Device handbook
SIRAX BM1400

Operating Instructions SIRAX BM1400

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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 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

Table of contents

1. Introduction

1.1 Purpose of this document

This document describes the universal measurement device SIRAX BM1400. 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 BM1400. 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 BM1400
- Safety instructions (multiple languages)
- Connection set: 4 mounting clamps

1.3 Further documents

The following documents are provided electronically via www.camillebauer.com:
- Safety instructions SIRAX BM1400
- Operating Instructions SIRAX BM1400

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 BM1400 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 3-phase mains with 3- or 4-wire.

3.2 Available measurement data

Measured Parameters	**Units**	**3P 3W**	**3P 4W**
System Voltage	V	•	•
Voltage UL1-N / UL2-N / UL3-N	V	–	•
Voltage UL1-2 / UL2-3 / UL3-1	V	•	•
System Current	A	•	•
Current IL1 / IL2 / IL3	A	•	•
Neutral Current	A	–	•
Frequency	Hz	•	•
Active Power	kW	–	•
Reactive Power	kVAr	–	•
Apparent Power	kVA	–	•
Power Factor	–	–	•
Phase Angle	degree	–	•
Active Import Energy (8 Digit resolution)*	kWh	•	•
Active Export Energy (8 Digit resolution)*	kWh	•	•
Capacitive Reactive Energy (8 Digit resolution)*	kVArh	•	•
Inductive Reactive Energy (8 Digit resolution)*	kVArh	•	•
Apparent Energy (8 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	–	•	•
Phase Absent Indication	–	•	•
Current Absent Indication	–	•	•
Voltage THD	%	•	•
Current THD	%	•	•
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)*

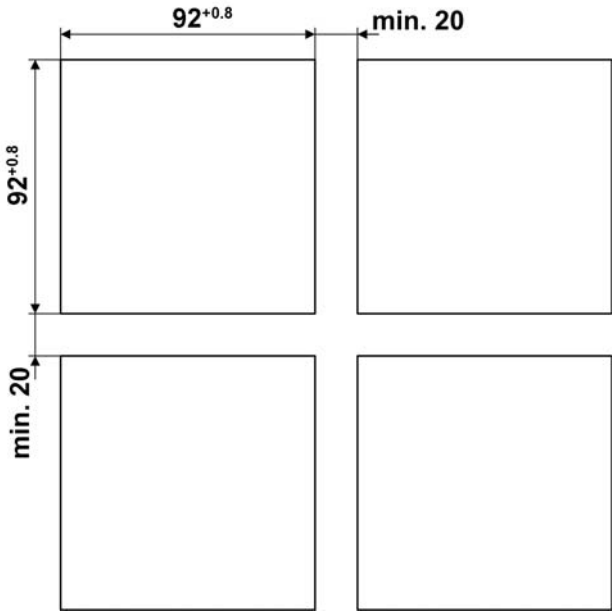
4. Mechanical mounting

The SIRAX BM1400 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**

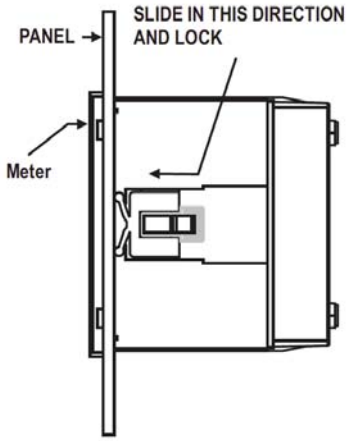
4.1 Panel cut out

Dimensional drawing BM1400: See section 15.1



4.2 Mounting of the device

The device is suitable for panel widths up to 5mm and a panel cutout of 96 x 96 mm.



Variant with Mounting clamps

a) Slide the device into the cutout from the outside

b) Mounting is by four side clamps, slide the side clamps through side slot till side clamp gets firmly locked in a groove (Refer fig.) Consideration should be given to the space required behind the instrument to allow for bends in the connection cables.

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).

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 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.

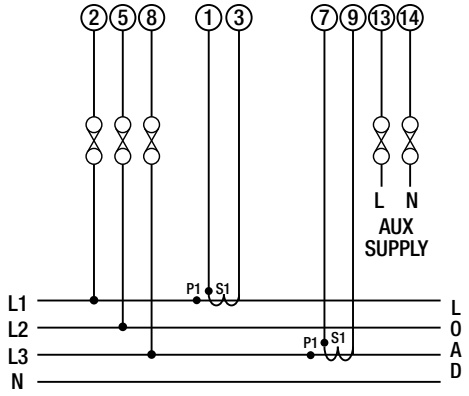
When using **voltage transformers** you have to ensure that their secondary connections never will be short-circuited.

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.

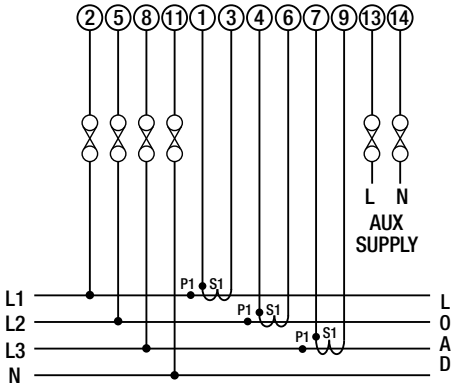
The connection of the inputs depends on the configured system (connection type).

Three Phase - three wire system, unbalanced load



Direct connection

Three Phase - four wire system, unbalanced load



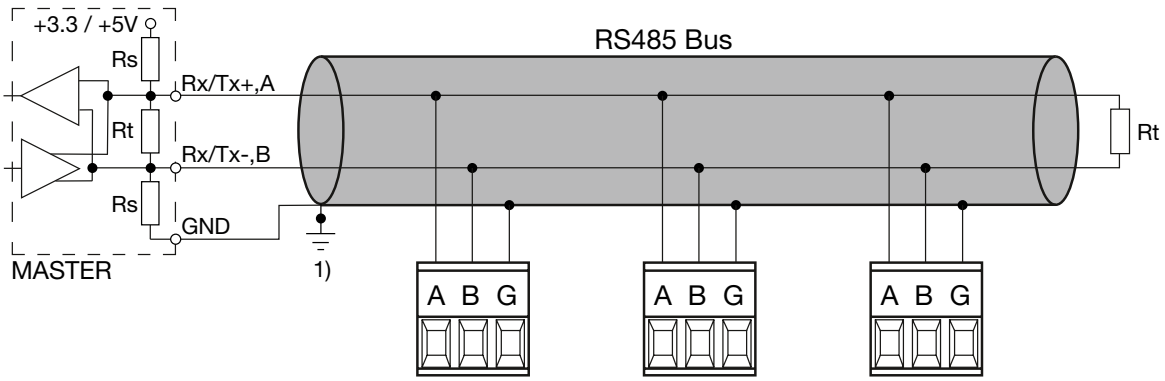
Direct connection

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. However, the Modbus interface cannot be used for device parameterization.



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.

SIRAX BM1400
ORDER CODE: 174988
SR No.: 15/11/0001
CLASS: 0.5 CAT III 300V Max. V18.05
INPUT: 3PH. 440 V L - L, 5A/1A, 45…66Hz
OPTION:
AUXILIARY: 100…250V AC/DC, 4.5VA

Label version standard

SIRAX BM1400
ORDER CODE: 174996
SR No.: 15/11/0001
CLASS: 0.5 CAT III 300V Max. V18.05
INPUT: 3PH. 440 V L - L, 5A/1A, 45…66Hz
OPTION: RS485 + 1PULSE + 2x4…20mA ANA.O/P
AUXILIARY: 100…250V AC/DC, 4.5VA

Label version with RS485

SIRAX BM1400
ORDER CODE: 175001
SR No.: 15/11/0001
CLASS: 0.5 CAT III 300V Max. V18.05
INPUT: 3PH. 440 V L - L, 5A/1A, 45...66Hz
OPTION: Ethernet
AUXILIARY: 100...250V AC/DC, 4.5VA

Label version with Ethernet

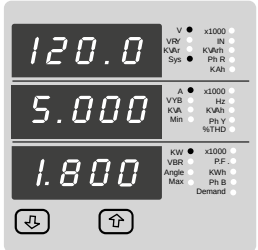
6.1 Operating the device

Operation is performed by means of 2 keys:

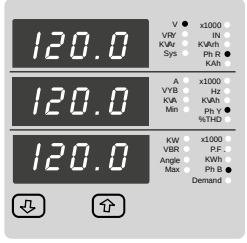
- 2 keys “ UP” und “ DOWN” for navigation and for the selection of values.

6.2 Measurement Reading Screens

In normal operation the user is presented with one of the measurement reading screens out of several screens. These screens may be scrolled through one at a time in incremental order by pressing the “ Up key” and in decremental order by pressing “ Down key”.

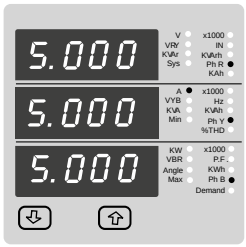


Screen 1: System screen (System Voltage, System Current, System Active Power)

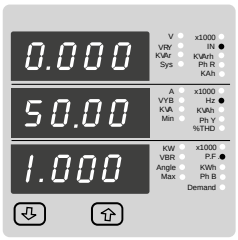


Screen 2: Line to Neutral Voltages (for 4 wire only)

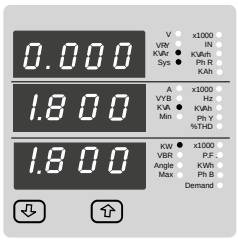
Screen 3: Line to Line Voltages



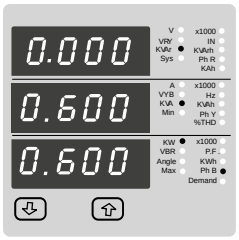
Screen 4: Line Currents



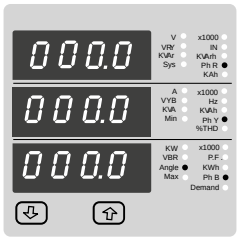
Screen 5: Neutral current (for 4W only), Frequency, Sys. Power Factor



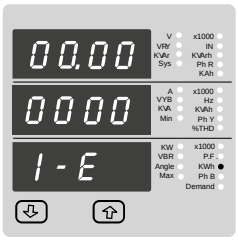
Screen 6: System Power (Reactive, Apparent, Active)



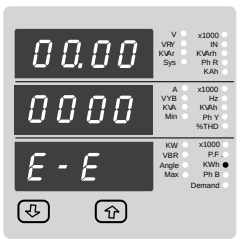
Screen 17: Phase Power (B) Reactive/Apparent/Active (for 4W only)



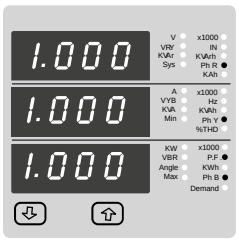
Screen 18: Phase Angle (Phase R / Y / B) (for 4W only)



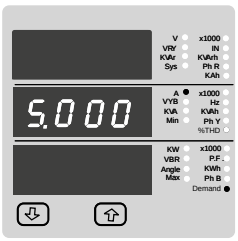
Screen 7: Active Energy (Import)



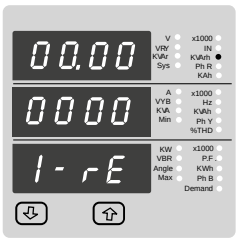
Screen 8: Active Energy (Export)



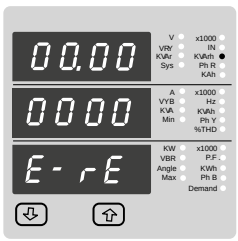
Screen 19: Phase Power Factor (Phase R/Y/B) (for 4W only)



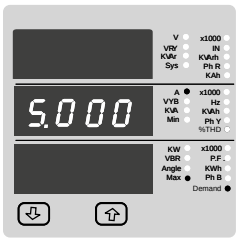
Screen 20: Current Demand



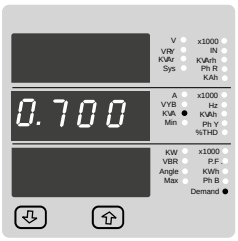
Screen 9: Reactive Energy (Import)



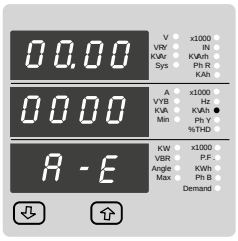
Screen 10: Reactive Energy(Export)



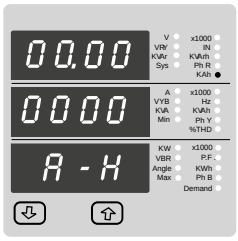
Screen 21: Max Current Demand



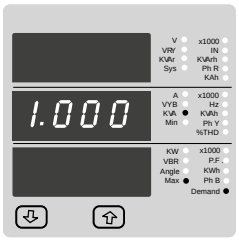
Screen 22: kVA Demand



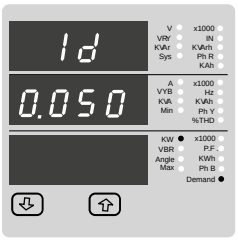
Screen 11: Apparent Energy



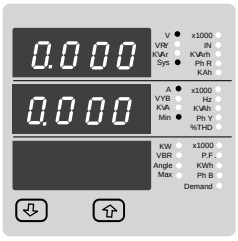
Screen 12: Ampere Hour



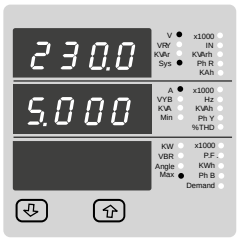
Screen 23 : Max kVA Demand



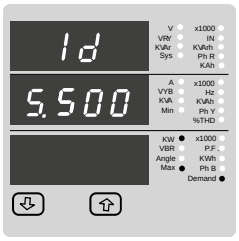
Screen 24: Import kW Demand



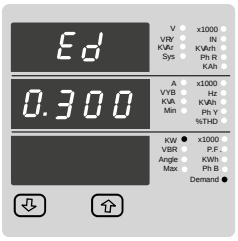
Screen 13: Min System Voltage & Current



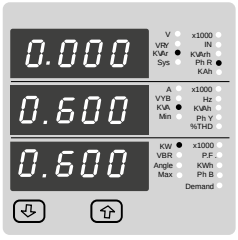
Screen 14: Max System Voltage & Current



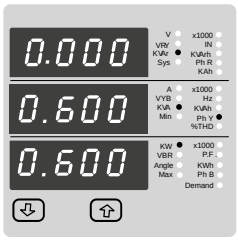
Screen 25: Max Import kW Demand



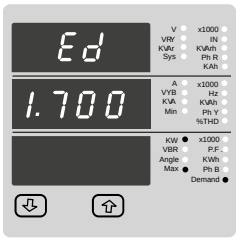
Screen 26: Export kW Demand



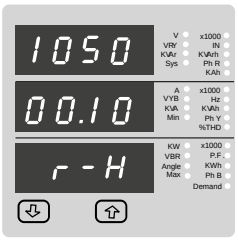
Screen 15: Phase Power (R) Reactive/Apparent/Active (for 4W only)



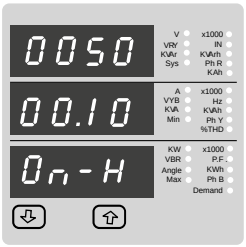
Screen 16: Phase Power (Y) Reactive/Apparent /Active (for 4W only)



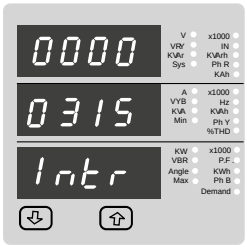
Screen 27: Max Export kW Demand



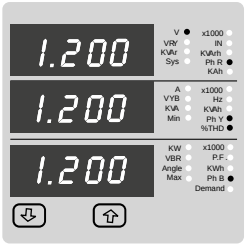
Screen 28: Run Hour



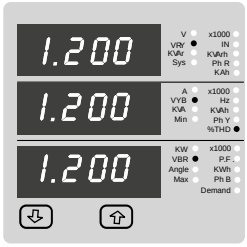
Screen 29: On Hour



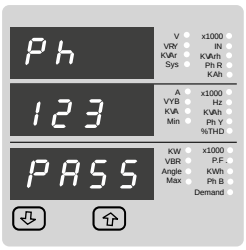
Screen 30: Number of Interruptions



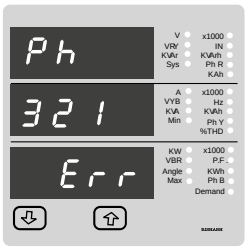
Screen 32a: Voltage %THD (for 4 wire only)



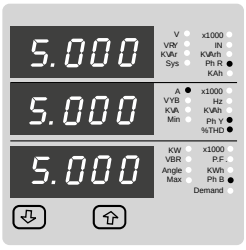
Screen 32b: (for 3 wire only)



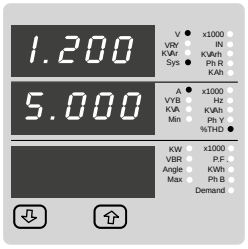
Screen 31a: Correct Phase sequence



Screen 31b: Phase sequence error

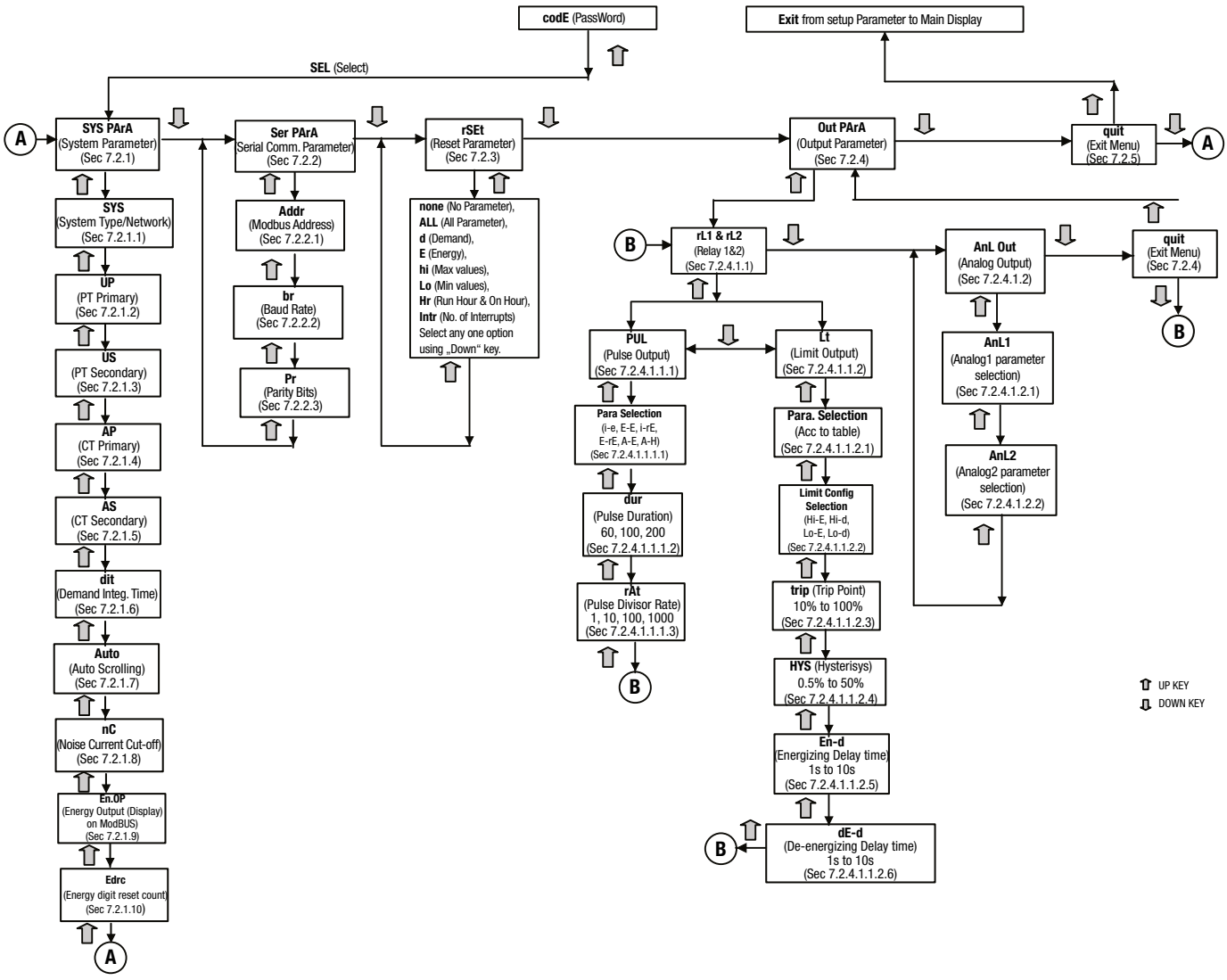


Screen 33: Current %THD



Screen 34: System Voltage & System Current %THD

Setup Parameter Screen

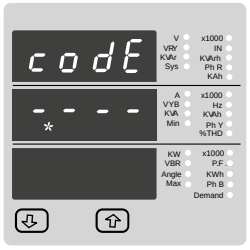


7. Programming

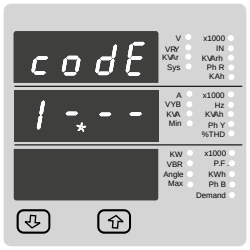
The following sections comprise step by step procedures for configuring the BM1400 for individual user requirements.
To access the set-up screens press and hold the " Down" and " Up". Key simultaneously for 5 seconds. This will take the User into the Password Protection Entry Stage (Section 7.1).

7.1. Password Protection

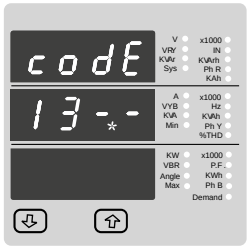
Password protection can be enabled to prevent unauthorised access to set-up screens, by default password protection is not enabled.
Password protection is enabled by selecting a four digit number other than 0000, setting a password of 0000 disables the password protection.



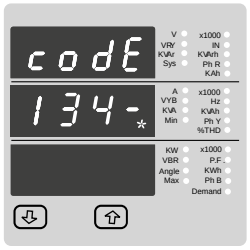
Enter Password, prompt for first digit. (* Denotes that decimal point will be flashing).
Press the " Down" key to scroll the value of the first digit from 0 through to 9, the value will wrap from 9 round to 0.
Press the " Up" key to advance to next digit.
In the special case where the Password is "0000" pressing the " Up" key when prompted for the first digit will advance to the "Password Confirmed" screen.



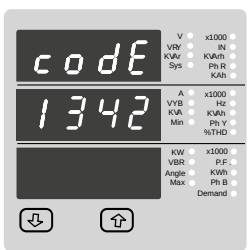
Enter Password, first digit entered, prompt for second digit. (* Denotes that decimal point will be flashing).
Use the " Down" key to scroll the value of the second digit from 0 through to 9, the value will wrap from 9 round to 0.
Press the " Up" key to advance to next digit.



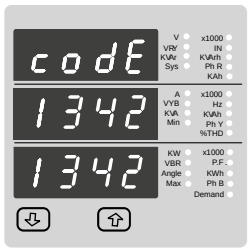
Enter Password, second digit entered, prompt for third digit.
(* Denotes that decimal point will be flashing).
Use the " Down" key to scroll the value of the third digit from 0 through to 9, the value will wrap from 9 round to 0.
Press the " Up" key to advance to next digit.



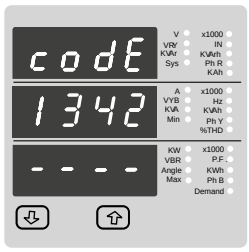
Enter Password, third digit entered, prompt for fourth digit.
(* Denotes that decimal point will be flashing).
Use the " Down" key to scroll the value of the fourth digit from 0 through to 9, the value will wrap from 9 round to 0.
Press the " Up" key to advance to verification of the password.



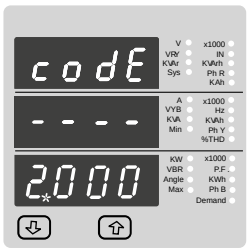
Enter Password, fourth digit entered, awaiting verification of the password.



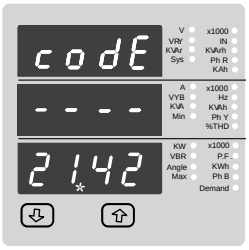
Password confirmed.
Pressing " Down" key will advance to the "New / change Password" entry stage.
Pressing the " Up" key will advance to the Menu selection screen. (See section 7.2).



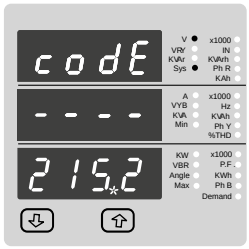
Password Incorrect.
The unit has not accepted the Password entered.
Pressing the " Down" key will return to the Enter Password stage.
Pressing the " Up" key exits the Password menu and returns operation to the measurement reading mode.



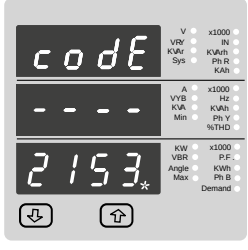
New / Change Password
(*Decimal point indicates that this will be flashing).
Pressing the " Down" key will scroll the value of the first digit from 0 through to 9, the value will wrap from 9 round to 0.
Pressing the " Up" key to advance the operation to the next digit and sets the first digit, in this case to "2"



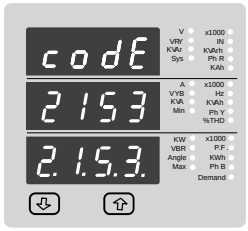
New / Change Password, first digit entered, prompting for second digit. (*Decimal point indicates that this will be flashing).
Pressing the " Down" key will scroll the value of the second digit from 0 through to 9, the value will wrap from 9 round to 0.
Pressing the " Up" key to advance the operation 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 " Down" key will scroll the value of the third digit from 0 through to 9, the value will wrap from 9 round to 0.
Pressing the " Up" key to advance the operation to the next digit and sets the third digit, in this case to "5"



New / Change Password, third digit entered, prompting for fourth digit. (* denotes that decimal point will be flashing).
Pressing the " Down" key will scroll the value of the fourth digit from 0 through to 9, the value will wrap from 9 round to 0.
Pressing the " Up" key to advance the operation to the "New Password Confirmed" and sets the fourth digit, in this case to "3".



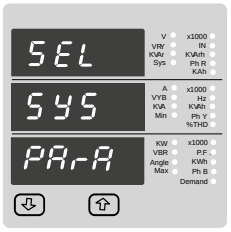
New Password confirmed.

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

Pressing the " Up" key will advances to the Menu selection screen.(see section 7.2).

7.2 Menu selection.

7.2.1 System Parameter selection screen.

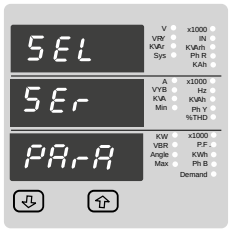


This screen is used to select the different system Parameter like "system type,""CT Ratio","PT Ratio",

Pressing the " Up" key allows the user to set Different system parameters. (see section 7.2.1.1 to 7.2.1.8)

Pressing the " down" key will advance to Communication selection screen (see section 7.2.2)

7.2.2 Communication Parameter selection screen.

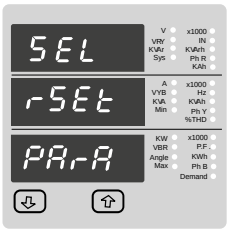


This screen is used to select the different communication parameters like "Address selection","RS485 Parity selection", "Rs485 baud rate"

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

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

7.2.3 Reset Parameter selection screen.

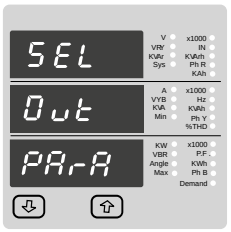


This screen is used to Reset the different parameters.

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

Pressing the " down key" will advance to Output option selection screen (see section 7.2.4).

7.2.4 Output Option selection screen.

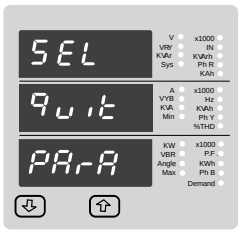


This screen will allow the user to select different Output options Like "Relay1", "Relay2", "Analog" Output.

Pressing the " Up" key allows the user to select & Configuare the output option (see section 7.2.4.1)

Pressing the " down key will advance to Quit screen. (see section 7.2.5)

7.2.5 Quit screen.



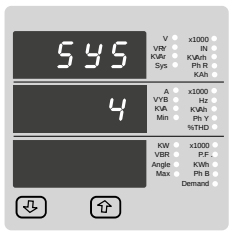
This screen will allow the user to Quit the Menu.

Pressing the " Up" key will allow the user to Quit from menu & return to measurement screen.

Pressing the " down key will advance to system Parameter selection screen. (see section 7.2.1)

7.2.1 System Parameters selection.

7.2.1.1 System type.

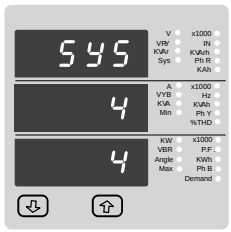


This screen is used to set the system type. System type "3" for 3 phase 3 wire & "4" for 3 phase 4 wire system.

Pressing the " Up" key accepts the present value and advances to the "Potential transformer primary value Edit" menu (see section 7.2.1.2)

Pressing the " Down" key will enter the system type edit mode and scroll the values through values available .Pressing the " Up" key advances to the system type confirmation menu.

7.2.2 Communication Parameter selection screen.



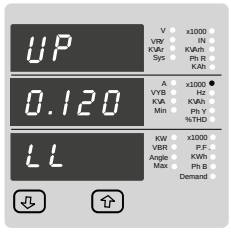
This screen will only appear following the edit of system type. If system type is to be Downed again.

Pressing the " Up" key sets the displayed value and will advance to "Potential Transformer Primary Value Edit" menu. (See section 7.2.1.2)

Pressing the " Down" key will return to the system type edit stage by blanking the bottom line of the display .

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 the x1000 enunciator).

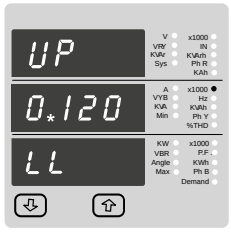


Pressing the " Up" key accepts the present value and advances to the "potential Transformer secondary Value edit" menu. (See Section 7.2.1.3)

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

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

Pressing the " Up" key accepts the present multiplier (decimal point position) and advances to the "potential Transformer primary Digit Edit" mode.



Potential Transformer primary Digit Edit

Pressing the " Down" key will scroll the value of the most significant digit from 0 through to 9 unless the presently displayed Potential Transformer Primary Value together with the Current Transformer Primary Value, previously set, would result in a maximum power of greater than 666.6 MVA per phase in which case the digit range will be restricted.

Pressing the " Up" key 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 100V L-L to 692.8 kV L-L.

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 " Up" key will advance to the

"Potential Transformer Primary Value Confirmation" stage.

Screen showing display of 0.120 kV i.e. 120 Volts indicating steady decimal point and cursor flashing at the "hundreds of volts" position.

Potential Transformer Primary Value Confirmation

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

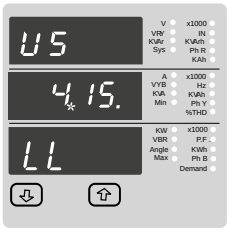
If the scaling is not correct, pressing the " Down" key will return to the "Potential Transformer Primary Value Edit" stage.

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

Note: 0.120 kV i.e. 120 V_{L-L}

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.



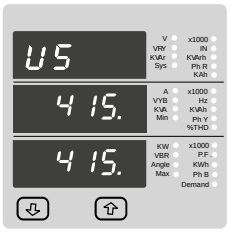
Pressing the " Up" key accepts the present value and advances to the "Current Transformer Primary Value edit" menu. (See Section 7.2.1.4)
Note that the range of instrument is from 240 to 480V for 415 VL-L. Please refer the table below for different ranges.
Pressing the " Down" key will enter the "Potential Transformer Secondary Value Edit" mode.
Down" key will scroll the value of the most significant digit From available range of PT secondary value
Pressing the " Up" key 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

110V L-L (63.5V L-N)	100 - 120V L-L (57.73V - 69.28V L-N)
230V L-L (133.0V L-N)	121 - 239V L-L (69.68V - 138V L-N)
415V L-L (239.6V L-N)	240 - 480V L-L (138.56 - 277.12V L-N)

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.

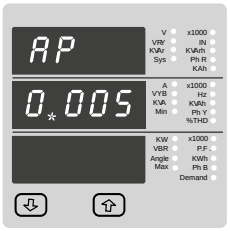
When the least significant digit has been set pressing the " Up" key will advance to the "Potential Transformer secondary Value Confirmation" stage.



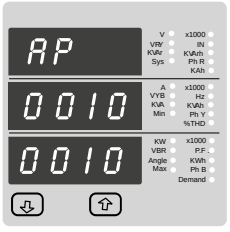
Potential Transformer Secondary Value Confirmation
This screen will only appear following an edit of the Potential Transformer Secondary Value.
If the scaling is not correct, pressing the " Down" key will return to the "Potential Transformer Secondary Value Edit"
Pressing the " Up" key sets the displayed 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 " Up" key accepts the present value and advances to the Current Transformer Secondary Value (See Section 7.2.1.5)

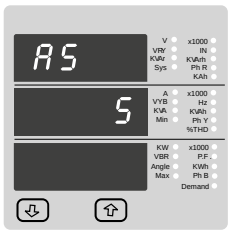


Pressing the " Down" key will enter the "Current Transformer Primary Value Edit" mode. This will scroll the value of the most significant digit from 0 through to 9, unless the presently displayed Current Transformer Primary Value together with the Potential Transformer Primary Value results in a maximum power of greater than 666.6 MVA in which case the digit range will be restricted, the value will wrap.
Example: If primary value of PT is set as 692.8kV L-L (max value) then primary value of Current is restricted to 1157A. Pressing the " Up" key will advance to the next less significant digit. (* Denotes that decimal point will be flashing).
The "Maximum Power" restriction of 666.6 MVA refers to 120% of nominal current and 120% of nominal voltage, i.e, 462.96 MVA nominal power per phase.
When the least significant digit had been set, pressing the " Up" key 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 " Up" key is pressed.

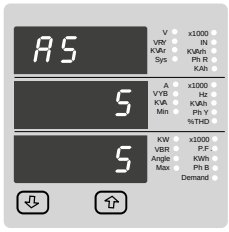


Current Transformer Primary Value Confirmation.
This screen will only appear following an edit of the Current Transformer Primary Value.
If the scaling is not correct, Pressing the " Down" key will return to the "Current Transformer Primary Value Edit " stage with the most significant digit highlighted (associated decimal point flashing) and the bottom line of the display will be blanked.
Pressing the " Up" key sets the displayed value and will advance to the "Current Transformer Secondary Value Edit" menu. (See Section 7.2.1.5)

7.2.1.5 Current Transformer Secondary Value

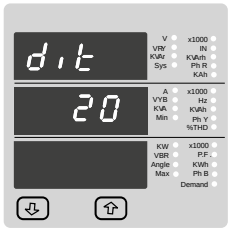


This screen is used to set the secondary value for Current Transformer. Secondary value "5" for 5A or "1" for 1A can be selected. Pressing " Up" key accepts the present value and advances to the Demand integration Time (See Section 7.2.1.6)
Pressing the " Down" key will enter the CT Secondary value edit mode and scroll the value through the values available.
Pressing the " Up" key will advance to the CT Secondary value confirmation.

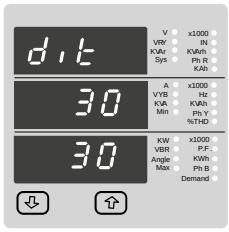


CT Secondary value confirmation
This screen will only appears following an edit of CT secondary value .
If secondary value shown is not correct, pressing the Down key will return to CT secondary edit stage by blanking the bottom line of the display.
Pressing " Up" key sets the displayed value and will advance to Demand integration Time Edit menu. (See Section 7.2.1.6)

7.2.1.6 Demand Integration Time

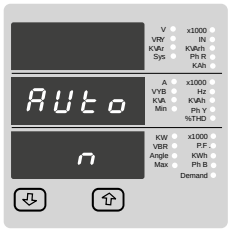


This screen is used to set the period over which current and power readings are to be integrated The Unit of displayed Readings is minutes.
Pressing the " Down" key will scroll through the Folliowing Options 8,15,20,30.
Pressing the " Up" key will advance to Demand Integration confirmation screen.

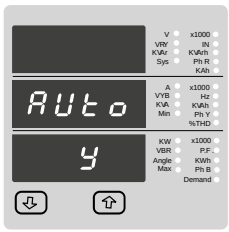


Demand Integration Time value confirmation
Pressing " Up" key sets the displayed value and will advance to scroll screen.
(See Section 7.2.1.7)

7.2.1.7 Auto Scrolling



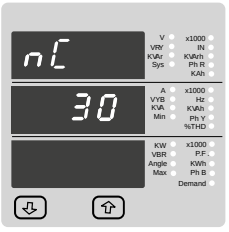
This screen allows user to enable screen scrolling.
Auto scrolling Edit.
Pressing " Up" key accepts the present status and advance to the Low Current noise cutoff (See Section 7.2.1.8).



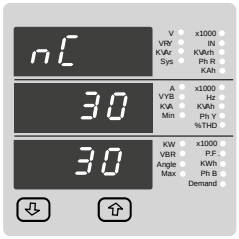
Pressing the " Down" key will enter the "Auto Screen Scrolling Edit" and toggle the status 'Yes' and 'No'.
Pressing the " Up" key will select the status displayed and advance to the Low Current noise cutoff (See Section 7.2.1.8)

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 " Up" key accepts the present value and advance to Energy output Selection.
(See section 7.2.1.9)
Pressing the " Down" key 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.



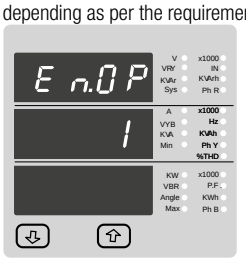
Low current noise cutoff Confirmation.

pressing the " Down" key will re-enter the "Low current Noise cutoff Edit" mode.

Pressing " Up" key set displayed value and Advance to the energy output selection (See section 7.2.1.9)

7.2.1.9. Energy Display on modbus

This screen enable user to set energy in terms of Wh / KWh / MWh on RS 485 Output depending as per the requirement. Same applicable for all types of energy.

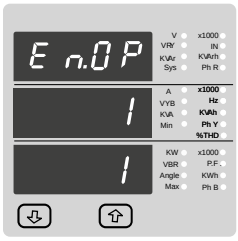


Pressing " Up" key accepts the presents value and advances to the "Energy digit reset count"menu (See section 7.2.1.10).

Pressing the " Down" key will enter the "Energy Display On Modbus Edit" mode and scroll the value through the values 1,2 & 3 wrapping back to 1

1: Energy In Wh
2: Energy in KWh
3: Energy in MWh

Pressing the " Up" key advances to the "Energy Display On Modbus Confirmation" menu.



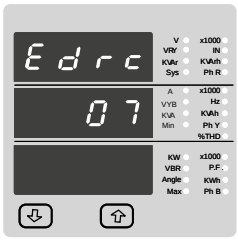
Energy Display On Modbus Confirmation.
This screen will only appear following an edit of the Energy Display On Modbus.

Pressing the " Down" key will enter the "Energy Display On Modbus Edit" Edit" stage by blanking the bottom line of the display.

Pressing " Up" key sets the displayed value and will advance to the "Energy digit reset count" menu. (See section 7.2.1.10)

Note: Default value is set to '1' i.e. Energy on Modbus will be in terms of Wh/VArh/VAh/Ah resp.

7.2.1.10 Energy Digit reset count:



This screen enables user for setting maximum energy count after which energy will rollback to zero depends upon setting of Wh,KWh, & MWh.

Pressing the " Up" key sets the displayed value and will jump back to the system parameter selection (See Section 7.2.1)

Pressing the " Down" key will enter the Energy digit reset count edit mode. This will scroll the value of reset count from 7 to 14 for Wh, **from 7 to 12 for KWh & from 7 to 9 for MWh.**

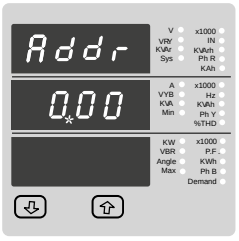
Ex. If energy display on modbus is set Wh & It will set Energy digit count to 10 then energy will reset after "9,999,999,999" & then will rollback to zero.

Pressing " Up key " will advance to Energy digit reset count confirmation screen.

Pressing the " Down" key will re-enter Energy digit reset count edit mode.

Pressing the " Up" key sets the displayed value and will jump back to the system parameter selection (See Section 7.2.1)

Note: 1) Default value is set to "14" i.e if energy count crosses 14 digit it will rollback to zero.
2) Energy displays on modbus is set to (2) & energy digit reset count is set to 12.Energy screen on display will show "-------" i.e Energy overflow .when energy crosses the 11 digit count.
3) Energy displays on modbus is set to (3) & energy digit reset count is set to 9.Energy screen on display will show "-------" i.e Energy overflow .when energy crosses the 8 digit count.



7.2.2 Communication Parameter Selection:

7.2.2.1 Address Setting:

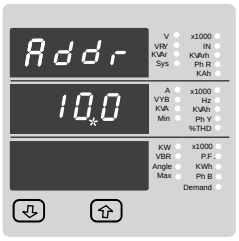
This screen applies to the RS 485 output only. This screen allows the user to set Rs485 parameter for instruments

The range of allowable address is 1 to 247.

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

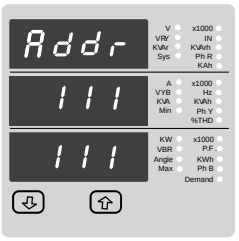
Press the " Down" key to scroll the value of the first digit.

Press the " Up" key to advance to next digit.



Enter Address, first digit entered, prompt for second digit (* Denotes that decimal point will be flashing).
Use the " Down" key to scroll the value of the second digit
Press the " Up" key to advance to next digit.

Enter Address, second digit entered, prompt for third digit (* Denotes that decimal point will be flashing).
Use the " Down" key to scroll the value of the third digit.



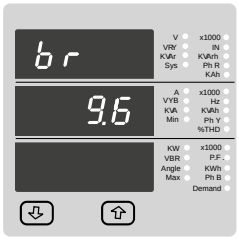
Address confirmation Screen.

This Screen confirms the Address set by user.

Press the " Up" key to advance to next Screen "Rs485 Baud Rate" (See Section 7.2.2.2)

Pressing the " Down" key will reenter the "Address Edit" mode.

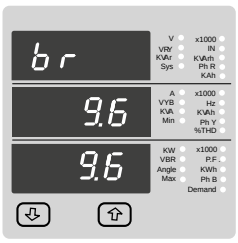
7.2.2.2 RS 485 Baud Rate



This screen allows the user to set Baud Rate of RS 485 port. The values displayed on screen are in kbaud.

Pressing " Up" key accepts the present value and advance to the Parity Selection (See Section 7.2.2.3)

Pressing the " Down" key will enter the "Baud Rate Edit" mode and scroll the value through 2.4, 4.8, 9.6 , 19.2 and back to 2.4



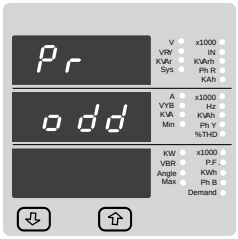
RS 485 Baud Rate confirmation:

Pressing " Down" key will be re-enter into the. Baud Rate Edit mode.

Pressing the " Up" key will select the value and advances to the Parity Selection (See Section 7.2.2.3).

7.2.2.3 RS 485 Parity Selection

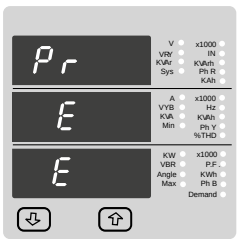
This screen allows the user to set Parity & number of stop bits of RS 485 port.



Pressing " Up" key accepts the present value and advance to Menu selection (see section 7.2).

Pressing the " Down" key will enter the "Parity & 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



RS 485 Parity confirmation:

Pressing " Down" key will be re-enter into Parity Edit mode.

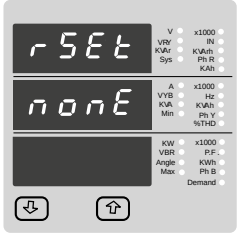
Pressing the " Up" key will set the value.

Pressing the " Up" key again will jump back to the communication parameter selection menu (see section 7.2.2).

7.2.3 Reset Parameter Selection

7.2.3.1 Resetting Parameter

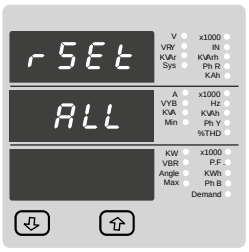
The following screens allow the users to reset the all Energy , Lo(Min), hi(Max),Demand,Run hour, . On hour, No.of Interrupts



Reset (Note)

Pressing " Up" key advances to Reset Parameter selection screen (see section 7.2.3)

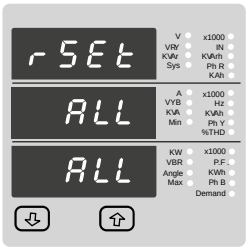
Pressing the " Down" key will enter the "Reset option" mode and scroll through Parameter and wrapping back to None.



Reset option select, (Resets ALL resettable parameter)

The user has scrolled through to the “ALL”.

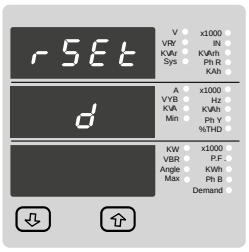
Pressing “ Up” key will select the value and advance to the “Reset ALL Confirmation” Mode &.
Will reset all resettable parameter.



Reset ALL Confirmation.

Pressing the “ Down” key will re-enter the Reset option Select mode.

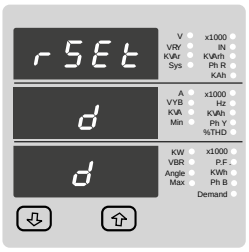
Pressing “ Up” key will jump back to the Reset Parameter selection screen (see section 7.2.3).



Reset option select, (Reset A Demand, KVA Demand Parameters KW demand (Import/Export))

The user has scrolled through to the “d”.

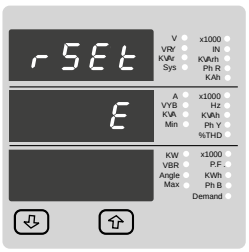
Pressing “ Up” key will select the value and resets all Demand parameters.



Reset Demand parameters Confirmation.

Pressing the “ Down” key will re-enter the “Reset option Select mode.

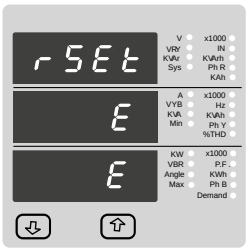
Pressing “ Up” key will jump back to the Reset Parameter selection screen (see section 7.2.3).



Reset option select, (Resets all Energies)

The user has scrolled through to the “E” Energy value.

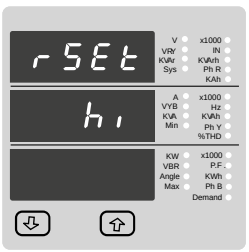
Pressing “ Up” key will select the value and advance to the “Reset Energy Confirmation” Mode.
& resets all Energies (Import Enegy, Export Energy Import reactive, Export reactive, Apparent Energy Ampere Hour)



Reset Energy Confirmation.

Pressing the “ Down” key will re-enter the “Reset option” mode.

Pressing “ Up” key will jump back to the Reset Parameter selection screen (see section 7.2.3).

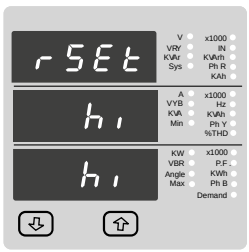


Reset option select, (Reset Hi)

The user has scrolled through to the “Hi” (Max)

Pressing “ Up” key will select the value and Pressing “ Up” key will select the value and advance to the “Reset Hi Confirmation” Mode.advance to the “Reset Hi Confirmation” Mode &

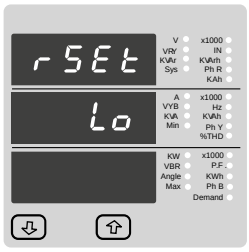
Will reset Maximum (Hi) values of Voltage & Current Avg. appeared at input.



Reset hl (Max) Confirmation.

Pressing the “ Down” key will re-enter the “Reset option Select mode.

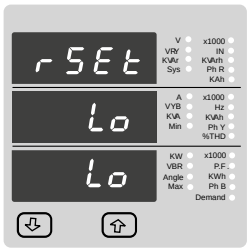
Pressing “ Up” key will jump back to the Reset Parameter selection screen (see section 7.2.3).



Reset option select, (Reset Lo)

The user has scrolled through to the “Lo” (Min)

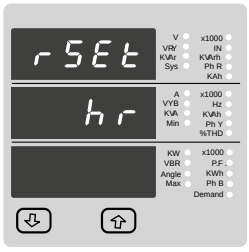
Pressing “ Up” key will select the value and advance to the “Reset Lo Confirmation” Mode &
Will reset minimum values of Voltage & Current Avg. appeared at Input.



Reset Lo Confirmation

Pressing the “ Down” key will re-enter the “Reset option Select mode.

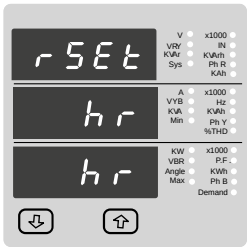
Pressing “ Up” key will jump back to the Reset Parameter selection screen (see section 7.2.3).



Reset option select, hr (ON Hour & Run Hour)

The user has scrolled through to the “hr”

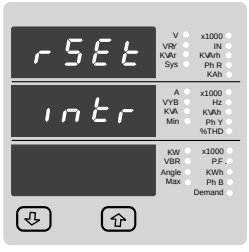
Pressing “ Up” key will select the value and advance to the “Reset hr Confirmation” Mode &
Will reset On hour & Run Hour both.



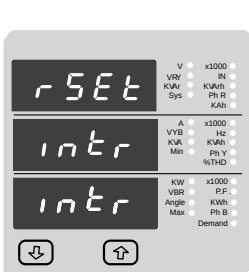
Reset hr Confirmation

Pressing the “ Down” key will re-enter the “Reset option Select mode.

Pressing “ Up” key will jump back to the Reset Parameter selection screen (see section 7.2.3).



Reset option select, (Reset Number of Interrupt)
The user has scrolled through to the “intr”
Pressing “ Up” key will select the value and advance to the “reset Interrupt Confirmation” Mode & Will reset number of Auxiliary supply interruption count.



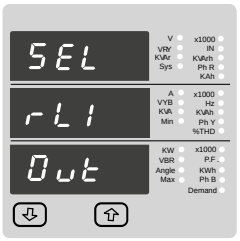
Reset Interrupt Confirmation

Pressing the “ Down” key will re-enter the “Reset parameter Selection”(see section 7.2.3).

Pressing “ Up” key will jump back to the Reset Parameter selection screen (see section 7.2.3).

7.2.4. Output Option selection menu

7.2.4.1 Configuration of Output

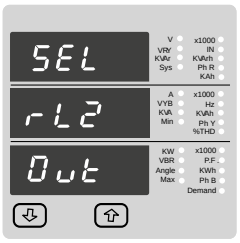


This screen applies to the Relay1 Output option Selection.

Pressing " Up" key will select the

Relay1 output selection menu (See section 7.2.4.1.1) pressing the " Down" key will advance

Relay2 output option below.



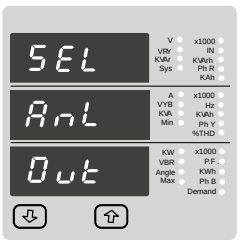
This screen applies to the Relay2 Output option Selection.

Pressing " Up" key will advance to the select

Relay 2 output selection menu. (See section 7.2.4.1.2)

pressing the " Down" key will advance to

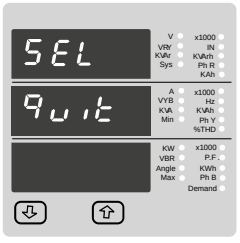
Analog output option below.



This screen applies to the Analog Output Selection.
Pressing " Up" key will Select the Analog output

selection menu (See section 7.2.4.3)

Pressing the " Down" key will advance to Quit screen.



This screen allows the user to quit the output option

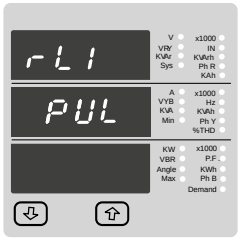
Pressing " Up" key will advance to the

Output Parameter selection (See section 7.2.4)

Pressing the " Down" key will go back to Relay1 output option (See section 7.2.4.1).

7.2.4.1.1 Relay1 output Selection menu:

7.2.4.1.1.1 Pulse output:



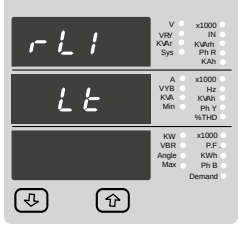
This screen is used to assign Relay1 in Pulse output mode

Pressing " Up" key will advance to the

Pulse (for Relay1) output configuration
(See section 7.2.4.1.1.1.1)

Pressing " Down" key will show "Limit"output option
(See section 7.2.4.1.1.2)

7.2.4.1.1.2 Limit output :



This screen is used to assign Relay1 in limit output mode.

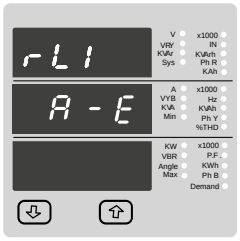
Pressing " Up" key will assign

Limit (for Relay1) output mode.(See section 7.2.4.1.1.2.1)

Pressing " Down" key wil go back to the pulse option (For Relay 1) screen.(See section 7.2.4.1.1.1)

7.2.4.1.1.1.1 Assignment of Energy to pulse output (Relay 1):

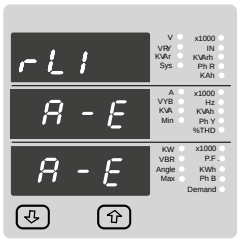
This screen allows the user to assign pulse output to energy (for Relay 1)



Pressing " Up" key accepts the present setting and advance to "Pulse duration selection" (see section 7.2.4.1.1.1.2).

Pressing the " Down" key will enter into edit mode and scroll through the energy setting

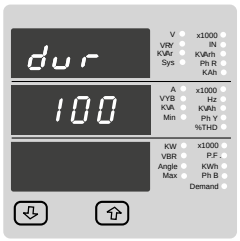
A - E: Apparent Energy
I - E: Import Energy (Active)
E - E: Export Energy (Active)
I - rE: Import Reactive Energy
E - rE: Export Reactive Energy
A - H: Ampere Hour



Pulse output (for Relay 1) confirmation:
Pressing " Down" key will be re-enter into edit mode.
Pressing the " Up" key will set the value and advances to the " Pulse duration selection " (see section 7.2.4.1.1.1.2).

7.2.4.1.1.1.2 Pulse Duration Selection:

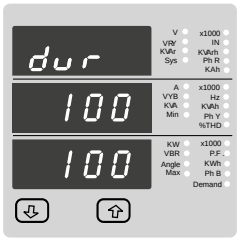
This screen applies only to the Pulsed output mode of both the relay.
This screen allows the user to set Relay energisation time in milliseconds.



Pulse Duration Edit.
Pressing " Up" key accepts the present value and advance to pulse rate selection menu (see section 7.2.4.1.1.1.3).

Pressing the " Down" key will enter the "Pulse Duration Edit" mode and scroll the value through 60, 100, 200 and wrapping back to 60.

Pressing the " Up" key will select the value and advances to "Pulse Duration Confirmation".



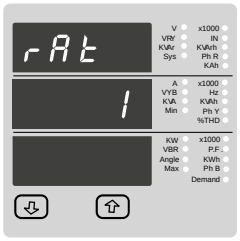
Pulse Duration Confirmation.
This screen will only appear following an edit of the Pulse duration.

Pressing the " Down" key will re-enter the "Pulse Duration Edit" mode.

Pressing " Up" key set displayed value and Will advance to pulse rate selection menu (See section 7.2.4.1.1.1.3)

7.2.4.1.1.1.3 Pulse Rate

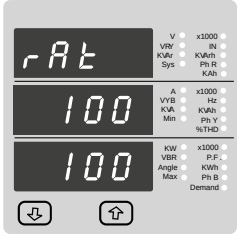
This screen applies to the Relay Output option only. The screen allows user to set the energy pulse rate divisor. Divisor values can be selected through 1,10,100,1000 in Wh.



Pressing " Up" key accepts the presents value and advances to the "Configuration of Output" (See section 7.2.4.1).

Pressing the " Down" key will enter the "Pulse rate divisor Edit" mode and scroll the value through the values 1,10,100, 1000 wrapping back to 1 in Wh but in KWh & MWh pulse rate divisor is only 1 ..

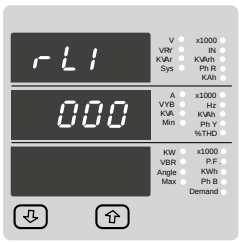
Pressing the " Up" key advances to the "Pulse rate Divisor Confirmation" menu.
For setting division value refer table 3.



Pulse Rate Divisor Confirmation.
This screen will only appear following an edit of the Pulse rate divisor.
If the Pulse rate shown is not correct, pressing the " Down" key will return to the "Pulse rate divisor Edit" stage by blanking the bottom line of the display. Pressing " Up" key sets the displayed value and will advance to the "Configuration of output". (See section 7.2.4.1)

7.2.4.1.1.2.1 Assignment of Limit output (for Relay1) to parameter.

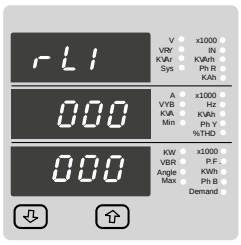
This screen is for Limit output mode selection. It allows the user to set Limit output corresponding measured value. Refer Table 2" Parameter for Analog & Limit output " for assignment.



Pressing " Up" key accepts the present value and advance to the Limit1 configuration select screen. (see section 7.2.4.1.1.2.2).

Pressing the " Down" key will enter the " Limit1 output Edit" mode and scroll the values, as per Table 2, " Parameter for Analog & Limit Output"

Pressing the " Up" key advance to the Limit1 output confirmation screen.



Limit1 output Confirmation:

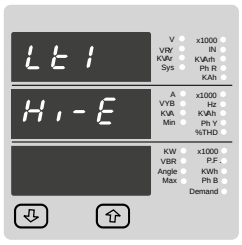
Pressing the " Down" key will re-enter the "Limit1 output Edit"

Pressing the " Up" key sets the displayed value and will advance to the Limit1 Configuration select screen.

(see section 7.2.4.1.1.2.2)

7.2.4.1.1.2.2 Limit1 Configuration select

This screen is used to set the Limit1 Configuration, four different types of configuration can be selected.

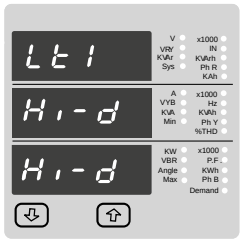


H i - E (High Alarm & Energized Relay)
H i - d (High Alarm & De-Energized Relay)
L o - E (Low Alarm & Energized Relay)
L o - d (Low Alarm & De-Energized Relay)
(For detail refer to section 9.2)

Pressing the " Up" key accepts the present value and advances to the "Trip point selection"screen (see section 7.2.4.1.1.2.3)

Pressing the " Down" key will enter the Limit1 configuration edit mode and scroll through the Modes available .

Pressing the " Up" key advances to the Limit1 configuration type confirmation menu.



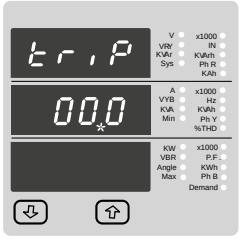
Limit1 Configuration Confirmation

This screen will only appear following the edit of system type. If system type is to be changed again, pressing the " Down" key will return to the Limit1 configuration Type edit stage by blanking the bottom line of the display.

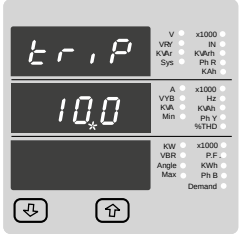
Pressing the " Up" key sets the displayed value and will advance to "Trip point selection" Screen (See section 7.2.4.1.1.2.3)

7.2.4.1.1.2.3 Trip point selection:

This screen applies to the Trip point selection.
This screen allows the user to set Trip point for instruments.



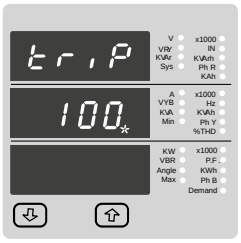
The allowable range is 10% to 120% for High Alarm.
The allowable range is 10% to 100% for Low Alarm.
Enter value, prompt for first digit.
(* Denotes that decimal point will be flashing).
Press the " Down" key to scroll the values of the first digit.
Press the " Up" key to advance to next digit.



The first digit entered, prompt for second digit
(* Denotes that decimal point will be flashing).

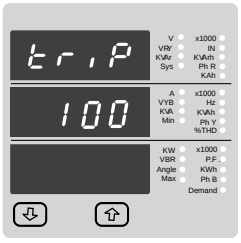
Use the " Down" key to scroll the value of the second digit

Press the " Up" key to advance to next digit.

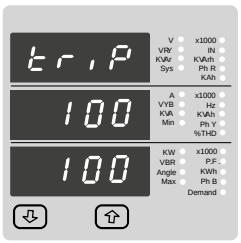


The second digit entered, prompt for third digit
(* Denotes that decimal point will be flashing).

Use the " Down" key to scroll the value of the third digit



Entered the value for third digit.
Press the " Up" key to advance to trip point confirmation Screen.

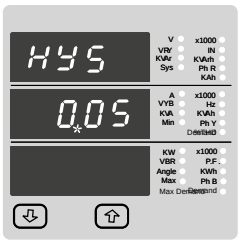


Value confirmation Screen.

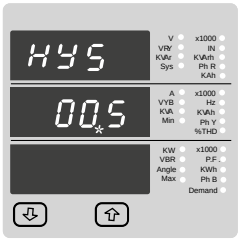
This Screen confirms the value set by user.
Press the " Up" key to advance to next Screen "Hysteresis selection" (see section 7.2.4.1.1.2.4)
Pressing the " Down" key will return in edit mode

7.2.4.1.1.2.4 Hysteresis selection:

This screen applies to the Hysteresis selection.

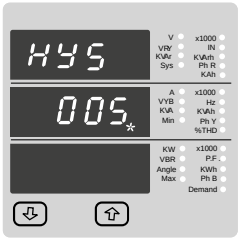


This screen allows the user to set Hysteresis for relay1 output. Trip point.
Enter value, prompt for first digit.
(* Denotes that decimal point will be flashing).
Press the " Down" key to scroll the value of the first digit.
Press the " Up" key to advance to next digit.



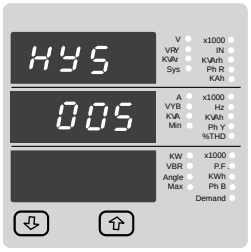
The first digit entered, prompt for second digit
(* Denotes that decimal point will be flashing).
Use the " Down" key to scroll the value of the second digit.

Press the " Up" key to advance to next digit.



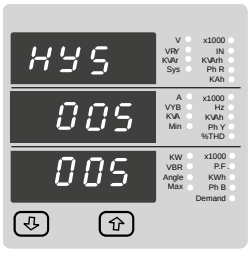
The second digit entered, prompt for third digit
(* Denotes that decimal point will be flashing).

Use the " Down" key to scroll the value of the third digit



Entered value for third digit.

Press the " Up" key to advance to Hysteresis confirmation Screen.



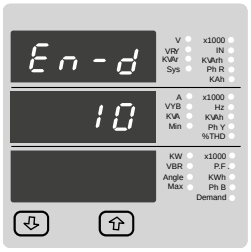
Hysteresis confirmation Screen.

This Screen confirms the percentage value set by user & Screen will appear only after edit mode of Hysteresis.

Press the " Up" key to advance to next Screen
"Energizing delay time" (7.2.4.1.1.2.5)

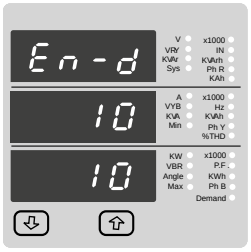
7.2.4.1.1.2.5 Energizing Delay time.

This screen allows the user to set Energizing Delay time for Relay 1 Limit Assigned Parameters.



Pressing " Up" key accepts the present value and advance to De-energizing delay screen.

Pressing the " Down" key will enter the "Energizing Delay" Edit mode and scroll the "Value" through 1 to10.



Energizing delay time Confirmation.

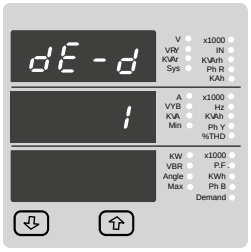
This screen will appear only after edit mode of Energizing delay time

pressing the " Down" key will re-enter the "Energizing delay Edit" mode.

Pressing " Up" key set displayed value and will advance to Assignment of De-energizing delay time. (See section 7.2.4.1.1.2.6)

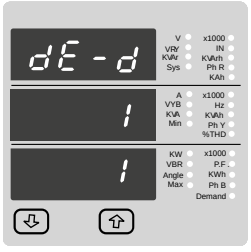
7.2.4.1.1.2.6 De-Energizing Delay time.

This screen allows the user to set De-Energizing Delay time for Relay 1 Limit Assigned Parameters.



.Pressing " Up" key accepts the present value and advance to Configuration of Output. (See section 7.2.4.1)

Pressing the " Down" key will enter the "De-Energizing Delay" Edit mode and scroll the "Value" through 1 to10.



De-Energizing delay time Confirmation.

This screen will appear only after edit mode of De-energizing delay time.

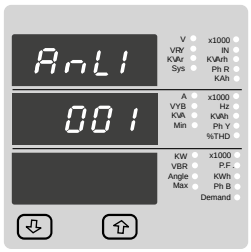
pressing the " Down" key will re-enter the "De-energizing delay Edit" mode.

Pressing " Up" key set displayed value and will advance to Configuration of Output. (See section 7.2.4.1)

7.2.4.1.2 Analog Output

7.2.4.1.2.1 Parameter setting for Analog Output 1 (Optional)

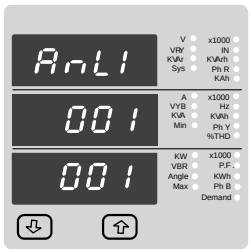
Configuration of Relay 2 for Pulse or Limit Output is same as Relay 1. If you Select the Pulse output option for Relay 1 same setting will be applicable for Relay 2 except assignment of energy to Pulse output (i.e. Energy assignment of both relay can be different.)



Pressing " Up" key accepts the present value and advance to the Analog output 2 selection (see section 7.2.4.1.3.2).
Pressing the " Down" key will enter the " Analog output 1 Edit" mode and scroll the values, as per Table 2

" Parameter for Analog & Limit output"

Pressing the " Up" key advance to the Analog output 1 confirmation screen.



Analog output 1 Confirmation:

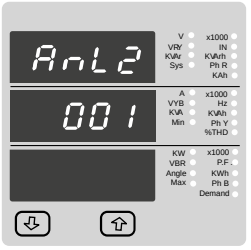
This Screen will appear only after edit mode of Analog output 1 Parameter.

Pressing the " Down" key will re-enter the " Analog output 1 Edit"

Pressing the " Up" key sets the displayed value and will advance to the Analog output 2 selection screen (see section 7.2.4.1.3.2)

7.2.4.1.2.2 Parameter setting Analog Output 2 (Optional)

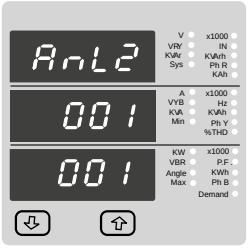
This screen is for analog output 2 only. It allows the user to set analog output 2 to corresponding measured parameter. Refer table2 " Parameter for Analog & Limit output ".



Pressing " Up" key accepts the present value and advance to Analog output selection screen (see section 7.2.4.1).

Pressing the " Down" key will enter the " Analog output 2 Edit" mode and scroll the values, as per Table 2." Parameter for Analog output"

Pressing the " Up" key advance to the Analog output 2 confirmation screen.



Analog output 2 Confirmation:

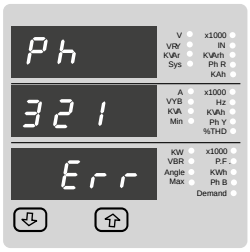
This Screen will appear only after edit mode of Analog output 2 Parameter.

Pressing the " Down" key will re-enter the " Analog output 2 Edit"

Pressing the " Up" key sets the displayed value and will advance to the Analog output selection screen (see section 7.2.4.1).

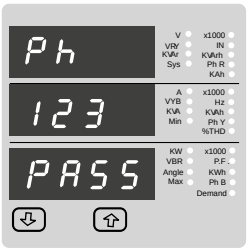
8. Phase Rotation Error screen:

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



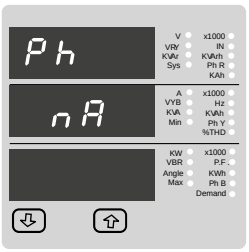
This screen indicates that Phase sequence is incorrect.

User must check this screen in order to get correct readings When meter is connected.



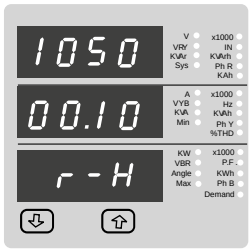
Correct Phase sequence:

This Screen indicates the phase sequence connected to meter is correct. If phase sequence is wrong this screen is useful to get correct phase sequence by interchanging connection & verifying it with screen.



This Screen indicates that all three phases (Voltages) are absent.

9. Run hour:



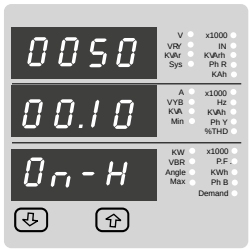
This Screen shows the total no. of hours the load is connected.

Even if the Auxiliary supply is interrupted count of Run hour will be maintained in internal memory & displayed in the format “hours. min”. For example if Displayed count is 105000.10 r-H it indicates 105000 hours & 10 minutes.

After 999999.59 run hours display will restart from zero.

To reset run hour manually see section Resetting Parameter 7.2.3.1

10. On hour:

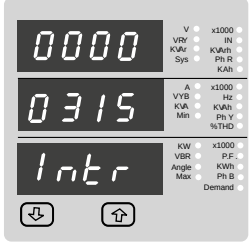


This Screen shows the total no. of hours the Axillary Supply is ON. Even if the Auxiliary supply is interrupted count of On hour will be maintained in internal memory & displayed in the format “hours. min”. For example if Displayed count is 005000.10 On-H it indicates 005000 hours & 10 minutes.

After 999999.59 On hours display will restart from zero.

To reset On hour manually see section Resetting Parameter 7.2.3.1

11. 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 7.2.3.1

12. Analog Output (optional):

This module provides two d.c. isolated outputs.
Two 4 - 20mA outputs, internally powered.

On module the output signals are present on pins A1 (Anolog Output 1) & A2 (Analog Output 2)

These outputs can be individually assigned to represent any one of the measured and displayed Parameters.

All settlings are user configurable via the user interface screen. See Analog o/p selection (section 7.2.4.1.3) for details.

*** Note: Refer diagrams 1**

Diagram 1: (4 -20 mA)

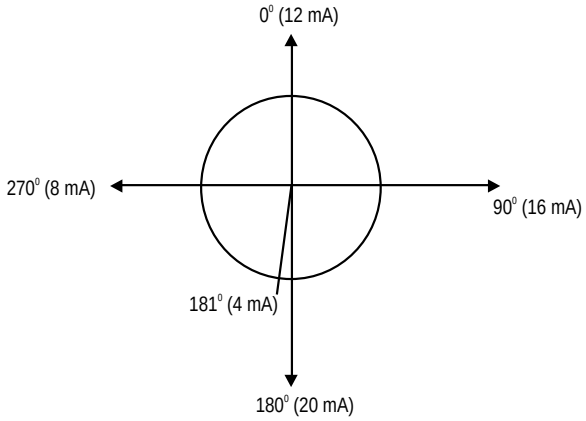


TABLE 2: Parameter for Analog & Limit output

Parameter No.	Parameter	3P 4W	3P 3W	Range
0	None	•	•	–
1	Volts 1	•	•	0 - 100 %
2	Volts 2	•	•	0 - 100 %
3	Volts 3	•	•	0 - 100 %
4	IL1	•	•	0 - 100 %
5	IL2	•	•	0 - 100 %
6	IL3	•	•	0 - 100 %
7	W1	•	x	0 - 120 %
8	W2	•	x	0 - 120 %
9	W3	•	x	0 - 120 %
10	VA1	•	x	0 - 120 %
11	VA2	•	x	0 - 120 %
12	VA3	•	x	0 - 120 %
13	VAr1	•	x	0 - 120 %
14	VAr2	•	x	0 - 120 %
15	VAr3	•	x	0 - 120 %
16	* PF1	•	x	180° / 0 / -180°
17	* PF2	•	x	180° / 0 / -180°
18	* PF3	•	x	180° / 0 / -180°
19	* PA1	•	x	180° / 0 / -180°
20	* PA2	•	x	180° / 0 / -180°
21	* PA3	•	x	180° / 0 / -180°
22	Volts Ave.	•	•	0 - 100 %
24	Current Ave.	•	•	0 - 100 %
27	Watts sum	•	•	10 - 120 %
29	VA sum	•	•	10 - 120 %
31	VAr sum	•	•	10 - 120 %
32	* PF Ave.	•	•	180° / 0 / -180°
34	* PA Ave.	•	•	180° / 0 / -180°
36	Freq.	•	•	10 - 100 % [1]
43	Watt Demand Imp.	•	•	10 - 120 %
44	WATT MAX DEMAND IMP.	•	•	10 - 120 %
45	Watt Demand Exp	•	•	10 - 120 %
46	Watt Demand Max Exp	•	•	10 - 120 %
51	VA DEMAND	•	•	10 - 120 %
52	VA MAX DEMAND	•	•	10 - 120 %
53	CURRENT DEMAND	•	•	10 - 120 %
54	CURRENT MAX DEMAND	•	•	10 - 120 %
101	VRY	•	x	10 - 120 %
102	VYB	•	x	10 - 120 %
103	VBR	•	x	10 - 120 %
113	I Neutral	•	x	10 - 120 %

Note: Parameters 1,2,3 are L-N Voltage for 3P 4W & L-L Voltage for 3P 3W

13. Relay output (Optional):

SIRAX BM1400 is provided with either 1 or 2 relay for pulse output as well as for limit switch

13.1 Pulse Output:

Pulse output is the potential free, very fast acting relay contact which can be used to drive an external mechanical counter for energy measurement.
SIRAX BM1400 pulse output can be configured to any of the following parameter through setup parameter screen.

1) Active Energy (Import)
2) Active Energy (Export)
3) Reactive Energy (Import)
4) Reactive Energy (Export)
5) Apparent Energy
6) Ampere hour

TABLE 3: Energy Pulse Rate Divisor
1. For Energy Output in Wh

	Pulse rate	
Divisor	Pulse	System Power *
1	1per Wh	Up to 3600W
	1per kWh	Up to 3600kW
	1per Mwh	Above 3600kW
10	1per 10Wh	Up to 3600W
	1per 10kWh	Up to 3600kW
	1per 10MWh	Above 3600kW
100	1per 100Wh	Up to 3600W
	1per 100kWh	Up to 3600kW
	1per 100MWh	Above 3600kW
1000	1 per 1000Wh	Up to 3600W
	1 per 1000kWh	Up to 3600kW
	1per 1000MWh	Above 3600kW
Pulse Duration 60 ms, 100 ms or 200 ms		

2. For Energy Output in Kwh

	Pulse rate	
Divisor	Pulse	System Power *
1	1per kWhr	Up to 3600kW
	1 per 1000kWhr	Up to 3600kW
	1per 1000MWhr	Above 3600kW

3. For Energy Output in Mwh

	Pulse rate	
Divisor	Pulse	System Power *
1	1 per Mwhr	Up to 3600W
	1 per 1000Mwhr	Up to 3600W
	1 per 1000Gwhr	Above 3600kW

Above options are also applicable for Apparent and Reactive Energy.
* System power = 3 x CT(Primary) x $PT(Primary)_{L-N}$ for 3 Phase 4 Wire
System power = Root3 x CT(Primary) x $PT(Primary)_{L-L}$ for 3 Phase 3 Wire

Ampere Hour:
Divisor 1(Default)
CT secondary = 1A Max pulse rate 3600 pulses per Ah **
CT secondary = 5A Max pulse rate 720 pulses per Ah **

Divisors 10
CT secondary = 1A Max pulse rate 3600 pulses per 10Ah **
CT secondary = 5A Max pulse rate 720 pulses per 10Ah **

Divisors 100
CT secondary = 1A Max pulse rate 3600 pulses per 100Ah **
CT secondary = 5A Max pulse rate 720 pulses per 100Ah **

Divisors 1000
CT secondary = 1A Max pulse rate 3600 pulses per 1000Ah **
CT secondary = 5A Max pulse rate 720 pulses per 1000Ah **

Pulse duration 60 ms, 100 ms or 200 ms
**No. of Pulses per Ampere hour = Maximum Pulses / CT Ratio Where, CT Ratio = (CT primary/ CT Secondary)

13.2 Limit Switch

Limit switch can be used to monitor the measured parameter (Ref.Table:2) in relation with to a set limit.
The limit switch can be configured in one of the four mode given below:

1) Hi alarm & Relay Energized Relay.
2) Hi alarm & De-Energized Relay.
3) Lo alarm & Energized Relay.
4) Lo alarm & De-Energized Relay.

Limit switch has user selectable Trip point, Hysteresis, Energizing Delay & De-Energizing delay.

Hi Alarm:

If Hi-Alarm Energized or Hi Alarm De-Energized option is selected then relay will get energized or De-energized,if selected parameter is greater than or equal to trip point.

Low Alarm:

If Lo-Alarm Energized or Lo Alarm De-Energized option is selected then relay will get energized or De-energized,if selected parameter is less than or equal to trip point.

Trip point:

Trip point can be set in the range of 10% to 120 % of nominal value for Hi-Alarm & 10% to 100 % of nominal value for Lo-Alarm.

Hysteresis:

Hysteresis can be set in the range of 0.5% to 50 % of set trip point. If Hi-alarm Energized or Hi-alarm De-energized is selected then relay will get De-energized or Energized respectively, if set parameter value is less than Hysteresis Similarly if Lo-alarm Energized or Lo-alarm De-Energized.

Energizing Delay:

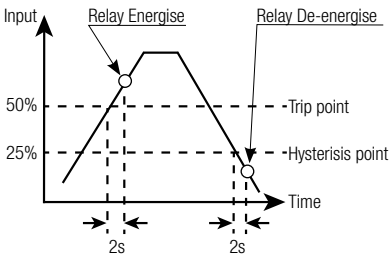
The energizing delay can be set in the range from1 to 10 sec.

De-Energizing Delay:

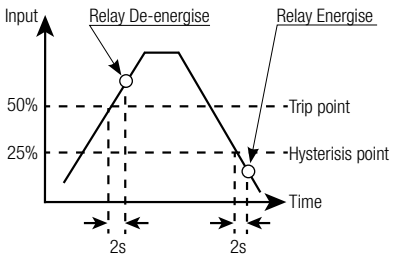
The De-energizing delay can be set in the range from1 to 10 sec.
Note: In case of lo alarm if trip point is set at 100% then maximum 20%
Hysterisis can be set.

Example of different configuration.
Parameter No: 4 (Current 1)
Trip Point = 50%
Hysteresis = 50% of trip point
Energising Delay: 2s
De-energising Delay: 2s

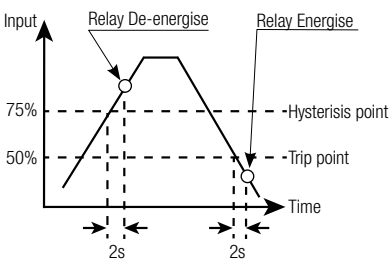
1) Hi alarm & Energised relay



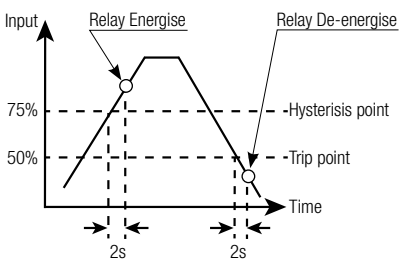
2) Hi alarm & De-energised relay



3) Lo alarm & Energised relay



4) Lo alarm & De-energised relay



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

3 Phase 3 Wire / 4 Wire programmable at site

Inputs

Nominal input voltage (Three wire and Four wire)	57.7 V to 277V (100V to 480 V)
Max continuous input voltage	120% of Rated Value
Max short duration input voltage	2 x Rated Value (1s application repeated 10 times at 10s intervals)
Nominal input voltage burden	0.2VA approx. per phase
Nominal input current	1A / 5A AC rms programmable at site
Max continuous input current	120% of Rated Value
Nominal input current burden	0.6VA approx. per phase
Max short duration current input	20 x Rated Value (1s application repeated 5 times at 5 min. intervals)
System CT primary values	Std. Values from 1 to 9999A (1 or 5 Amp secondaries)

Auxiliary

Standard nominal Auxillary supply voltages & Frequency	110V AC/50 Hz, 230V AC/50 Hz, 380V AC/50 Hz,100 - 250V AC- DC (45-66Hz), 12 - 48V DC
a.c. supply voltage tolerance	+20 % / -15 % of Rated Value
a.c. supply frequency range	45 to 66 Hz
a.c. supply burden	4.5VA
d.c. supply burden	3W

Operating Measuring Ranges

Voltage	5 .. 120 % of Rated Value
Current	5 .. 120 % of Rated Value
Frequency	40 .. 70 Hz
Power Factor	0.5 Lag ... 1 ... 0.8 Lead

Accuracy

Voltage	+ 0.5 % of range
Current	+ 0.5 % of range
Frequency	0.15% of mid frequency
Active Power	+ 0.5 % of range
Re-Active Power	+ 0.5 % of range
Apparent Power	+ 0.5 % of range
Active Energy	+ 0.5 % of range
Re-Active Energy	+ 0.5 % of range
Apparant Energy	+ 0.5 % of range
Power Factor	+ 1 % of Unity
Angle	+ 1 % of range
Analog Output	+ 1 % of Output end value
Total Harmonic Distortion	+ 1 %
Neutral Current	+ 4 % of range

Reference conditions for Accuracy:

Reference temperature	23 C + 2 C
Input frequency	50 or 60Hz + 2%
Input waveform	Sinusoidal (distortion factor 0.005)

Auxiliary supply voltage	Rated Value + 1 %
Auxiliary supply frequency	Rated Value + 1 %
Voltage Range	50... 100% of Nominal Value. 60... 100% of Nominal Value for THD.
Current Range	10... 100% of Nominal Value. 20... 100% of Nominal Value for THD.
Power	cosØ / sinØ = 1 For Active / Reactive Power & Energy 10... 100% of Nominal Current & 50... 100% of Nominal Voltage.
Power Factor / Phase Angle	40... 100% of Nominal Current & 50... 100% of Nominal Voltage.

Nominal range of use of influence quantities for measurands

Voltage	50 .. 120 % of Rated Value
Current	10 .. 120 % of Rated Value Rated
Input frequency	Value + 10 %
Temperature	0 to 50° C
Auxiliary supply voltage	Rated Value + 10 %
Auxiliary supply frequency	Rated Value + 10 %
Temperature Coefficient (For Rated value range of use 0…50° C)	0.025% / °C for Voltage (50..120% of Rated Value) 0.05% / °C for Current (10..120% of Rated Value)
Error change due to variation of an influence quantity	2 * Error allowed for the reference condition applied in the test.

Display

LED	3 line 4 digits . Digit height 11mm
Update	Approx. 1 seconds

Controls

User Interface	Two push buttons

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
Enclosure (IP for water & dust)	IP 54 (front), IP 20 (housing/terminals) acc. to IEC 60529

Isolation

Dielectric voltage withstand test between circuits and accessible surfaces	2.2 kV RMS 50 Hz for 1 minute between all electrical circuits

Environmental

Operating temperature	-10 to 55 ° C
Storage temperature	-20 to +65 °C
Relative humidity	0 .. 90 % RH
Warm up time	3 minute (minimum)
Shock	15g in 3 planes
Vibration	10 .. 55 Hz, 0.15mm amplitude

Enclosure

Style	96mm x 96mm DIN Quadratic
Material	PC 10% unfilled
Terminals	Screw-type terminals
Depth	< 80 mm
Weight	0.620 kg Approx.

Pulse output Option (1 Relay)

Relay	1NO + 1NC
Switching Voltage & Current	240VDC , 5Amp.
Default Pulse rate Divisor	1 per Wh (up to 3600W), 1 per kWh (up to 3600kW), 1 per MWh (above 3600 kW)
Pulse rate Divisors	Programmable on site
10	1 per 10Wh (up to 3600W), 1 per 10kWh (up to 3600kW), 1 per 10MWh (above 3600 kW)
100	1 per 100Wh (up to 3600W), 1 per 100kWh (up to 3600kW), 1 per 100MWh (above 3600 kW)
1000	1 per 1000Wh (up to 3600W), 1 per 1000kWh (up to 3600kW), 1 per 1000MWh (above 3600 kW)
Pulse Duration ModBus (RS 485) Option:	60ms , 100ms or 200ms

Note: Above conditions are also applicable for Reactive & Apparent Energy .

ModBus (RS 485) Option:	ModBus (RS 485)
Protocol	19200 , 9600 , 4800 or 2400 (Programmable)
Baud Rate	Odd or Even, with 1 stop bit, Or None with 1 or 2 stop bits
Parity	

Analog Output Option:

Linear	4 ... 20mA dc into 0 - 500 ohm Uni-directional, internally powered.

15.1 Dimensional drawings

16. 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 together. 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 bothends 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 2400, 4800, 9600, 19200 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

16.1 Accessing 3 X register for reading measured values

Two consecutive 16 bit registers represent one parameter. Refer **TABLE 1: 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)	00 (Hex)	04 (Hex)	00 (Hex)	02 (Hex)	30 (Hex)	0A (Hex)
Device Address	Function Code	Start Adress High	Start Adress 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)	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

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
			High Byte	Low Byte		
30001	1	Volts 1	00	0	•	•
30003	2	Volts 2	00	2	•	•
30005	3	Volts 3	00	4	•	•
30007	4	Current 1	00	6	•	•
30009	5	Current 2	00	8	•	•
30011	6	Current 3	00	A	•	•
30013	7	W1	00	C	•	x
30015	8	W2	00	E	•	x
30017	9	W3	00	10	•	x
30019	10	VA 1	00	12	•	x
30021	11	VA 2	00	14	•	x
30023	12	VA 3	00	16	•	x
30025	13	VAR 1	00	18	•	x
30027	14	VAR 2	00	1A	•	x
30029	15	VAR 3	00	1C	•	x
30031	16	PF 1	00	1E	•	x
30033	17	PF 2	00	20	•	x
30035	18	PF 3	00	22	•	x
30037	19	Phase Angle 1	00	24	•	x
30039	20	Phase Angle 2	00	26	•	x
30041	21	Phase Angle 3	00	28	•	x
30043	22	Volts Ave	00	2A	•	•
30045	23	Volts Sum	00	2C	•	•
30047	24	Current Ave	00	2E	•	•
30049	25	Current Sum	00	30	•	•
30051	26	Watt Ave	00	32	•	•

TABLE 1: Continued…

Adress (Register)	Parameter No.	Parameter	Modbus Start Adress Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30053	27	Watt Sum	00	34	•	•
30055	28	VA Av g	00	36	•	•
30057	29	VA Sum	00	38	•	•
30059	30	VAR Av g	00	3A	•	•
30061	31	VAR Sum	00	3C	•	•
30063	32	PF Av g	00	3E	•	•
30065	33	PF Sum	00	40	•	x
30067	34	Phase Angle Av g	00	42	•	•
30069	35	Phase Angle Sum	00	44	•	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	•	•
30083	42	Ah	00	52	•	•
30085	43	W Demand (Import)	00	54	•	•
30087	44	W Max Demand (Import)	00	56	•	•
30089	45	W D e m and (Export)	00	58	•	•
30091	46	W Max Demand (Export)	00	5A	•	•
30093	47	–	–	–	–	–
30095	48	–	–	–	–	–
30097	49	–	–	–	–	–
30099	50	–	–	–	–	–
30101	51	VA De mand (Utility / Gen)	00	64	•	•
30103	52	V A Max Demand (Utility)	00	66	•	•
30105	53	A Dema nd (Utility / Gen)	00	68	•	•
30107	54	A Max Demand (Utility)	00	6A	•	•
30133	67	System Max Voltage	00	84	•	•
30135	68	System Min Voltage	00	86	•	•
30141	71	System Max Currrent	00	8C	•	•
30143	72	System Min Current	00	8E	•	•
30201	101	VL 1 - 2 (Calculated)	00	C8	•	x
30203	102	VL 2 - 3 (Calculated)	00	CA	•	x
30205	103	VL 3- 1 (Calculated)	00	CC	•	x
30207	104	V1 THD (%)	00	CE	•	•
30209	105	V2 THD (%)	00	D0	•	•
30211	106	V3 THD (%)	00	D2	•	•
30213	107	I1 THD (%)	00	D4	•	•
30215	108	I2 THD (%)	00	D6	•	•
30217	109	I3 THD (%)	00	D8	•	•
30219	110	System Voltage THD (%)	00	DA	•	•
30221	111	System Current THD (%)	00	DC	•	•
30225	113	I Neutral	00	E0	•	x
30227	114	Run Hou	00	E2	•	•
30229	115	On Hour	00	E4	•	•
30231	116	No. of Interruptions	00	E6	•	•

Note: Parameters 1,2,3 are L-N Voltage for 3P 4W & L-L Voltage for 3P 3W.

16.2 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 2** 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	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.)

TABLE 2: 4 X register addresses

Adress (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Adress Hex	
				High Byte	Low Byte
40001	1	Demand Time	R/Wp	00	00
40003	2	Demand Integration Time	R/Wp	00	02
40005	3	–	–	–	–
40007	4	System Voltage	R	00	06
40009	5	System Current	R	00	08
40011	6	System Type*	R/Wp	00	0A
40013	7	Pulse Width	R/Wp	00	0C
40015	8	Reset Parameters	Wp	00	0E
40017	9	Number of Poles	R/Wp	00	10
40019	10	RS485 Set-up Code	R/Wp	00	12
40021	11	Node Address	R/Wp	00	14
40023	12	Pulse Divisor	R/Wp	00	16
40025	13	Min Reset	WP	00	18
40027	14	Max Reset	WP	00	1A
40029	15	Analog Out 1- Para Sel	R/Wp	00	1C
40031	16	Analog Out 2- Para Sel	R/Wp	00	1E
40033	17	PT Primary	R/Wp	00	20
40035	18	CT Primary	R/Wp	00	22
40037	19	System Power	R	00	24
40039	20	Energy Digit Reset Count	R/Wp	00	26
40041	21	Register Order / Word Order	R/Wp	00	28
40043	22	CT Secondary	R/Wp	00	2A
40045	23	PT Secondary	R/Wp	00	2C
40047	24	Relay 1 output select	R/Wp	00	2E
40049	25	Pulse 1 / Limit 1 Parameter select	R/Wp	00	30
40051	26	Limit 1 Trip point	R/Wp	00	32
40053	27	Limit 1 Hysteresis	R/Wp	00	34
40055	28	Limit 1 Delay (On)	R/Wp	00	36
40057	29	Limit 1 Delay (Off)	R/Wp	00	38
40071	36	Password	R/W	00	46
40073	37	Limit 1 Configuration select	R/Wp	00	48
40077	39	Auto scroll	R/Wp	00	4C
40079	40	30mA Noise Current Elimination	R/Wp	00	4E

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

Explanation for 4X register:

Adress	Parameter	Description
40001	Demand Reset	Demand Reset is used to reset the Demand parameter. A value of zero must be Written to this register to reset the Demand period. Writing any other value will return an error.
40003	Demand Period	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 display on Modus	This address is used to set energy display on modbus 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. 2: 3 Phase 3 Wire 3: 3 Phase 4 Wire. Writing any other value will return error.
40013	Pulse Width of Relay	This address is used to set pulse width of the Pulse output. Write one of the following values to this address: 60: 60 ms 100: 100 ms 200: 200 ms Writing any other value will return error.
40015	Reset Energy Counter	This address is used to reset the Energy Counter. Write zero value to this register to reset the energy counter. Writing any other value will return an error.
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 3 for details.
40021	Node Address	This register address is used to set Device address between 1 to 247 .
40023	Pulse Divisor	This address is used to set pulse divisor of the Pulse output. Write one of the following values to this address for Wh: 1 : Divisor 1 10 : Divisor 10 100 : Divisor 100 1000 : Divisor 1000 Writing any other value will return an error.
40025	Min - Reset	This address is used to reset the Min parameters value. Write Zero value to this register to reset the Min parameters. Writing any other value will return an error.
40027	Max - Reset	This address is used to reset the Max parameters value. Write Zero value to this register to reset the Max parameters. Writing any other value will return an error.
40029	Analog Out 1-Para Set	This address is used to set the parameter for Analog Output 1. Write one of the parameter no. As per the options given in Table 2 for Analog & Limit Output Parameters. Writing any other value will return an error.
40031	Analog Out 2-Para Set	This address is used to set the parameter for Analog Output 2. Write one of the parameter no. As per the options given in Table 2 for Analog & Limit Output Parameters. Writing any other value will return an error.
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.

Continue Explanation for 4X register:

Adress	Parameter	Description
40039	Energy digit Reset Count	This address is used to setting maximum energy count after which energy will rollback to zero depends upon setting of Wh, KWh & MWh. If Energy display on modbus in Wh count will be set in between 7 to 14 or in KWh set in between 7 to 12 & in MWh set in between 7 to 9.
40041	Word Order	Word Order controls the order in which Multifunction Meter receives or sends floating - point num-bers:- 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 instrument will detect the order used to send this value and set that order for all ModBus transaction involving floating point numbers.
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 for the range of PT secondary settable values in Section 7.2.1.3
40047	Relay1 output select	This address is used to select the Relay1 operation as pulse or Limit. Write one of the following values to this address. 0: Pulse output on Relay1 128 (Decimal): Limit output on Relay1. Writing any other value will return an error.
40049	Pulse 1 / Limit 1 parameter select	This address is used to assign the Parameter to Relay1 If Limit option is selected refer TABLE 2 for parameter number & if Pulse option is selected then refer TABLE 4.
40051	Limit 1 Trip Point	This address is used to set the trip point in %. Any value between 10 to 100 for Lo- alarm & 10 to120 for Hi-alarm can be written to this address. Writing any other value will return an error.
40053	Limit 1 Hysteresis	This address is used to set the hysteresis between 0.5 to 50.0%. Writing any other value will return an error.
40055	Limit 1 Energizing Delay	This address is used to set the Energizing delay between 1 to 10. Writing any other value will return an error.
40057	Limit 1 De-energizing Delay	This address is used to set the De-Energizing delay between 1 to 10. Writing any other value will return an error.
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.
40073	Limit 1 Configuration Select	This address is used to set the Configuration for Relay 1 see TABLE 5. Writing any other value will return an error.
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.

Table 3: RS485 Set-up Code

Baud Rate	Parity	Stop Bit	Decimal value
2400	NONE	01	0
2400	NONE	02	1
2400	EVEN	01	2
2400	ODD	01	3
4800	NONE	01	4
4800	NONE	02	5
4800	EVEN	01	6
4800	ODD	01	7
9600	NONE	01	8
9600	NONE	02	9
9600	EVEN	01	10
9600	ODD	01	11
19200	NONE	01	12
19200	NONE	02	13
19200	EVEN	01	14
19200	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 4: Pulse1 & Pulse2 Configuration select

Code	Configuration
0	Import Active Energy
1	Export Active Energy
2	Import Reactive Energy
3	Export Reactive Energy
4	Apparent Energy

Table 5: Limit1 & Limit2 Configuration select

Code	Configuration
0	Hi- alarm & Energized relay
1	Hi- alarm & De-energized relay
2	Lo- alarm & Energized relay
3	Lo- alarm & De-energized relay

16.3 User Assignable Modbus Register

The Multifunction Energy Meter contains 20 user assignable registers in the address range of 0x200 (30513) to 0x226 (30551) (see TABLE 6). Any of the parameter addresses (3X register addresses TABLE 1) accessible in the instrument can be mapped to these 20 user assignable registers.

Parameters (3X registers addresses) that resides in different locations may be accessed by the single request by re-mapping them to adjacent address in the user assignable registers area.

The actual address of the parameters (3X registers addresses) which are to be accessed via address 0x200 to 0x226 are specified in 4X Register 0x200 to 0x213. (see TABLE 7)

TABLE 6: 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 7: 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

Example:

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 7) 0x0200 and 0x0201 respectively.

Assigning Query:

							Voltage 2* (3X Adress 0x0002)		Power Factor 1* (3X Adress 0x001E)			
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 7) which will point to user assignable 3x registers 0x200 and 0x202 (TABLE 6). 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 registers 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 Table7)		(Starting Address)	User Assignable mapping Register (4x Register Table6)	
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 a "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).**

16.4 Connection RS485 output