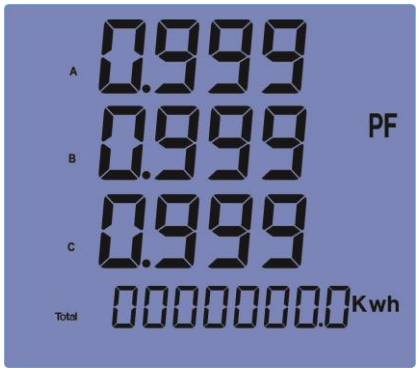
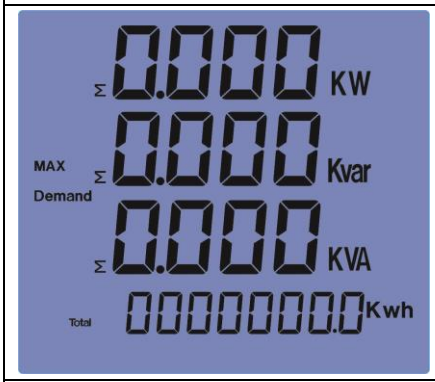
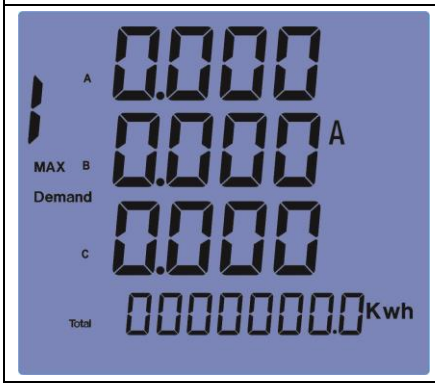
	Total kW Frequency Power factor (total)
	Power factor of each phase
	Max. Power demand
	Max. Current demand

3.3Power

Each successive pressing of the  button select a new range:

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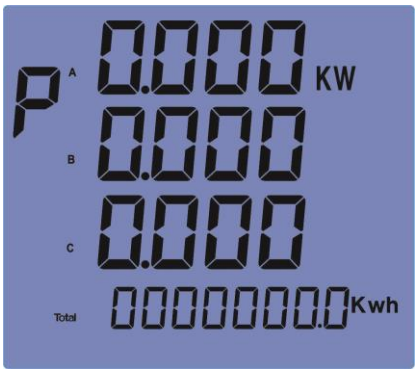
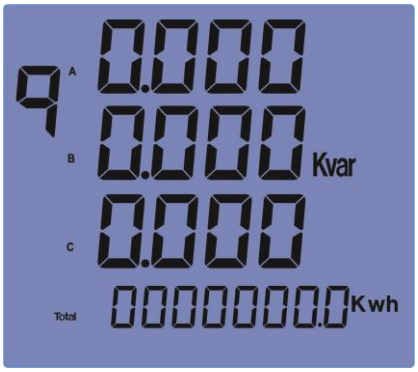
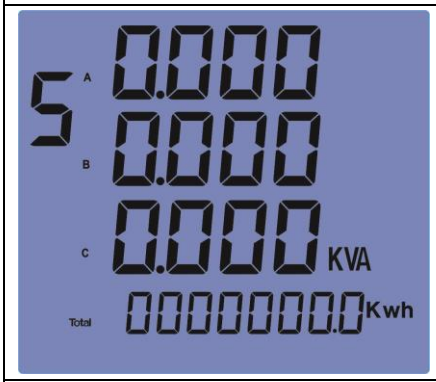
	Instantaneous active power (kW)
	Instantaneous reactive power (kVAr)
	Instantaneous Volt-amps (KVA)
	Total kW, kVArh, kVA

3.4 Energy Measurements

Each successive pressing of the  button selects a new range:

	Total active energy in kWh

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

4. Set-up

Long press button  to enter the set-up interface

The default pass-word is 1000,if the input is wrong,the LCD displays ”PASS Err”

Press the button  to exit set-up interface.

4.1 Set-up Mode

4.1.1 Modbus Address

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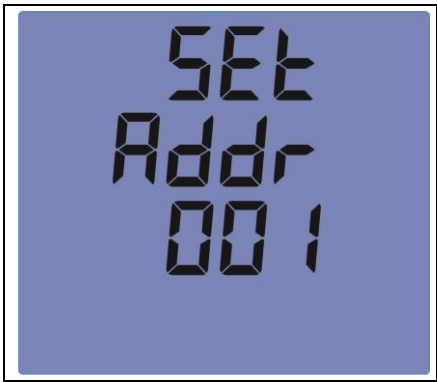
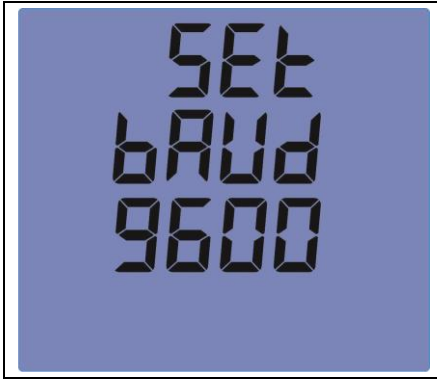
(The address ranges from 001 to 247)

	The default address is 001. press  to activate the modification.
	use  and  buttons to set the address with the range 001~247,and pressing the button  for confirmation.
Press  to confirm the setting and press  to return to the main set up menu.	

4.1.2 Baud Rate

	From the Set-up menu, use  and  buttons to select the Baud Rate option. The default is 9600bps.

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	Press E to enter the selection routine. The Baud Rate setting will flash Use M and P buttons to choose Baud rate 2.4k. 4.8k, 9.6k, 19.2k, 38.4k
Press E to confirm the setting and press UI ESC to return to the main set up menu.	

4.1.3 Parity

	From the Set-up menu, use M and P buttons to select the Parity option(ODD/EVEN/NONE) Default is NONE
	Press E to enter the selection routine. The current setting will flash. Use M and P buttons to choose Parity (EVEN / ODD / NONE)
Press E to confirm the setting and press UI ESC to return to the main set up menu.	

4.1.4 Stop bits

	From the Set-up menu, use M and P buttons to select the Stop Bit option.(1/2) Default it 1

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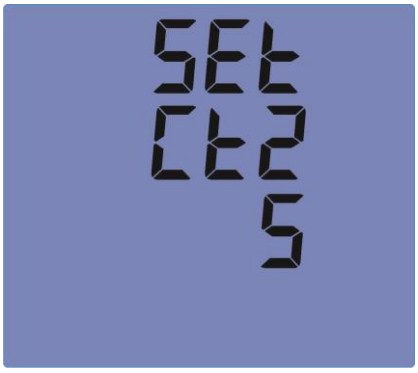
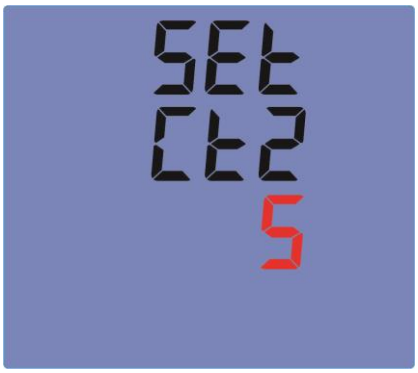
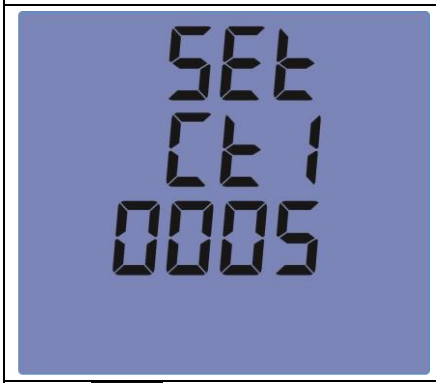
	Press  to enter the selection routine. The current setting will flash. Use  and  buttons to choose Stop Bit (2 or 1)
Press  to confirm the setting and press  to return to the main set up menu.	

4.2 CT

	From the Set-up menu, use  and  buttons to select the CT2 option(5A/1A). The screen will show the current CT secondary current value. Default is 5
	Secondary CT setting Press  to enter the CT secondary current selection routine. (5A/1A)
	Set CT Ratio Value Press  to enter the CT1 set-up interface The range is from 0005~9999. Default is 0005
Press  to confirm the setting and press  to return to the main set up menu.	

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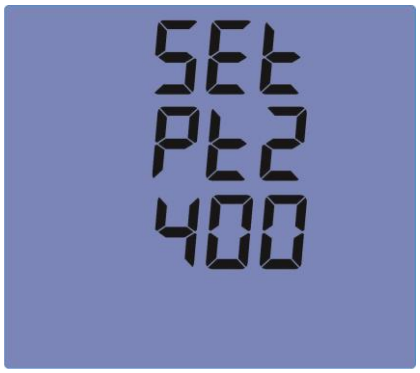
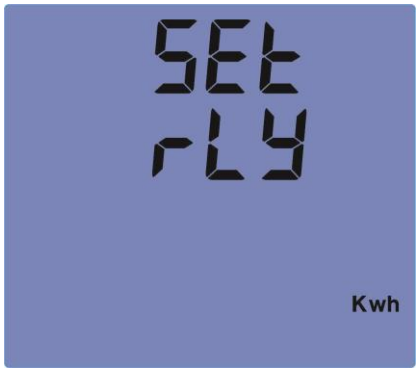
4.3 PT

	From the Set-up menu, use M and P buttons to select the PT option. The screen will show the voltage Secondary PT voltage value. The range is from 100~500 Default is 400
	Primary PT setting The range is from 000400~500000 Default is 000400
Press E to confirm the setting and press UI ESC to return to the main set up menu.	

4.4 Pulse output

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

	From the Set-up menu, use M and P buttons to select the Pulse output option .
	Press E to enter the selection routine. The unit symbol will flash Use M and P buttons to choose kWh or kVArh.

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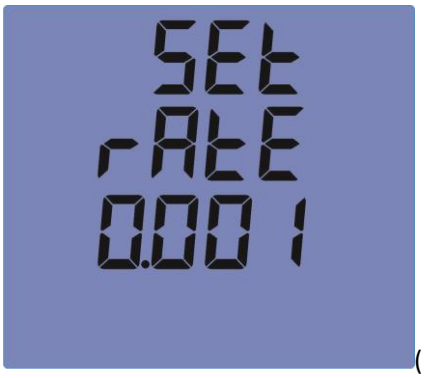
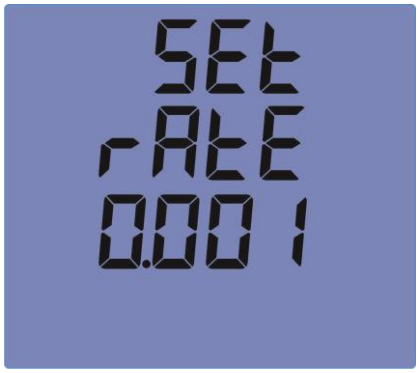
Press  to confirm the setting and press  to return to the main set up menu.

4.4.1 Pulse constant

Use this to set the energy represented by each pulse. Rate can be set to 1 pulse per 0.001kWh/0.01kWh/0.1kWh/1kWh/10kWh/100kWh.



(It shows 1 pulse = 0.001kWh/kVArh)

	From the Set-up menu, use  and  buttons to select the Pulse Rate option.
	Press  to enter the selection routine. The current setting will flash Use  and  buttons to choose pulse rate. **1 pulse = 0.001/0.01/0.1/1/10/100/1000kWh/kVArh** 0.001/0.01/0.1/1/10/100 kWh/kVArh per pulse
Press  to confirm the setting and press  to return to the main set up menu.	

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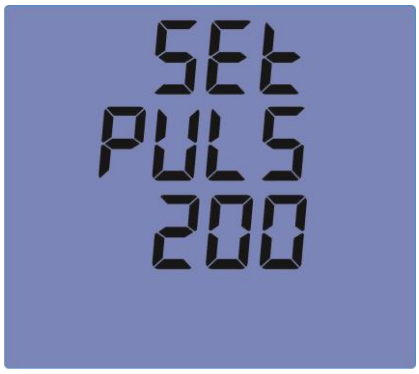
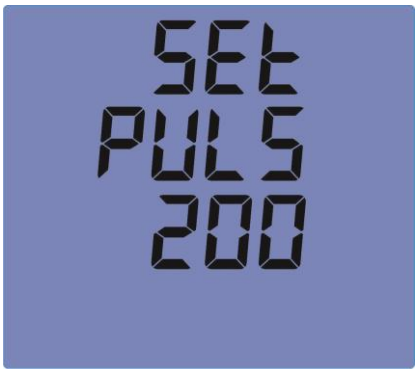
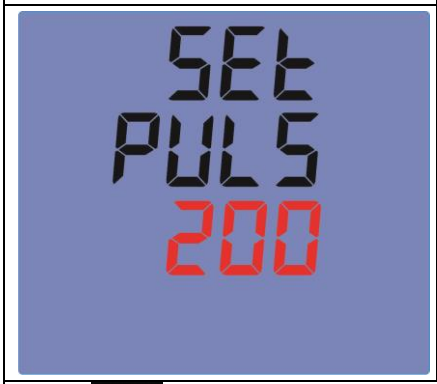
4.4.2 Pulse Duration

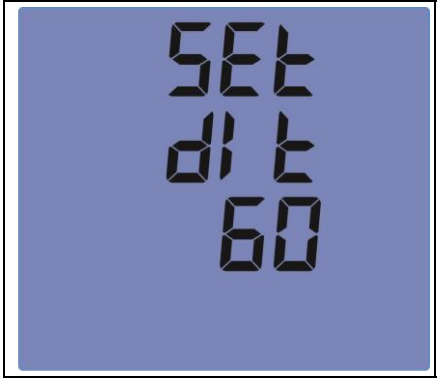


(The default set-up is 200ms)

	From the Set-up menu, use M and P buttons to select the Pulse width option.
	Press E to enter the selection routine. The current setting will flash. Use M and P buttons to choose pulse width(200/100/60ms)
Press E to confirm the setting and press UI ESC to return to the main set up menu.	

4.5 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(off), 5, 8, 10, 15, 30, 60 minutes

	From the set-up menu, use M and P buttons to select the dIT option. The screen will show the currently selected integration time. Default is 60

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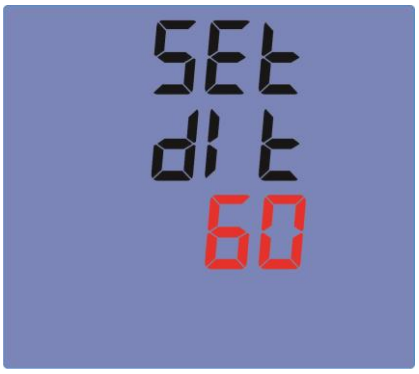	Press  to enter the selection routine. The current time interval will flash Use  and  buttons to select the time required.
Press  to confirm the setting and press  to return to the main set up menu.	

4.6 Backlit set-up

The meter provides a function to set the blue backlit lasting time.

	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. Notes: If it's set as 0, the backlit will always be on.
	Press  to enter the selection routine. The current time interval will flash The options can be: 0/5/10/30/60/120minutes
Use  and  buttons to select the time required. Then press  to confirm the set-up,	

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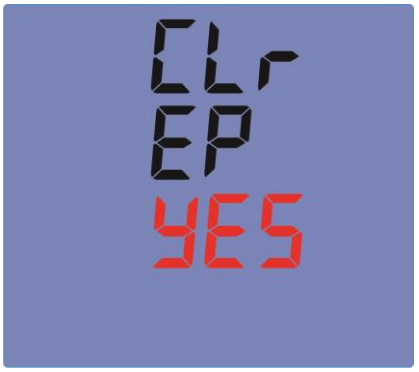
4.7 Supply System

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

	From the Set-up menu, use M and P buttons to select the System option. The screen will show the currently selected power supply
	Press E to enter the selection routine. The current selection will flash Use M and P buttons to select the required system option: 3P4W,3P3W or 1P2W
Press E to confirm the setting and press UI ESC to return to the main set up menu.	

4.8 CLR

4.8.1 Clear kWh

	From the Set-up menu, use M and P buttons to select the reset option.
	Press E to enter the selection routine. The yes will flash.

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Press  to confirm the setting and press  to return to the main set up menu.

4.8.2 Clear KVArh

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

4.8.3 Clear Max Demand

	From the Set-up menu, use  and  buttons to select the reset option.

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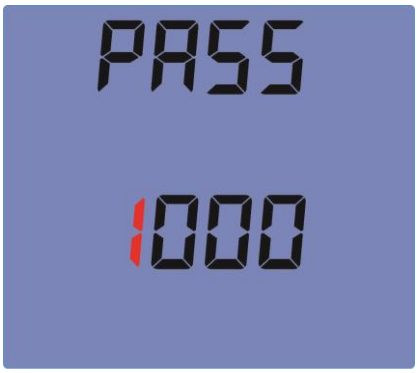
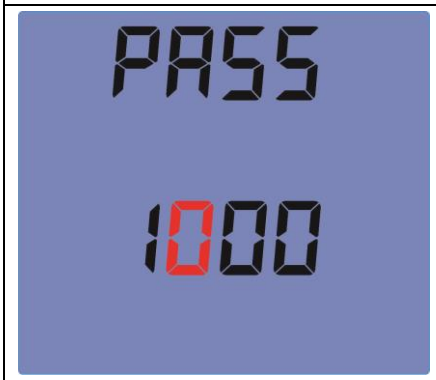
	Press  to enter the selection routine. The YES will flash.
Press  to confirm the setting and press  to return to the main set up menu.	

4.9 Change Password

	Use the  and  to choose the change password option
	Press the  to enter the change password routine. The new password screen will appear with the first digit flashing
	Use  and  to set the first digit and press  to confirm your selection. The next digit will flash

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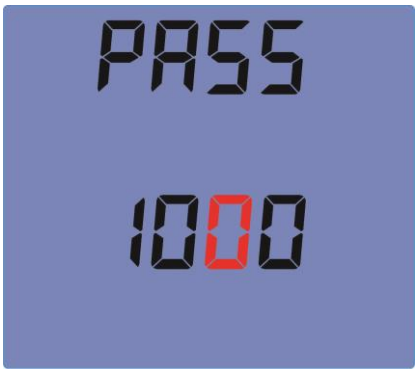
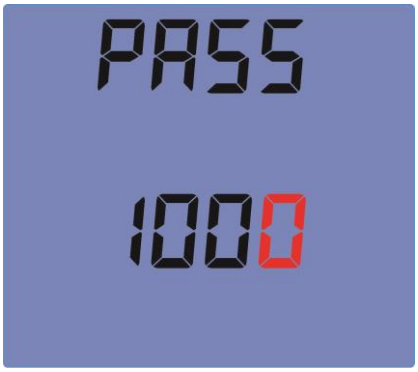
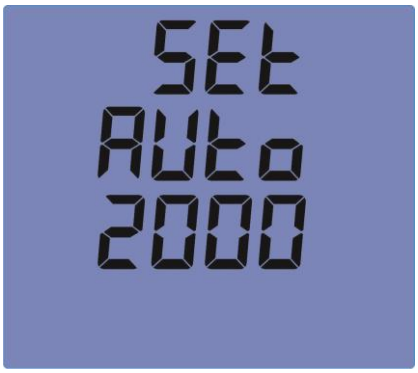
	Use M and P to set the second digit and press E to confirm your selection. The next digit will flash
	Use M and P to set the third digit and press E to confirm your selection. The next digit will flash. Use M and P to set the forth digit and press E to confirm your selection.
Press E to confirm the setting and press UI ESC to return to the main set up menu.	

4.10 Auto display in turns

	From the set-up menu, use M and P buttons to select page “SET AUTO” Press the button E to activate the modification on the time. Options: 9000/8000/7000/6000/5000/4000/3000/2000/1000/500 Default is 2000mS, which means 2 seconds.
	Use the M and P to set the auto display interval time.
Press E to confirm the setting and press UI ESC to return to the main set up menu.	

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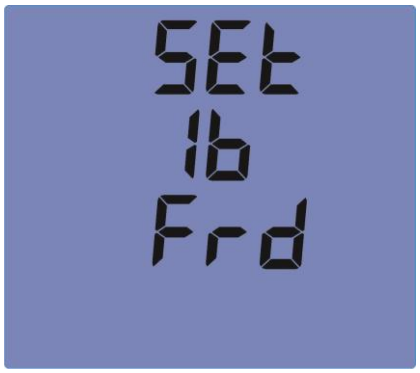
4.11 Reverse connected current inputs correction setting.

	From the Set-up menu, use M and P buttons to select page “SET SYS CONT”
	Press to E enter Phase A , the default is FRD (forward)
	Use M and P buttons to Phase B or C setting pages
Press button E to confirm the setting and press UI ESC to return to the main set up menu.	

4.11.1 How to operate if phase A is reversely connected

	Go to phase A setting page

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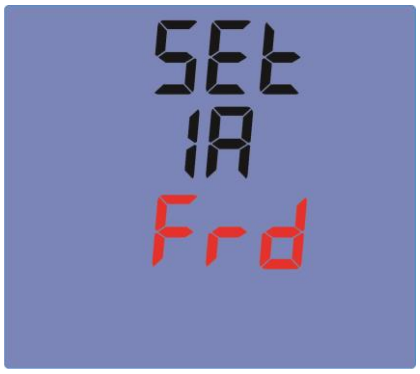
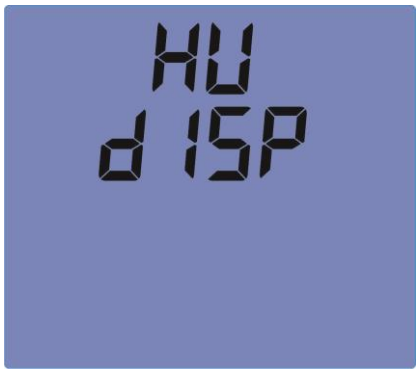
	Press  to enter the selection routine. The FRD will flash. Use  button to change FRD to REV.
Press  to confirm the setting and press  to return to the main set up menu.	

4.12 Harmonic checking

	From the Set-up menu, use  and  buttons to select page “DISP ADU” Press the button  , you will see the Voltage Harmonic
	Press the button  , you will see the individual Voltage Harmonic from 2nd to 60th
	U-----voltage P1 --- phase A /L1. P2 --- Phase B/L2 ,P3--- Phase C/L3 02 --- 2nd THD%

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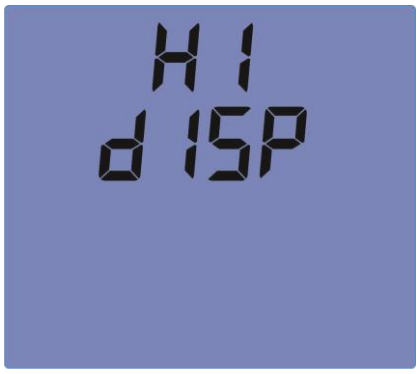	Press the button  , you will see the individual Current Harmonic from 2nd to 60th
	I--- Current P1 --- phase A /L1. P2 --- Phase B/L2 ,P3--- Phase C/L3 02 --- 2ND THD%
Press  to confirm the setting and press  to return to the main set up menu.	

5 Specifications

5.1 Measured Parameters

The unit can monitor and display the following parameters of a single phase, 3-phase 3-wire or 3-phase 4-wire supply.

5.1.1 Voltage and Current

- Phase to neutral voltages 100 to 289V a.c. (not for 3p3w supplies)
- Voltages between phases 173 to 500V a.c. (3p supplies only)
- Percentage total voltage harmonic distortion (THD%) for each phase to N
- percentage current harmonic distortion for each phase
- Current on each phase
- Key factor
- Crest factor

5.1.2 Power factor and Frequency and Max. Demand

- Frequency in Hz
- Instantaneous power:
- Power 0 to 999MW
- Reactive Power 0 to 999MVAr
- Volt-amps 0 to 999 MVA
- Maximum demanded power since last Demand reset Power factor
- Maximum demand current, since the last Demand reset (three phase supplies only)

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5.1.3 Energy Measurements

- Imported active energy 0 to 9999999.9 kWh
- Exported active energy 0 to 9999999.9 kWh
- Imported reactive energy 0 to 9999999.9 kVArh
- Exported reactive energy 0 to 9999999.9 kVArh
- Total active energy 0 to 9999999.9 kWh
- Total reactive energy 0 to 9999999.9 kVArh

5.2 Accuracy

- Voltage 0 • 5% of range maximum
- Current 0 • 5% of nominal
- Frequency 0 • 2% of mid-frequency
- Power factor 1% of unity (0.01)
- Active power (W) ±1% of range maximum
- Reactive power (VAr) ±2% of range maximum
- Apparent power (VA) ±1% of range maximum
- Active energy (Wh) Class 1 IEC 62053-21
- Reactive energy (VARh) ±2% of range maximum

5.3 Auxiliary Supply

Two-way fixed connector with 2·5mm2 stranded wire capacity.

85 to 275V a.c. 50/60Hz ±10% or 120V to 380V d.c. ±20%. Consumption < 2W.

5.4 Interfaces for External Monitoring

The 2RAE96L4C485E provides 3 communication ports:

1 RS485 port

2 ports of pulse input

5.4.1 Pulse Output

0.001=1Wh/VArh

0.01 = 10 Wh/VArh

0.1 = 100 Wh/VArh

1 = 1 kWh/kVArh

10 = 10 kWh/kVArh

100 = 100 kWh/kVArh

Pulse width 200/100/60 ms.

5.4.2 Modbus RTU

Baud rate 2400,4800,9600,19200,38400

Parity none/odd/even

Stop bits 1 or 2

Network address *nnn* –001 to 247

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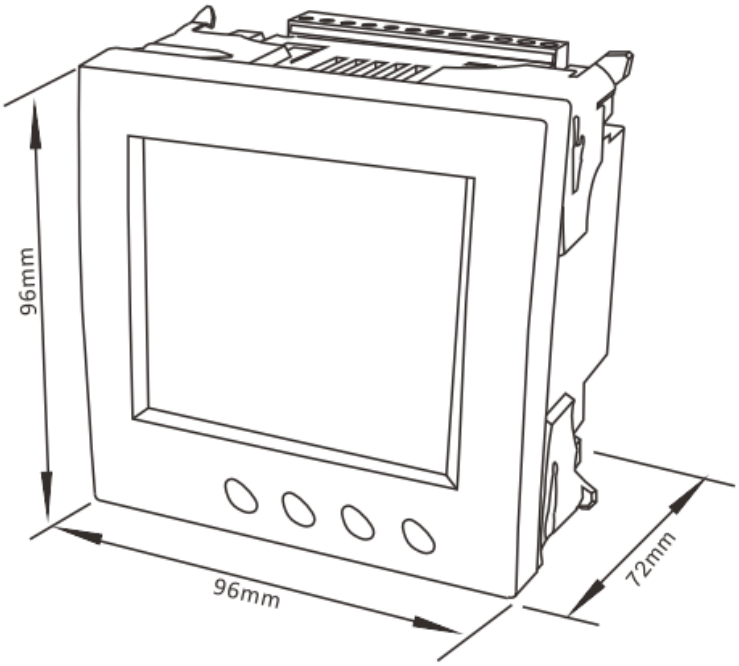
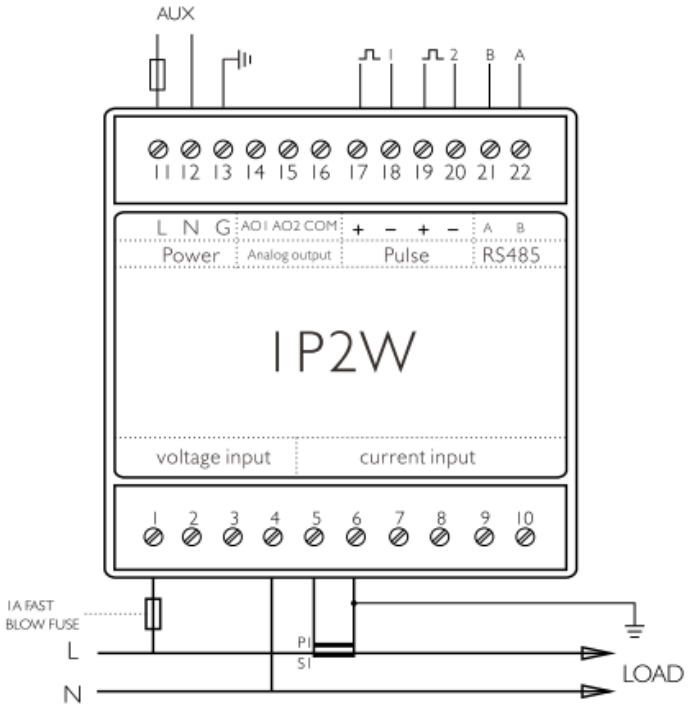
5.5 Environment

- Operating temperature -25° C to +55° C*
- Storage temperature -40° C to +70° C*
- Relative humidity 0 to 90%, non-condensing
- Altitude Up to 3000m
- Vibration 10Hz to 50Hz, IEC 60068-2-6, 2g

6. Dimensions



7. Wiring diagran



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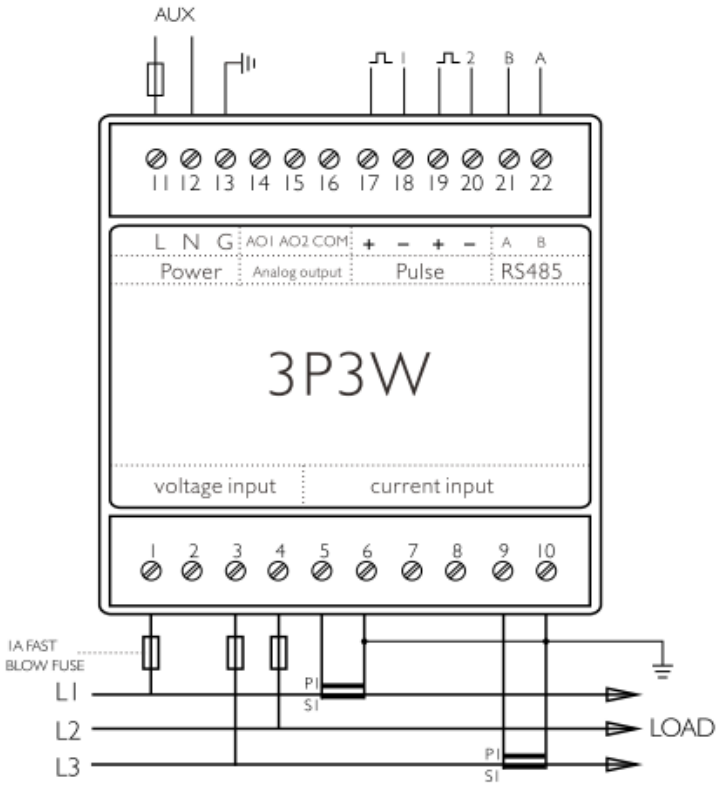

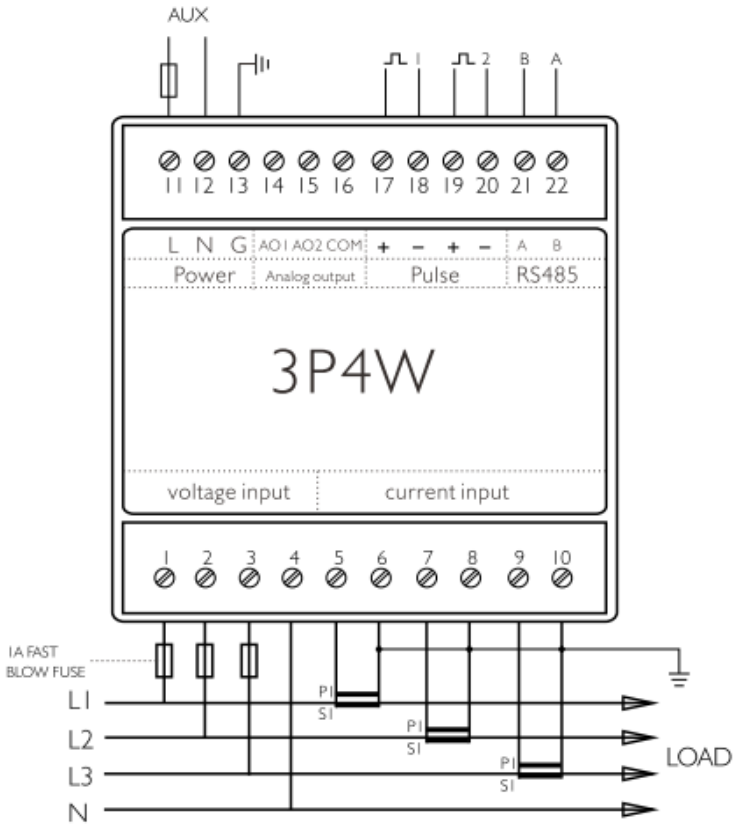

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