Device handbook
SIRAX BM1200

Operating Instructions SIRAX BM1200

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Legal information

Warning notices

In this document warning notices are used, which you have to observe to ensure personal safety and to prevent damage to property. Depending on the degree of danger the following symbols are used:

If the warning notice is not followed death or severe personal injury **will** result.

If the warning notice is not followed damage to property or severe personal injury **may** result.

If the warning notice is not followed the device **may** be damaged or **may** not fulfill the expected functionality.

Qualified personnel

The product described in this document may be handled by personnel only, which is qualified for the respective task. Qualified personnel have the training and experience to identify risks and potential hazards when working with the product. Qualified personnel are also able to understand and follow the given safety and warning notices.

Intended use

The product described in this document may be used only for the application specified. The maximum electrical supply data and ambient conditions specified in the technical data section must be adhered. For the perfect and safe operation of the device proper transport and storage as well as professional assembly, installation, handling and maintenance are required.

Disclaimer of liability

The content of this document has been reviewed to ensure correctness. Nevertheless it may contain errors or inconsistencies and we cannot guarantee completeness and correctness. This is especially true for different language versions of this document. This document is regularly reviewed and updated. Necessary corrections will be included in subsequent version and are available via our webpage http://www.camillebauer.com.

Feedback

If you detect errors in this document or if there is necessary information missing, please inform us via e-mail to:
customer-support@camillebauer.com

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1. Introduction

1.1 Purpose of this document

This document describes the universal measurement device SIRAX BM1200. It is intended to be used by:
- Installation personnel and commissioning engineers
- Service and maintenance personnel
- Planners

Scope

This handbook is valid for all hardware versions of the BM1200. Some of the functions described in this doc-ument are available only, if the necessary optional components are included in the device.

Required knowledge

A general knowledge in the field of electrical engineering is required. For assembly and installation of the device knowledge of applicable national safety regulations and installation standard is required.

1.2 Scope of supply

- Measurement device SIRAX BM1200
- Safety instructions (multiple languages)
- Connection set: 2 mounting clamps

1.3 Further documents

The following documents are provided electronically via www.camillebauer.com :
- Safety instructions SIRAX BM1200
- Operating Instructions SIRAX BM1200
- Data sheet SIRAX BM1200

2. Safety notes

Device may only be disposed in a professional manner!

The installation and commissioning should only be carried out by trained personnel.
Check the following points before commissioning:

- that the maximum values for all the connections are not exceeded, see „Technical data“ section,
- that the connection wires are not damaged, and that they are not live during wiring,
- that the power flow direction and the phase rotation are correct.

The instrument must be taken out of service if safe operation is no longer possible (e.g. visible damage). In this case, all the connections must be switched off. The instrument must be returned to the factory or to an authorized service dealer.

It is forbidden to open the housing and to make modifications to the instrument. The instrument is not equipped with an integrated circuit breaker. During installation check that a labeled switch is installed and that it can easily be reached by the operators.

Unauthorized repair or alteration of the unit invalidates the warranty.

3. Device overview

3.1 Brief description

The universal measuring device SIRAX BM1200 is suited for fixed mounting and the measurement of Voltage, current, frequency, power, energy (active / reactive / apparent), power factor, phase angle, etc in low voltage switchgear. The units are designed for unbalanced load network forms of single-phase to 3-phase mains with 2-, 3- or 4-wire.

3.2 Available measurement data

Measured Parameters	**Units**	**3P 4W**	**3P 3W**	**1P 2W**
System Voltage	V	•	•	•
Voltage UL1-N / UL2-N / UL3-N	V	•	x	x
Voltage UL1-2 / UL2-3 / UL3-1	V	•	•	x
System Current	A	•	•	•
Current IL1 / IL2 / IL3	A	•	•	x
Neutral Current	A	•	x	x
Frequency	Hz	•	•	•
Active Power	kW	•	only system	only system
Reactive Power	kVAr	•	only system	only system
Apparent Power	kVA	•	only system	only system
Power Factor	–	•	only system	only system
Phase Angle	degree	•	only system	only system
Active Import Energy (9 Digit resolution)*	kWh	•	•	•
Active Export Energy (9 Digit resolution)*	kWh	•	•	•
Capacitive Reactive Energy (9 Digit resolution)*	kVArh	•	•	•
Inductive Reactive Energy (9 Digit resolution)*	kVArh	•	•	•
Apparent Energy (9 Digit resolution)*	kVAh	•	•	•
Current Demand	A	•	•	•
Max Current Demand	A	•	•	•
Apparent Power Demand	kVA	•	•	•
Max Apparent Power Demand	kVA	•	•	•
Import Active Power Demand	kW	•	•	•
Export Active Power Demand	kW	•	•	•
Max Import Active Power Demand	kW	•	•	•
Max Export Active Power Demand	kW	•	•	•
Run Hour	hours	•	•	•
On Hour	hours	•	•	•
Number of Interruptions	counts	•	•	•
Phase Rotation Error	–	•	•	x
Phase Absent Indication	–	•	•	x
Current Absent Indication	–	•	•	•
Voltage THD	%	•	•	only system
Current THD	%	•	•	only system
Min / Max System Voltage	V	•	•	•
Min / Max System Current	A	•	•	•

** Note: Units of these parameters will depend on „Energy Output" (Refer section 7.2.1.10)*

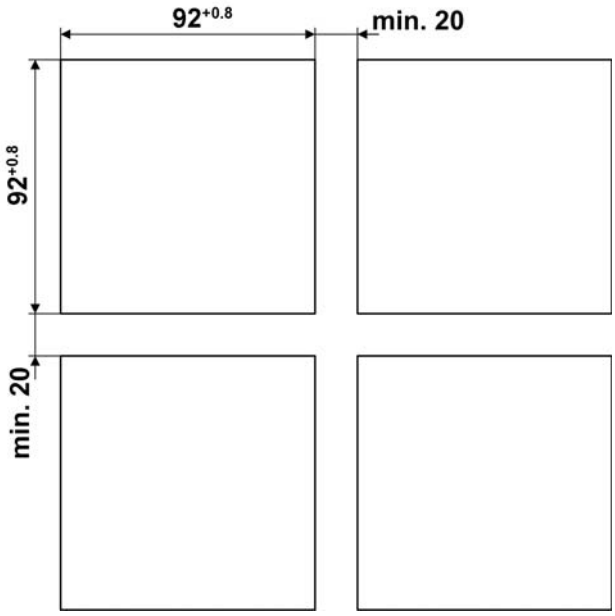
4. Mechanical mounting

The SIRAX BM1200 is designed for panel mounting.

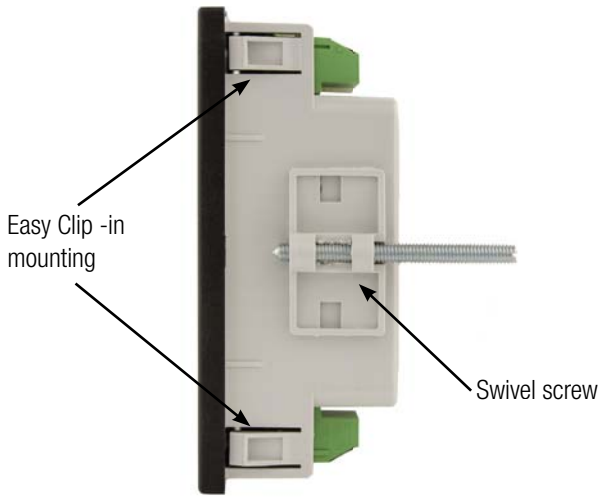
Please ensure that the operating temperature limits are not exceeded when determining the place of mounting (place of measurement): **–10 … +55° C**

4.1 Panel cut out

Dimensional drawing BM1200: See section 16



4.2 Mounting of the device



Variant with Easy Clip-in

a) Slide the device into the cutout from the outside until the easy clip-in snaps in

Variant with Mounting clamps (Swivel screws)

a) Slide the device into the cutout from the outside

b) From the side slide in the mounting clamps into the intended openings and pull them back about 2 mm

c) Tighten the fixation screws until the device is tightly fixed with the panel

Panel thickness: 1-3mm for self clicking
1-6mm for swivel screws

4.3 Demounting of the device

The demounting of the device may be performed only if all connected wires are out of service. Remove all plug-in terminals and all connections of the current and voltage inputs. Pay attention to the fact, that current transformers must be shortened before removing the current connections to the device. Then demount the device in the opposite order of mounting (4.2).

4.4 Mounting Pluggable Module

Dimensional drawing BM1200: See section 16

Standard version

Version with RS485
(can not be retofitted)

5. Electrical connections

Ensure under all circumstances that the leads are free of potential when connecting them!

5.1 General safety notes

Please observe that the data on the type plate must be adhered to!

The national provisions have to be observed in the installation and material selection of electric lines!

Symbol	Meaning
	Device may only be disposed of in a professional manner!
	Double insulation, device of protection class 2
CAT III	Measurement category CAT III for current / voltage inputs, power supply and relay outputs
CE	CE conformity mark. The device fulfills the requirements of the applicable EC directives. See declaration of conformity.
	Caution! General hazard point. Read the operating instructions.
	Attention: Danger to life!
	Please note

5.2 Possible cross sections and tightening torques

Inputs L1(2), L2(5), L3(8), N(11), I1(1-3), I2(4-6), I3(7-9), power supply (13-14), RS485 connector (A/B/G)

Single wire: 1 x 0,5 … 4,0mm2 oder 2 x 0,5 … 2,5mm2
Multiwire with end splices: 1 x 0,5 … 4,0mm2 oder 2 x 0,5 … 2,5mm2

Tightening torque

0,5 … 0,6 Nm resp. 4,42 … 5,31 lbf in

5.3 Inputs

All voltage measurement inputs must originate at circuit breakers or fuses rated by 1 Amps. This does not apply to the neutral connector. You have to provide a method for manually removing power from the device, such as a clearly labeled circuit breaker or a fused disconnect switch.

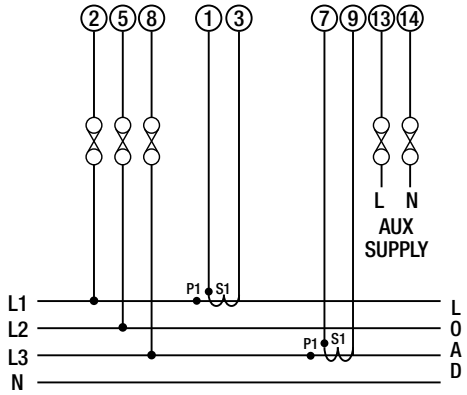
When using **voltage transformers** you have to ensure that their secondary connections never will be short-circuited.

No fuse may be connected upstream of the **current measurement inputs!**

When using **current transformers** their secondary connectors must be short-circuited during installation and before removing the device. Never open the secondary circuit under load.

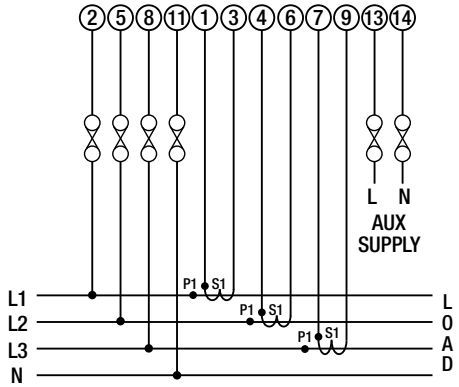
The connection of the inputs depends on the configured system (connection type).

Three Phase - three wire system, unbalanced load



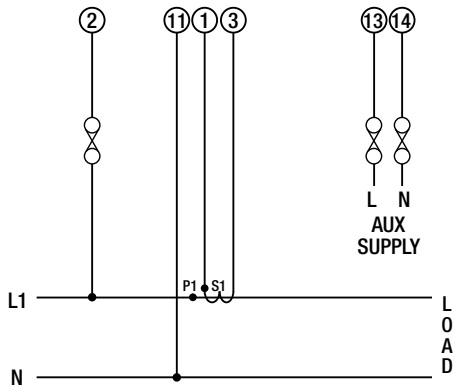
Direct connection

Three Phase - four wire system, unbalanced load



Direct connection

One Phase – two wire sytem



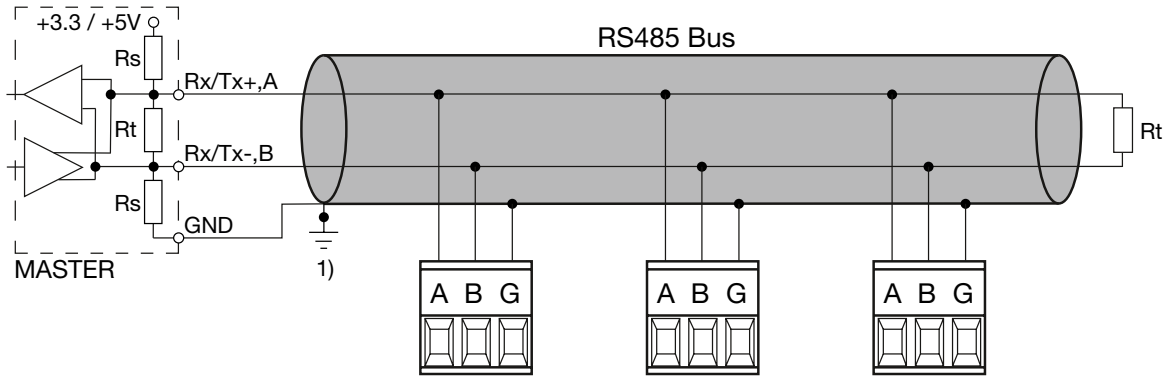
Direct connection

5.4 Power supply

A marked and easily accessible current limiting switch has to be arranged in the vicinity of the device for turning off the power supply. Fusing should be 10 Amps or less and must be rated for the available voltage and fault current.

5.5 Modbus interface RS485

Via the optional Modbus interface measurement data may be provided for a superior system.



1) One ground connection only. This is possibly made within the master (PC).

Rt: Termination resistors: 120 Ω each for long cables (> approx. 10 m)

Rs: Bus supply resistors, 390 Ω each

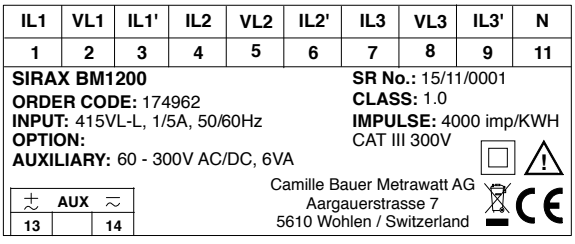
The signal wires (A, B) have to be twisted. GND (G) can be connected via a wire or via the cable screen. In disturbed environments shielded cables must be used. Supply resistors (Rs) have to be present in bus master (PC) interface. Stubs should be avoided when connecting the devices. A pure daisy chain network is ideal.

You may connect up to 32 Modbus devices to the bus. A proper operation requires that all devices connected to the bus have equal communication settings (baud rate, transmission format) and unique Modbus addresses.

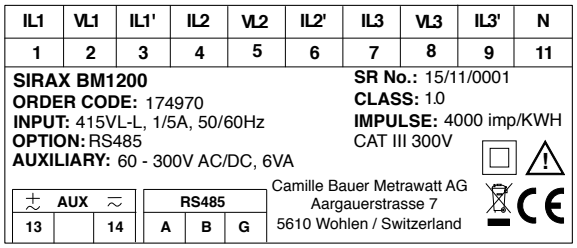
The bus system is operated half duplex and may be extended to a maximum length of 1200 m without repeater.

6. Commissioning

Before commissioning you have to check if the connection data of the device match the data of the plant.
If so, you can start to put the device into operation by switching on the power supply and the measurement inputs.



Label version standard



Label version with RS485

6.1 Operating the device

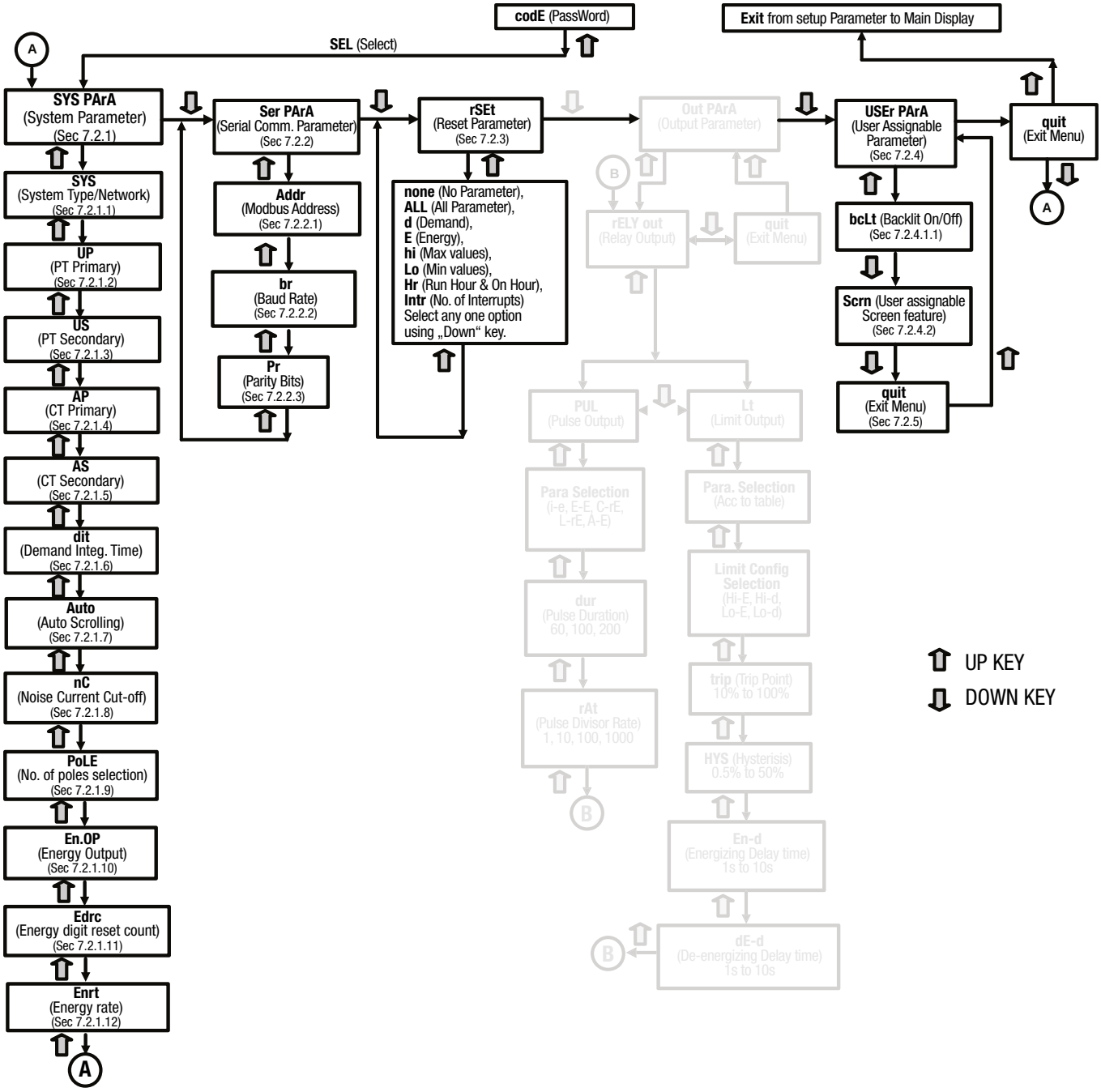
Operation is performed by means of 2 keys:

- 2 keys " UP" und " DOWN" for navigation and for the selection of values.
- To access the set-up screens press and hold " UP" and " DOWN" keys simultaneously for 5 seconds.
- After 1 min. without interaction, the menu will be automatically closed and the last active measurement display will be represented.
- The front panel also has Impulse red led, flashing at rate proportional to measured power.

6.2 Measurement Screens

Screen No.	Parameter	On Display	On Modbus	Screen No.	Parameter	On Dis-play	On Mod-bus
1	Sys Power / Voltage / Current	•	•	23	Max W IMP / VA / Current Demand	•	•
2	Voltage L1/L2/L3	•	•	24	W EXP / VA / Current Demand	•	•
3	Voltage L1-2/L2-3/L3-1	•	•	25	Max W EXP/VA/Current Demand	•	•
4	Current L1/L2/L3	•	•	26	Per Phase Voltage THD	•	•
5	Sys RPM / Frequency	•	•	27	Per Phase Current THD	•	•
6	Sys W / VA / Phase Angle	•	•	28	Sys Voltage / Current THD	•	•
7	Sys VAr / PF	•	•	29	Run Hour	•	•
8	Active Energy Import	•	•	30	On Hour	•	•
9	Active Energy Export	•	•	35	No of Interruptions	•	•
10	Capacitive Reactive Energy	•	•	37	I neutral	•	•
11	Inductive Reactive Energy	•	•	38	Old Active Import Energy	•	•
12	Apparent Energy	•	•	39	Old Active Export Energy	•	•
14	Min Sys Voltage & Current	•	•	41	Old Reactive Capacitive Energy	•	•
15	Max Sys Voltage & Current	•	•	42	Old Reactive Inductive Energy	•	•
16	R Phase W/ VA / Phase Angle	•	•	43	Old Apparent Energy	•	•
17	Y Phase W/ VA / Phase Angle	•	•	45	Old Run Hour	•	•
18	B Phase W/ VA / Phase Angle	•	•	46	Old On Hour	•	•
19	R Phase VAr / PF	•	•	51	Old No of Interruptions	•	•
20	Y Phase VAr / PF	•	•	53	Current Reversal	•	x
21	B Phase VAr / PF	•	•	54	Phase Rotation Error	•	x
22	W IMP / VA / Current Demand	•	•	55	Phase Absent	•	x

6.3 Setup Parameter Screen



7. Programming

The following sections comprise step by step procedures for configuring the SIRAX BM1200 according to in-dividual user requirements.
To access the set-up screens press and hold ″▲ UP″ and ″▼ DOWN″ keys simultaneously for 5 seconds. This will take the User into the Password Protection Entry Stage (Section 7.1).

7.1 Password Protection

Password protection can be enabled to prevent unauthorised access to set-up screens, by default password protection is not enabled.

Password protection is enabled by selecting a four digit number other than 0000, setting a password of 0000 disables the password protection.

Enter Password, prompt for first digit. (*Denotes that decimal Point will be flashing).

Press the key ″▼ Down″ to scroll the value of first digit from 0 through to 9, the value will wrap from 9 round to 0.

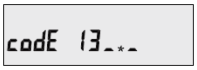
Press the key ″▲ UP″ to advance to next digit.

In special case where the Password is ″0000″ pressing the key ″▲ UP″ when prompted for the first digit will advance to ″Password confirmed″ screen.

Enter Password, first digit entered, prompt for second digit. (*Denotes that decimal Point will be flashing).

Use the key ″▼ Down″ to scroll the value of the second digit from 0 through to 9, the value will wrap from 9 round to 0.

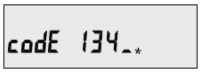
Press the key ″▲ UP″ to advance to next digit.



Enter Password, second digit entered, prompt for third digit. (* Denotes that decimal Point will be flashing).

Use the key ″▼ Down″ to scroll the value of the third digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the key ″▲ UP″ to advance to next digit.



Enter Password, third digit entered, prompt for fourth digit. (*Denotes that decimal Point will be flashing).

Use the key ″▼ Down″ to scroll the value of the fourth digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the key ″▲ UP″ to advance to verification oft he password.

Enter Password, fourth digit entered, awaiting verification of the password.

Password confirmed

Press key ″▲ UP″ will advance to the ″New / change Password″ entry stage.

Pressing the key ″▲ UP″ will advance to the Menu selection screen. (See section 7.2)

Password Incorrect

The unit has not accepted the Password entered.

Press the key ″▼ Down″ will return to the Enter Password stage.

Pressing the key ″▲ UP″ exits the Password menu and returns operation to the measurement reading mode.

New / Change Password

(*Decimal point indicates that this will be flashing).

Pressing the key ″▼ Down″ will scroll the value of first digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the key ″▲ UP″ to advance the operation to the next digit and sets the first digit, in this case to ″2″.

New/ Change Password, first digit entered, prompting for second digit. (*Decimal point indicates that this will be flashing).

Pressing the key ″▼ Down″ will scroll the value of first digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the key ″▲ UP″ to advance the operation to the next digit and sets the second digit, in this case to ″1″.

New/ Change Password, second digit entered, prompting for third digit. (*Decimal point indicates that this will be flashing).

Pressing the key ″▼ Down″ will scroll the value of first digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the key "▲ UP" to advance the operation to the next digit and sets the second digit, in this case to "5".

New/ Change Password, third digit entered, prompting for fourth digit. (*Decimal point indicates that this will be flashing).

Pressing the key "▼ Down" will scroll the value of first digit from 0 through to 9, the value will wrap from 9 round to 0.

Press the key "▲ UP" to advance the operation to the next digit and sets the second digit, in this case to "3".

New Password confirmed

Pressing the key "▼ Down" will return to the "New/Change Password".

Pressing the key "▲ UP" will advances to the Menu selection screen (See section 7.2).

7.2 Menu selection

7.2.1 System Parameter selection screen

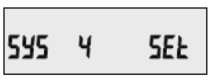
This screen is used to select the different system Parameter like" system type", "CT Ratio", "PT Ratio".

Pressing the key "▲ UP" allows the user to set Different system parameters (see section 7.2.1.1 to 7.2.1.12).
Pressing the key "▼ Down" will advance to Communication selection screen (see section 7.2.2)

7.2.1.1 System Type

This screen is used to set the system type (Only for 3 phase). System type "3" for 3 phase 3 wire, "4" for 3 phase 4 wire system or "1" for single phase system.
Pressing the key "▲ UP" accepts the present value and advances to the "Potential transformer primary value EditV menu (see section 7.2.1.2).
Pressing the key "▼ Down" will enter the system type edit mode and scroll through the values available.
Pressing the key "▲ UP" advabces to the system type confirmation menu.

System Type Confirmation



This screen will only appear following the edit of system type.
Pressing the key "▲ UP" sets the displayed value and will advance to "Potential Transformer Primary Value Edit" menu. (see section 7.2.1.2)
Press the key "▼ Down" will return to the system type edit stage.
Note: Default value is set to "4" i.e. 3P 4W

7.2.1.2 Potential Transformer Primary Value

The nominal full scale voltage which will be displayed as the Line to Line voltages for all system types. The values displayed represent the voltage in kilovolts (note "K" symbol).

Pressing the key "▲ UP" accepts the present value and advances to the "potential Transformer secondary Value Edit" menu. (see section 7.2.1.3).

Pressing the key "▼ Down" will enter the "Potential Transformer Primary Value Edit" mode.

Initially the multiplier must be selected, pressing the key " ▼ Down " will move the decimal point position to the right until it reaches # # # #. after which it will return to #. # # #.

Pressing the key "▲ UP " accepts the present multiplier (decimal point position) and advances to the "potential Transformer primary digit edit" mode.

Potential Transformer Primary Digit Edit

Pressing the key "▼ Down" will scroll the value of the most significant digit from 0 throughto 9 unless the presently displayed Potential Transformer Primary Value together with the Current Transformer Primary Value, previously set, would result in a maximum system power of greater than 3000 MVA (1000 MVA per phase) in which case the digit range will be restricted.

Pressing the key "▲ UP" accepts the present value at the cursor position and advances the cursor to the next less significant digit. The PT Primary value can be set from 100 VL-L to 1200 kVL-L. The value will be forced to 100 VL-L if set less than 100.

Note: the flashing decimal point indicates the cursor position, a steady decimal point will be present to identify the scaling of the number until the cursor position coincides with the steady decimal point position. At this stage the decimal point will flash.

When the least significant digit has been set pressing the key "▲ UP" will advance to the "Potential Transformer Primary Value Confirmation" screen showing display of 0.120 kV i.e. 120 Volts indicating steady decimal point and cursor flashing at the "hundreds of volts" position.

Note :
1. PT Values must be set as Line to Line Voltage for Primary as Well as Secondary for all system types (3P3W/3P4W/1P2W).
2. Default value is set as System Input Voltage.

Potential Transformer Primary Digit Edit

This screen will only appear following an edit of the Potential Transformer Primary Value.

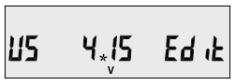
If the scaling is not correct, pressing the key "⬇ Down" will return to the "Potential Transformer Primary Value Edit" stage with the digits flashing indicating that the multiplier (decimal point position) should be selected.

Pressing the key "⬆ UP" sets the displayed value and will advance to the Potential Transformer secondary Value (See Section 7.2.1.3)

7.2.1.3 Potential Transformer Secondary Value

The value must be set to the nominal full scale secondary voltage which will be obtained from the Transformer when the potential transformer (PT) primary is supplied with the voltage defined in 7.2.1.2 Potential Transformer Primary voltage.

The ratio of full scale primary to full scale secondary is defined as the transformer ratio. The PT Secondary value can be set from 100V_{L-L} to 480V_{L-L} (according to input voltage range).



By pressing the key "⬆ UP" accepts the present value and advances to the "Current Transformer Primary Value edit" menu. (see section 7.2.1.4).

Pressing the key "⬇ Down" will enter the Potential Transformer Secondary Value Edit" mode. Pressing the key "⬇ Down" will scroll the value of the most significant digit from available range of PT secondary value. Please refer the table below for different ranges.

Pressing the key "⬆ UP" accepts the present value at the cursor position and advances the cursor to the next less significant digit.

Potential Transformer secondary ranges for various Input Voltages

Input Voltage	PT Secondary Settable Range
110 V_{L-L} (63.5 V_{LN})	100 - 125 V_{L-L} (57 - 72 V_{LN})
230 V_{L-L} (133 V_{LN})	126 - 250 V_{L-L} (73 - 144 V_{LN})
415 V_{L-L} (239.6 V_{LN})	251 - 480 V_{L-L} (145 - 277 V_{LN})

Note: the flashing decimal point indicates the cursor position, a steady decimal point will be present to identify the scaling of the number until the cursor position coincides with the steady decimal point position. At this stage the decimal point will flash.

When the least significant digit has been set, pressing the key "⬆ UP" will advance to the "Potential Transformer secondary Value Confirmation" stage.

Potential Transformer Secondary Value Confirmation

This screen will only appear following an edit of the Potential Transformer Secondary Value.

If the scalling is not correct, pressing the key "⬇ Down" will return to the "Potential Transformer Secondary Value Edit" menu.

Pressing the key "⬆ UP" sets the displayed value and will advance to the Current Transformer Primary Value. (See Section 7.2.1.4).

7.2.1.4 Current Transformer Primary Value

The nominal Full Scale Current that will be displayed as the Line currents. This screen enables the user to display the Line currents inclusive of any transformer ratios, the values displayed represent the Current in Amps.

Pressing the key "⬆ UP" accepts the present value and advances to the Current Transformer secondary Value (see section 7.2.1.5).

Pressing the key "⬇ Down" will enter the "Current Transformer Primary Value Edit" mode.
This will scroll the value of the most significant digit from 0 through to 9, unless the presently displayed Current Transformer Primary Value together with the Potential Transformer Primary Value results in a maximum system power of greater than 3000 MVA (1000 MVA per phase) in which case the digit range will be restricted, the value will wrap.

Example: If primary value of PT is set as 1200 kV_{L-L} (max value) then primary value of Current is restricted to 1002 A.

Pressing the key "⬆ UP" will advance to the next less significant digit. (*Denotes that decimal point will be flashing).

The "Maximum Power" restriction of 3000 MVA refers to 120% of nominal current and 120% of nominal voltage, i.e, 2083.3 MVA nominal power per phase.

When the least significant digit has been set, pressing the key "⬆ UP" will advance to the "Current Transformer Primary Value Confirmation" stage.
The minimum value allowed is 1, the value will be forced to 1 if the display contains zero when the key "⬆ UP" is pressed.

Current Transformer Primary Value Confirmation

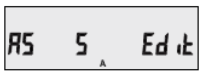
This screen will only appear following an edit of the Current Transformer Primary Value.

If the scaling is not correct, pressing the key "⬇ Down" will return to the "Current Transformer Primary Value Edit" stage with the most significant digit highlighted (associated decimal point flashing) and the bottom line of the display will be blanked.

Pressing the key "⬇ Down" sets the displayed value and will advance to the "Current Transformer Secondary Value Edit" menu. (See Section 7.2.1.5)

NOTE: Default value is set to "5" i.e. 5A.

7.2.1.5 Current Transformer Secondary Value



This screen is used to set the secondary value for Current Transformer. Secondary value "5" for 5A or "1" for 1A can be selected.

Pressing the key "⬆ UP" accepts the present value and advances to the Demand integration Time. (see section 7.2.1.6).

Pressing the key "⬇ Down" will enter the CT Secondary value edit mode and scroll the value through the values available.

Pressing the key "⬆ UP" will advance to the CT Secondary Value Confirmation screen.

CT Secondary Value Confirmation

This will only appears following an edit of CT secondary value. If secondary value shown is not correct, pressing the key "⬇ Down" will return to CT secondary edit stage.

Pressing the key "⬆ UP" sets the displayed value and will advance to Demand Integration Time Edit menu. (See Section 7.2.1.6).

7.2.1.6 Demand Integration Time

This screen is used to set the period over which current and power readings are to be integrated. The Unit of displayed values is minutes.

Pressing the key "⬇ Down" will scroll through the following Options 8, 15, 20 or 30.

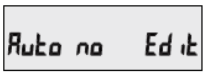
Pressing the key "⬆ UP" will advance to Demand Integration confirmation screen.

Demand Integration Time value confirmation

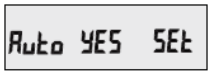
Pressing the key "⬆ UP" sets the displayed value and will advance to Auto Scroll screen. (see section 7.2.1.7).

NOTE: Default value is set to '8' i.e. 8 min.

7.2.1.7 Auto Scrolling



This screen allows user to enable screen scrolling.
Pressing the key "⬆ UP" accepts the present status and advance to the Low Current Noise Cutoff selection. (see section 7.2.1.8).



Pressing the key "⬇ Down" will enter the "Auto Screen Scrolling Edit" and toggle the status "Yes" and "No".
Pressing the key "⬆ UP" will select the status displayed and advance to the Low Current Noise Cutoff selection. (see section 7.2.1.8).
NOTE: Default value is set to "NO".

7.2.1.8 Low Current Noise Cutoff

This screen allows the user to set Low noise current cutoff in mA.

Low Current Cutoff Edit

Pressing the key "⬆ UP" accepts the present value and advance to No. of Poles selection. (see section 7.2.1.9).
Pressing the key "⬇ Down" will enter the "Low Current Noise Cutoff Edit" mode and scroll the value through 0 & 30 and wrapping back to 0. Setting 30 will display measured currents as 0 below 30 mA.

Low Current Cutoff Confirmation

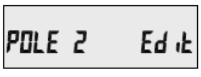
Press the key "⬇ Down" will reenter the "Low current Noise cutoff Edit" mode.
Pressing the key "⬆ UP" will set displayed value and advance to the No. of Poles selection. (see section 7.2.1.9).

NOTE: Default value is set as "0".

7.2.1.9 No. of Poles Selection

This screen enables to set No. of poles of a Generator of which RPM is to be measured and to which the instrument is connected to monitor its parameters.

Selection of No. of poles of the Generator



Pressing the key "⬆ UP" accepts the present value and advance to Energy Output menu. (see section 7.2.1.10).

Pressing the key "⬇ Down" will enter the "No. of Poles Selection" mode and scroll the number from 2 to 40 in steps of 2. After 40 it scrolls the number back to 2.

No. of poles Confirmation

Pressing the key "▼ Down" will reenter the "No. of Poles Selection" mode.

Pressing the key "▲ UP" set the number on screen as number of poles of generator and advance to "Energy Resolution" menu. (See section 7.2.1.10)

NOTE: Default value is set to "2".

7.2.1.10 Energy Output

This screen enables user to set energy in terms of Wh / kWh / MKWh as per the requirement. Same is applicable to all types of energy.

Pressing the key "▲ UP" accepts the presents value and advances to the "Energy Digit Reset Count" menu. (see section 7.2.1.11).

Pressing the key "▼ Down" will enter the "Energy Output Edit" mode and scroll through the values 1, 2 and 3.

1: Energy in Wh
2: Energy in kWh
3: Energy in MWh

Pressing the key "▲ UP" advances to the "Energy Output Confirmation" menu.

Energy Output Confirmation

This screen will only appear following an edit of the Energy Output.

Pressing the key "▼ Down" will enter the "Energy Output Edit" stage.

Pressing the key "▲ UP" sets the displayed value and will advance to the "Energy Digit Reset Count" menu. (see section 7.2.1.10)

Note:
1. Default value is set to 2 i.e. Energy will be in terms of kWh/kVArh/ kVAh resp.
2. If (PT primary (VLL) * CT primary * Root3) >30000 kW, then Energy Output can be set only as kWh and MWh.
3. Old Energy is stored as per Energy Output only.

7.2.1.11 Energy Digit Reset Count

This screen enables user for setting maximum energy count after which energy will roll over to zero depending on setting of Wh, KWh and MWh.

Pressing the key "▲ UP" accepts the present value and will advance to the "Energy Rate" menu. (see section 7.2.1.12).

Pressing the key "▼ Down" will enter the Energy Digit Reset Count edit mode. This will scroll the value of reset count from 7 to 9.
Ex: If Energy Digit count is set to 9 then energy will reset after "999,999,999" & rollback to zero.

Pressing the key "▲ UP" will advance to Energy Digit Reset Count confirmation screen.

Pressing the key "▼ Down" will reenter Energy Digit Reset Count edit mode.

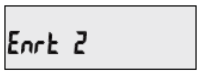
Pressing the key "▲ UP" sets the displayed value and will advance to the "Energy Rate" menu. (see section 7.2.1.12)

Note: Default value is set to '8' i.e. if energy count crosses 8 digits, then it will reset and rollback to zero.

7.2.1.12 Energy Rate

This screen allows user to enter energy update rate in min. After entering particular value in min. the energy will be updated on modbus location from 30145 to 30153 of 3X register and 44241 to 44249 of 4X register as per value that user has entered.

Pressing the key "▲ UP" accepts the present value and will jump back to System Parameter selection. (see section 7.2.1).



Pressing the key " Down" will enter the Energy Rate edit mode. This will scroll the count in minutes from 1 to 60.

Ex: If Energy Rate is set to 2 then energy will get stored after 2 minutes.

Pressing the key "▲ UP" will advance to Energy Digit Reset Count confirmation screen.

Pressing the key "▼ Down" will re-enter Energy Digit Reset Count edit mode.

Pressing the key "▲ UP" sets the displayed value and will jump back to System Parameter selection. (See Section 7.2.1)

NOTE: Default value is set to "15" i.e. 15 min.

7.2.2 Communication Parameter Selection Screen

This screen is used to select the different communication parameters like "Address selection", "RS485 Parity selection", "RS485 baud rate".

Pressing the key "▲ UP" allows the user to set different Communication parameters. (see section 7.2.2.1 to 7.2.2.3)

Pressing the key "▼ Down" will advance to Reset parameter Screen. (see section 7.2.3)

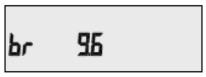
7.2.2.1 Adress Setting

This screen applies to the RS 485 output only. This screen allows the user to set RS 485 address for the meter.
The allowable range of addresses is 1 to 247. When entering new address, it will prompt for first digit. (*Denotes that decimal point will be flashing).
Press the key "▼ Down" to scroll the value of the first digit.
Press the key "▲ UP" to advance to next digit.
Similarly, Enter second and third digits of address. After entering third digit, press the key "▲ UP" to advance to Address Confirmation screen.

Energy Output Confirmation

This Screen confirms the Address set by user.
Press the key "▲ UP" to advance to next Screen "Rs485 Baud Rate" (see Section 7.2.2.2).
Press the key "▼ Down" will reenter the "Address Edit" mode.

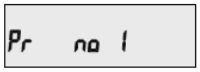
7.2.2.2 Baud Rate



This screen allows the user to set Baud Rate of the RS485 port. The values displayed on screen are in kbaud.
Pressing the key "▲ UP" accepts the present value and advance to the Parity Selection (see selection 7.2.2.3).
Pressing the key "▼ Down" will enter the "Baud Rate Edit" mode and scroll the value through 4.8, 9.6, 19.2 and 38.4 and back to 4.8.
Pressing the key "▲ UP" will select the value and advances to the Parity Selection (see Section 7.2.2.3).
NOTE: Default value is set to "9.6".

7.2.2.3 RS485 Parity Selection

This screen allows the user to set Parity & number of stop bits of RS 485 port.



Pressing the key "▲ UP" accepts the present value and advance to Communication Parameter selection screen. (see section 7.2.2)
Pressing the key "▼ Down" will enter the "Parity and Stop bit Edit" mode and scroll the value through

Odd: odd parity with one stop bit
No 1: no parity with one stop bit
No 2: no parity with two stop bit
E: even parity with one stop bit

Pressing the key "▲ UP" will set the value.
Press the key "▲ UP" again will jump back to the Communication Parameter selection menu (see section 7.2.2).

NOTE: Default value is set as "no 1".

7.2.3 Reset Parameter Selection Screen

This screen is used to Reset the different parameters.

Pressing the key "▲ UP" allows the user to Reset different system parameters. (see section 7.2.3.1)

Pressing the key "▼ Down" twice will advance to User Assignable Featur Selection Screen. (see section 7.2.4).

7.2.3.1 Resetting Parameter

This screen allows the users to reset Energy, Lo(Min), hi(Max), Demand, Run hour, On hour, No. of Interrupts.

After Reset, the current value of the parameters are shown on their respective OLD screens.

Reset (None)
Pressing the key "▲ UP" advances to Reset Parameter selection screen. (see section 7.2.3).

Pressing the key "▼ Down" will enter the "Reset option" mode and scroll through the parameter given below.

ALL: reset all resettable parameters
d: reset all demand parameters
E: reset all energies
Hi: reset maximum values of voltage & current
Lo: reset minimum values of voltage & current
hr: reset run hour & on hour
intr: reset no. of auxiliary supply interruption count

Pressing the key "▲ UP" will select the value.
Pressing the key "▲ UP" again will jump back to the Communication Parameter selection menu (see section 7.2.2).

7.2.4 User Assignable Features Selection screen

This screen will allow the user to access different features like ″Backlit″, ″User assignable screens″.

Pressing the key ″▲ UP″ will allow the user to select and configure the features. (see section 7.2.4.1)

Pressing the key ″▼ Down″ will advance to Quit screen. (see section 7.2.5)

7.2.4.1 Feature Selection Menu

This menu allows the user to scroll through different User Configurable features:
bcLt: backlit on/off
Scrn: user screen on/off

Pressing the key ″▼ Down″ will scroll through the features backlit, user screen and quit.

Pressing the key ″▲ UP″ will select that particu-lar option. (see section 7.2.4.1.1 or 7.2.4.1.2)

Selecting ″Quit″ option will return to ″User Assignable Features″ screen. (see section 7.2.5)

7.2.4.1.1 Backlight

This screen allows the user to switch the backlit on or off.
Pressing the key ″▼ Down″ will toggle between options ″ON″ or ″OFF″.

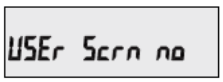
Pressing the key ″▲ UP″ will select that particular option and jump back to ″Feature Selection Menu″. (see section 7.2.4.1).

Note: When backlit is switched ″Off ″, on pressing any key backlit will turn ″On″ for 1 min..

Default value is set on ″ON″.

7.2.4.2 User Assignable Screens

This screen allows the user to turn On or Off the User Screen feature. Using this feature, the user can select any FIVE / TEN measurement screens of his choice and scroll through only those selected screens.



Pressing the key ″▼ Down″ will toggle between options ″no″, ″5″ or ″10″.

If ″no″ option is selected by pressing the key ″▼ Down″, then it will jump back to ″Feature Selection Menu″. (see section 7.2.4.1)
If ″5″ or ″10″ option is selected, then it will advance to ″User Screen 1″ selection screen.

NOTE: If User Screen feature is ON and System type is changed, then Active Energy screen (No. 8) is shown after exiting from setup.

User Screen Selection

Pressing the key ″▲ UP″ accepts the present value and advance to ″User Screen 2″ selection.

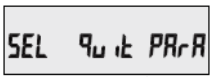
Pressing the key ″▼ Down″ will enter the ″User Screen″ Edit mode and scroll through the screen numbers as per “6.2 Measurement Screens”.

Pressing the key ″▲ UP″ will set the displayed value and advance to ″User Screen 2″ selection.

Similarly, enter the screen numbers for ″User Screens 2 to 5 or 2 to 10″ depending upon the selection.

After entering User Screen 10 value, pressing the key ″▲ UP″ will jump back to ″Feature Selection Menu″. (see section 7.2.4.1)

7.2.5 Quit screen



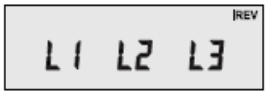
This screen will allow the user to Quit the Menu.

Pressing the key ″▲ UP″ will allow the user to Quit from menu and return to measurement screen.

Pressing the key ″▼ Down″ will advance to System Parameter Selection screen. (see section 7.2.1)

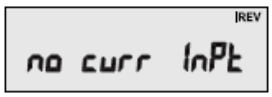
8. Current Reversal screen

This screen is useful to indicate if current in any phase is reversed or not. If current in any phase gets reversed, then corresponding phase will be indicated on this screen.



This screen shows that currents in all three phase are reversed.

This screen shows that currents in all three phase are correct.



This screen shows that the meter has no current input.

9. Phase Rotation Error screen

Meter shows phase rotation error if the phase sequence R-Y-B (L1-L2-L3) is not maintained or if any of the phase is absent.

This screen indicates that Phase Sequence is incorrect.User must check this screen in order to get correct readings when meter is connected.

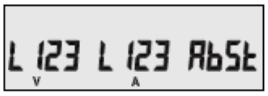
This screen indicates that Phase Sequence is correct.

This screen indicates that all three phases (voltages) are absent.

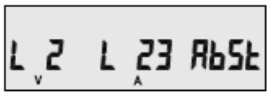
Note: In 3P3W, this screen is applicable only when load is balanced.

10. Phase Absent screen

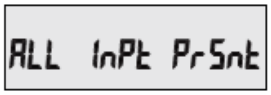
This screen is useful to indicate if voltage or current in any phase is absent. Hence, user will know which voltage or current is missing and take corrective action.



This screen indicates that all three phases (voltage & current) are absent.



This screen indicates that U2, I2 and I3 are absent.



This screen indicates that all three phases are present i.e. all inputs are present.

11. Run Hour

This Screen shows the total no. of hours the load is connected. Even if the Auxiliary supply is interrupted, count of Run hour will be maintained in internal memory & dis-played in the format format “hours. min”.
For example if Displayed count is 105000.10 it indicates 105000 hours and 10 minutes. After 999999.59 run hours display will restart from zero. To reset run hour manually see section Resetting Parameter 7.2.1.11.

12. On Hour

This Screen shows the total no. of hours the Auxiliary Supply is ON. Even if the Aux-iliary supply is interrupted count of On hour will be maintained in internal memory & displayed in the format “hours. min”. For example if Displayed count is 105000.10 it indicates 105000 hours and 10 minutes. After 999999.59 On hours display will restart from zero. To reset On hour manually see section Resetting Parameter 7.2.1.11

13. Number of Interruption

This Screen Displays the total no. of times the Axillary Supply was Interrupted. Even if the Auxiliary supply is interrupted count will be maintained in internal memory. To reset No of Interruption manually see section Resetting Parameter 7.2.3.

14. Service, maintenance and disposal

For devices that have not been opened in the factory, no warranty or guarantee can be assumed.

14.1 Repair work and modifications

Repair work and modifications shall exclusively be carried out by the manufacturer. Do not open the housing of the device. In case of any tampering with the device, the guaranty claim shall lapse. We reserve the right of changing the product to improve it.

14.2 Calibration and new adjustment

Each device is adjusted and checked before delivery. The condition as supplied to the customer is measured and stored in electronic form.

The uncertainty of measurement devices may be altered during normal operation if, for example, the specified ambient conditions are not met.

14.3 Cleaning

The display and the operating keys should be cleaned in regular intervals. Use a dry or slightly moist cloth for this.

Damage due to detergents

Detergents may not only affect the clearness of the display but also can damage the device. Therefore, do not use detergents.

14.4 Disposal

The disposal of devices and components may only be realised in accordance with good professional practice observing the country-specifi c regulations. Incorrect disposal can cause environmental risks.

14.5 Return

All devices delivered to Camille Bauer Metrawatt AG shall be free of any hazardous contaminants (acids, lyes, solutions, etc.).
Use original packaging or suitable transport packaging to return the device.

Damage by returning

Damages caused by improper returning, no warranties or guarantees can be given.

15. Technical data

System

Connection types:	Single Phase 2-Wire 3-Phase 3-Wire unbalanced load 3-Phase 4-Wire unbalanced load
Nominal frequency:	45 … 50/60 … 65 Hz
Measurement TRMS:	Up to the 15th harmonic

Inputs

Nominal current:	1 A / 5 A AC RMS
Maximum:	120% of nominal value
Consumption:	<0,3 VA per Phase
SystemCT primary values:	Std. Values 1 to 9999 A (1 or 5 A secondary)
System secondary values:	1A / 5A, programmable at site
Nominal voltage:	1. 110 V_{L-L} (63.5 V_{LN}) 2. 230 V_{L-L} (133 V_{LN}) 3. 415 V_{L-L} (239.6 V_{LN})
System PT primary values:	100 VL-L to 1200 k V_{L-L}, programmable at site
System PT secondary values:	

Spannungseingang	Spannungswandler sekundär einstellbarer Bereich
110 V_{L-L} (63.5 V_{LN})	100 - 125 V_{L-L} (57 - 72 V_{LN})
230 V_{L-L} (133 V_{LN})	126 - 250 V_{L-L} (73 - 144 V_{LN})
415 V_{L-L} (239.6 V_{LN})	251 - 480 V_{L-L} (145 - 277 V_{LN})

Maximum:	120% of nominal value
Consumption:	<0,3 VA per Phase
Overload indication:	″-OL-″ >121% of nominal value (for voltage and current)
Overload withstand:	Voltage input: 2 x Rated value (1s application repeated 10 times at 10s intervals) Current input: 20 x Imax für 0.5s
Power supply	via terminals 13 - 14
Nominal voltage:	60…300V AC/DC
Auxiliary supply:	±5% approx.
Nominal value:	230V AC/DC; 50/60 Hz for AC Aux
Consumption:	with RS485 module ≤ 6 VA without RS485 module ≤ 4 VA

Operating Measuring Ranges

Voltage with external Aux.:	50 … 120% of nominal Value
Current:	**1A** – 20mA bis 1.2A **5A** – 100mA bis 6A
Starting current: (as per IEC 62053-21)	**1A** – 2mA **5A** – 10mA
Frequency:	50 Hz / 60 Hz
Power factor:	0.5 Lag … 1 … 0.8 Lead
Total Harmonic Distortion:	0 … 50%

Accuracy

Reference conditions:	Acc. to IEC 62053-21, ambient 23°C ±2°C
Voltage, current:	± 0,5% (of the nominal value)
Active power:	± 0,5% (of nominal value at cosϕ=1)
Reactive power:	± 1,0% (of nominal value at sinϕ=1)
Apparent power:	± 0,5% (of nominal value)
Power factor / Phase angle:	± 3°
Frequency:	± 0,2% (of mid frequency)
Active energy:	Class 1, EN 62053-21
Reactive energy:	Class 2, EN 62053-23
Apparent energy:	Class 1
THD (voltage / current):	± 2%

Variation due to influence quantity is 100% of class index for all other parameters except energy.

Mechanical attributes

Orientation:	Any
Bezel size:	96 mm x 96 mm (DIN 43718)
Panel cut out:	92+0.8 mm x 92+0.8 mm detail see cut out drawing
Overall depth:	35mm/55 mm
Panel thickness:	1 – 3 mm for Easy Clip-in
	1 – 6 mm for mounting clamps
Housing material:	PC 10% unfilled
Weight:	ca. 320 g
Dimensions:	see dimensional drawings
Display:	LCD Display with backlight
	Update rate approx. 1 sec.
User interface:	2 push buttons
Terminals:	Screw-type terminals

Environmental conditions

Operating temperature	-10 to 55 ° C
Storage temperature	-20 to +65 °C
Relative humidity	0 .. 90 % RH
Warm up time	3 minute (minimum)
Shock	300 m/s^2 (30g) iduration 18ms
Vibration	10 .. 150 ... 10 Hz, 0.15mm amplitude
Number of Sweep cycles	10 per axis
Enclosure (IP for water & dust)	IP 54 (front), IP 20 (housing/terminals) acc. to IEC 60529

Standards

EMC Emmision	IEC 61326-1: 2005
EMC Immunity	10V/m min (IEC 61000-4-3)
Safety	IEC 61010-1: 2001
Protection class	2
Pollution degree	2
Installation category	CATIII
High voltage test (Input+Aux vs Surface)	4 kV RMS 50 Hz for 1 minute between all electrical circuits
High voltage test (Input vs Remaining circuit)	2 kV RMS 50 Hz for 1 minute between all electrical circuits

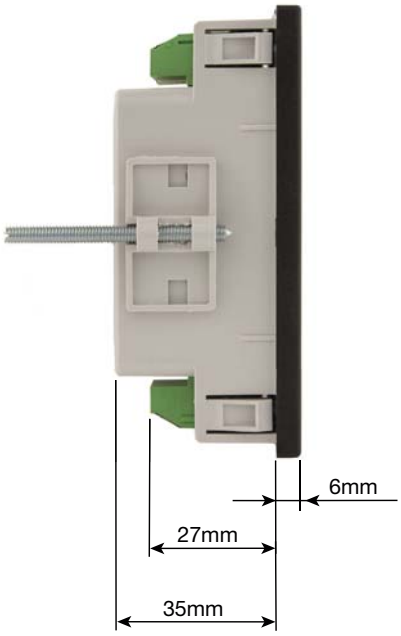
Outputs

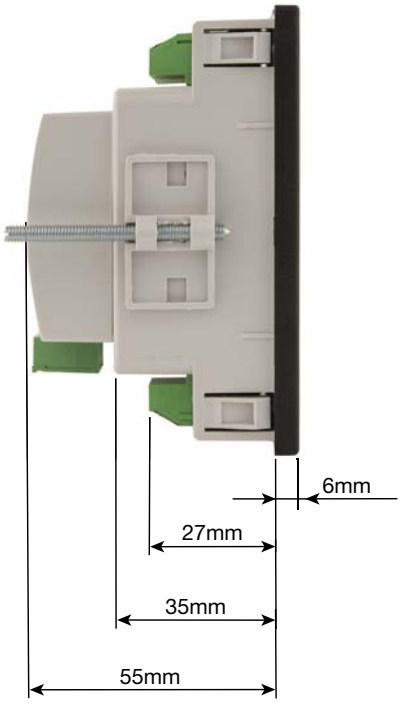
Modbus (RS485)	via plug-in terminal (B, A, G)
Protocol:	Modbus (RS485)
Physics:	RS-485, max. 1200m (4000 ft)
Baud rate:	4‘800, 9‘600, 19‘200, 38‘400 Baud (programmable)
Parity:	Odd oder even, mit 1 Stop Bit, oder None mit 1 oder 2 Stop Bits
Number of participants:	< 32

Impulse Output

Impulse constant:	**110 V_{L-L} :** 16000 impulse/kWh
	230 V_{L-L} : 8000 impulse/kWh
	415 V_{L-L} : 4000 impulse/kWh

16. Dimensional drawings





17. Interface Definition Modbus (RS485)

THE MULTIFUNCTION ENERGY METER supports MODBUS (RS485) RTU protocol (2-wire).

Connection should be made using twisted pair shielded cable. All "A" and "B" connections are daisy chained to-gether. The screens should also be connected to the “Gnd” terminal. To avoid the possibility of loop currents, an Earth connection should be made at one point on the network. Loop (ring) topology does not require any termination load. Line topology may or may not require terminating loads depending on the type and length of cable used. The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (1/4 Watt min.) resistor.

RS 485 network supports maximum length of 1.2km. Including the Master, a maximum of 32 instruments can be connected in RS485 network. The permissible address range for The Meter is between 1 and 247 for 32 instruments. Broadcast Mode (address 0) is not allowed.

The maximum latency time of an Meter is 200ms i.e. this is the amount of time that can pass before the first response character is output.

After sending any query through software (of the Master), it must allow 200ms of time to elapse before assuming that the Meter is not going to respond. If slave does not respond within 200 ms, Master can ignore the previous query and can issue fresh query to the slave.

The each byte in RTU mode has following format:

	8-bit binary, hexadecimal 0-9, A-F 2 hexadecimal characters contained in each 8-bit field of the message
Format of Data Bytes	4 bytes (32 bits) per parameter. Floating point format (to IEEE 754) Most significant byte first (Alternative least significant byte first)
Error Checking Bytes	2 byte Cyclical Redundancy Check (CRC)
Byte format	1 start bit, 8 data bits, least significant bit sent first 1 bit for even/odd parity 1 stop bit if parity is used; 1 or 2 bits if no parity

Communication Baud Rate is user selectable from the front panel between 4800, 9600, 19200, 38400 bps.

Function code:

03	Read Holding Registers	Read content of read /write location (4X)
04	Read input Registers	Read content of read only location (3X)
16	Presets Multiple Registers	Set the content of read / write locations (4X)

Exception Cases : An exception code will be generated when Meter receives ModBus query with valid parity and error check but which contains some other error (e.g. Attempt to set floating point variable to an invalid value) The response generated will be “Function code” ORed with HEX (80H). The exception codes are listed below

01	Illegal function	The function code is not supported by Meter
02	Illegal Data Address	Attempt to access an invalid address or an attempt to read or write part of a floating point value
03	Illegal DataValue	Attempt to set a floating point variable to an invalid value

17.1 Accessing 3 X register for reading measured values

Two consecutive 16 bit registers represent one parameter. Refer **TABLE: 3 X register addresses** (Parameters measured by the instruments). Each parameter is held in the 3X registers. Modbus Code 04 is used to access all parameters.

Example :
To read parameter ,
Volts 3 : Start address = 04 (Hex) Number of registers = 02

Note : Number of registers = Number of parameters x 2
Each Query for reading the data must be restricted to 20 parameters or less. Exceeding the 20 parameter limit will cause a ModBus exception code to be returned.

Query :

01 (Hex)	04 (Hex)	04 (Hex)	43 (Hex)	5B (Hex)	41 (Hex)	21 (Hex)	6F (Hex)	9B (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Start Address High: Most significant 8 bits of starting address of the parameter requested.
Start Address low: Least significant 8 bits of starting address of the parameter requested.
Number of register Hi: Most significant 8 bits of Number of registers requested.
Number of register Lo: Least significant 8 bits of Number of registers requested.
(Note: Two consecutive 16 bit register represent one parameter.)

Response: Volt3 (219.25V)

01 (Hex)	04 (Hex)	00 (Hex)	04 (Hex)	00 (Hex)	02 (Hex)	30 (Hex)	0A (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Low	CRC Low	CRC High

Byte Count: Total number of data bytes received.
Data register 1 High Byte: Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte: Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte: Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte: Least significant 8 bits of Data register 2 of the parameter requested.
(Note: Two consecutive 16 bit register represent one parameter.)

TABLE 1: 3 X register addresses (measured parameters)

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
30001	1	Volts 1	00	0	•	•	•
30003	2	Volts 2	00	2	•	•	x
30005	3	Volts 3	00	4	•	•	x
30007	4	Current 1	00	6	•	•	•
30009	5	Current 2	00	8	•	•	x
30011	6	Current 3	00	A	•	•	x
30013	7	W1	00	C	•	x	•
30015	8	W2	00	E	•	x	x
30017	9	W3	00	10	•	x	x
30019	10	VA 1	00	12	•	x	•
30021	11	VA 2	00	14	•	x	x
30023	12	VA 3	00	16	•	x	x
30025	13	VAR 1	00	18	•	x	•
30027	14	VAR 2	00	1A	•	x	x
30029	15	VAR 3	00	1C	•	x	x
30031	16	PF 1	00	1E	•	x	•
30033	17	PF 2	00	20	•	x	x
30035	18	PF 3	00	22	•	x	x
30037	19	Phase Angle 1	00	24	•	x	•
30039	20	Phase Angle 2	00	26	•	x	x
30041	21	Phase Angle 3	00	28	•	x	x
30043	22	Volts Avg	00	2A	•	•	•

TABLE 1: Continued…

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
30045	23	Volts Sum	00	2C	•	•	•
30047	24	Current Avg	00	2E	•	•	•
30049	25	Current Sum	00	30	•	•	•
30051	26	Watt Avg	00	32	•	•	x
30053	27	Watt Sum	00	34	•	•	•
30055	28	VA Avg	00	36	•	•	x
30057	29	VA Sum	00	38	•	•	•
30059	30	VAR Avg	00	3A	•	•	x
30061	31	VAR Sum	00	3C	•	•	•
30063	32	PF Avg	00	3E	•	•	•
30065	33	PF Sum	00	40	•	x	x
30067	34	Phase Angle Avg	00	42	•	•	•
30069	35	Phase Angle Sum	00	44	•	x	x
30071	36	Freq	00	46	•	•	•
30073	37	Wh Import / Utility	00	48	•	•	•
30075	38	Wh Export / Gen	00	4A	•	•	•
30077	39	Capacitive / Utility VARh	00	4C	•	•	•
30079	40	Inductive / Gen VARh	00	4E	•	•	•
30081	41	VAh / Vah Utility	00	50	•	•	•
30085	43	W Demand (Import / Utility / Gen)	00	54	•	•	•
30087	44	W Max Demand (Import / Utility)	00	56	•	•	•
30089	45	W Demand (Export)	00	58	•	•	•
30091	46	W Max Demand (Export / Gen)	00	5A	•	•	•
30093	47	Old W Max Demand (Import / Utility)	00	5C	•	•	•
30095	48	Old W Max Demand (Export / Gen)	00	5E	•	•	•
30097	49	Old VA Utility Max Demand	00	60	•	•	•
30099	50	Old A Utility Max Demand	00	62	•	•	•
30101	51	VA Demand (Utility / Gen)	00	64	•	•	•
30103	52	V A Max Demand (Utility)	00	66	•	•	•
30105	53	A Demand (Utility / Gen)	00	68	•	•	•
30107	54	A Max Demand (Utility)	00	6A	•	•	•
30109	55	Wh Import / Utility Overflow count	00	6C	•	•	•
30111	56	-	-	-			
30113	57	Wh Export / Gen Overflow count	00	70	•	•	•
30115	58	-	-	-			
30117	59	Capacitive / Utility VARh Overflow count	00	74	•	•	•
30119	60	-	-	-			
30121	61	Inductive / Gen VARh Overflow count	00	78	•	•	•
30123	62	-	-	-			
30125	63	Vah / VAh Utility Overflow count	00	7C	•	•	•
30127	64	-	-	-			
30131	66	-	-	-			
30133	67	System Max Voltage	00	84	•	•	•
30135	68	System Min Voltage	00	86	•	•	•
30137	69	RPM	00	88	•	•	•
30141	71	System Max Currrent	00	8C	•	•	•

TABLE 1: Continued…

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
30143	72	System Min Current	00	8E	•	•	•
30145	73	Wh Import / Utility depending on update rate	00	90	•	•	•
30147	74	Wh Export / Gen depending on update rate	00	92	•	•	•
30149	75	Capacitive / Utility VArh depending on update rate	00	94	•	•	•
30151	76	Inductive / Gen VArh depending on update rate	00	96	•	•	•
30153	77	VAh / VAh Utility depending on update rate	00	98	•	•	•
30157	79	Wh Import / Utility Overflow count depending on update rate	00	9C	•	•	•
30159	80	Wh Export / Gen Overflow count depending on update rate	00	9E	•	•	•
30161	81	Capacitive / Utility VArh Overflow count depending on update rate	00	A0	•	•	•
30163	82	Inductive / Gen VArh Overflow count depending on update rate	00	A2	•	•	•
30165	83	VAh Utility Overflow count depending on update rate	00	A4	•	•	•
30169	85	Old Wh Import / Utility Overflow count	00	A8	•	•	•
30173	87	Old Wh Export / Gen Overflow count	00	AC	•	•	•
30177	89	Old Capacitive / Utility VArh Overflow count	00	B0	•	•	•
30179	90	Old Capacitive / Utility VArh	00	B2	•	•	•
30181	91	Old Inductive / Gen VArh Overflow count	00	B4	•	•	•
30183	92	Old Inductive / Gen VArh	00	B6	•	•	•
30185	93	Old VAh / VAh Utility Overflow count	00	B8	•	•	•
30187	94	Old VAh / VAh Utility	00	BA	•	•	•
30193	97	VA Max Demand (Gen)	00	C0	•	•	•
30195	98	A Max Demand (Gen)	00	C2	•	•	•
30197	99	Old VA Max Demand (Gen)	00	C4	•	•	•
30199	100	Old A Max Demand (Gen)	00	C6	•	•	•
30201	101	VL 1 - 2 (Calculated)	00	C8	•	x	x
30203	102	VL 2 - 3 (Calculated)	00	CA	•	x	x
30205	103	VL 3- 1 (Calculated)	00	CC	•	x	x
30207	104	V1 THD (%)	00	CE	•	•	•
30209	105	V2 THD (%)	00	D0	•	•	x
30211	106	V3 THD (%)	00	D2	•	•	x
30213	107	I1 THD (%)	00	D4	•	•	•
30215	108	I2 THD (%)	00	D6	•	•	x
30217	109	I3 THD (%)	00	D8	•	•	x
30219	110	System Voltage THD (%)	00	DA	•	•	•
30221	111	System Current THD (%)	00	DC	•	•	•
30225	113	I Neutral	00	E0	•	x	x
30227	114	Run Hour Utility	00	E2	•	•	•
30229	115	On Hour Utility	00	E4	•	•	•
30231	116	No. of Interruptions Utility	00	E6	•	•	•
30247	124	Old Wh Import / Utility	00	F6	•	•	•
30249	125	Old Wh Export / Gen	00	F8	•	•	•
30251	126	Old Run Hour Utility	00	FA	•	•	•
30255	128	Old On Hour Utility	00	FE	•	•	•
30263	132	Old No. of Interruptions Utility	01	06	•	•	•
30267	134	Relay Output 1 Status	01	0A	•	•	•

Note : 1. Parameters 1,2,3 are L-N Voltage for 3P 4W & L-L Voltage for 3P 3W.
2. Energy Overflow count feature is applicable to modbus only.
3. Relay Output 1 Status shows whether relay is Energized or De-energized.
1 :- Relay Energized 0:- Relay De-energized

TABLE 2: 3 X register addresses for 32-bit Integr Energy

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex	
			High Byte	Low Byte
30769	1	Active Energy Import / Utility	03	00
30771	2	Active Energy Export / GEN	03	02
30773	3	Reactive Energy Import / Utility	03	04
30775	4	Reactive Energy Export / GEN	03	06
30777	5	Apparent Energy Utility	03	08
30781	7	Active Energy Import / Utility Overflow Count	03	0C
30783	8	Active Energy Export / GEN Overflow Count	03	0E
30785	9	Reactive Energy Import Overflow Count	03	10
30787	10	Reactive Energy Export / GEN Overflow Count	03	12
30789	11	Apparent Energy Utility Overflow Count	03	14
30793	13	Active Energy Import / Utility on update rate*	03	18
30795	14	Active Energy Export / GEN on update rate*	03	1A
30797	15	Reactive Energy Import / Utility on update rate*	03	1C
30799	16	Reactive Energy Export / GEN on update rate*	03	1E
30801	17	Apparent Energy Utility on update rate*	03	20
30805	19	Active Energy Import / Utility Overflow Count on update rate*	03	24
30807	20	Active Energy Export / GEN Overflow Count on update rate*	03	26
30809	21	Reactive Energy Import / Utility Overflow Count on update rate*	03	28
30811	22	Reactive Energy Export / GEN Overflow Count on update rate*	03	2A
30813	23	Apparent Energy Utility Overflow Count on update rate*	03	2C
30817	25	Old Active Energy Import / Utility Overflow Count	03	30
30819	26	Old Active Energy Import / Utility	03	32
30821	27	Old Active Energy Export / GEN Overflow Count	03	34
30823	28	Old Active Energy Export / GEN	03	36
30825	29	Old Reactive Energy Import / Utility Overflow Count	03	38
30827	30	Old Reactive Energy Import / Utility	03	3A
30829	31	Old Reactive Energy Export / GEN Overflow Count	03	3C
30831	32	Old Reactive Energy Export / GEN	03	3E
30833	33	Old Apparent Energy Utility Overflow Count	03	40
30835	34	Old Apparent Energy Utility	03	42

***Note:**

1. The values are updated depending on update rate which is settable by user.
   For example, if user set update rate 15 min, then the values on these registers (marked with *) will get updated on every 15 min.
2. For model BM1200, energy is in terms of Import and Export.

17.2 Accessing 4 X register for reading measured values

Two consecutive 16 bit registers represent one parameter. Refer TABLE 3 for the addresses of 4X registers (Parameters measured by the instruments). Each parameter is held in the 4X registers. Modbus Code 03 is used to access all parameters.

Example:

To read parameter,
Volts 3: Start address = 04 (Hex) Number of registers = 02

Note: Number of registers = Number of parameters x 2

Each Query for reading the data must be restricted to 20 parameters or less. Exceeding the 20 parameter limit will cause a ModBus exception code to be returned.

Query:

01 (Hex)	03 (Hex)	10 (Hex)	04 (Hex)	00 (Hex)	02 (Hex)	81 (Hex)	0A (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Low	CRC Low	CRC High

Start Address High: Most significant 8 bits of starting address of the parameter requested.
Start Address low: Least significant 8 bits of starting address of the parameter requested.
Number of register Hi: Most significant 8 bits of Number of registers requested.
Number of register Lo: Least significant 8 bits of Number of registers requested.
(Note : Two consecutive 16 bit register represent one parameter.)

Response: Volt3 (219.25V)

01 (Hex)	03 (Hex)	04 (Hex)	43 (Hex)	5B (Hex)	40 (Hex)	1B (Hex)	EF (Hex)	AF (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count: Total number of data bytes received.
Data register 1 High Byte: Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte: Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte: Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte: Least significant 8 bits of Data register 2 of the parameter requested.
(Note: Two consecutive 16 bit register represent one parameter.)

TABLE 3: 4 X register addresses (measured parameters)

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44097	1	Volts 1	10	00	•	•	•
44099	2	Volts 2	10	02	•	•	x
44101	3	Volts 3	10	04	•	•	x
44103	4	Current 1	10	06	•	•	•
44105	5	Current 2	10	08	•	•	x
44107	6	Current 3	10	0A	•	•	x
44109	7	W1	10	0C	•	x	•
44111	8	W2	10	0E	•	x	x
44113	9	W3	10	10	•	x	x
44115	10	VA 1	10	12	•	x	•
44117	11	VA 2	10	14	•	x	x
44119	12	VA 3	10	16	•	x	x
44121	13	VAR 1	10	18	•	x	•
44123	14	VAR 2	10	1A	•	x	x
44125	15	VAR 3	10	1C	•	x	x
44127	16	PF 1	10	1E	•	x	•

TABLE 3: Continued…

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44129	17	PF 2	10	20	•	x	x
44131	18	PF 3	10	22	•	x	x
44133	19	Phase Angle 1	10	24	•	x	•
44135	20	Phase Angle 2	10	26	•	x	x
44137	21	Phase Angle 3	10	28	•	x	x
44139	22	Volts Avg	10	2A	•	•	•
44141	23	Volts Sum	10	2C	•	•	•
44143	24	Current Avg	10	2E	•	•	•
44145	25	Current Sum	10	30	•	•	•
44147	26	Watt Avg	10	32	•	•	x
44149	27	Watt Sum	10	34	•	•	•
44151	28	VA Avg	10	36	•	•	x
44153	29	VA Sum	10	38	•	•	•
44155	30	VAR Avg	10	3A	•	•	x
44157	31	VAR Sum	10	3C	•	•	•
44159	32	PF Avg	10	3E	•	•	•
44161	33	PF Sum	10	40	•	x	x
44163	34	Phase Angle Avg	10	42	•	•	•
44165	35	Phase Angle Sum	10	44	•	x	x
44167	36	Freq	10	46	•	•	•
44169	37	Wh Import / Utility	10	48	•	•	•
44171	38	Wh Export / Gen	10	4A	•	•	•
44173	39	Capacitive / Utility VARh	10	4C	•	•	•
44175	40	Inductive / Gen VARh	10	4E	•	•	•
44177	41	VAh / Vah Utility	10	50	•	•	•
44181	43	W Demand (Import / Utility / Gen)	10	54	•	•	•
44183	44	W Max Demand (Import / Utility)	10	56	•	•	•
44185	45	W Demand (Export)	10	58	•	•	•
44187	46	W Max Demand (Export / Gen)	10	5A	•	•	•
44189	47	Old W Max Demand (Import / Utility)	10	5C	•	•	•
44191	48	Old W Max Demand (Export / Gen)	10	5E	•	•	•
44193	49	Old VA Utility Max Demand	10	60	•	•	•
44195	50	Old A Utility Max Demand	10	62	•	•	•
44197	51	VA Demand (Utility / Gen)	10	64	•	•	•
44199	52	VA Max Demand (Utility)	10	66	•	•	•
44201	53	A Demand (Utility / Gen)	10	68	•	•	•
44203	54	A Max Demand (Utility)	10	6A	•	•	•
44205	55	Wh Import / Utility Overflow count	10	6C	•	•	•
44207	56	-	-	-			
44209	57	Wh Export / Gen Overflow count	10	70	•	•	•
44211	58	-	-	-			
44213	59	Capacitive / Utility VARh Overflow count	10	74	•	•	•
44215	60	-	-	-			
44217	61	Inductive / Gen VARh Overflow count	10	78	•	•	•
44219	62	-	-	-			
44221	63	Vah / VAh Utility Overflow count	10	7C	•	•	•

TABLE 3: Continued…

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44223	64	-	-	-			
44227	66	-	-	-			
44229	67	System Max Voltage	10	84	•	•	•
44231	68	System Min Voltage	10	86	•	•	•
44233	69	RPM	10	88	•	•	•
44237	71	System Max Currrent	10	8C	•	•	•
44239	72	System Min Current	10	8E	•	•	•
44241	73	Wh Import / Utility depending on update rate	10	90	•	•	•
44243	74	Wh Export / Gen depending on update rate	10	92	•	•	•
44245	75	Capacitive / Utility VArh depending on update rate	10	94	•	•	•
44247	76	Inductive / Gen VArh depending on update rate	10	96	•	•	•
44249	77	VAh / VAh Utility depending on update rate	10	98	•	•	•
44253	79	Wh Import / Utility Overflow count depending on update rate	10	9C	•	•	•
44255	80	Wh Export / Gen Overflow count depending on update rate	10	9E	•	•	•
44257	81	Capacitive / Utility VArh Overflow count depending on update rate	10	A0	•	•	•
44259	82	Inductive / Gen VArh Overflow count depending on update rate	10	A2	•	•	•
44261	83	VAh Utility Overflow count depending on update rate	10	A4	•	•	•
44265	85	Old Wh Import / Utility Overflow count	10	A8	•	•	•
44269	87	Old Wh Export / Gen Overflow count	10	AC	•	•	•
44273	89	Old Capacitive / Utility VArh Overflow count	10	B0	•	•	•
44275	90	Old Capacitive / Utility VArh	10	B2	•	•	•
44277	91	Old Inductive / Gen VArh Overflow count	10	B4	•	•	•
44279	92	Old Inductive / Gen VArh	10	B6	•	•	•
44281	93	Old VAh / VAh Utility Overflow count	10	B8	•	•	•
44283	94	Old VAh / VAh Utility	10	BA	•	•	•
44289	97	VA Max Demand (Gen)	10	C0	•	•	•
44291	98	A Max Demand (Gen)	10	C2	•	•	•
44293	99	Old VA Max Demand (Gen)	10	C4	•	•	•
44295	100	Old A Max Demand (Gen)	10	C6	•	•	•
44297	101	VL 1 - 2 (Calculated)	10	C8	•	x	x
44299	102	VL 2 - 3 (Calculated)	10	CA	•	x	x
44301	103	VL 3- 1 (Calculated)	10	CC	•	x	x
44303	104	V1 THD (%)	10	CE	•	•	•
44305	105	V2 THD (%)	10	D0	•	•	x
44307	106	V3 THD (%)	10	D2	•	•	x
44309	107	I1 THD (%)	10	D4	•	•	•
44311	108	I2 THD (%)	10	D6	•	•	x
44313	109	I3 THD (%)	10	D8	•	•	x
44315	110	System Voltage THD (%)	10	DA	•	•	•
44317	111	System Current THD (%)	10	DC	•	•	•
44321	113	I Neutral	10	E0	•	x	x

TABLE 3: Continued…

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex		3P 4W	3P 3W	1P 2W
			High Byte	Low Byte			
44323	114	Run Hour Utility	10	E2	•	•	•
44325	115	On Hour Utility	10	E4	•	•	•
44327	116	No. of Interruptions Utility	10	E6	•	•	•
44343	124	Old Wh Import / Utility	10	F6	•	•	•
44345	125	Old Wh Export / Gen	10	F8	•	•	•
44347	126	Old Run Hour Utility	10	FA	•	•	•
44351	128	Old On Hour Utility	10	FE	•	•	•
44359	132	Old No. of Interruptions Utility	11	06	•	•	•
44363	134	Relay Output 1 Status	11	0A	•	•	•

Note: 1. Parameters 1,2,3 are L-N Voltage for 3P 4W & L-L Voltage for 3P 3W.
2. Energy Overflow count feature is applicable to modbus only.

TABLE 4: 4 X register addresses for 32-bit Integr Energy

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex	
			High Byte	Low Byte
44865	1	Active Energy Import / Utility	13	00
44867	2	Active Energy Export / GEN	13	02
44869	3	Reactive Energy Import / Utility	13	04
44871	4	Reactive Energy Export / GEN	13	06
44873	5	Apparent Energy Utility	13	08
44877	7	Active Energy Import / Utility Overflow Count	13	0C
44879	8	Active Energy Export / GEN Overflow Count	13	0E
44881	9	Reactive Energy Import Overflow Count	13	10
44883	10	Reactive Energy Export / GEN Overflow Count	13	12
44885	11	Apparent Energy Utility Overflow Count	13	14
44889	13	Active Energy Import / Utility on update rate*	13	18
44891	14	Active Energy Export / GEN on update rate*	13	1A
44893	15	Reactive Energy Import / Utility on update rate*	13	1C
44895	16	Reactive Energy Export / GEN on update rate*	13	1E
44897	17	Apparent Energy Utility on update rate*	13	20
44901	19	Active Energy Import / Utility Overflow Count on update rate*	13	24
44903	20	Active Energy Export / GEN Overflow Count on update rate*	13	26
44905	21	Reactive Energy Import / Utility Overflow Count on update rate*	13	28
44907	22	Reactive Energy Export / GEN Overflow Count on update rate*	13	2A
44909	23	Apparent Energy Utility Overflow Count on update rate*	13	2C
44913	25	Old Active Energy Import / Utility Overflow Count	13	30
44915	26	Old Active Energy Import / Utility	13	32
44917	27	Old Active Energy Export / GEN Overflow Count	13	34
44919	28	Old Active Energy Export / GEN	13	36
44921	29	Old Reactive Energy Import / Utility Overflow Count	13	38
44923	30	Old Reactive Energy Import / Utility	13	3A
44925	31	Old Reactive Energy Export / GEN Overflow Count	13	3C
44927	32	Old Reactive Energy Export / GEN	13	3E
44929	33	Old Apparent Energy Utility Overflow Count	13	40
44931	34	Old Apparent Energy Utility	13	42

17.3 Accessing 4 X register for reading & Writing Settings

Each setting is held in the 4X registers. ModBus code 03 is used to read the current setting & code 16 is used to write/change the setting. Refer **TABLE** for 4X Register addresses.

Example: Reading System type

System type: Start address = 0A (Hex)
Number of registers = 02

Note : Number of registers = Number of parameters x 2

Query:

01 (Hex)	03 (Hex)	00 (Hex)	0A (Hex)	00 (Hex)	02 (Hex)	E4 (Hex)	09 (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Low	CRC Low	CRC High

Start Address High: Most significant 8 bits of starting address of the parameter requested.
Start Address low: Least significant 8 bits of starting address of the parameter requested.
Number of register Hi: Most significant 8 bits of Number of registers requested.
Number of register Lo: Least significant 8 bits of Number of registers requested.
(Note: Two consecutive 16 bit register represent one parameter.)

Response: System Type (3phase 4 wire = 3)

01 (Hex)	03 (Hex)	04 (Hex)	40 (Hex)	40 (Hex)	00 (Hex)	00 (Hex)	EE (Hex)	27 (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count : Total number of data bytes received.
Data register 1 High Byte: Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte: Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte: Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte: Least significant 8 bits of Data register 2 of the parameter requested.
(Note: Two consecutive 16 bit register represent one parameter.)

Example : Writing System type

System type : Start address = 0A (Hex)
Number of registers = 02

Query: (Change System type to 3phase 3wire = 2)

01 (Hex)	10 (Hex)	00 (Hex)	0A (Hex)	00 (Hex)	02 (Hex)	04 (Hex)	40 (Hex)	00 (Hex)	00 (Hex)	00 (Hex)	66 (Hex)	10 (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Low	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count: Total number of data bytes received.
Data register 1 High Byte: Most significant 8 bits of Data register 1 of the parameter requested.
Data register 1 Low Byte: Least significant 8 bits of Data register 1 of the parameter requested.
Data register 2 High Byte: Most significant 8 bits of Data register 2 of the parameter requested.
Data register 2 Low Byte: Least significant 8 bits of Data register 2 of the parameter requested.
(Note: Two consecutive 16 bit register represent one parameter.)

Response:

01 (Hex)	10 (Hex)	00 (Hex)	0A (Hex)	00 (Hex)	02 (Hex)	61 (Hex)	CA (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Low	Data Register2 Low Byte	CRC Low

Start Address High: Most significant 8 bits of starting address of the parameter requested.
Start Address low: Least significant 8 bits of starting address of the parameter requested.
Number of register Hi: Most significant 8 bits of Number of registers requested.
Number of register Lo: Least significant 8 bits of Number of registers requested.
(Note: Two consecutive 16 bit register represent one parameter.)

TABLE 5: 4 X register addresses

Adress (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Adress Hex		Default Value
				High Byte	Low Byte	
40003	1	Demand Integration Time	R/Wp	00	02	8
40005	2	Energy Output	R/Wp	00	04	2
40007	3	System Voltage	R	00	06	As per order
40009	4	System Current	R	00	08	5
40011	5	System Type*	R/Wp	00	0A	3
40015	7	Reset Parameters	Wp	00	0E	0
40017	8	Number of Poles	R/Wp	00	10	2
40019	9	RS485 Set-up Code	R/Wp	00	12	4
40021	10	Node Address	R/Wp	00	14	As per set
40033	16	PT Primary	R/Wp	00	20	System Voltage
40035	17	CT Primary	R/Wp	00	22	System Current
40037	18	System Power	R	00	24	System voltage *current* 1.732
40039	19	Energy Digit Reset Count	R/Wp	00	26	8
40041	20	Register Order / Word Order	R/Wp	00	28	0
40043	21	CT Secondary	R/Wp	00	2A	5
40045	22	PT Secondary	R/Wp	00	2C	System Voltage
40071	35	Password	R/W	00	46	1
40077	38	Auto Scroll	R/Wp	00	4C	0
40079	39	30mA Noise Current Elimination	R/Wp	00	4E	0
40081	40	Energy Update Rate	R/Wp	00	50	15
40083	41	Facory Reset	Wp	00	52	0
40085	42	Backlight ON/OFF	R/Wp	00	54	0
40087	43	Impulse Selection	R/Wp	00	56	1
40089	44	System VA Calculation method	R/Wp	00	58	0
40097	48	Serial Number	R	00	60	
40099	49	Model Number	R	00	62	
40101	50	Version Number	R	00	64	
40103	51	User Assignable Screen ON/OFF	R/Wp	00	66	0
40105	52	User Screen 1	R/Wp	00	68	8
40107	53	User Screen 2	R/Wp	00	6A	9
40109	54	User Screen 3	R/Wp	00	6C	10
40111	55	User Screen 4	R/Wp	00	6E	11
40113	56	User Screen 5	R/Wp	00	70	12
40115	57	User Screen 6	R/Wp	00	72	8
40117	58	User Screen 7	R/Wp	00	74	9
40119	59	User Screen 8	R/Wp	00	76	10
40121	60	User Screen 9	R/Wp	00	78	11
40123	61	User Screen 10	R/Wp	00	7A	12

*NOTE: System type can be changed in 3 Phase system only

Wp: Write protected
R: Read only
R/Wp: Read & Write protected

Explanation for 4X register:

Adress	Parameter	Description
40003	Demand Integration Time	Demand period represents demand time in minutes. The applicable values are 8,15,20 or 30. Writing any other value will return an error.
40005	Energy Output	This address is used to set energy output in Wh,kWh & MWh. Write one of the following value to this address. 1: Energy in Wh. 2: Energy in KWh. 3: Energy in MWh.
40007	System Voltage	This address is read only and displays System Voltage
40009	System Current	This address is read only and displays System Current
40011	System Type	This address is used to set the System type. Write one of the following value to this address. 1: 1 Phase 2 Wire 2: 3 Phase 3 Wire 3: 3 Phase 4 Wire. Writing any other value will return error.
40015	Reset Paramters	This address is used to reset different parameters. Write specific value to this register to reset the corresponding parameter. Writing any other value will return an error. Following are the values to reset various data. 0: Energy Reset 1: Demand Reset 2: System Min Values Reset 3: System Max Values Reset 4: Run hour & On hour Reset 5: No of Interruptions Reset 6: Reset All data
40017	Number of Poles	This address is used to set the no. of poles of generator of which RPM is to be measured. The value must be between 2 to 40. Writing any other value will return an error.
40019	Rs485 Set-up Code	This address is used to set the baud rate, Parity, Number of stop bits. Refer to TABLE 8 for details.
40021	Node Address	This register address is used to set Device address between 1 to 247 .
40033	PT Primary	This address allows the user to set PT Primary value (in terms of VL-L). The settable range is 100 VL-L to 1200 kVL-L for all system types & also depends on the per phase 1000 MVA Restriction of power combined with CT primary.
40035	CT Pimary	This address allows the user to set CT Primary value. The settable range is 1 to 9999. It also depends on the per phase 1000 MVA Restriction of power combined with PT primary.
40037	Sys Power	System Power (Read Only) is the Nominal system power based on the values of Nominal system volts and Nominal system current.
40039	Energy Digit Reset Count	This address is used to set Energy Digit Reset Count value. Energy count can be configured to reset in between 7 to 9.
40041	Word Order	Word Order controls the order in which Multifunction Meter receives or sends floating - point numbers:- normal or reversed register order . In normal mode, the two registers that make up a floating point numbers are sent most significant bytes first. In reversed register mode, the two regis-ters that make up a floating point numbers are sent least significant bytes first. To set the mode, write the value ‘2141.0’ into this register-the instru-ment will detect the order used to send this value and set that order for all ModBus transaction involving floating point numbers.

Continue Explanation for 4X register:

Adress	Parameter	Description
40043	CT secondary	This address is used to read and write the CT secondary value. Write one of the following values to this address. 1: 1A CT secondary 5: 5A CT secondary writing any other value will return an error.
40045	PT secondary	This address is used to read and write the PT secondary value. Ref TABLE 8 for the range of PT secondary settable values.
40071	Password	This address is used to set & reset the password. Valid Range of Pass-word can be set is 0000 - 9999 . 1) If password lock is present & if this location is read it will return zero. 2) If Password lock is absent & if this location is read it will return One. 3) If password lock is present & to disable this lock first send valid pas word to this location then write “0000” to this location 4) If password lock is present & to modify 4X parameter first send valid password to this location so that 4X parameter will be accessible for modification. 5) If for in any of the above case invalid password is send then meter will return exceptional error 2.
40077	Auto scroll	This address is used to activate or de-activate the auto scrolling. Write 0: Deactivate 1: Activate, Writing any other value will return an error.
40079	30mA Noise current Elimination	This address is used to activate or de-activate the 30 mA noise current elimination write 0: Deactivate 30 (Decimal): Activate Writing any other value will return an error.
40081	Energy Update Rate	This address is used to specify update rate of energy in corresponding 3X registers. The valid values for update rate are from 1 to 60 min. Writing any other value will return an error.
40083	Factory Reset	This address allows the user to reset the instrument to factory settings. Refer the Default Values in TABLE 5 for factory settings. Write 5555 at this address to reset the instrument. Writing any other value will return an error.
40085	Backlight ON/OFF	This address is used to turn On or turn Off the backlit. 0: Backlit On 1: Backlit Off Writing any other value will return an error.
40087	Impulse Selection	This address is used to select the energy to which impulse is to be as-signed. Writing any other value will return an error. 0: None 1: Active Energy 2: Reactive Energy 3: Apparent Energy
40089	System VA Calculation method	This address is used to select the method to be used to calculate System VA. 0: Arithmetic method (VAsys = VA1 + VA2 + VA3) 1: Vector method (VAsys = sqrt((Wsys)2 + (VArsys)2) Writing any other value will return an error.
40097	Serial Number	This address is read only and displays the serial number of the meter.
40099	Model Number	This address is read only and displays the model number of the meter.
40101	Version Number	This address is read only and displays the model number of the meter.
40103	User Assignable Screen On/Off	This address is used to activate or deactivate the User Assignable Screen feature. 0: Deactivate 10: 10 User screens 5: 5 User screens Writing any other value will return an error.
40105 to 40123	User Screens 1 to 10	These addresses are used to assign the screen numbers to user screens 1 to 10 respectively. Refer to TABLE 6 for screen numbers. Writing any other value will return an error.

NOTE: Changing system type, PT/CT ratio, Energy Output, Energy Digit Reset Count will reset the energy.

Table 6: Measurement Screens (Model wise)

Screen No.	Parameter	On Display	On Modbus	Screen No.	Parameter	On Display	On Modbus
1	Sys Power / Voltage / Current	•	•	23	Max W IMP / VA / Current Demand	•	•
2	Voltage L1/L2/L3	•	•	24	W EXP / VA / Current Demand	•	•
3	Voltage L1-2/L2-3/L3-1	•	•	25	Max W EXP/VA/Current Demand	•	•
4	Current L1/L2/L3	•	•	26	Per Phase Voltage THD	•	•
5	Sys RPM / Frequency	•	•	27	Per Phase Current THD	•	•
6	Sys W / VA / Phase Angle	•	•	28	Sys Voltage / Current THD	•	•
7	Sys VAr / PF	•	•	29	Run Hour	•	•
8	Active Energy Import	•	•	30	On Hour	•	•
9	Active Energy Export	•	•	35	No of Interruptions	•	•
10	Capacitive Reactive Energy	•	•	37	I neutral	•	•
11	Inductive Reactive Energy	•	•	38	Old Active Import Energy	•	•
12	Apparent Energy	•	•	39	Old Active Export Energy	•	•
14	Min Sys Voltage & Current	•	•	41	Old Reactive Capacitive Energy	•	•
15	Max Sys Voltage & Current	•	•	42	Old Reactive Inductive Energy	•	•
16	R Phase W/ VA / Phase Angle	•	•	43	Old Apparent Energy	•	•
17	Y Phase W/ VA / Phase Angle	•	•	45	Old Run Hour	•	•
18	B Phase W/ VA / Phase Angle	•	•	46	Old On Hour	•	•
19	R Phase VAr / PF	•	•	51	Old No of Interruptions	•	•
20	Y Phase VAr / PF	•	•	53	Current Reversal	•	x
21	B Phase VAr / PF	•	•	54	Phase Rotation Error	•	x
22	W IMP / VA / Current Demand	•	•	55	Phase Absent	•	x

Table 7: RS485 Set-up Code

Baud Rate	Parity	Stop Bit	Decimal value
4800	NONE	01	0
4800	NONE	02	1
4800	EVEN	01	2
4800	ODD	01	3
9600	NONE	01	4
9600	NONE	02	5
9600	EVEN	01	6
9600	ODD	01	7
19200	NONE	01	8
19200	NONE	02	9
19200	EVEN	01	10
19200	ODD	01	11
38400	NONE	01	12
38400	NONE	02	13
38400	EVEN	01	14
38400	ODD	01	15

NOTE: Codes not listed in the table above may give rise to unpredictable results including loss of communication. Exercise caution when attempting to change mode via direct Modbus writes.

Table 8: PT Secondary Ranges

Input Voltage	PT Secondary Settable Range
$110V_{L-L}$ ($63.5V_{L-N}$)	$100V…125V_{L-L}$ ($57V…72V_{L-N}$)
$230V_{L-L}$ ($133V_{L-N}$)	$126V…250V_{L-L}$ ($73V…144V_{L-N}$)
$415V_{L-L}$ ($239.6V_{L-N}$)	$251V…480V_{L-L}$ ($145V…277V_{L-N}$)

17.4 User Assignable Modbus Register

The Multifunction Energy Meter contains 20 user assignable registers in the address range of 0x200 (30513) to 0x226 (30551) for 3X registers (see TABLE 9) and address range of 0x1E00 (47681) to 0x1E26 (47719) for 4X registers (see TABLE 10).
Any of the parameter addresses (3X register addresses TABLE 1 and 4X register addresses TABLE 3) accessible in the instrument can be mapped to these 20 user assignable registers.
Parameters (3X and 4X registers addresses) that reside in different locations may be accessed by the single re-quest by re-mapping them to adjacent address in the user assignable registers area.
The actual address of the parameters (3X and 4X registers addresses) which are to be accessed via address 0x200 to 0x226 (or 0x1E00 to 0x1E26) are specified in 4X Register 0x200 to 0x213. (see TABLE 11)

TABLE 9: User Assignable 3X Data Registers

Adress (Register)	Assignable Register	Modbus Start Adress Hex	
		High Byte	Low Byte
30513	Assignable Reg 1	02	00
30515	Assignable Reg 2	02	02
30517	Assignable Reg 3	02	04
30519	Assignable Reg 4	02	06
30521	Assignable Reg 5	02	08
30523	Assignable Reg 6	02	0A
30525	Assignable Reg 7	02	0C
30527	Assignable Reg 8	02	0E
30529	Assignable Reg 9	02	10
30531	Assignable Reg 10	02	12
30533	Assignable Reg 11	02	14
30535	Assignable Reg 12	02	16
30537	Assignable Reg 13	02	18
30539	Assignable Reg 14	02	1A
30541	Assignable Reg 15	02	1C
30543	Assignable Reg 16	02	1E
30545	Assignable Reg 17	02	20
30547	Assignable Reg 18	02	22
30549	Assignable Reg 19	02	24
30551	Assignable Reg 20	02	26

TABLE 10: User Assignable 4X Data Registers

Adress (Register)	Assignable Register	Modbus Start Adress Hex	
		High Byte	Low Byte
47681	Assignable Reg 1	1E	00
47683	Assignable Reg 2	1E	02
47685	Assignable Reg 3	1E	04
47687	Assignable Reg 4	1E	06
47689	Assignable Reg 5	1E	08
47691	Assignable Reg 6	1E	0A
47693	Assignable Reg 7	1E	0C
47695	Assignable Reg 8	1E	0E
47697	Assignable Reg 9	1E	10
47699	Assignable Reg 10	1E	12
47701	Assignable Reg 11	1E	14
47703	Assignable Reg 12	1E	16
47705	Assignable Reg 13	1E	18
47707	Assignable Reg 14	02	1A
47709	Assignable Reg 15	02	1C
47711	Assignable Reg 16	02	1E
47713	Assignable Reg 17	02	20
47715	Assignable Reg 18	02	22
47717	Assignable Reg 19	02	24
47719	Assignable Reg 20	02	26

TABLE 11: User Assignable mapping register (4X register)

Adress (Register)	Assignable Register	Modbus Start Adress Hex	
		High Byte	Low Byte
40513	Mapped Add for register #0x0200	02	00
40514	Mapped Add for register #0x0202	02	01
40515	Mapped Add for register #0x0204	02	02
40516	Mapped Add for register #0x0206	02	03
40517	Mapped Add for register #0x0208	02	04
40518	Mapped Add for register #0x020A	02	05
40519	Mapped Add for register #0x020C	02	06
40520	Mapped Add for register #0x020E	02	07
50521	Mapped Add for register #0x0210	02	08
40522	Mapped Add for register #0x0212	02	09
40523	Mapped Add for register #0x0214	02	0A
40524	Mapped Add for register #0x0216	02	0B
40527	Mapped Add for register #0x0218	02	0C
40528	Mapped Add for register #0x021A	02	0D
40529	Mapped Add for register #0x021C	02	0E
40530	Mapped Add for register #0x021E	02	0F
40531	Mapped Add for register #0x0220	02	10
40532	Mapped Add for register #0x0222	02	11
40533	Mapped Add for register #0x0224	02	12
40534	Mapped Add for register #0x0226	02	13

Assigning parameter to User Assignable Registers:

To access the voltage2 (3X address 0x0002) and Power Factor1 (3X address 0x001E) through user assignable register assign these addresses to 4x register (TABLE 11) 0x0200 and 0x0201 respectively.

Assigning Query:

							Voltage 2* (3X Adress 0x0002)		Voltage 2* (3X Adress 0x0002)			
01 (Hex)	10 (Hex)	02 (Hex)	00 (Hex)*	00 (Hex)*	02 (Hex)*	04 (Hex)	00 (Hex)	02 (Hex)	00 (Hex)	1E (Hex)	CB (Hex)	07 (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Low	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

* Note : Parameters should be assigned in Multiple of two i.e. 2,4,6,8.....20.

Response:

01 (Hex)	10 (Hex)	02 (Hex)	00 (Hex)	00 (Hex)	02 (Hex)	40 (Hex)	70 (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Low	CRC Low	CRC High

Reading Parameter data through User Assignable Registers:

In assigning query Voltage 2 & Power Factor 1 parameters were assigned to 0x 200 & 0x201 (TABLE 13) which will point to user assignable 3x registers 0x200 and 0x202 (TABLE 11). So to read Voltage2 and Power Factor1 data reading query should be as below.

Query:

01 (Hex)	04 (Hex)	02 (Hex)	00 (Hex)	00 (Hex)	04 (Hex)**	F0 (Hex)	71 (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Low	CRC Low	CRC High

Start Address High: Most significant 8 bits of starting address of User assignable register.
Start Address low: Least significant 8 bits of starting address of User assignable register.
Number of register Hi: Most significant 8 bits of Number of registers requested.
Number of register Lo: Least significant 8 bits of Number of registers requested.

**Note: Two consecutive 16 bit register represent one parameter. Since two parameters are requested four regis-ters are required.

Response:

			Voltage 2 Data				Power Factor 1 Data					
01 (Hex)	04 (Hex)	08 (Hex)	43 (Hex)*	5B (Hex)*	4E (Hex)*	04 (Hex)	3F (Hex)	80 (Hex)	00 (Hex)	00 (Hex)	79 (Hex)	3F (Hex)
Device Address	Function Code	Byte Count	Data Register-1 High Byte	Data Register-1 Low Byte	Data Register-2	Data Register-2 Low Byte	Data Register-3 High Byte	Data Register-3 Low Byte	Data Register-4	Data Register-4 Low Byte	CRC Low	CRC High

(Starting Address)	User Assignable mapping Register (4x Register Table13)		(Starting Address)	User Assignable mapping Register (4x Register Table11)	
0x200	Voltage 2 (0x0002)	→	0x200	0x200 (16 bit)	0x201 (16 bit)
0x201	Power factor 1 (0x001E)	→	0x202	0x202 (16 bit)	0x203 (16 bit)
0x202	Wh Import (0x0048)	→	0x204	0x204 (16 bit)	0x205 (16 bit)
0x203	Frequency (0x0046)	→	0x206	0x206 (16 bit)	0x207 (16 bit)
⋮	⋮		⋮	⋮	⋮
0x212	Current 1 (0x0006)	→	0x224	0x224 (16 bit)	0x225 (16 bit)
0x213	VAh (0x0050)	→	0x226	0x226 (16 bit)	0x227 (16 bit)

To get the data through User Assignable Register go through the following steps:

1) Assign starting addresses(TABLE 1) of parameters of interest to "User assignable mapping registers" in a sequence in which they are to be accessed (see section **"Assigning Parameter to User Assignable Registers").**
2) Once the parameters are mapped, data can be acquired by using "User assignable data register" Starting address. i.e to access data of Voltage2, Power factor1,Wh import, Frequency send query with starting address 0x200 with number of register 8 or individually parameters can be accessed. For example, if current1 is to be accessed use starting address 0x212. (See section **Reading Parameter data through User Assignable Registers).**

17.5 Connection for RS485 Output