

Operating Manual

RISH Master 3440 0.2S (as per IEC62053-22)



INDEX

Multi-function Digital Meter Installation & Operating Instructions

Section	Contents
1.	Introduction
2.	Measurement Reading Screens
3.	Programming
	3.1 Password Protection
	3.2 Menu selection
	3.2.1 System Parameter selection screen
	3.2.1.1 System type
	3.2.1.2 Potential transformer Primary value
	3.2.1.3 Potential transformer secondary value
	3.2.1.4 Current transformer Primary value
	3.2.1.5 Current transformer Secondary value
	3.2.1.6 Demand integration time
	3.2.1.7 Auto Scrolling
	3.2.1.8 Low current noise cutoff
	3.2.1.9 Energy Display on Modbus
	3.2.1.10 Energy digit reset count
	3.2.1.11 Energy Auto-Ranging On Display
	3.2.1.11.1 Calculating Display energy (Auto-ranging)
	3.2.1.11.2 Entering Energy start count
	3.2.2 Communication Parameter selection screen
	3.2.2.1 Address Setting
	3.2.2.2 RS 485 Baud rate
	3.2.2.3 RS 485 Parity selection

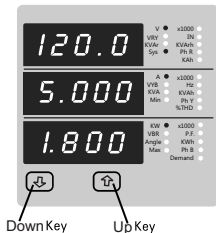
- 3.2.3 Reset Parameter selection screen
 - 3.2.3.1 Resetting Parameter
- 3.2.4 Output Option selection screen (menu)
 - 3.2.4.1 Configuration of Output
 - 3.2.4.1.1 Relay 1 output selection menu
 - 3.2.4.1.1.1 Pulse output
 - 3.2.4.1.1.1.1 Assignment of Energy to Pulse (Relay 1)
 - 3.2.4.1.1.1.2 Pulse Duration Selection
 - 3.2.4.1.1.1.3 Pulse Rate
 - 3.2.4.1.1.2 Limit output
 - 3.2.4.1.1.2.1 Assignment of Limit Output1 to Parameter
 - 3.2.4.1.1.2.2 Limit Configuration
 - 3.2.4.1.1.2.3 Trip point selection
 - 3.2.4.1.1.2.4 Hysteresis selection
 - 3.2.4.1.1.2.5 Energizing delay time
 - 3.2.4.1.1.2.6 De-energizing delay time
 - 3.2.4.1.2 Relay 2 output selection menu
 - 3.2.4.1.3 Analog Output Selection
 - 3.2.4.1.3.1 Parameter setting for Analog Output-1
 - 3.2.4.1.3.2 Parameter setting for Analog Output-2

- 4. Phase Rotation Error screen.
- 5. On - Hour.
- 6. Number of Interruption
- 7. Analog Output
- 8. Relay Output
 - 8.1 Pulse output
 - 8.2 Limit switch
- 9. Phasor Diagram

- 10. Installation
 - 10.1 EMC Installation Requirements
 - 10.2 Case Dimensions and Panel Cut-out
 - 10.3 Wiring
 - 10.4 Auxiliary Supply
 - 10.5 Fusing
 - 10.6 Earth / Ground Connections
- 11. Connection Diagrams
- 12. Specification
- 13. Connection for Optional Pulse output / RS 485 / Analog / Ethernet Output

1. Introduction

The 3440 is a panel mounted 96 x 96mm DIN Quadratic Digital metering system for the measurement important electrical parameters like AC voltage, AC Current, Frequency, Power, Energy(Active / Reactive / Apparent) . The instrument integrates accurate measurement technology (All Voltages & Current measurements are True RMS up to 31th Harmonic) with 3 line 4 digits Ultra high brightness LED display.



3440 can be configured and programmed at site for the following :

PT Primary, PT Secondary, CT Primary, CT Secondary (5A or 1A) and 3 phase 3W or 3 Phase 4W or 1 Phase 3W system.

The screen shown on left is of 3 Phase Meter.

The screen shown further is of 1 Phase Meter. The front panel has two push buttons through which the user may scroll through the available measurement readings, reset the energy (Import/Export) Min/Max (System Voltage and System Current) and configure the product.

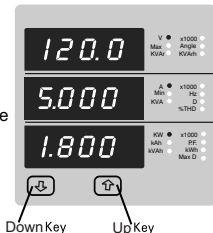


TABLE 1:

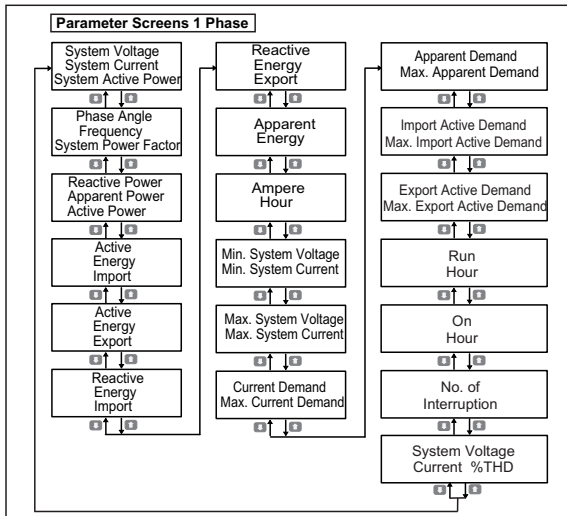
Measured Parameters	1P 2W	3P 4W	3P 3W	1P 3W	Units of Measurement
System Voltage	✓	✓	✓	✓	Volts
System Current	✓	✓	✓	✓	Amps
Voltage VL1-N	✓	✓	✗	✓	Volts
Voltage VL2-N	✗	✓	✗	✓	Volts
Voltage VL3-N	✗	✓	✗	✗	Volts
Voltage VL1-L2	✗	✓	✓	✓	Volts
Voltage VL2-L3	✗	✓	✓	✗	Volts
Voltage VL3-L1	✗	✓	✓	✗	Volts
Current L1	✓	✓	✓	✓	Amps
Current L2	✗	✓	✓	✓	Amps
Current L3	✗	✓	✓	✗	Amps
Neutral Current	✓	✓	✓	✓	Amps
Frequency	✓	✓	✓	✓	Hz
Active Power	✓	✓	✓	✓	Kwatts
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
Inductive Reactive Energy (8 Digit resolution)	✓	✓	✓	✓	kVArh
Capacitive Reactive Energy (8 Digit resolution)	✓	✓	✓	✓	kVArh
Apparent Energy (8 Digit resolution)	✓	✓	✓	✓	kVAh

Measured Parameters	1P 2W	3P 4W	3P 3W	1P 3W	Units of Measurement
Current Demand	✓	✓	✓	✓	Amps
KVA Demand	✓	✓	✓	✓	KVA
KW Import Demand	✓	✓	✓	✓	KW
KW Export Demand	✓	✓	✓	✓	KW
KVAr Cap. Demand	✓	✓	✓	✓	KW
KVAr Ind. Demand	✓	✓	✓	✓	KW
Max Current Demand	✓	✓	✓	✓	Amps
Max kVA Demand	✓	✓	✓	✓	KVA
Max KW Import Demand	✓	✓	✓	✓	KW
Max KW Export Demand	✓	✓	✓	✓	KW
Max KVAr Ind. Demand	✓	✓	✓	✓	KW
Max KVAr Cap. Demand	✓	✓	✓	✓	KW
Run Hour	✓	✓	✓	✓	Hours
On Hour	✓	✓	✓	✓	Hours
Number of Interruptions	✓	✓	✓	✓	Counts
Phase Reversal Indication	✓	✓	✓	✓	—
V1 THD*	✓	✓	✓	✓	%
V2 THD*	✗	✓	✗	✓	%
V3 THD*	✗	✓	✓	✗	%
I1 THD	✓	✓	✓	✓	%
I2 THD	✗	✓	✗	✓	%
I3 THD	✗	✓	✓	✗	%
System Voltage THD	✓	✓	✓	✓	%
System Current THD	✓	✓	✓	✓	%

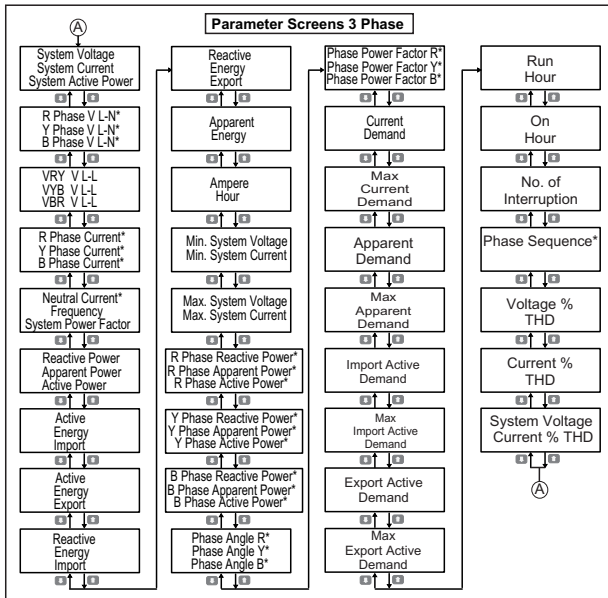
*Note : THD Parameters are L-N in case of 3P 4W, 1P 3W & L-L in case of 3P 3W .

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”.

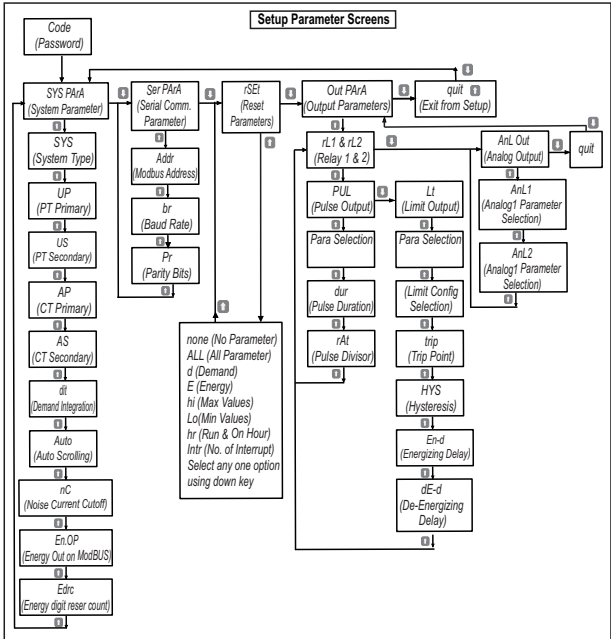


Parameter Screens 3 Phase



NOTE: SCREENS MARKED WITH * ARE AVAILABLE ONLY IN 4W SYSTEM (NOT IN 3 WIRE SYSTEM)
 1P3W USES 3P4W SCREENS BUT, WITH PHASE 3 HIDDEN

Setup Parameter Screens



3. Programming

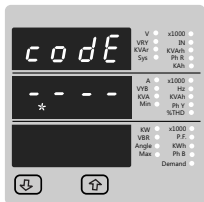
The following sections comprise step by step procedures for configuring the **3440** for individual user requirements.

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 3.1).

3.1. Password Protection

Password protection can be enabled to prevent unauthorized 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.

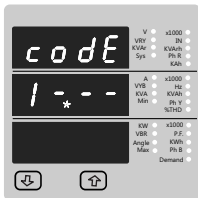


Enter Password, prompt for first digit.
(* Denotes that decimal point will be flashing).

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.

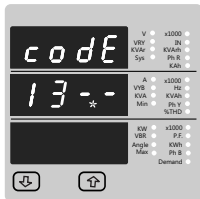
Press the “**↑**Up” key to advance to next digit.

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.

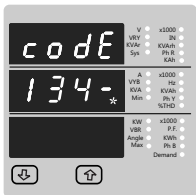


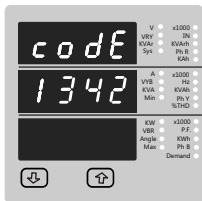
Enter Password, third digit entered, prompt for fourth digit.

(* 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.



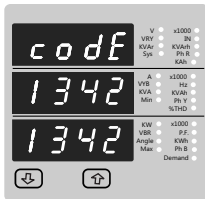


Enter Password, fourth digit entered, awaiting verification of the password.

Password confirmed.

Pressing "↓Down" key will advance to the "New / change Password" entry stage.

Pressing the "↑Up" key will advance to the Menu selection

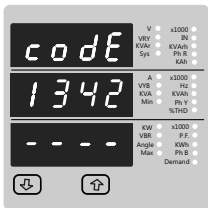


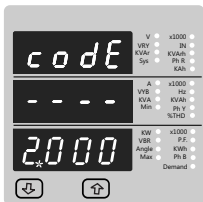
Password Incorrect.

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).

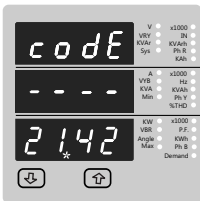
Pressing the "↓ Down" key will scroll the value of the first digit from 0 through to 9, the value will wrap from 9 round to 0.

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.

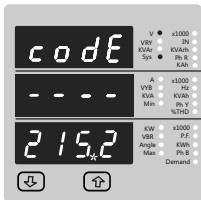
Pressing the "↑ Up" key to advance the operation to the next digit and sets the second digit, in this case to "1"

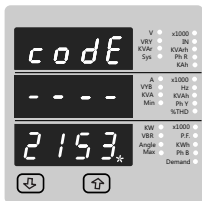


New / Change Password, second digit entered, prompting for third digit. (*decimal point indicates that this will be flashing).

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"

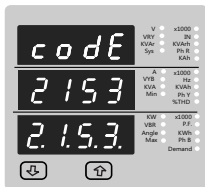




New Password confirmed.

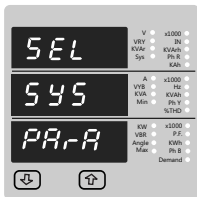
Pressing the "↓ Down" key will return to the "New/Change Password".

Pressing the "↑ Up" key will advance to the Menu selection screen.(see section 3.2).



3.2 Menu selection.

3.2.1 System Parameter selection screen.



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.

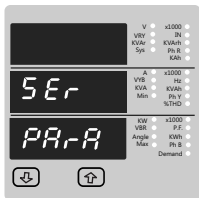
Pressing the "↑ Up" key to advance the operation to the "New Password Confirmed" and sets the fourth digit, in this case to "3".

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 3.2.1.1 to 3.2.1.10)

Pressing the "↓ down" key will advance to Communication selection screen (see section 3.2.2)

3.2.2 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 3.2.2.1 to 3.2.2.3)

Pressing the "↓ down key will advance to Reset parameter Screen. (see section 3.2.3)

3.2.3 Reset Parameter selection screen.

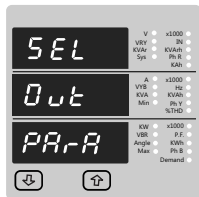
This screen is used to Reset the different parameters .

Pressing the "↑ Up" key allows the user to Reset different system parameters (see section 3.2.3.1)

Pressing the "↓ down key" will advance to Output Option selection screen (see section 3.2.4).



3.2.4 Output Option selection screen.

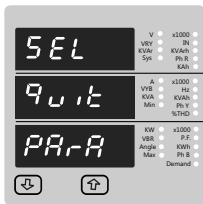


This screen will allow the user to select different Output options Like "Relay1", "Relay2", "Analog" Output.

Pressing the "↑ Up" key allows the user to select & Configure the output option (see section 3.2.4.1)

Pressing the "↓ down key will advance to Quit screen. (see section 3.2.5)

3.2.5 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 3.2.1)

3.2.1 System parameters Selection

3.2.1.1 System Type

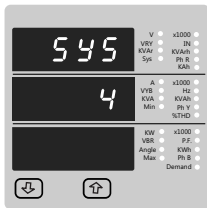
This screen is used to set the system type .

System type "2" for 1 phase 3 wire, "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 3.2.1.2)

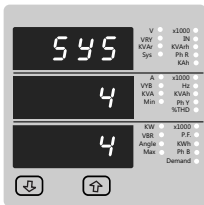
Pressing the "↓ Down" key will enter the system type edit mode and scroll the values through values available .

Pressing the "↑ Up" key advances to the system type confirmation menu.



Note:- This Screen is available only for 3 Phase Meter.

System Type Confirmation



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 3.2.1.2)

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

3.2.1.2 Potential Transformer Primary Value

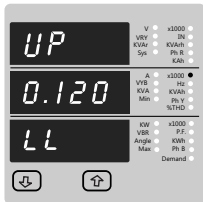
The nominal full scale voltage which will be displayed as the Line to Line voltages for all system types. The values displayed represent the voltage in kilovolts (note the x1000 enunciator).

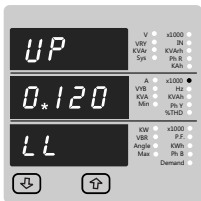
Pressing the "↑ Up" key accepts the present value and advances to the "Potential Transformer secondary Value edit" menu. (See Section 3.2.1.3)

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.

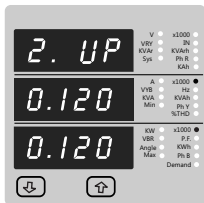
Pressing the “**↑** Up” key accepts the present value at the cursor position and advances the cursor to the next less significant digit.

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.



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

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 3.2.1.3)

3.2.1.3 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 3.2.1.2. potential transformer primary voltage. The ratio of full scale primary to full scale secondary is defined as the transformer ratio.

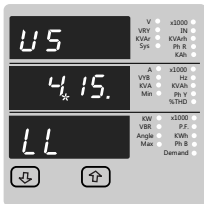
Pressing the “**↑ Up**” key accepts the present value and advances to the “Current Transformer Primary Value edit” menu. (See Section 3.2.1.4)

The Valid range of instrument is from 100 to 600V_{L-L}.

Pressing the “**↓ Down**” key will enter the “Potential Transformer Secondary Value Edit” mode.

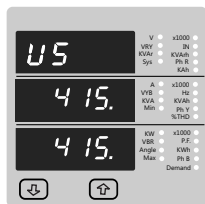
Down” key will scroll the value of the most significant digit from available range of PT secondary value

Pressing the “**↑ Up**” key accepts the present value at the cursor position and advances the cursor to the next less significant digit.



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”

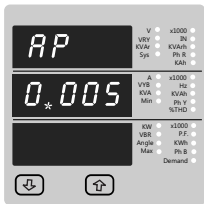
Pressing the “**↑** Up” key sets the displayed value and will advance to the Current Transformer Primary Value (See Section 3.2.1.4)

3.2.1.4 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 3.2.1.5)

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



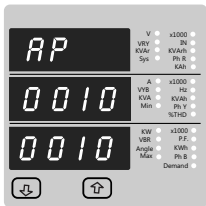
Primary Value results in a maximum power of greater than 666.6 MVA in which case the digit range will be restricted, the value will wrap. Example: If primary value of PT is set as 692.8kV L-L (max value) then primary value of Current is restricted to 1157A.

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.

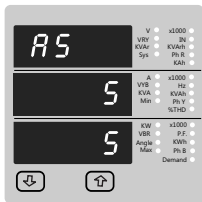
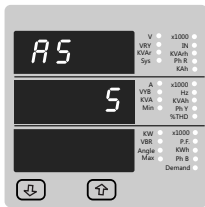
If the scaling is not correct, Pressing the “**Down**” key will return to the “Current Transformer Primary Value”Edit stage with the most significant digit highlighted (associated decimal point flashing) and the bottom line of the display will be blanked. Pressing the “**Up**” key sets the displayed value and will advance to the “Current Transformer Secondary Value Edit” menu. (See Section 3.2.1.5)

3.2.1.5 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 3.2.1.6)

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 appear 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.

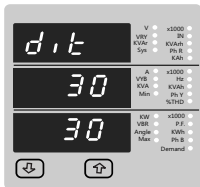
Pressing "↑Up" key sets the displayed value and will advance to Demand integration Time Edit menu. (See Section 3.2.1.6)

3.2.1.6 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 Following Options 8,15,20,30.

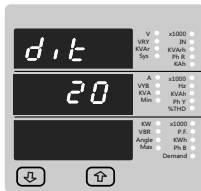
Pressing the "↑ Up" key will advance to Demand Integration confirmation screen.



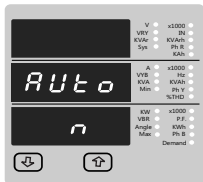
Demand Integration Time value confirmation

Pressing "↑Up" key sets the displayed value and will advance to scroll screen.

(See Section 3.2.1.7)



3.2.1.7 Auto Scrolling :

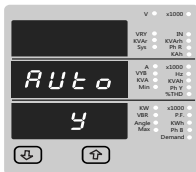


This screen allows user to enable screen scrolling. Auto scrolling Edit.

Pressing "↑ Up" key accepts the present status and advance to the Low Current noise cutoff (See Section 3.2.1.8).

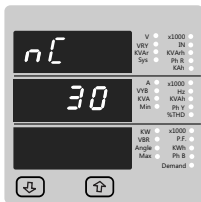
Pressing the "↓ Down" key will enter the "Auto Screen Scrolling Edit" and toggle the status 'Yes' and 'No'.

Pressing the "↑ Up" key will select the status displayed and advance to the Low Current noise cutoff (See Section 3.2.1.8)



3.2.1.8 Low Current noise cutoff.

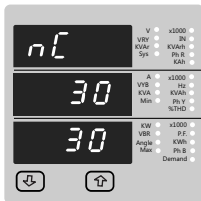
This screen allows the user to set Low noise current cutoff in mA.



Low current noise cutoff Edit.

Pressing “**↑Up**” key accepts the present value and advance to Energy Display on Modbus.
(See section 3.2.1.9)

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 Display on Modbus selection
(See section 3.2.1.9)

3.2.1.9. Energy Display on modbus

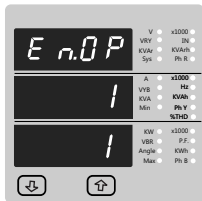
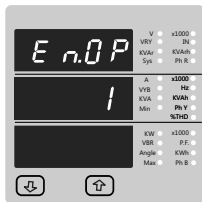
This screen enable user to set energy in terms of Wh / KWh / MWh on RS 485 Output depending as per the requirement .Same applicable for all types of energy.

Pressing “**↑Up**” key accepts the presents value and advances to the “Energy digit reset count” menu (See section 3.2.1.10).

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 3.2.1.10)

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

3.2.1.10 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.

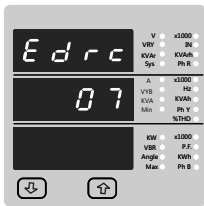
Pressing the "↑Up" key sets the displayed value and will jump back to the system parameter selection
(See Section 3.2.1)

Pressing the "↓Down" key will enter the Energy digit reset count edit mode. This will scroll the value of reset count **from 7 to 9**

Ex. If energy display on modbus is set Wh & It will set Energy digit count to 9 then energy will reset after "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 3.2.1)



Note :-

- 1) If Energy Resolution is set to MW & 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.
- 2) Energy in display is auto ranging, details in Section 3.2.1.11.

3.2.1.11. Energy Auto-Ranging On Display :

3.2.1.11.1 Calculating Display energy (Auto-ranging):

In case of energy auto-ranging the energy shown on modbus will be in terms of Overflow count (OF) & main energy counter (M) based on energy resolution & energy digit reset count (EDRC). So energy on modbus will have unit set in energy resolution on modbus (ie. Wh or kWh or MWh) & overflow energy counter (OF) on modbus will increment when main energy counter (M) on modbus will cross the number of digits set in energy digit reset count (EDRC) register (ie 7 or 8 or 9).

Whereas energy shown on display will be Combined energy (ie. Calculated from overflow count (OF) on modbus & main energy Count (M) on modbus) autoranged based on the 8 digits available on display to show energy.

Hence the purpose of this document is to establish a relation between modbus energy counters & display energy.

$$\text{Total Energy} = \text{OF} \times 10^{(\text{EDRC})} + \text{M}$$

Where:

OF => Overflow Count on modbus

Modbus registers for Overflow count (OF):

Wh import Overflow count => 30109 or 40109

Wh export Overflow count => 30113 or 40113

VARh Capacitive Overflow count => 30117 or 40117

VARh Inductive Overflow count => 30121 or 40121

Vah Overflow count => 30125 or 40125

M => Main Energy Counter on modbus

Modbus registers for Main energy Count (M):

Wh import => 30111 Or 40111

Wh export => 30115 Or 40115

VARh Capacitive => 30119 Or 40119

VARh Inductive => 30123 Or 40123

Vah => 30127 Or 40127

EDRC => Energy digit reset count set by user from display or modbus

For display setting refer Section 3.2.1.10.

For modbus refer Register 46039

Example for Calculating Display Energy from modbus Energy Counters:

Energy resolution on modbus register 46005 is set to 2 (ie. It will measure energy in kWh).

Overflow count (OF) value on modbus register 30109 for watt Import is 25.

Energy main counter (M) value on modbus register 30111 for watt import is 2587413.189

Energy digit reset count (EDRC) set by user in modbus register 46039 is 8.
Then,

$$\begin{aligned}\text{Total Energy} &= 25 \times 10^8 + 2587413.189 \\ &= 2500000000 + 2587413.189 \\ &= 2502587413.189 \text{ kWh}\end{aligned}$$

Therefore Energy shown on display will be:
= 2502587.41 MWh

As maximum number of digits for displaying energy present on display is 8 and the value of Total Energy in above example exceeds 8 counts so Energy in kWh is converted to MWh for displaying as shown above.

Note: As maximum energy shown on the display is XXXXXXXXX (8 Count) MWh so if count of above calculation for Total energy exceeds XXXXXXXXX (8 Count) MWh then the display will show "----" with unit MWh that indicates display energy has overflowed. This condition will only get reset if the Total Energy Count gets reset.

Overflow count (OF) on modbus will reset to 0 if it exceeds 99999999 in case of Wh resolution, 99999 in case of kWh resolution & 99 in case of Mwh resolution.

3.2.1.11.2 Entering Energy start count:

(Applicable for meter with modbus or Ethernet)

Energy start count is the feature that allows user to set count from which the meter should start incrementing energy. The start count can be set for main energy start counter & Overflow energy start Counter separately from modbus or Ethernet. Setting of energy start count is dependent on Energy resolution & Energy digit reset count (EDRC).

Energy resolution on modbus can be set by user from display (Refer Section 3.2.1.9) or from modbus (refer modbus register 46005).

Value for Energy resolution can be set to Wh,kWh or MWh.

Minimum resolution of energy that can be set in energy start count register is, the Energy resolution set by user.

For Eg.: Energy start count can be set to minimum 1Wh if the value on modbus register 46005 is set to Wh Or Energy start count can be set to minimum 1MWh if the value on modbus register 46005 is set to MWh.

Maximum value that can be set in the main energy start count register is $(10^{(EDRC)}-1)$.

Where:

EDRC => Energy digit reset count set by user from display or modbus

For display setting refer Section 3.2.1.10.

For modbus refer Register 46039

Example for calculating maximum limit of main energy start count :

If EDRC is 7 then Maximum value that can be set in the main energy start count (M) register is

$$\begin{aligned} &= (10^{(EDRC)}-1) \\ &= ((10^7)-1) \\ &= (10000000-1) \\ &= 9999999 \end{aligned}$$

Similarly if EDRC is 8 the maximum value is 99999999 & if EDRC is 9 maximum value is 999999999.

Maximum value that can be set in the Overflow energy start count register is 99999999 for Wh energy resolution ,99999 for kWh energy resolution ,99 for MWh resolution.

Note: Energy start Count can only be entered in integer value.

3.2.2 Communication Parameter Selection :

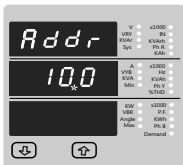
3.2.2.1 Address Setting : This screen applies to the RS 485 output only. This screen allows the user to set Rs485 parameter for instruments
The range of allowable address is 1 to 247 .

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.

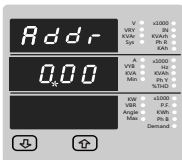


Enter Address, first digit entered, prompt for second digit

(* Denotes that decimal point will be flashing).

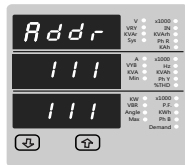
Use the "↓Down" key to scroll the value of the second digit.

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



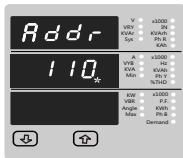
Address confirmation Screen.

This Screen confirms the Address set by user .

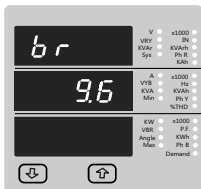
Press the "↑Up" key to advance to next Screen

"Rs485 Baud Rate" (See Section 3.2.2.2)

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



3.2.2.2 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 ..

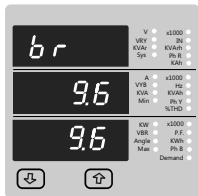
Pressing "↑Up" key accepts the present value and advance to the Parity Selection (See Section 3.2.2.3)

Pressing the "↓Down" key will enter the "Baud Rate Edit" mode and scroll the value through 4.8, 9.6, 19.2, 38.4, 57.6 and back to 4.8

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 3.2.2.3).



3.2.2.3 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 3.2).

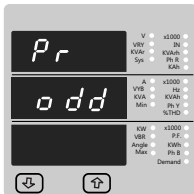
Pressing the "↓Down" key will enter the "Parity & stop bit Edit" mode and scroll the value through

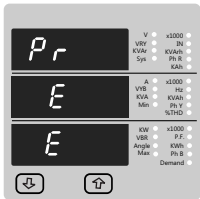
odd : odd parity with one stop bit

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.

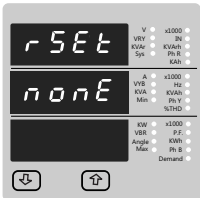
Pressing the “**↑ Up**” key will set the value.

Pressing the “**↑ Up**” key again will jump back to the communication parameter selection menu (see section 3.2.2).

3.2.3 Reset Parameter Selection :

3.2.3.1 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 (None)

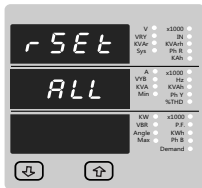
Pressing “**↑ Up**” key advances to Reset Parameter selection screen (see section 3.2.3)

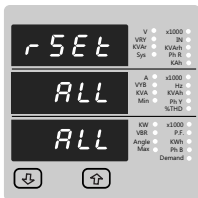
Pressing the “**↓ Down**” key will enter the “Reset option” mode and scroll through Parameter and wrapping back to None.

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.

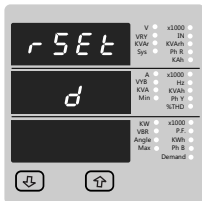




Reset ALL Confirmation.

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 3.2.3).



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

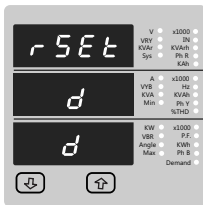
The user has scrolled through to the “d” .

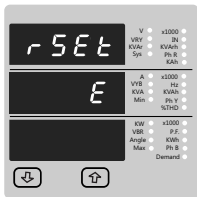
Pressing “↑Up” key will select the value and advance to the “Reset “d” Confirmation” Mode & resets all Demand parameters.

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 3.2.3).

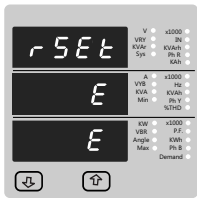




Reset option select, (Resets all Energies)

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 Energy, Export Energy Import reactive, Export reactive, Apparent Energy)



Reset Energy Confirmation.

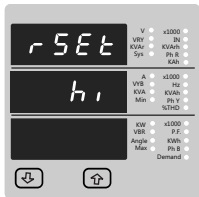
Pressing the "↓Down" key will re-enter the "Reset option" mode.

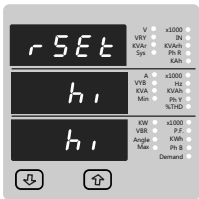
Pressing "↑Up" key will jump back to the Reset Parameter selection screen (see section 3.2.3).

Reset option select, (Reset Hi)

The user has scrolled through to the "Hi" (Max)

Pressing "↑Up" key will select the value and advance to the "Reset Hi Confirmation" Mode. Will reset Maximum (Hi) values of Voltage & Current Avg. appeared at input.

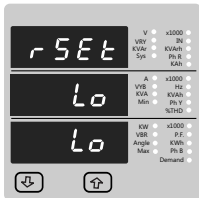




Reset option select, (Reset Lo)

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.

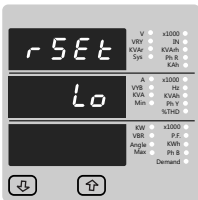


Reset option select, hr (ON Hour & Run Hour) The user has scrolled through to the "hr" Pressing "↑Up" key will select the value and advance to the "Reset hr Confirmation" Mode & Will reset On hour & Run Hour both.

Reset hl (Max) Confirmation.

Pressing the "↓Down" key will re-enter the "Reset option Select mode.

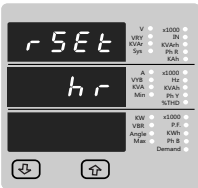
Pressing "↑Up" key will jump back to the Reset Parameter selection screen (see section 3.2.3).

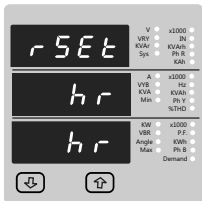


Reset Lo Confirmation

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 3.2.3).





Reset hr Confirmation

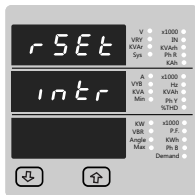
Pressing the “↓Down” key will re-enter the “Reset option Select mode.”

Pressing “↑Up” key will jump back to the Reset Parameter selection screen (see section 3.2.3).

Reset option select, (Reset Number of Interrupt)

The user has scrolled through to the “intr”

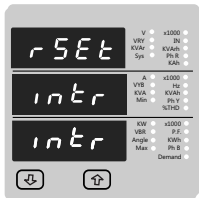
Pressing “↑Up” key will select the value and advance to the “reset Interrupt Confirmation” Mode & Will reset number of Auxiliary supply interruption count.



Reset Interrupt Confirmation

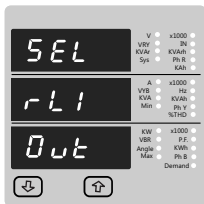
Pressing the “↓Down” key will re-enter the “Reset parameter Selection”(see section 3.2.3).

Pressing “↑Up” key will jump back to the Reset Parameter selection screen (see section 3.2.3).



3.2.4. Output Option selection menu

3.2.4.1 Configuration of Output



This screen applies to the Relay1 Output option Selection .

Pressing "↑Up" key will select the

Relay1 output selection menu(See section 3.2.4.1.1)

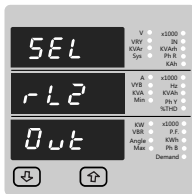
pressing the "↓Down" key will advance

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 3.2.4.1.2)

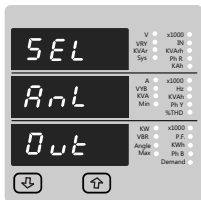
pressing the "↓Down" key will advance to Analog output option below.

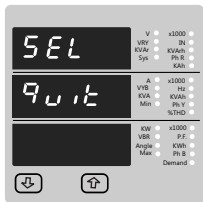


This screen applies to the Analog Output Selection.

Pressing "↑Up" key will Select the Analog output selection menu (See section 3.2.4.1.3)

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 3.2.4)

Pressing the “**↓**Down” key will go back to Relay1 output option (See section 3.2.4.1).

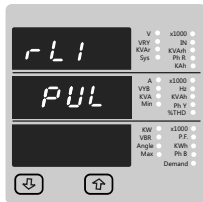
3.2.4.1.1 Relay1 output Selection menu :

3.2.4.1.1.1 Pulse output :

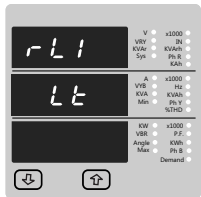
This screen is used to assign Relay1 in Pulse output mode.

Pressing “**↑**Up” key will advance to the Pulse (for Relay1) output configuration (See section 3.2.4.1.1.1.1)

Pressing “**↓**Down” key will show “Limit”output option (See section 3.2.4.1.1.2)



3.2.4.1.1.2 Limit output :



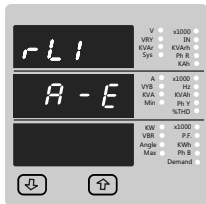
This screen is used to assign Relay1 in limit output mode.

Pressing “**↑**Up” key will assign Limit (for Relay1) output mode(See section 3.2.4.1.1.2.1)

Pressing “**↓**Down” key will go back to the pulse option (For Relay 1) screen.(See section 3.2.4.1.1.1)

3.2.4.1.1.1 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 3.2.4.1.1.1.2).

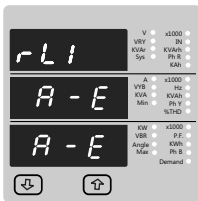
Pressing the "↓ Down" key will enter into edit mode and scroll through the energy setting

A - E : Apparent Energy **C - rE** : Reactive Energy Cap.
I - E : Import Active Energy **L - rE** : Reactive Energy Ind.
E - E : Export Active Energy

Pulse output (for Relay 1) confirmation :

Pressing "↓ Down" key will be re-enter into edit mode .

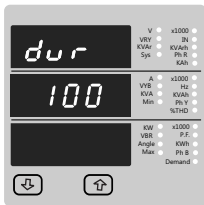
Pressing the "↑ Up" key will set the value and advances to the " Pulse duration selection "(see section 3.2.4.1.1.1.2).



3.2.4.1.1.2 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 3.2.4.1.1.1.3).

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.

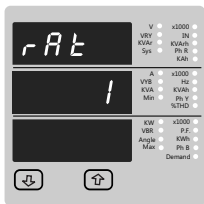
Pressing the “**↓Down**” key will re-enter the “Pulse Duration Edit” mode.

Pressing “**↑Up**” key set displayed value and Will advance to pulse rate selection menu (See section 3.2.4.1.1.1.3)



3.2.4.1.1.1.3 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 3.2.4.1).

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.

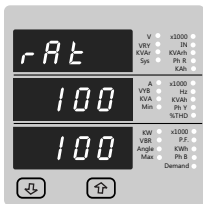
For setting divisor value refer table 3.

Pulse Rate Divisor Confirmation.

This screen will only appear following an edit of the Pulse rate divisor.

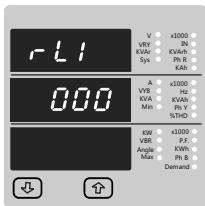
If the Pulse rate shown is not correct, pressing the “**↓Down**” key will return to the “Pulse rate divisor Edit” stage by blanking the bottom line of the display.

Pressing “**↑Up**” key sets the displayed value and will advance to the “Configuration of output”. (See section 3.2.4.1)



3.2.4.1.2.1 Assignment of Parameter to Limit output (for Relay1)

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 3.2.4.1.1.2.2).

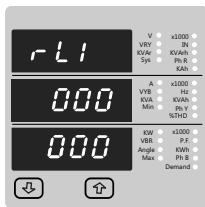
Pressing the “**↓** Down” key will enter the “ Limit1 output Edit” mode and scroll the values, as per Table 2, “ Parameter for Analog & Limit Output”

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” mode.

Pressing the “**↑** Up” key sets the displayed value and will advance to the Limit1 Configuration select screen (see section 3.2.4.1.1.2.2)



3.2.4.1.1.2.2 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)

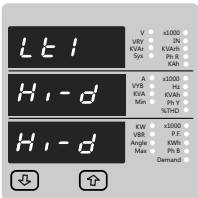
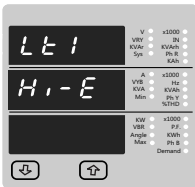
(For detail refer to Section 8.2)

Pressing the “**↑** Up” key accepts the present value and advances to the “Trip point selection” screen (see section 3.2.4.1.1.2.3)

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 3.2.4.1.1.2.3)

3.2.4.1.1.2.3 Trip point selection :

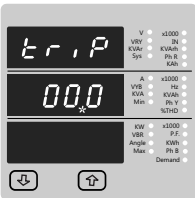
This screen applies to the Trip point selection for instrument.

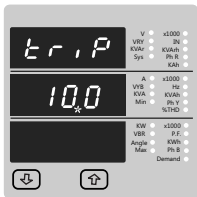
The allowable range is 10% to 120% for High Alarm and 10% to 100% for Low Alarm .

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.





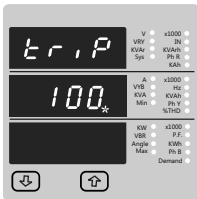
The first digit entered, prompt for second digit
 (* Denotes that decimal point will be flashing).

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

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

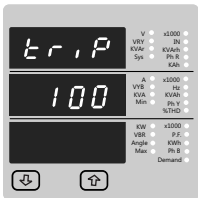
The second digit entered, prompt for third digit
 (* Denotes that decimal point will be flashing).

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



Entered the value for third digit .

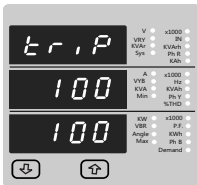
Press the "↑ Up" key to advance to trip point confirmation Screen.



This Screen confirms the value set by user .

Press the "↑ Up" key to advance to next Screen
 "Hysteresis selection" (see section 3.2.4.1.1.2.4)

Pressing the "↓ Down" key will return in edit mode



3.2.4.1.1.2.4 Hysteresis selection :

This screen applies to the Hysteresis selection.

This screen allows the user to set Hysteresis for relay1 output

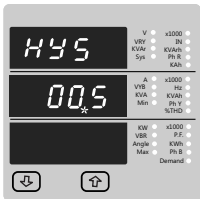
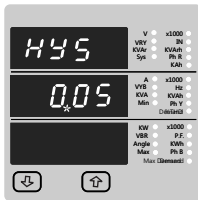
The allowable range is 0.5% to 50 % of Trip point .

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.

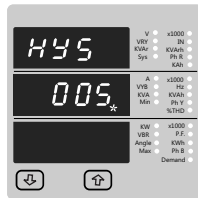
Press the "↑Up" key to advance to next digit.



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.

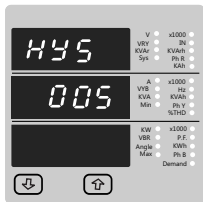
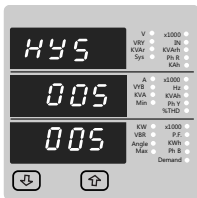


The second digit entered, prompt for third digit
(* Denotes that decimal point will be flashing).

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.



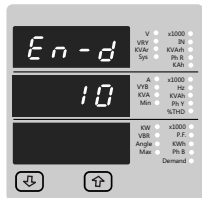
Hysteresis confirmation Screen.

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” (3.2.4.1.1.2.5)

3.2.4.1.1.2.5 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

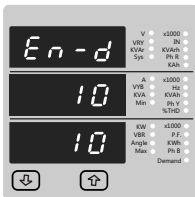
Pressing the “**↓Down**” key will enter the “Energizing Delay” Edit mode and scroll the “Value” through 1 to10

Energizing delay time Confirmation.

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

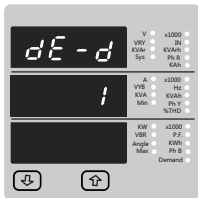
pressing the "↓Down" key will re-enter the "Energizing delay Edit" mode.

Pressing "↑Up" key set displayed value and will advance to Assignment of De-energizing delay time. (See section 3.2.4.1.1.2.6)



3.2.4.1.1.2.6 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 3.2.4.1)

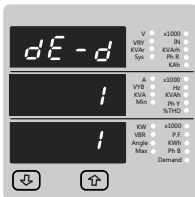
Pressing the "↓Down" key will enter the "De-Energizing Delay" Edit mode and scroll the "Value" through 1 to 10

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 3.2.4.1)



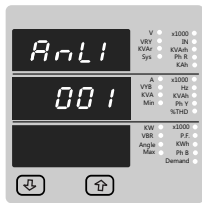
3.2.4.1.2 Relay 2 Output Selection :

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.)

3.2.4.1.3 Analog Output

3.2.4.1.3.1 Parameter setting for Analog Output 1 (Optional)

This screen is for analog output 1 only . It allows the user to set analog output 1 to corresponding measured parameter . Refer table2 " Parameter for Analog & Limit output ".



Pressing the "↑Up" key accepts the present value and advance to the Analog output 2 selection (see section 3.2.4.1.3.2) .

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"

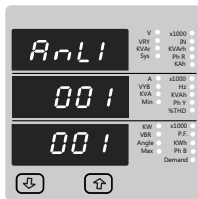
Pressing the "↑Up" key advance to the Analog output 1 confirmation screen .

Analog output 1 Confirmation :

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

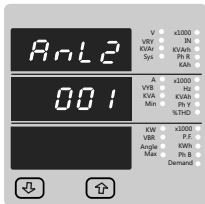
Pressing the " ↓Down" key will re-enter the " Analog output 1 Edit"

Pressing the " ↑Up" key sets the displayed value and will advance to the Analog output 2 selection screen (see section 3.2.4.1.3.2)



3.2.4.1.3.2 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 **TABLE 7.1** "Parameter for Analog & Limit output".



Pressing the "↑Up" key accepts the present value and advance to Analog output selection screen (see section 3.2.4.1).

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

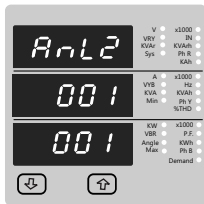
Pressing the "↑Up" key advance to the Analog output 2 confirmation screen .

Analog output 2 Confirmation :

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

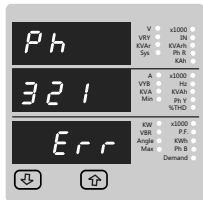
Pressing the "↓Down" key will re-enter the "Analog output 2 Edit"

Pressing the "↑Up" key sets the displayed value and will advance to the Analog output selection screen (see section 3.2.4.1.3).



4.Phase Rotation Screen :

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

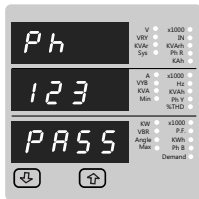


This screen indicates that Phase sequence is incorrect.

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

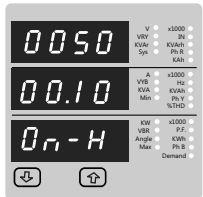
Correct Phase sequence :

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.



5. On Hour

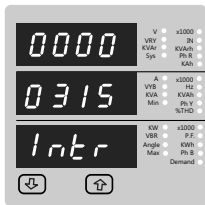
This Screen shows the total no. of hours the Auxiliary Supply is ON.



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)

6. 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 3.2.3.1

7. Analog Output (optional) :

This module provides two d.c. isolated outputs.The output options available are :

Two 4 - 20mA outputs , internally powered .

The analog output module has an 0V return on each end of the 4 way connector (Please refer Section 13 for connection details)

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

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

All settings are user configurable via the user interface screen. See Analog o/p selection (section 3.2.4.1.3.1 & section 3.2.4.1.3.2) for details .

*** Note : Refer diagram 1**

Diagram 1 : (4 -20 mA)

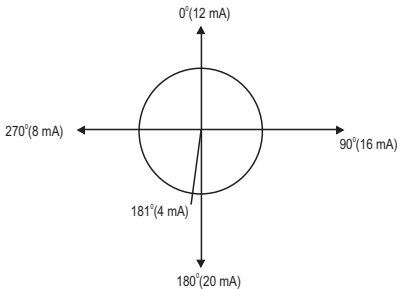


TABLE 7.1 : Parameter for Analog & Limit Output

Sr. No.	Parameter	1P 2W	3P 4W	3P 3W	1P 3W	Range	
						Analog Output	Limit Output
0	None	✓	✓	✓	✓	–	–
1	INPUT VOLTAGE L1	✓	✓	✓	✓	0 - 100 %	10 - 120 %
2	INPUT VOLTAGE L2	✗	✓	✓	✓	0 - 100 %	10 - 120 %
3	INPUT VOLTAGE L3	✗	✓	✓	✗	0 - 100 %	10 - 120 %
4	INPUT CURRENT IL1	✓	✓	✓	✓	0 - 100 %	10 - 120 %
5	INPUT CURRENT IL2	✗	✓	✓	✓	0 - 100 %	10 - 120 %
6	INPUT CURRENT IL3	✗	✓	✓	✗	0 - 100 %	10 - 120 %
7	ACTIVE POWER L1	✓	✓	✗	✓	0 - 120 %	10 - 120 %
8	ACTIVE POWER L2	✗	✓	✗	✓	0 - 120 %	10 - 120 %
9	ACTIVE POWER L3	✗	✓	✗	✗	0 - 120 %	10 - 120 %
10	APPARENT POWER L1	✓	✓	✗	✓	0 - 120 %	10 - 120 %
11	APPARENT POWER L2	✗	✓	✗	✓	0 - 120 %	10 - 120 %
12	APPARENT POWER L3	✗	✓	✗	✗	0 - 120 %	10 - 120 %
13	REACTIVE POWER L1	✓	✓	✗	✓	0 - 120 %	10 - 120 %
14	REACTIVE POWER L2	✗	✓	✗	✓	0 - 120 %	10 - 120 %
15	REACTIVE POWER L3	✗	✓	✗	✗	0 - 120 %	10 - 120 %
16	POWER FACTOR L1	✓	✓	✗	✓	181 ⁰ /0 / -180 ⁰	10 - 90 % ⁽²⁾
17	POWER FACTOR L2	✗	✓	✗	✓	181 ⁰ /0 / -180 ⁰	10 - 90 % ⁽²⁾
18	POWER FACTOR L3	✗	✓	✗	✗	181 ⁰ /0 / -180 ⁰	10 - 90 % ⁽²⁾
19	PHASE ANGLE L1	✓	✓	✗	✓	181 ⁰ /0 / -180 ⁰	10 - 90 % ⁽²⁾
20	PHASE ANGLE L2	✗	✓	✗	✓	181 ⁰ /0 / -180 ⁰	10 - 90 % ⁽²⁾
21	PHASE ANGLE L3	✗	✓	✗	✗	181 ⁰ /0 / -180 ⁰	10 - 90 % ⁽²⁾
22	VOLTAGE AVG	✗	✓	✓	✓	0 - 100 %	10 - 120 %
24	CURRENT AVG	✗	✓	✓	✓	0 - 100 %	10 - 120 %

Sr. No.	Parameter	1P 2W	3P 4W	3P 3W	1P 3W	Range	
						Analog Output	Limit Output
27	ACTIVE POWER SUM	✗	✓	✓	✓	0 - 120 %	10 - 120 %
29	APPARENT POWER SUM	✗	✓	✓	✓	0 - 120 %	10 - 120 %
31	REACTIVE POWER SUM	✗	✓	✓	✓	0 - 120 %	10 - 120 %
32	POWER FACTOR AVG	✗	✓	✓	✓	181°/ 0 / -180 °	10 - 90 % ⁽²⁾
34	PHASE ANGLE AVG	✗	✓	✓	✓	181°/ 0 / -180 °	10 - 90 % ⁽²⁾
36	FREQUENCY	✓	✓	✓	✓	45 to 66 Hz	10 - 90 % ⁽¹⁾
43	WATT DEMAND IMPORT	✓	✓	✓	✓	0 - 120 %	10 - 120 %
44	WATT MAX DEMAND IMP.	✓	✓	✓	✓	0 - 120 %	10 - 120 %
45	WATT DEMAND EXPORT	✓	✓	✓	✓	0 - 120 %	10 - 120 %
46	WATT MAX DEMAND EXP.	✓	✓	✓	✓	0 - 120 %	10 - 120 %
47	VAR DEMAND IND.	✓	✓	✓	✓	0 - 120 %	10 - 120 %
48	VAR MAX DEMAND IND.	✓	✓	✓	✓	0 - 120 %	10 - 120 %
49	VAR DEMAND CAP.	✓	✓	✓	✓	0 - 120 %	10 - 120 %
50	VAR MAX DEMAND CAP.	✓	✓	✓	✓	0 - 120 %	10 - 120 %
51	VA DEMAND	✓	✓	✓	✓	0 - 120 %	10 - 120 %
52	VA MAX DEMAND	✓	✓	✓	✓	0 - 120 %	10 - 120 %
53	CURRENT DEMAND	✓	✓	✓	✓	0 - 100 %	10 - 120 %
54	CURRENT MAX DEMAND	✓	✓	✓	✓	0 - 100 %	10 - 120 %
101	INPUT VOLTAGE L12	✗	✓	✗	✓	0 - 100 %	10 - 120 %
102	INPUT VOLTAGE L23	✗	✓	✗	✗	0 - 100 %	10 - 120 %
103	INPUT VOLTAGE L31	✗	✓	✗	✗	0 - 100 %	10 - 120 %
113	NEUTRAL CURRENT	✗	✓	✗	✓	0 - 100 %	10 - 120 %

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

- (1) For Frequency 0% corresponds to 45 Hz and 100% corresponds to 66 Hz.
- (2) For 3P 4W, 1P 3W and 1P2W the nominal value is VLN and that for 3P 3W is VLL.
- (3) Nominal Value for power is calculated from Nominal Voltage and current values.
- (4) Nominal Value is to be considered with set CT/ PT Primary values.
- (5) For single phase L1 Phase values are to be considered as System values.

8. Relay output (Optional) :

This instrument is provided with 2 relay for pulse output as well as for limit switch

8.1 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.

This instrument's 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 (Cap.)
- 4) Reactive Energy (Ind.)
- 5) Apparent Energy

TABLE 8.1.1 : 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

Above options are also applicable for Apparent and Reactive Energy.

- 1) System power = $3 \times CT(\text{Primary}) \times PT(\text{Primary})_{L-N}$ for 3 Phase 4 Wire
- 2) System power = $\text{Root}3 \times CT(\text{Primary}) \times PT(\text{Primary})_{L-L}$ for 3 Phase 3 Wire
- 3) System power = $CT(\text{Primary}) \times PT(\text{Primary})_{L-N}$ for 1 Phase 2 Wire
- 4) System power = $2 \times CT(\text{Primary}) \times PT(\text{Primary})_{L-N}$ for 1 Phase 3 Wire

2. For Energy Output in Kwh

Pulse rate		
Divisor	Pulse	System Power*
1	1 per kWh	Up to 3600W
	1 per 1000kWh	Up to 3600kW
	1 per 1000MWh	Above 3600kW

3. For Energy Output in Mwh

Pulse rate		
Divisor	Pulse	System Power*
1	1 per Mwh	Up to 3600W
	1 per 1000Mwh	Up to 3600kW
	1 per 1000Gwh	Above 3600kW

8.2 Limit Switch :

Limit switch can be used to monitor the measured parameter (Ref. **TABLE 7.1**) 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.

Lo 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.

Example for Phase angle:

If trip point is set 70% then maximum applicable hysteresis is 42.8%. i.e Trip point 70% (252°) + Hysteresis 42.8% (107.8°) = 359.8°

If total value is greater than the 100% i.e. 360° then relay will not release.

Example for PF:

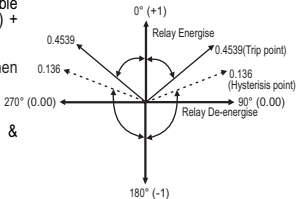
For Hi-Alarm Energized, if trip point is 70% & hysteresis is 30%,

then trip value = $0.7 \times 90^\circ = 63^\circ$.

Tripping PF = $\cos(63) = 0.4539$ &

hysteresis = $0.3 \times 0.4539 = 0.136$.

Hence, the relay will energize above 0.4539 and de-energize below 0.3179.



Note: This function will work irrespective of +/- sign. It depends only on value.

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 from 1 to 10 sec.

De-Energizing Delay:

The De-energizing delay can be set in the range from 1 to 10 sec.

Note : In case of lo alarm if trip point is set at 100% then maximum 20% Hysteresis can be set..

Example of different configuration.

Parameter No: 4 (Current 1)

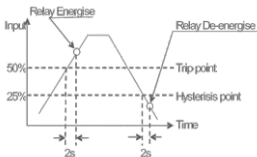
Trip Point = 50%

Hysteresis = 50% of trip point

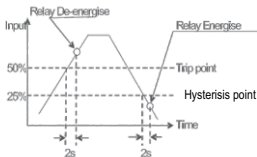
Energizing Delay: 2s

De-energizing Delay: 2s

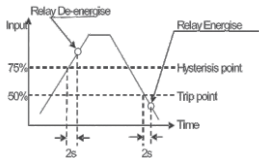
1) Hi alarm & Energised relay



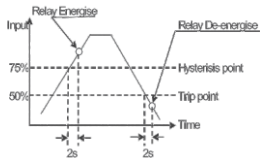
2) Hi alarm & De-energised relay



3) Lo alarm & Energised relay



4) Lo alarm & De-energised relay



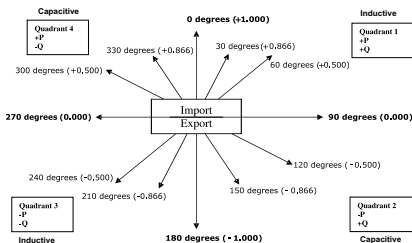
9. Phasor Diagram :

Quadrant 1: 0° to 90°

Quadrant 3: 180° to 270°

Quadrant 2: 90° to 180°

Quadrant 4: 270° to 360°



Connections	Quadrant	Sign of Active Power (P)	Sign of Reactive Power (Q)	Sign of Power Factor (PF)	Inductive / Capacitive
Import	1	+ P	+ Q	+	L
Import	4	+ P	- Q	+	C
Export	2	- P	+ Q	-	C
Export	3	- P	- Q	-	L

Inductive means Current lags Voltage

Capacitive means Current leads Voltage

When Multifunction Meter displays Active power (P) with "+" (positive sign), the connection is "Import".

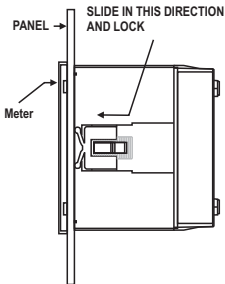
When Multifunction Meter displays Active power (P) with "-" (negative sign), the connection is "Export".

10. Installation

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.

As the front of the enclosure conforms to IP54 it is protected from water spray from all directions, additional protection to the panel may be obtained by the use of an optional panel gasket.

The terminals at the rear of the product should be protected from liquids.



The instrument should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range -20 to 70°C . Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to excessive direct sunlight.

Caution

1. **In the interest of safety and functionality this product must be installed by a qualified engineer, abiding by any local regulations.**
2. **Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection.**
3. **These products do not have internal fuses therefore external fuses must be used to ensure safety under fault conditions.**

10.1 EMC Installation Requirements

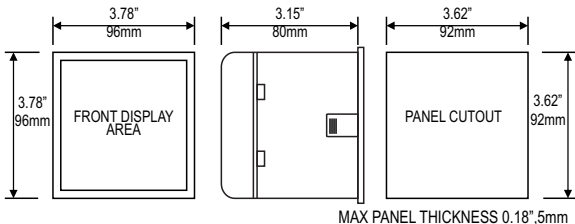
This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

1. Screened output and low signal input leads or have provision for fitting RF suppression components, such as ferrite absorbers, line filters etc., in the event that RF fields cause problems.

Note: It is good practice to install sensitive electronic instruments that are performing critical functions, in EMC enclosures that protect against electrical interference which could cause a disturbance in function.

2. Avoid routing leads alongside cables and products that are, or could be, a source of interference.
3. To protect the product against permanent damage, surge transients must be limited to 2kV pk. It is good EMC practice to suppress differential surges to 2kV at the source. The unit has been designed to automatically recover in the event of a high level of transients. In extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation. The Current inputs of these products are designed for connection in to systems via Current Transformers only, where one side is grounded.
4. ESD precautions must be taken at all times when handling this product.

10.2 Case Dimension and Panel Cut Out



10.3 Wiring

Input connections are made directly to screw-type terminals with indirect wire pressure. Numbering is clearly marked in the plastic moulding. Choice of cable should meet local regulations. Terminal for both Current and Voltage inputs will accept upto $3\text{mm}^2 \times 2$ diameter cables.

Note : It is recommended to use wire with lug for connection with meter.

10.4 Auxiliary Supply

The instrument should ideally be powered from a dedicated supply, however it may be powered from the signal source, provided the source remains within the limits of the chosen auxiliary voltage.

10.5 Fusing

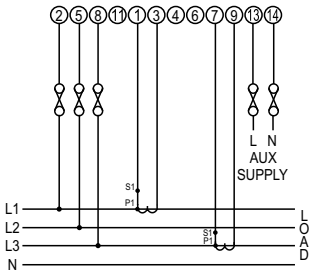
It is recommended that all voltage lines are fitted with 1 amp HRC fuses.

10.6 Earth/Ground Connections

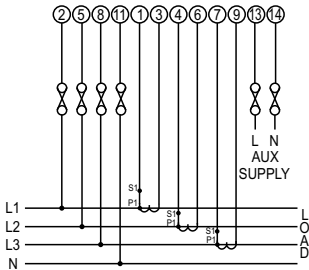
For safety reasons, CT secondary connections should be grounded in accordance with local regulations.

11. Connection Diagrams

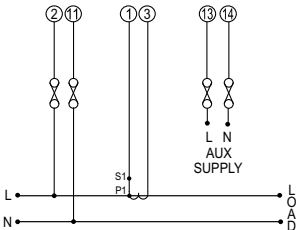
3-PHASE 3-WIRE UNBALANCED LOAD
DIGITAL METERING SYSTEM



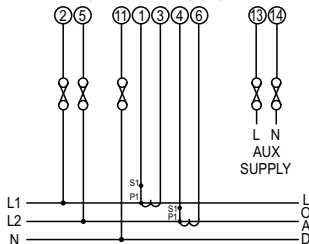
3-PHASE 4-WIRE UNBALANCED LOAD
DIGITAL METERING SYSTEM



SINGLE PHASE
DIGITAL METERING SYSTEM



1-PHASE 3-WIRE UNBALANCED LOAD
DIGITAL METERING SYSTEM



12. Specification

System

3 Phase 3 Wire / 3 phase 4 Wire / 1 phase 3 Wire programmable at site

1 Phase 2 Wire as per order

Display

LED

3 Line 4 Digits, (Digit Height 11mm)

Update

Approx. 1 seconds

Controls

User Interface

Two Push Buttons

Inputs

Nominal Input Voltage (AC RMS)

100VLL to 600VLL programmable on site.
(57.7VLN to 346.4VLN)

System PT Primary Values

100VLL to 692.8 kVLL, programmable on site

System PT Secondary Values

100VLL to 600VLL programmable on site.
(57.7VLN to 346.4VLN)

Max continuous input voltage

120% of Nominal Value

Nominal input voltage burden

<0.3 VA approx. per Phase (at nominal 240V)

Nominal Input Current

1A/5A

max continuous input current

120% of Nominal value

Nominal input current burden
(Inbuilt CT)

<0.3 VA approx. per phase

System CT primary values

Std. Values 1 to 9999A (1 or 5 Amp secondary)

System CT secondary values

1A / 5A, programmable on site

Overload withstand

Voltage input

2 x Rated Value

(1s application at 10s intervals) repeated 10 times

Current input

2 x nominal Value

(1s application at 5min intervals) repeated 5 times

Auxiliary Supply

External Higher Aux.	100V to 550V AC/DC
External Higher Aux. Nominal Value	230V AC/DC 50/60 Hz for AC Aux
External Lower Aux.	12V to 60V AC/DC
External Lower Aux. Nominal Value	24V AC/ 48V DC 50/60 Hz for AC Aux
Aux Frequency Range	45 to 65 Hz
VA Burden With Addon card	< 7 VA approx. (at nominal)
VA Burden With Ethernet card	< 8 VA approx. (at nominal)

Operating Measuring Ranges

Voltage	20 ... 120 % of nominal Value
Current	1....120% of nominal value
Starting Current	as per IEC 62053-22 (0.2S)
Frequency	45 to 65 Hz
Power Factor	0.5 Lag ... 1 ... 0.8 Lead
Total Harmonic Distortion	50% upto 15th harmonic 10% upto 31st harmonic

Accuracy

Voltage	± 0.2 % of range
Current	± 0.2 % of range
Frequency	0.15% of mid frequency
Active Power	± 0.2 % of range
Re- Active Power	± 1.0 % of range
Apparent Power	± 0.2 % of range
Active Energy	as per IEC 62053-22 (0.2S)
Re - Active Energy	Class 2 as per IEC 62053-23
Apparant Energy	± 0.2 % of range
Power Factor	± 1 % of Unity
Angle	± 1 % of range
Analog Output	± 1 % of Output end value
Total Harmonic Distortion	± 3 %
Neutral Current	± 4 % of range

Reference conditions for Accuracy :

Reference temperature	23 °C ± 2 °C (as per IEC 62053-22)
Input Waveform	Sinusoidal(distortion factor 0.005)
Input frequency	50/60 Hz ± 2%
Auxiliary supply	230V AC/DC ± 1%
Auxiliary supply frequency	50/60 Hz ± 1%
Total Harmonic distortion	50% up to 15th Harmonics 10% up to 31st Harmonics (Current range 20%..100% of nominal value)
Voltage range	50%.....100% of nominal value

Standards

EMC Immunity	IEC 61326 - 1 :2012
Immunity	IEC 61000-4-3 10V/m min-Level 3 industrial low level electromagnetic radiation environment IEC 61000-4-3.
Safety	IEC 61010-1 , Year 2010 Permanently connected use
IP for water & dust	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
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Environmental

Operating temperature	-20 to +70 ^o C
Storage temperature	-25 to +75 ^o 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 (front only)	IP 54 as per IEC 60529

Enclosure

Style	96mm x 96mm DIN Quadratic
Material	Polycarbonate Housing , Self extinguish & non dripping as per UL 94 V-0
Terminals	Screw-type terminals
Depth	< 80 mm
Weight	0.620 kg Approx.

Pulse output Option (1 or 2 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	60ms , 100ms or 200ms

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

Note : Pulse rate divisor is set to 1, when Energy on Rs485 is set to kWh or MWh.

ModBus (RS 485) Option :

Protocol	ModBus (RS 485)
Baud Rate	4.8k, 9.6k, 19.2k, 38.4k, 57.6k (Programmable)
Parity	Odd or Even, with 1 stop bit, Or None with 1 or 2 stop bits

Analog Output Option :

Linear	0 ... 1mA dc into 0 - 2 kohm Uni-directional, internally powered . 4 ... 20mA dc into 0 - 500 ohm Uni-directional, internally powered.
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Ethernet

Ethernet access on
Modbus TCP/IP Protocol

Impulse Output :

Impulse LED

For Energy testing

Impulse Constant

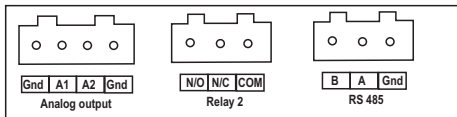
Depending on nominal system nominal power, the number of impulses are created to measure the energy. The number of impulses for particular nominal power is set which indicates 1kWh energy. Energy can be Watt, VA or Var. Following table shows impulses corresponding to nominal system energy.

Note: For External CT option consider Nominal current as 5A.

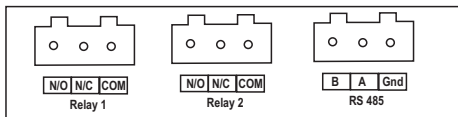
System nominal power	Impulse constant
<=400	16000
<=800	8000
<=1600	4000
<=3200	2000
>3200	1000

13. Connection for Optional Pulse Output / RS 485 / Analog Output / Ethernet (rear view of the instrument) :

1. RS 485 Output + One Pulse (One Limit) + Two Analog Output



2. Two Pulse (Two Limit) + RS 485 Output



3. Ethernet



The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product.

It is the user's responsibility to determine the suitability of the installation method in the user's field conditions.
