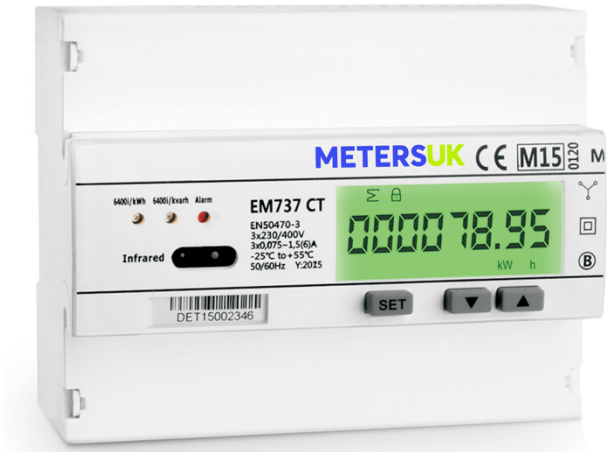
EM-737CT

Smart Energy Meter

KEY FEATURES



Three phase metering

- Standard DIN rail Format (DIN43880)
- EN50470-3 Class B.
- Import & Export active energy
- Import & Export reactive energy
- Instant Volt, Amp, Power factor, Frequency, Active power, Reactive power, Apparent power
- Isolate pulse output and IR (DIN43864)
- LCD display, 6 integer 2 decimal
- Large display LCD
- Internal transformer
- 27 CT rate can be selected
- Optional single-phase model
- RS485 communication port, Modbus protocol, IR port
- Program by button on the front panel
- Memory back-up (EEprom)
- 7 DIN modules
- MID approval

- The meter is intended to be installed in a Mechanical Environment ‘M1’, with Shock and Vibrations of low significance, as per 2004/22/EC Directive and should be installed in Electromagnetic Environment ‘E2’, as per 2004/22/EC Directive.

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1. SAFETY NOTICE

The smart energy meter EM737CT series does not require special mechanical or electrical tools for its installation. Mounting position (with any angle of tilt) has no effect on the measurement functions of the meter.
Connection of the meter must follow the wiring diagram.
Incorrect connection of the meter to the electricity network will cause a major display problem and can also cause serious damage to the meter.
Before connecting the meter, ensure the local conditions of the energy supply is consistent with the information under the model number of the meter.

Preferably use shielded cables. Make sure that all connection cables are not damaged during the installation of the meter and not energized or showing any non-mechanical stress.

Repairs to the meter are to be made by a qualified electrician only.

PLEASE NOTE: The capacitors in the meter may still be charged after the meter is disconnected for all power.

2. PACKAGE CONTENTS

Three phase, electronic energy meter
Instructions for assembly; ID setting; Baud rate setting; CT rate setting; Password setting

5. TECHNICAL DESCRIPTION

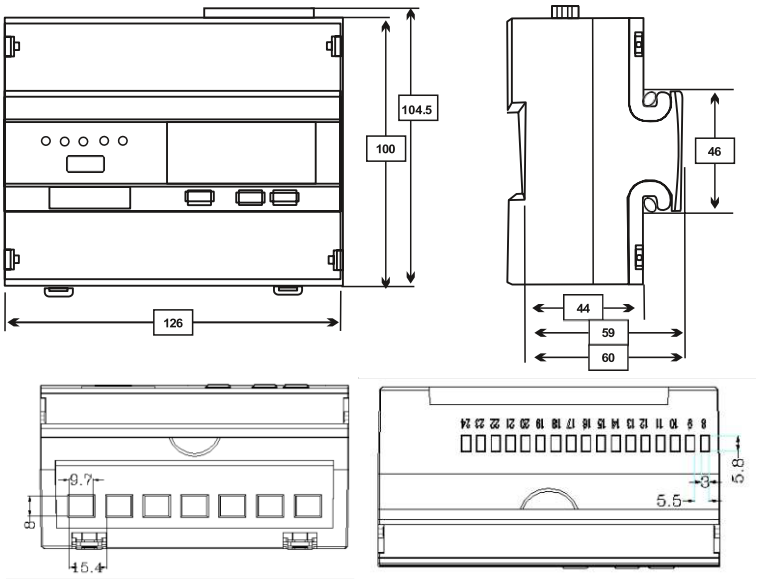
5.1 PERFORMANCE CRITERIA

Operating humidity	≤ 75%
Storage humidity	≤ 95%
Limit range of operating temperature	-25°C - +55°C(3K6)
Limit range for storage temperature	-25°C - +55°C(1K4)
Humidity	75% yearly average,95% on 30 days/year
International standard	EN50470-3 &IEC62053-21
Accuracy class	Class B
Protection against penetration of dust and water	IP51
Insulating encased meter protective class	
Connection area main terminals (Indoor meter)	
Current terminals flexible 1×mm²	0-16mm²
another terminal flexible 1×mm²	0-2.5mm²

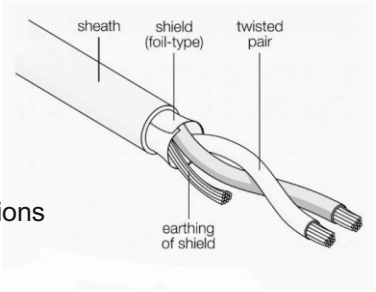
5.2 METER SPECIFICATION

Voltage	3 x 230/400v
Operational voltage	70% Un
Current (A)	
- Lref	1.5A
- Ltr	0.15A
- Lmax	6A
- Lmin	0.075A
- Ist	3mA
Power consumption of current circuits (VA)	< 0.01
< 0.01	
Power consumption of voltage circuits(W)	< 1.3W
General data	
Frequency (Hz)	50
Memory back-up	EEprom
Environment resistance to heat and fire	Terminal 960 C
	Cover 650 C
upper	ABS+PC
lower	ABS+PC
Pulse output	
Pulse width(ms)	80
Pulse Value = 1kWh	**6400 PULSES**
LED constant	6400
Width x Height x Depth (mm)	126 x 104.5 x 60

5.3 DIMENSIONS & SEALING POINTS



5A. TYPE OF CABLE TO USE



The cable to be used is a shielded twisted pair (telephone type). AWG18 cable may be specified, but different types of cable with equivalent characteristics can be used.
The twin cable consists of two conductors that are twisted together.
This arrangement improves immunity to electromagnetic disturbances because the cable forms a series of successive coils, each of which faces in the opposite direction to the next one.
In this manner any magnetic field in the environment traverses each pair of coils in opposite directions and its effect is therefore reduced.

5B. MODBUS BASICS

A Modbus RS485 connects a Master device to one or more Slave devices, which are measuring instruments with serial communication.

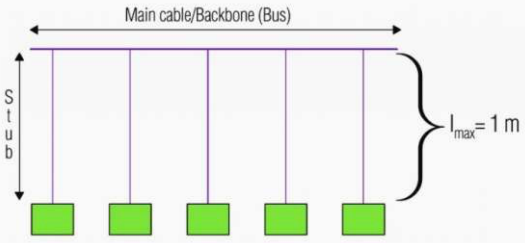
Each device has a communication port with two terminals, which can be marked A and B. In both terminals the communication cable is connected so that all the devices that form part of the communication are connected in parallel.

All the 'A' terminals must be connected together and all the 'B' terminals must be connected together, respectively.

Inverting the 'A' and 'B' connections of a device does not only prevent it from communicating but may also stop the entire communication system from working owing to incorrect direct (polarization) voltage found on the terminals of the incorrectly connected device.

In order to avoid errors when many devices are connected, cables of the same color should be used for all the connections to the terminals A and cables of the same color should be used for all the connections to the terminals B of the various devices (e.g. white for A and blue for B).

Figure 1 shows an example of a correct Bus connection.



Network with Bus structure

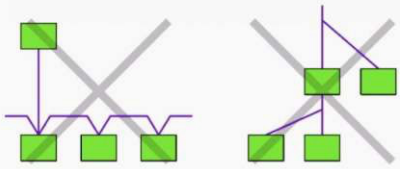


Figure 2 – Examples of incorrect Bus connections

5C. BAUD RATE & BIT RATES

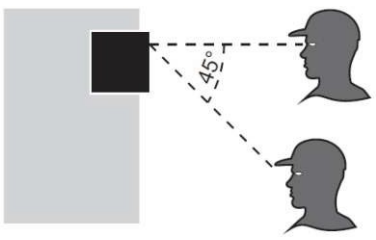
Bit rate is a measurement of the number of data bits (that's 0's and 1's) transmitted in one second. A figure of 2400 bits per sec means 2400 zeros or ones can be transmitted in one second, hence the abbreviation 'bps'. Baud rate by definition means the number of times a signal in a communications channel changes state.

One of the more common baud rates, especially for simple communication where speed is not critical, is 9600 bps.
Other "standard" baud are 1200, 2400, 4800, 19200, 38400, 57600, and 115200. The higher a baud rate goes, the faster data is sent/received, but there are limits as to how fast data can be transferred.

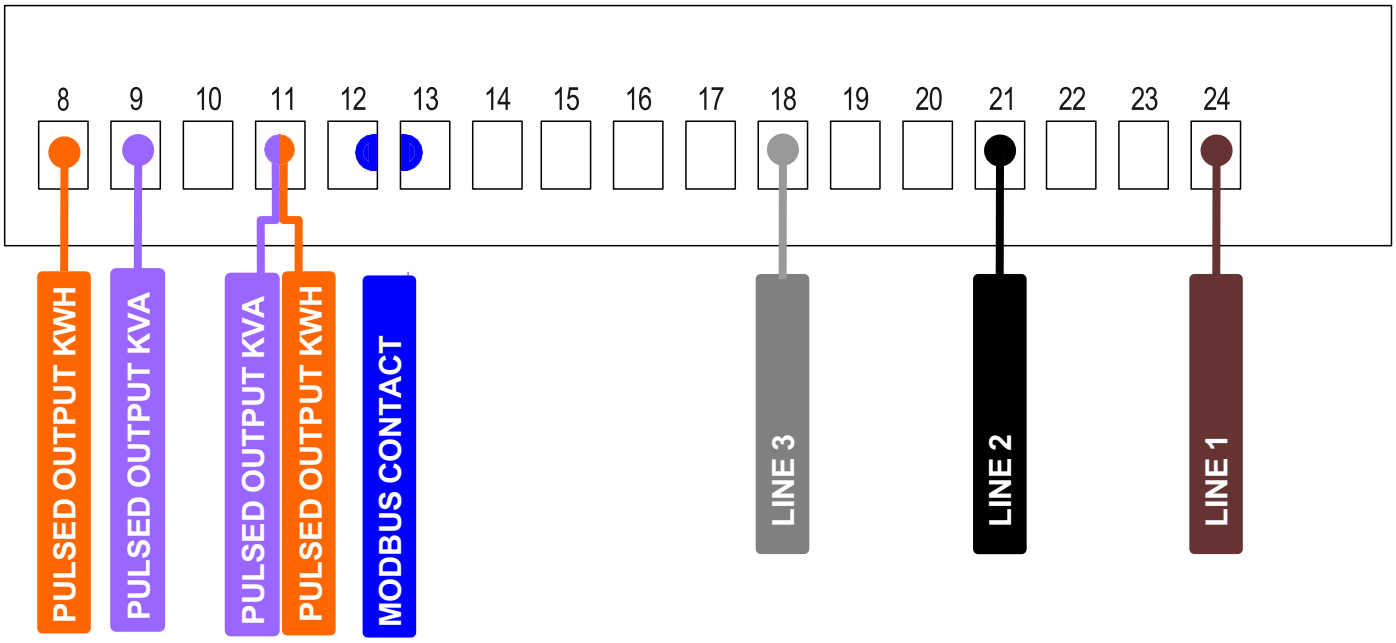
Common Settings for Modbus - 9600 or 19200. Parity (Error Checking) is EVEN or NONE.
ALL items MUST have the same settings otherwise they CANNOT communicate.

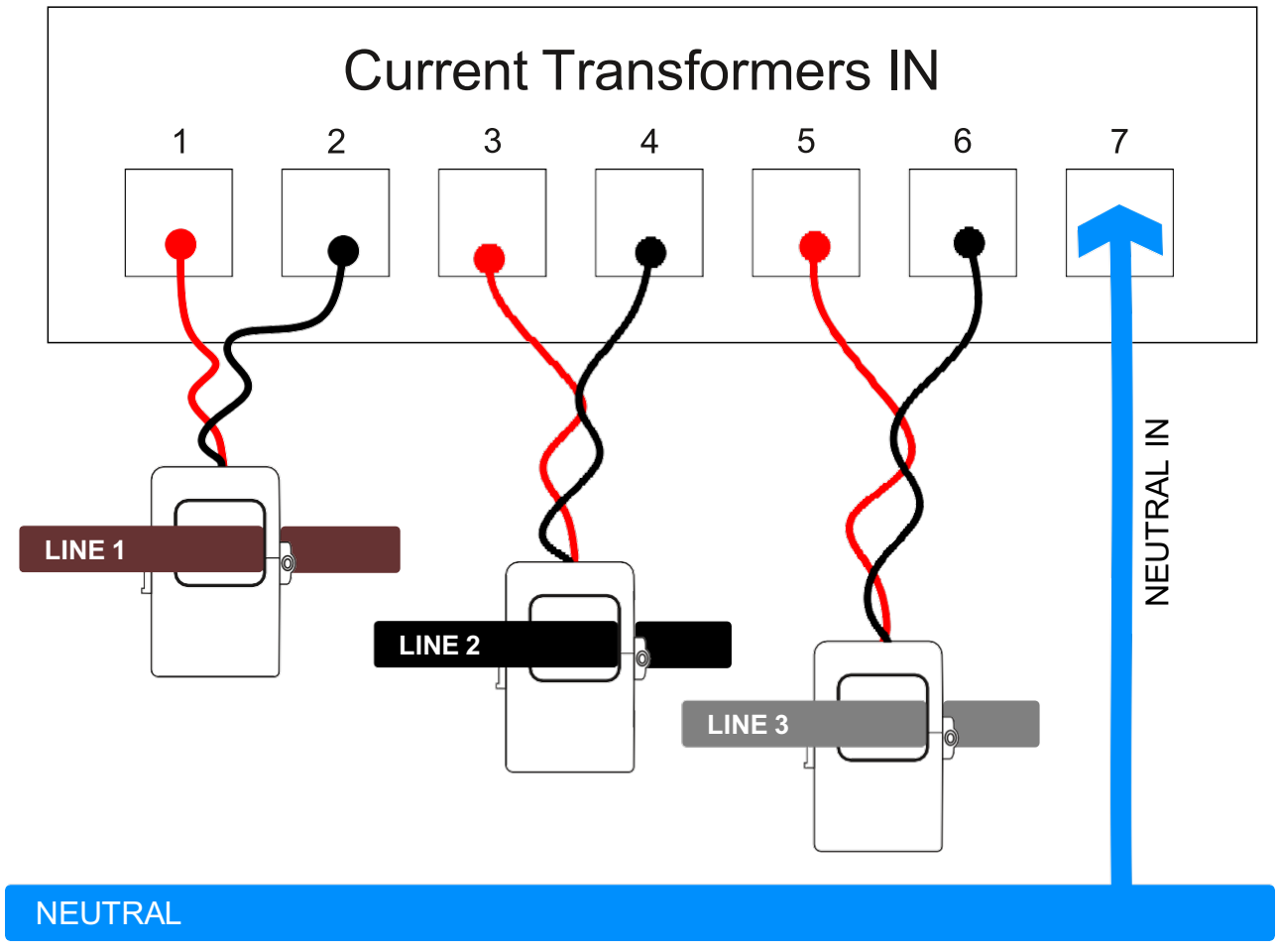
7. METER READING

The viewing angle Operator meter should be at 45°.



6. METER WIRING





CT's: Black = S2 | Red = S1
Live Voltage IN = 5AMP Fused

8 + 11 = Active Test Pulse Output KwH
9 + 11 = Reactive Test Pulse Output KVA
12 + 13 = RS485 Communication
23 + 24 = Test Pulse Output (23 - | 24 +)

8. MAIN FUNCTIONS

8.1 MEASURING FUNCTION

On the EM-737CT front panel, there are three LED lights, Active Energy pulse light, Reactive Energy pulse light and alarm Indicator. The meter can measure Import & Export active energy as well as Import & Export reactive energy.
All measurement types can be programmed.

8.2 DISPLAY FUNCTION

The meter has three buttons: Scroll Up, Scroll Down and Set.

Register Map - Commands used to read the meter

No.	Comments	Read	Write	Bytes	Starting Address
1	Voltage L1	Y	N	4	0010
2	Voltage L2	Y	N	4	0012
3	Voltage L3	Y	N	4	0014
4	Current L1	Y	N	4	0016/0050
5	Current L2	Y	N	4	0018/0052
6	Current L3	Y	N	4	001A/0054
7	Current N	Y	N	4	001C/0056
8	Total Current	Y	N	4	CC1E/0058
9	Active Power L1	Y	N	4	0020/0090
10	Active Power L2	Y	N	4	0022/0092
11	Active Power L3	Y	N	4	0024/0094
12	Total Active Power	Y	N	4	0026/0096
13	Reactive Power L1	Y	N	4	0028/0110
14	Reactive Power L2	Y	N	4	002A/0112
15	Reactive Power L3	Y	N	4	002C/0114
16	Total Reactive Power	Y	N	4	002E/0116
17	Apparent Power L1	Y	N	4	0030/00D0
18	Apparent Power L2	Y	N	4	0032/00D2
19	Apparent Power L3	Y	N	4	0034/00D4
20	Total Apparent Power	Y	N	4	0036/00D6
21	Power Factor L1	Y	N	4	0038/0150
22	Power Factor L2	Y	N	4	003A/0152
23	Power Factor L3	Y	N	4	003C/0154
24	Total Power Factor	Y	N	4	003E/0156
25	Frequency	Y	N	4	0040/004E

Total Energy Accumulator

No.	Comments	Read	Write	Bytes	Starting Address
26	Active Energy Net	Y	N	4	0700/0618
27	Active Energy Import	Y	N	4	0800/0160
28	Active Energy Export	Y	N	4	0900/0166
29	Reactive Energy Import	Y	N	4	0A00/0162
30	Reactive Energy Export	Y	N	4	0B00/0168

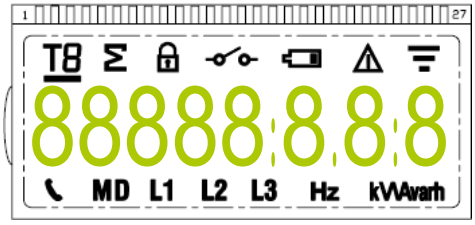
Production Data and Identification

No.	Comments	Read	Write	Bytes	Starting Address
31	Serial Number	Y	N	4	FF00
32	Manufacture Code	Y	N	4	FF02
33	Type Code	Y	N	2	FF04
34	Hardware Version	Y	N	2	FF05
35	Software Version	Y	N	2	FF06

Settings

No.	Comments	Read	Write	Bytes	Starting Address
36	Modbus id	Y	N	2	0524
37	Baud Rate	Y	N	2	0525

LCD Content



Symbol	Description
kWArh	kWh - Active Energy kW - Active Power kvarh - Reactive Energy kvar - Reactive Power kVA - Apparent Power


Total


Unpermitted Programming


LCD Alarm Indicator


Communication Symbols

8.3 ELECTRICITY PARAMETERS MEASUREMENT AND MONITORING

Measure record and display voltage, current, power and power factors. error is less than ±1%.
Provides limitless monitoring capabilities.

8.4 COMMUNICATION FUNCTION

Wireless IR Communication and RS485 communications can be used simultaneously. The meter can read data, specific reading times can be set. The meter can be read, programmed and managed through hand-held or data acquisition terminals, test equipment and computers.

Communication protocols fit Modbus RTU standards. The RS485 communication and internal meter circuit can monitor and isolate electrical faults and protect the unit.

RS485 communications transfer rates allow selected at 1200bps, 2400bps, 4800bps and 9600bps, default is 9600bps.

8.5 ALARM FUNCTION

When the meter is incorrectly wired, ie. current reverse, lost phase and reversed phase sequence, the warning ALARM LED will show.

8.6 PULSE OUTPUT FUNCTION

The meter is equipped with a pulse output which is separated from the internal circuit. Generated pulses are proportionate to the measured energy, which include the testing pulse output for active energy and reactive energy.

8/ 11 Test pulse output contact (P+/P-)
9/ 11 Test pulse output contact (Q+/Q-)

PULSE OUTPUT

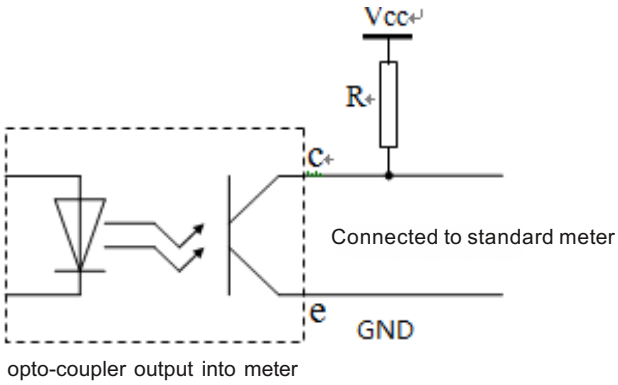
The test pulses are polarity dependent. Passive transistor output requires an external voltage source for correct operation.

The external voltage source, must comply to the following: -

Voltage (Ui): 5-27V DC
Maximum input current (Imax): 27mA DC.

Pulse output: connect 5-27V DC to connector 23 (anode), and pulse cable (S) to connector 24 (cathode).

The pulse readings are shown on the front panel.

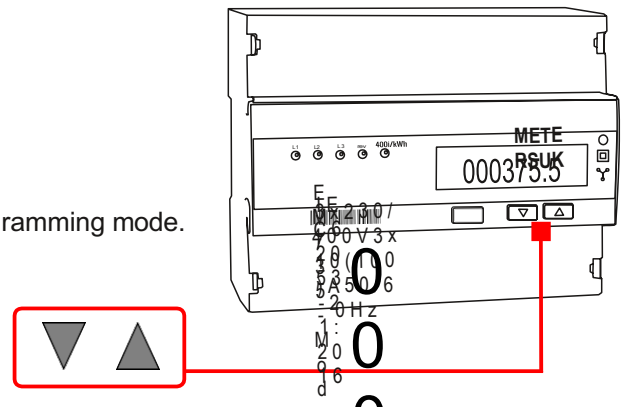


opto-coupler output into meter

Complete the wiring and switch the meter on.
Default screen will show

9. PROGRAMMING

Press and HOLD the “SET” key for 3 seconds. The meter will go into the programming mode.



9.1 PASSWORD VERIFICATION

“PA” stands for “Password”,”0000” are the 4 digits of the Password.

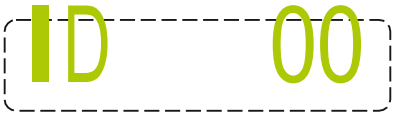
Set the password by pressing the “Down” button to decrease the digit value, or “Up” to increase the value.

Password is 0000 Press the “SET” button **<u>five</u>** times to move onto the next setting.

9.2 ID SETTING

After entering the password, the meter will ask for the address range.

Example below” Id 00” shows that the current ID address is 00 (the ID address is in hex code)
Address should be between 1 - 247



Use “Down” button to decrease the digit or” Up” button to increase the digit value.
Press the “SET” button to save digit move onto the next digit.

0
0
1
2
3
4
5
6
7
8
9

9.3 BAUD RATE SETTING

Press “SET” button to bypass entering the Baud rate.

Baud Rate = bits per second (Speed of communication).
This is the rate that devices exchange information online (on a RS485 network)

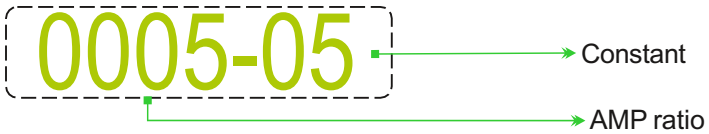
All devices MUST BE SET at the SAME rate otherwise they cannot communicate.

Common Baud rate settings for Modbus:
1200
2400) Far Distance
4800 Medium Distance
9600 Short Distance

Press “Down” and “Up” buttons to select the communication baud rate, press “SET” button to save the setup.
The interface will enter CT setup.

Note :
The default baud rate will be set at 9600BPS.

9.4 CURRENT TRANSFORMER RATE SETTING



Press “Down” and “Up” buttons to scroll and select one of the settings below.

CT Rate	5:5	50:5	60:5	75:5	100:5	125:5	150:5	160:5	200:5
	250:5	300:5	400:5	500:5	600:5	750:5	800:5	1000:5	1200:5
	1250:5	1500:5	2000:5	2400:5	2500:5	3000:5	4000:5	5000:5	6000:5
	7500:5								
Note:	When CT Ratio is lower than 200, there are 1 digit decimal. Equal or higher than 200 no decimal is used								

Press “SET” button to save the setting.

NOTE:
After the CT setup, the meter reading will show as 0.
The default CT ratio is 5:5

9.5 PASSWORD SETTING:

The meter will display the current password.

You DO NOT have to change the current password (0000), however if you wish to change it use the “Up” and “Down” buttons to change each digit. Once happy with the chosen number press set to move to the next digit.

Once complete, the meter will automatically save the password after 30 seconds or when powered off.

PLEASE NOTE:
It is important to take a note of the new password as one cannot bypass the system. If the password is not crucial, leave the password as the default (0000)

10. TECHNICAL SUPPORT

Any questions, please contact: Meters UK 01524 555 929

OTHER

Branches must not be longer than 1200m. Longer branches could cause signal reflections and generate disturbances and consequent errors in the reception data.

Max. distance of main cable: 1.2 km

Max number of devices: 64 including the master