Operating Manual

RiSH PQA

Power Quality Analyzer

DMAN-00IM-0638_Rev_A 03/2017

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CHAPTER 1
GENERAL ASPECTS

1.1 Features of PQA

1.1.1 Touch Screen Function

All functions described below are operable using color LCD touch screen technology. Users may use a finger and/or a PDA stylus to apply pressure to the LCD screen to result in touch screen recognition. Display has resistive touch.

1.1.2 Meter Mode

Meter mode functions as true rms voltmeter and ammeter. Voltage and current measurements, along with other parameters like Demand, power, energy, distortion ,unbalance and system parameter are displayed on meter mode screens in textual format.

1.1.3 Harmonics and Interharmonics

Harmonics display the amplitude and phase of each harmonic up to 63rd order in both graphical and textual format.

1.1.4 Scope Mode and Phasor Diagram

Scope mode functions as an oscilloscope, displaying real-time waveforms of three phase voltage and current simultaneously with one second update rate. The colors of waveform display are user programmable. Scope mode also provides a textual display of rms values, division for axis values and frequency.

The Phasor screen displays a graph that indicates phase relations between voltage and current based upon the angles at the fundamental frequency. Phasor diagram displays voltage and current Phasor for all phases.The phase angle display can be used to verify if monitoring connections have been made correctly. Animated Phasor demo shows inductive resistive and capacitive load on three phase system.

1.1.5 Recording

All the events occurring during particular specified time period is recorded. The analysis of recorded data can be done later by loading data from memory card.

1.1.6 Events

An event occurs when a programmed threshold limit is crossed. An event consists of the pre-trigger cycles, trigger cycles and post-trigger cycles.

1.1.8 Trend

User can generate the plot of all data that is collected into graphical form to get knowledge about trend flow of system.

1.1.9 Reports

User can have report in EN50160 mode. EN50160 displays statistical reports based on an analysis of the voltage as per requirements of the EN50160 standard. Compliance data is presented in statistical tables and graphs. Statistical data is calculated on the required parameters specified in EN50160 over one week interval to produce a pass/fail decision.

1.1.10 Settings

User can perform miscellaneous settings to keep the PQA running efficiently. Setting tab is used to set time, date, PT/CT ratio, communication set up etc.

Home screen is as shown below

CHAPTER 2
ANALYSIS OF REAL TIME DATA

Introduction

PQA allows users to view power quality phenomenon as it happens, when it happens. The instrument is able to capture and process data in real time, and allows users to view it in meter mode, harmonics and scope mode.

Access to Real Time Data

Icons for meter mode, harmonics and Scope mode are displayed on the home screen.

This chapter is divided into three sections

2.1 METER

Meter icon allows you to view real-time meter data. The meter parameters available are logically separated into the following tabs: Basic, Power/Energy, Demand, Distortion, Unbalance and System. Meter screens are displayed in tabular form.

Following topics are considered in this section

2.1.1 Basic

Basic mode can be displayed by pressing parameter tab in the meter icon on the home screen. At start up, meter mode defaults in the basic tab featuring the basic power quality parameters available. The basic mode shows voltage, current, phase angle and crest factor of each phase.Neutral current is measured parameter. details refer table no.1.

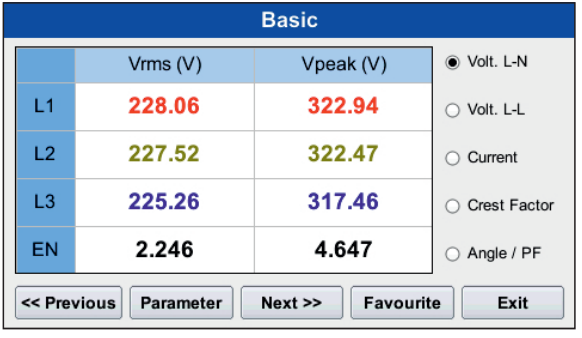


Table 1: Basic

Basic	Parameter	Label
Voltage For 3P4W (L1,L2,L3,EN) For 3P3W and 3P4W (L12,L23,L31)	RMS voltage	Vrms(V)
	Peak voltage	Vpeak(V)
Current (L1,L2,L3,IN)	Rms current	Irms(A)
	Peak current	Ipeak(A)
Creast factor (Phase 1,2,3)	Voltage and current crest factor	Voltage, current
Angle/PF (Phase 1,2,3)	voltage angle	Voltage
	current angle	current
	angle between voltage and current	Volt-Curr
	Power Factor	PF

Note:Volt L-N, EN voltage,IN is not displayed in case of 3P3W.

2.1.2 Power/Energy

Power/energy tab shows active, reactive, apparent power. Active energy(Import and Export),Reactive energy(Import and Export),Apparent energy. It also shows phase angle and power factor. For details refer table no.2.

For example power screen in the Power/Energy tab is shown below.

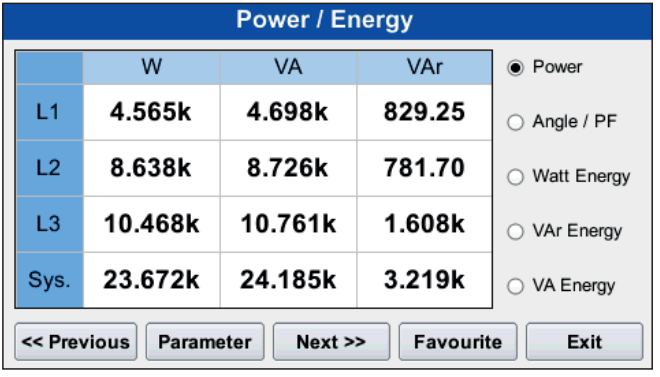


Table 2: Power and energy

Power / Energy Tab	Parameter Name	Label
Power(L1,L2,L3,Sys)	Active/apparent /Reactive Power	W/VA/VAr
Angle / PF (Phase 1, Phase 2, Phase 3)	Voltage Angle	Voltage
	Current Angle	Current
	Angle Between Voltage and Current	Volt -Curr
	Power Factor	PF
Watt Energy (L1, L2, L3, Total, Roll Over Count)	Import and Export Active Energy R.Ovr	Import (Wh / kWh / MWh) & Export (Wh / kWh / MWh)
Var Energy (L1, L2, L3, Total, Roll Over Count)	Import and Export Reactive Energy R.Ovr	Import (VArh / kVArh / MVArh) & Export (VArh / kVArh / MVArh)
VA Energy (L1, L2, L3, Total, Roll Over Count)	Apparent Energy R.ovr	Vah / kVAh / MVAh

Note:L1,L2,L3 power and energy is not displayed in case of 3P3W.
R.Ovr means Roll over count

2.1.3 Demand

Demand tab provides information about Demand parameters. It provides data about current demand for all three phases. It also shows system demand, max demand and coincident demand.

Coincident demand shows demand values of VA ,VAr, Watt demand at maximum values of Watt,VA,VAr demand. For e.g. It shows VA demand which was present at maximum watt demand. Coincident Pf shows PF Avg. values at maximum VA,VAr,watt demand.

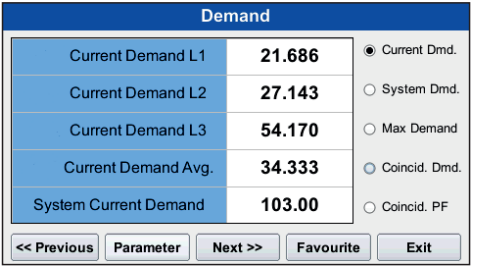


Table 3: Demand

Demand Tab	Parameter Name
Current Demand	Current Demand L1
	Current Demand L2
	Current Demand L3
	Current Demand Average
	System Current Demand
System Demand	Import Active Demand
	Export Active Demand
	Import Reactive Demand
	Export Reactive Demand
	Apparent Demand

Demand Tab	Parameter Name
Max Demand	Import Active Demand
	Export Active Demand
	Import Reactive Demand
	Export Reactive Demand
	Apparent Demand
	System Current Demand
Coincid Dmd (Coincident Demand)	VA Demand At Max Watt Demand
	Var Demand At Max Watt Demand
	Watt Demand At Max VAr Demand
	VA Demand At Max VAr Demand
	VAr Demand At Max VA Demand
	Watt Demand At Max VA Demand
Coincid PF (Coincident Power Factor)	Average Power Factor At Max Watt Demand
	Average Power Factor At Max VAr Demand
	Average Power Factor At Max VA Demand

2.1.4 Distortion Meter Tab

PQA is able to measure distortions or uncharacteristic changes in the waveform of original signals. Distortion calculation measures the deviation of complex wave shape from pure sine waves.

Voltage and Current for each phase can be measured under user frequency meter icon. Frequency can be set and corresponding voltage and current harmonics can be measured. The frequency should be set in multiples of 5 but not greater than 4160.
For details refer table no.4.

THD(Total Harmonic Distortion)

THD is defined as the ratio of the sum of the powers of all harmonic components to the power of the fundamental frequency.
RSS is the root sum square and it is used to express total harmonic distortion.
for formulae refer appendix B.

POWER:
For signed and unsigned power formulae refer Appendix B

For example THD screen is shown below

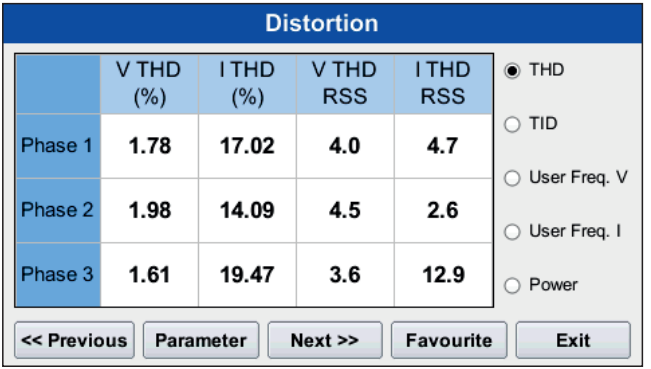


Table 4: Distortion

Distortion Tab	Parameter Name	Label
THD (Phase 1, Phase 2, Phase 3)	Voltage Total Harmonics Distortion	VTHD(%)
	Current Total Harmonic Distortion	ITHD(%)
	Voltage Magnitude of VTHD	VTHD RSS
	Current Magnitude of ITHD	ITHD RSS
TID (Phase 1, Phase 2, Phase 3)	Voltage Total Interharmonics Distrotion	VTID(%)
	Current Total Interharmonics Distortion	ITID(%)
	Voltage Magnitude of VTID	VTID RSS
	Current Magnitude of ITID	ITID RSS
User Frequency Voltage for 3P3W(L1, L2, L3) for 3p4W(L12,L23,L31)	User 1 Frequency and Voltage	User 1
	User 2 Frequency and Voltage	User 2
	User 3 Frequency and Voltage	User 3
	User 4 Frequency and Voltage	User 4
User Frequency Current for 3P4W(L1, L2, L3) for 3P3W(L1, L3)	User 1 Frequency and Current	User 1
	User 2 Frequency and Current	User 2
	User 3 Frequency and Current	User 3
	User 4 Frequency and Current	User 4
Power (Phase 1,2,3)	Signed Power	Signed
	Unsigned Power	Unsigned

Note:Power is not displayed in case of 3P3W.

2.1.5 Unbalance

The Unbalance meter tab shows symmetrical component i.e. positive, negative and zero sequence components for voltage and current. It also indicates the unbalance and imbalance factor of the system.formulaes of sequence, unbalance, imbalance are mentioned in appendix B.for details refer table no.5.

for example V sequence screen is as shown below

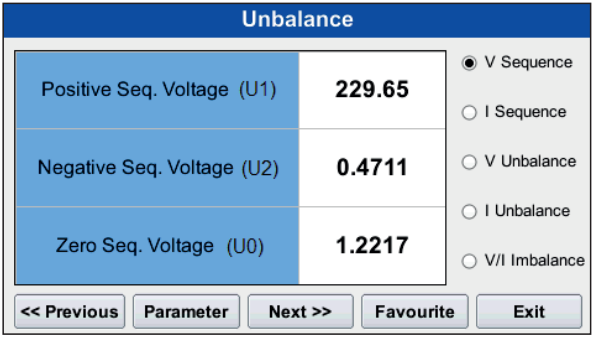


Table 5: Unbalance

Unbalnce Tab	Parameter Name
V Sequence	Positive Sequence Voltage U1
	Negative Sequence Voltage U2
	Zero Sequence Voltage U0
I Sequence	Positive Sequence Current U1
	Negative Sequence Current U2
	Zero Sequence Current U0
Voltage Unbalance	Voltage Unbalance U2 / U1
	Voltage Unbalance U0 /U1
Current Unbalance	Current Unbalance RMS/RMS_Average
	Current Unbalance U2/ U1
	Current Unbalance U0 / U1
Voltage And Current Imbalance	Voltage Imbalance L1,L2,L3,max(3P4W) and L12,L23,L31(3P3W)
	Current Imbalance L1,L2,L3,max(3P4W)

Note:Current unbalance and imbalance is not displayed in case of 3P3W.

2.1.6 System

System meter tab shows the system voltage, system current, system frequency, system power, Total harmonic distortion(system voltage and current) and phase sequence error detection. It provides information about arithmetic and vector sum of PF, DPF, VA. It provides data about minimum and maximum system voltage and current. This helps to analyze the complete system on single screen. for details refer table no.6.

Phase sequence
Normal:
Meter shows normal if phase sequence connected to the meter is correct.

Reverse:
Meter shows reverse if phases are connected reverse order.

Input absent:
Meter shows input absent when either of the phases or all three phases are absent.

Phase error:
If the Phase sequence is not maintained then meter shows Phase error.

For example basic screen is shown below

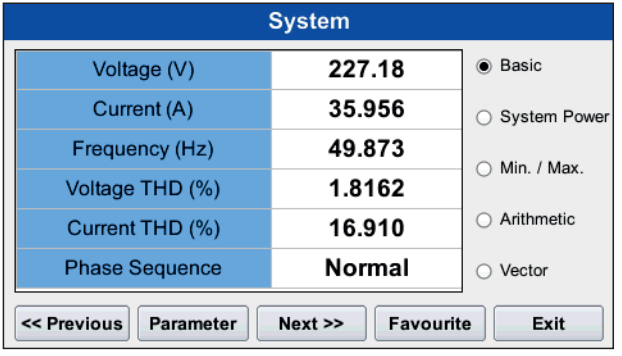


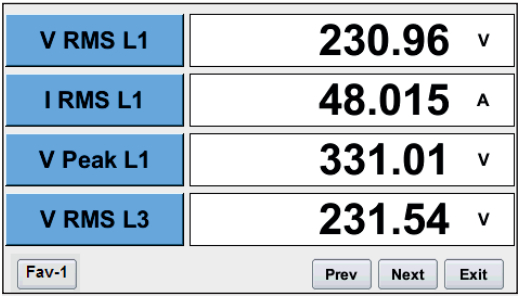
Table 6: System

System Tab	Parameter Name
Basic	System Voltage
	System current
	Frequency
	System Voltage Total Harmonics Distortion(%)
	System Current Total Harmonics Distortion(%)
	Phase sequence
System Power	Active Power(kW)
	Apparent Power(kVA)
	Reactive Power(kVAr)
	Power Factor
Min / Max Values	System Max Voltage
	System Min Voltage
	System Max Current
	System Min Current
Arithmatic	Arithmetic Sum Power Factor
	Arithmetic Sum Displacement Power Factor
	Arithamatic Sum VA
	Fundamental Arithmetic Sum VA
Vector	Vector Sum Power Factor
	Vector Sum Displacement Power Factor
	Vector Sum VA
	Fundamental Vector Sum VA

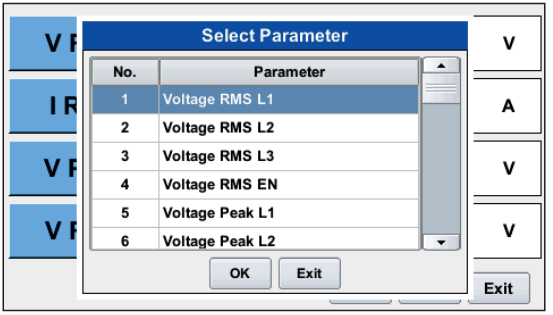
Note:Arithmatic sum is not displayed in case of 3P3W.

2.1.7 Favourite

Favorite Tab shows 20 parameters selected by user. Four parameters will be displayed on screen at a time. Total five favourite screens are available,User can scroll the screen by using Prev and Next button.



After touching parameter name select parameter list will be displayed, User can select parameter out of 143 parameter by touching Ok button.



2.2 HARMONICS

Harmonic screen displays voltage, current, power harmonics and inter-harmonics in graphical and list form. Harmonics are integral multiples of fundamental frequency. The harmonic analysis is done by synchronous window of 10 cycles for 50 Hz and 12 cycles for 60 Hz. This results in interharmonic spacing which 5 Hz wide. The actual interharmonic spacing value is actual frequency divided by 10 for 50 Hz and divided by 12 for 60Hz. Use parameter button to view next channel or next parameters. The number of harmonics that can be displayed are 63. Summary values of odd, even and total distortion are displayed. The summary of harmonics and inter-harmonics distortion values per phase per parameter is displayed.

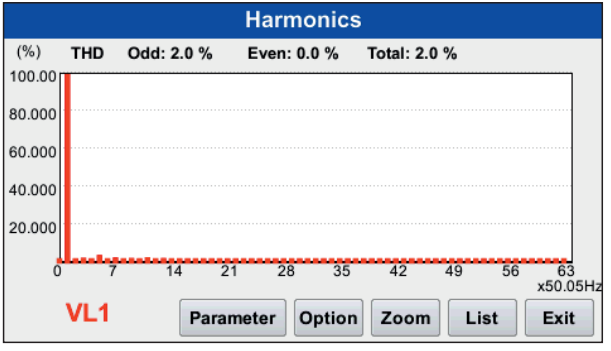
User can view Harmonics,Inter-harmonics,Harmonics group,Interharmonics group,Harmonic sub group, Inter-harmonics sub group.

Harmonic Graph: Harmonics are measured up to 63rd order. Users can choose the unit for display by which harmonic data is graphed based on percentage of the fundamental value or in basic units (volts,amps,watts).Harmonic graphs can be displayed either in Hertz or in harmonic number. The graphs can be zoomed and rescaled.

Harmonic List: The list gives a textual display of magnitude of harmonic parameter(i.e voltage, current or power), weightage(with respect to fundamental)(%), phase angle(in degrees), harmonic number and frequency related to each harmonic number.

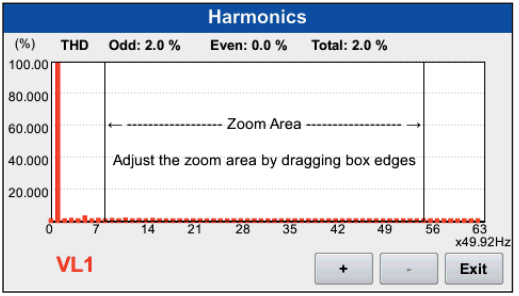
➢ **Harmonic Parameter**

The harmonic parameter can be displayed by pressing harmonics icon on the home screen. The screen defaults to a graphical spectrum display, although users have the option to choose between the graph and list form. The screen will show a spectral graph featuring the amplitude of the harmonics relative to the fundamental frequency. by pressing the options button user can select the vertical & horizontal measurement scale. The percent magnitude of the first 63 harmonics is plotted with respect to fundamental. User can select parameter(Voltage, current & power) and also select phase(1,2,3),by pressing parameter button.



➢ **Harmonic Zoom**

A Black box showing the default zoomed area appears once the Zoom button is pressed. Touch the sides of the zoom box to expand or narrow the area to be covered.



The Zoom button serves as magnifying function, each of which feature a plus sign or minus sign within. Press '+' to display the zoomed area and view harmonic parameter in greater detail. User may repeatedly zoom in on a plot. Press '-' to unzoom graph display.

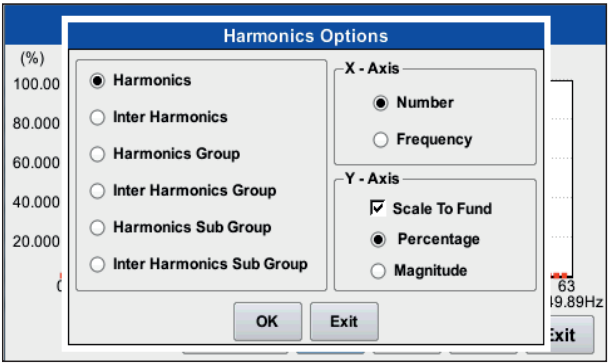
➢ **Harmonic Options**

The voltage and current harmonics and interharmonics for each phase can be plotted using the option button. The properties specified under Harmonic Option apply when harmonic/interharmonic data is viewed in either graph or list form.

User can select harmonics, inter-harmonics ,harmonics group, interharmonic group, harmonic sub group, inter-harmonics sub group. If Interharmonics is enabled then harmonics along with inter harmonics are displayed.

The Y axis can be labeled in **Percent, magnitude or Scale to Fundamental (percetage or magnitude)**. The X axis can be labeled in **Number and frequency**.

If scale to fundamental percentage or scale to fundamental magnitude is selected then graph is plotted with respect to fundamental voltage, and if percentage or magnitude(without scale to fundamental) is selected then graph is plotted with respect to highest magnitude of harmonics.



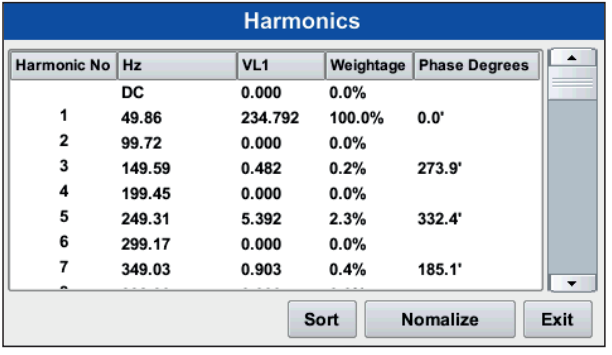
➢ **Harmonic List**

To view the harmonic magnitude text display, press **List** from harmonic graph screen. The harmonic parameters displayed on list include harmonic number, frequency in Hz, parameter (voltage, current or power), weightage (in %) and phase (in degrees).

By default, harmonics and inter harmonics frequency values are arranged in order of increasing frequency. Use the sort tab to organize harmonic text display in order of decreasing magnitude.

Harmonic phase degree values from 1 to 63 are displayed for voltage and current. Harmonic phase angle values can be normalized to the phase of the fundamental of the displayed channel. Use the Normalize button to show the normalized phase angle values. In case of unnormalized all calculations are done with respect to normally phase L1 .While in case of normalized calculations are made with respect to phase selected by user. By default meter shows normalized values. We can toggle between normalized and unnormalized values by pressing normalize button. screen for harmonic list is as shown below.

Note: Sort option is not available during recording is ON.



2.3 SCOPE AND PHASOR

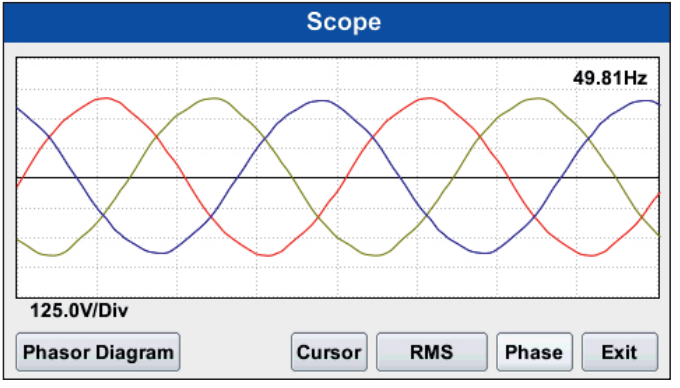
2.3.1 SCOPE

Scope mode allows viewing the real time data of voltage and current on screen for six parameters simultaneously.

Scope Mode Screen

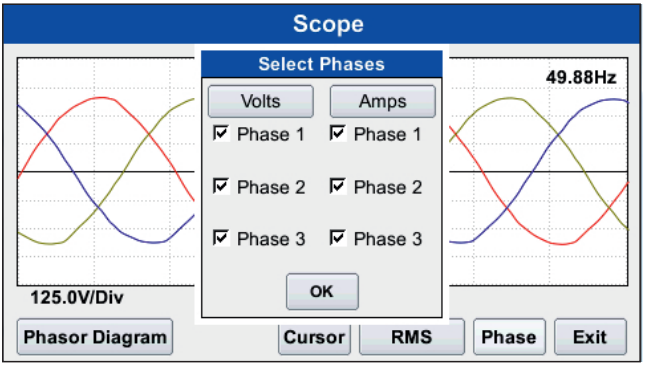
Scope mode can be selected by pressing the scope icon on the home screen.By pressing RMS button user can see RMS voltage and RMS current for each phase along with the waveform.

scope screen is as shown below.



➢ **Select Phases to display**

From scope mode, select the phase button to select phases.

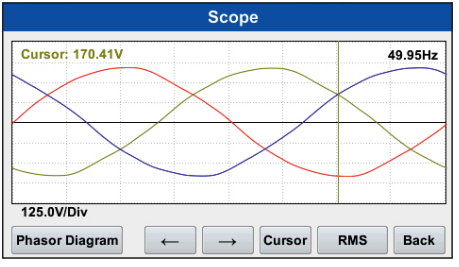


Any of the following will select phases to plot on scope

- Press desired Volts or Amps to select/deselect all phases.
- Press Phase1, Phase2, Phase3 to select particular phase of a parameter.

➢ **Cursor**

By pressing on the cursor button user can set cursor for particular phase. User can move cursor by using Left and Right navigation buttons or by dragging touch. Cursor will display peak value of voltage or current at that point.



Note: I2 is absent in 3P3W

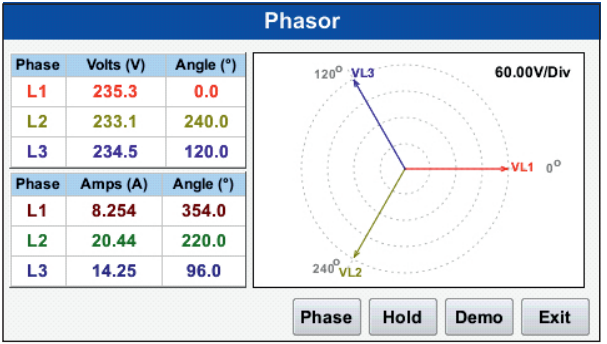
2.3.2 PHASOR

The Phasor screen displays the phase relations between the voltage and current based upon the angles of the fundamentals as per determined by Fourier analysis. Phasor screen shows six phasors auto scaled. Users are allowed to display up to three phases at any one time for either voltage or current or both voltage and current at same instant.

Demo button presents the animated demo for resistive load, inductive load and capacitive load. By pressing Hold button user can pause running condition.

➢ **Phasor Screen**

The Phasor screen is displayed by pressing Phasor diagram on the scope screen. The Phasor screen shows six phasors autoscaled rotation. The screen shows rms values for voltage and current for phases L1, L2 and L3. Phase angle can be seen. An arrow head and Phase label are displayed on the vector.



➢ **Phasor Demo**

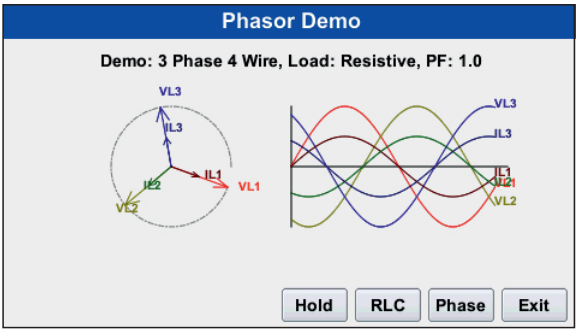
Animated Phasor Rotation

Graphical illustration in the form of rotating Phasors relative to sine wave graph of 3 phase 4 wire circuit and 3 phase 3wire is available by pressing Demo button of Phasor screen. By using phase option user can select phases. User can start/stop rotation at any time by pressing Run/Hold button.

Phasor vectors are displayed using anti-clockwise rotation from zero degree. User can view Demo Phasor rotation for resistive load, inductive load and capacitive load. pressing RLC button user can change Load type.

Sample For Three Phase Four Wire load

The following diagram describes the Phasor rotation for loads(resistive, inductive and capacitive) for three phase four wire connection. The arrow head on the line indicates the direction pointing towards the load.



➢ **Phasor Parameter**

Phasor parameter is selected by using Phase button on Phasor screen. Depending on the number of parameters to be monitored, the six maximum parameters can be selected. Parameters that are selected can be both voltage and current.

Chapter 3
Analysis Of Stored Data

PQA offers a graphical, information-packed and easy to navigate display of event data. The events of sag, swell and interruptions are recorded. It also provides trend data over specified time period. It helps in graphical analysis of data.

Record

Record is the capturing of the data and storing them in external memory card. In recording, the data that occur during running recording is captured.

Event

An event occurs when a voltage or current programmed threshold is crossed. An event consists of pre-trigger cycle(s), trigger cycle(fault) and post-trigger cycle(s). A contiguous collection of cycles caused by events is recorded into memory.

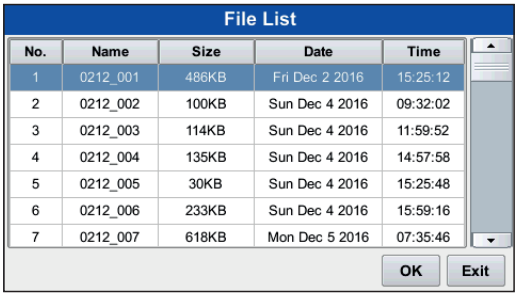
Trend

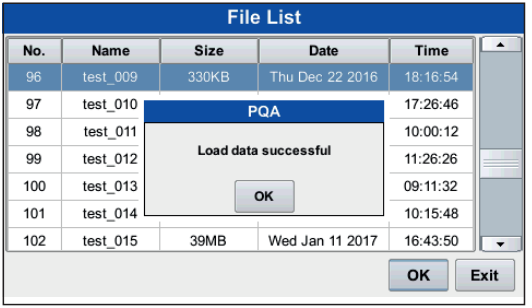
A Trend is a graph of the value of one parameter over time. In trend, instantaneous value of parameter is recorded over a time span. Users can zoom in on trends for a more detailed view.

Report

Meter can generate EN50160 compliance report, for files stored in memory card

After touching Event and trend icon if file is not present, the list of file which are stored on memory card will be displayed , user can select file which is to be loaded. after file is loaded load data successful message will be displayed.





In this chapter there are four parts,

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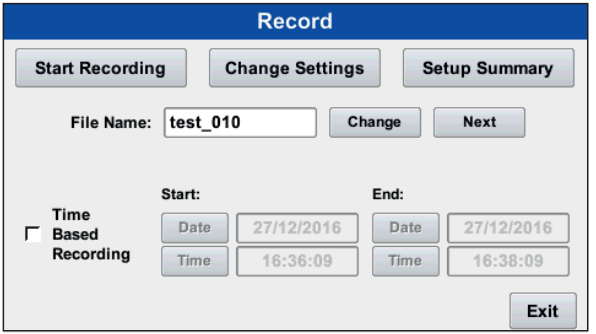
3.1 Record

Record is the capturing of the data and storing them in external memory card. In recording, the data that occur during running recording is captured. The data that is captured can be viewed later. User can change settings before starting recording. Once recording is started then settings cannot be changed. User can get complete overview of setup summary also. Time based recording can also be done in the record tab.User can set file name of 4 letters, which can be character or number.user can also change the name by touching next button. After touching change button file number is incremented and file name is changed . Record Screen is as shown below



In this section, following topics are covered

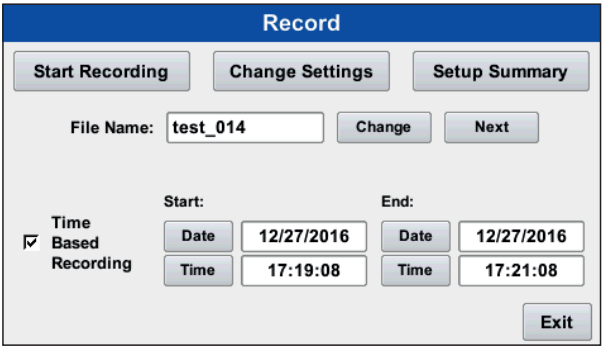
3.1.1 Normal Recording

In normal recording, the start and stop of recording is done manually. The recording once started can be stopped or aborted. Once recording is aborted then data recorded is not saved. In Stop option, the data recorded is saved. User can set file name as per his need.user can set file name of four character or number. on pressing next button file name is changed by incrementing file number.

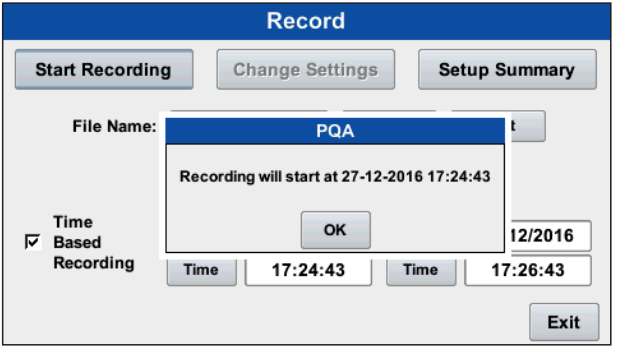
3.1.2 Time Based Recording

Time based recording is one in which start date & time along with stop date & time is specified before starting recording. It is mainly implemented to get data over larger period of time. The duration that can be set can minimum 1 minute to maximum 30 days. User must tick option of time based recording. The start and stop time and date has to be set. The stop time must be greater than start time. The Start Recording option is selected which gives the messageabout start time of recording. The recording is stopped automatically on reaching stop time.

Fig. shows time based recording setting screen



By touching touching start recording button recording will start ,and message will be displayed as shown in fig. below.

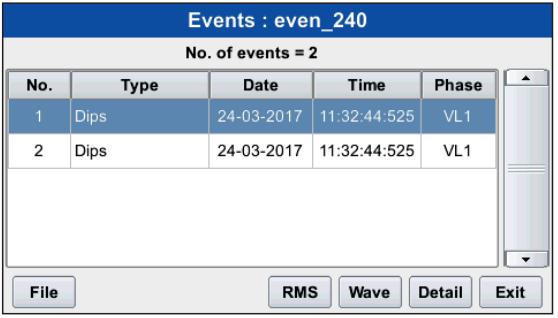


3.2 Event

The event screen displays actual voltage or current waveform that occurred when a certain threshold parameter limit is crossed. Event activity provides event list, waveform display and rms display. The event screen also enables users to customize data plots, allowing users to change and/or add parameters/channels. Zoom box features, wherein users can expand or narrow the size of a zoomed area via touch are also available for more thorough data analysis and interpretation. Users can set number of pre and post cycles of waveform in settings tab for recording.

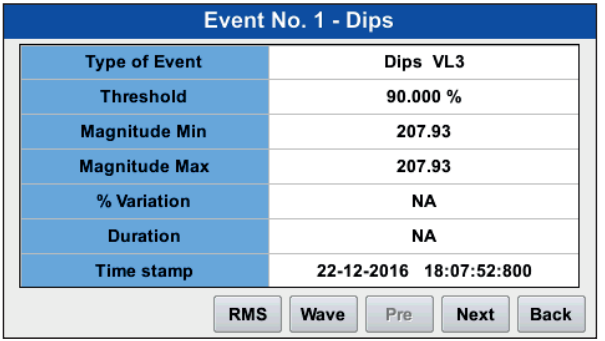
➢ **Event List**

Event list shows number of events occurring, type of event, date and time of event occurrence and channel at which event occurs. By touching File button user can change the file. It also shows RMS wave, text detail.Event list screen is as shown below



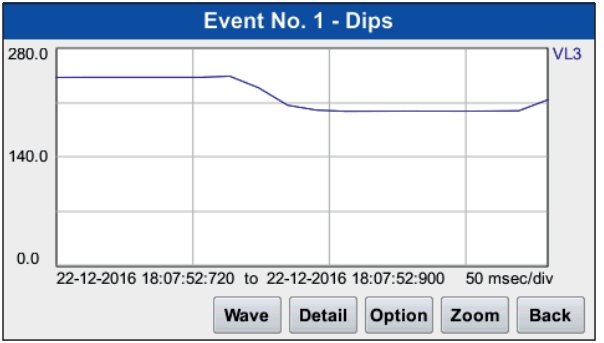
➢ **Event Text Data Display**

On pressing detail button Event data is displayed. Event Text data display is used to display type of event, threshold set for an event, minimum and maximum magnitude of event and time stamp of event.



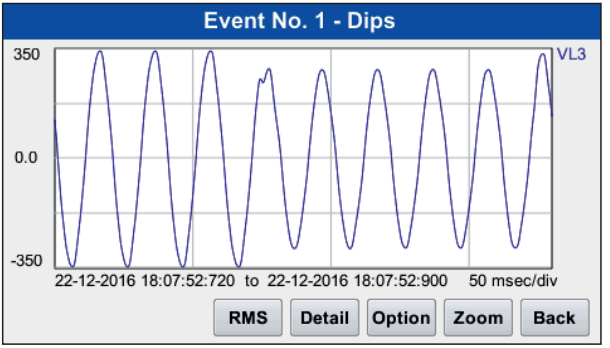
➢ **Event RMS Plot**

Event RMS shows the waveform of selected parameters, half cycle RMS wave details and zoom wave in and out. User can zoom plot by dragging touch on the screen.



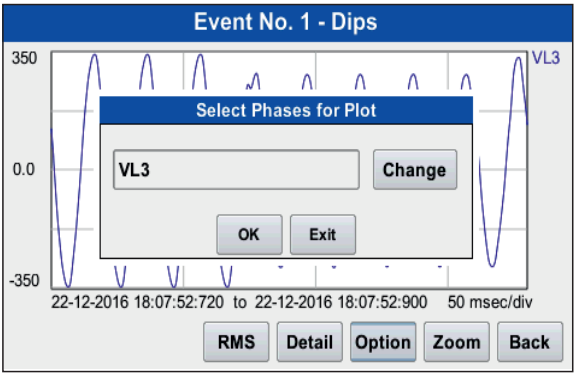
➢ **Event Waveform Plot**

The event waveform gives graphical representation of the actual event waveform over the period. User can analyze the details of waveform from zoom option. User can zoom plot by dragging touch on the screen.



➢ **Event Option**

In event option User can select the parameters to be displayed for plot.

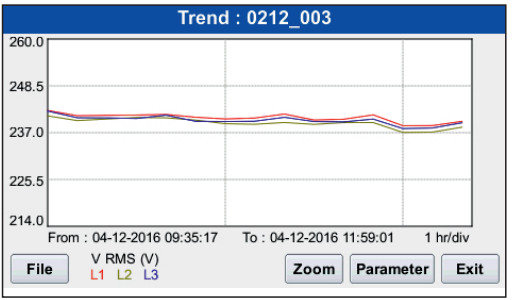


3.3 Trend

A trend consists of the timed and threshold plot for the parameters on display. Users have option to enable /disable phases for trend display. The trend screen also features a zoom box, wherein users can expand or narrow the size of a zoomed area using touch. The zoom feature allows users to view trend instantaneous values in greater detail.

➢ Trend Screen

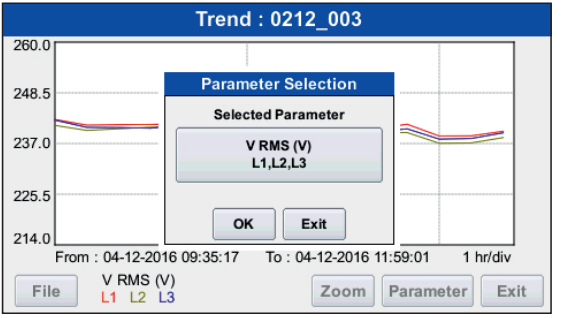
Trend screen is used to display the trend data recorded in graphical form. User can also zoom into the plot for greater details of particular parameter. It also displays the time period of trend recorded. X-axis on the graph shows start/stop time and Y axis shows magnitude of the parameter. By touching File button user can change the file.Trend screen is as shown below.



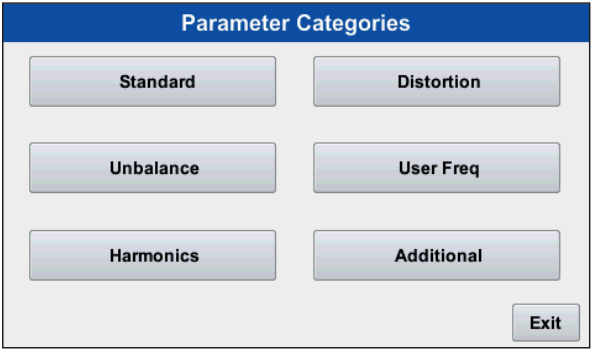
➢ Trend Parameter Selection Screen

In Trend parameter selection, parameter is selected which is to be plotted.User can select the parameters from list of standard, distortion, harmonics, unbalance, user frequency and additional.

After clicking parameter button selected parameter is displayed .



Parameter can be selected through screen as shown below.



3.4 Reports

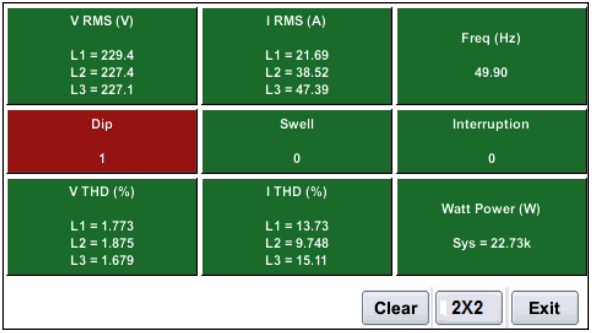
Users have the option to view report in any mode. When recording is completed, user can load file from memory card. If file is recorded in EN50160 mode then it is possible to view the report.

Also when recording is ON, the user can view the status of various real time parameters on the screen.

3.4.1 Status Report In Annunciator Panel

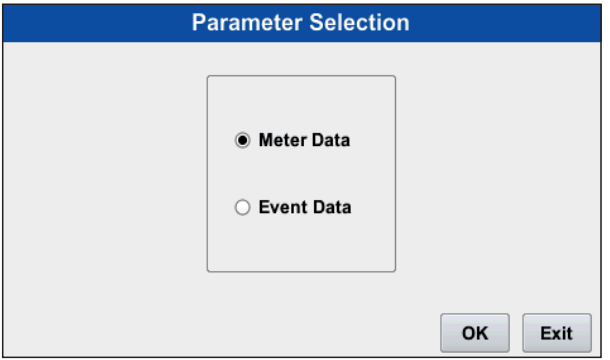
Status summary can be displayed via the annunciator panel. User can change number of parameter displayed on annunciator panel by touching 2X2 or 3x3 button. Real time data, event count is available in the matrix display of the annunciator panel. When monitoring is ON, the annunciator panel displays the status of a parameter using a color scheme. Meter data and events can be directly viewed from the annunciator panel. By clicking on particular parameter the user can select meter data or event data to be displayed on annunciator panel.

annunciator panel will be displayed only when recording is ON.



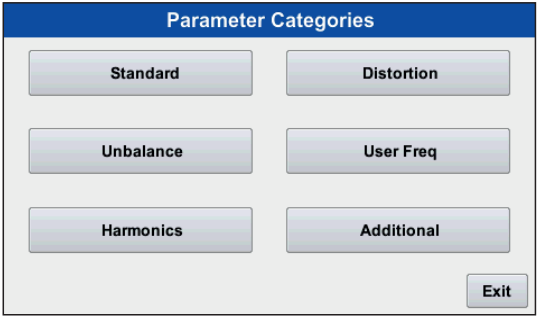
➢ **Parameter Selection**

Meter data and events can be directly viewed from the annunciator panel. By clicking on particular parameter the user can select meter data or event data to be displayed on annunciator panel.



➢ **Parameter Categories**

Meter data to be displayed on annunciator panel is selected from parameter categories like standard, distortion, harmonics, unbalance, user frequency and additional. The selected parameters are displayed on particular cell.



➢ **Event Data Display Option**

Event data to be displayed on the annunciator panel is selected from display option under Event data. The options available are Dip, Swell and Interruption count.

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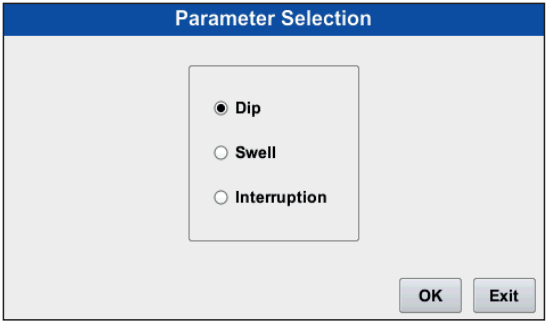
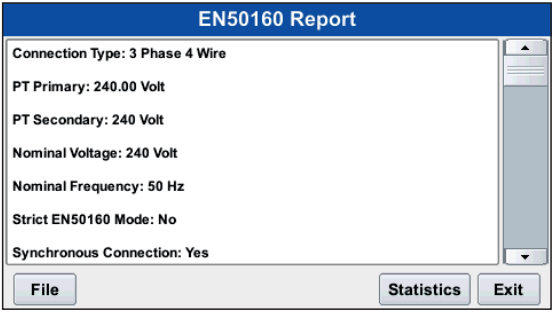
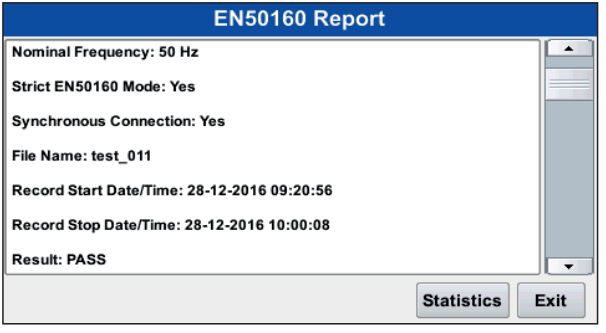


3.4.2 EN50160 Report

EN50160 compliance report is generated only if the file is recorded in EN50160 mode. The report consist of parameters according to EN50160 compliance. The report can be viewed by loading the file from memory card using Load From Card option in setting. Recording must be done in EN50160 mode only for generation of report.



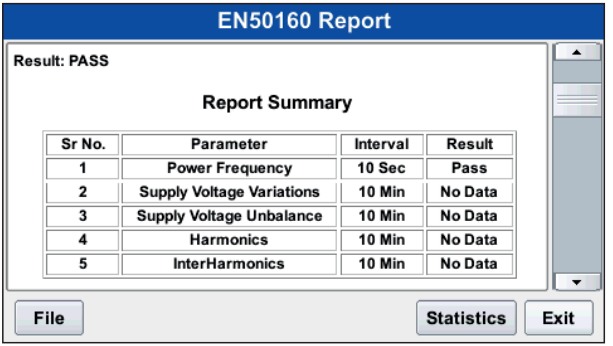
The above screen displays the basic settings of meter such as connection type, PT primary, PT secondary, nominal voltage, nominal frequency and whether strict compliance mode of EN50160 is enabled or not.



The screen shows whether synchronous connection is present or not. If not then it is in Islanded Mode. It also displays start time and stop time of recording. If all parameters are within specified range then result shown is Pass.

- **Report Summary**

The parameters shown under report summary are Power Frequency, Supply Voltage Variations, Supply Voltage Unbalance, Harmonics and Inter Harmonics. Summary shows the interval of test and result i.e., whether pass or fail. Each above parameters have their own detailed table.



- **Power Frequency**

Power frequency table indicates the limits of frequency, required %, actual % and result of recording. For e.g. if 60480 readings are acquired then 57456 reading must be in limit range of frequency and as per standard all reading must be in limit range of frequency which is 47 to 52 Hz, otherwise result will be fail. user can program Required percentage of week and frequency range in setting, but for standard Required percentage of week is fixed to 100%.

- **Supply Voltage**

Supply Voltage Variations table indicates the limits of voltage, required %, actual % of each phase and result of recording.

for e.g. if 1008 readings are acquired then 957 reading must be in limit range and as per standard all reading must be in limit range of voltage which is 204 to 264 V, otherwise result will be fail. user can program Required percentage of week and voltage range in setting, but for standard Required percentage of week is fixed to 100%.

➢ **Supply Voltage Unbalance**

Supply Voltage Unbalance indicates limits of supply voltage unbalance, required %, actual % and result of recording.User can program Required percentage of week and limit range in setting.

➢ **Harmonic Voltage**

Harmonic Voltage up to 25th order is recorded in report and compared with limit of each phase and corresponding Fail/Pass result is indicated.limit is applied to individual phase. user can program Required percentage of week and limit range in setting.

➢ **Inter Harmonic Voltage**

Inter Harmonic Voltage up to 25th order is recorded in report and compared with limits of each phase and corresponding Fail/Pass result is indicated.limit is applied to individual phase. user can program Required percentage of week and limit range in setting

Note:Interharmonic data is recorded only if strict compliance option is disabled.

➢ **Dips, Interruption, Swell**

Dip table shows the voltage measured as percentage of nominal and corresponding duration of particular magnitude also called blocks. For example, an voltage variation with a magnitude of 80-90% of nominal and 10-200msec cycles in duration is one block, whereas 80-90% and 0.2 to 0.5 sec is another and so on. Each time that the characteristics of an voltage variation match the criteria of the block, the counter is incremented.

This type of phenomena are typically found in block groupings such as:

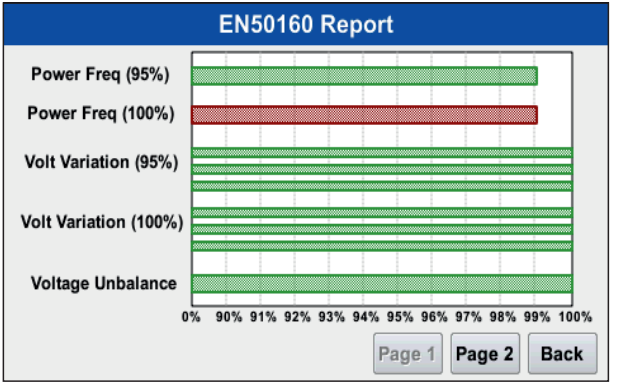
- Dips - classified in 5 Magnitudes x 6 Durations
- Interruptions - classified in 1 Magnitude x 2 Durations
- Swells - classified in 2 Magnitudes x 4 Durations

➢ **Statistics in Report**

Statistics in report indicate bar graph of parameters that are recorded. The parameters like Power Frequency, Supply Voltage Variation, Supply Voltage Unbalance, Harmonic Voltage and Inter Harmonic Voltage are displayed in bar graph form.

➢ **Statistics Graphs**

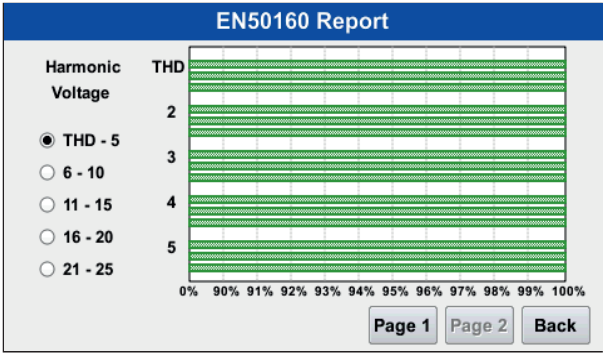
Data recorded in EN50160 report is displayed in graphical format.The red color in the graph indicates that the particular parameter is not within limits(For required % of time) and hence result is fail. The green color indicate that the particular parameter is within specified limits(For required % of time) and result is pass. The X-axis indicate the % of actual time and Y-axis indicate the parameters mentioned above.



In above figure, the red color of power frequency indicate that frequency is below preset limits for required % of time. Hence result of frequency is fail. Green color of supply voltage unbalance indicate that the voltage unbalance is within preset limits for required % of time and hence result is pass for that particular parameter.

➢ **Harmonic Voltage Screen**

By clicking on the page 2 , button harmonic data(from 2nd order to 25th order) stored in report is shown in graphical format.



➢ **Inter Harmonic Voltage Screen**

If inter harmonic data is present then page 3 option will be enabled.By clicking on page 3 interharmonic data recorded in report is shown in graphical format.

CHAPTER 4
PQA SETTINGS

4.1 Introduction

This chapter describes the miscellaneous settings that users can perform to keep the PQA running efficiently. These are settings that user might perform only occasionally. This is used to set time, date, PT/CT ratio, communication set up etc.

This chapter covers following topics.

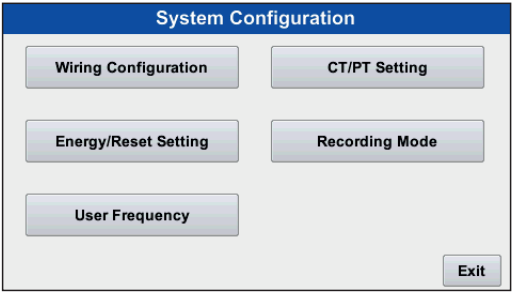
Settings Screen

4.2 System Configuration

System configuration tab includes wiring configuration, CT/PT setting, Energy/Reset setting, recording mode and user frequency. It helps to configure above parameters of meter for required application.

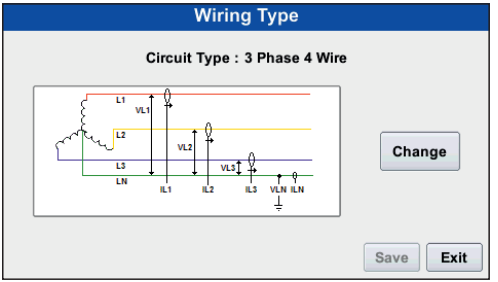
Following configuration options are available for this section

System Configuration Screen



➢ **Wiring Configuration**

Wiring configuration tab provides flexibility to change wiring type. Two wiring configuration are mainly employed which are: Three Phase Four Wire and Three Phase Three Wire connection. By pressing change button user can switch between two configuration. Configuration is selected by pressing Save button.



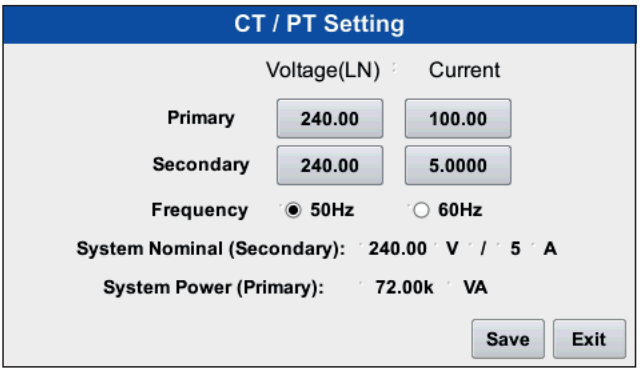
➢ **CT/PT Setting**

CT/PT setting option is used to set primary and secondary of PT/CT, nominal frequency of system and It also display system nominal voltage and current. It also displays System Power in VA. Frequency can be set to 50 Hz or 60 Hz.

Parameter Range Limit

System Type	PT Primary	PT Secondary	CT Primary	CT Secondary
3 Phase, 4 Wire	57 V to 9999 KV	57 VLN to 500 VLN	1 A to 9999 A	1A or 5A
3 Phase, 3 Wire	100 V to 9999 KV	100 VLL to 867 VLL	1 A to 9999 A	1A or 5A

Note: PT or CT limits can vary depending on locking of 5100 MVA System Power.



➢ **Energy /Reset Setting**

This setting allows one to reset parameters, Energy Digit Reset Count & to change energy resolution unit and impulse assignment.

➢ **Reset**

This option is used to reset energy, reset demand, reset maximum & minimum and reset all parameters.

➢ **Energy Digit Reset Count**

Energy Digit Reset Count can be set for 7 digit, 8 digit and 9 digit. According to set value, for e.g. for 7 digit, the reset roll over occurs at 9999999. According to set digit,Roll over occurs. By default Energy reset count is set to 8.

➢ **Energy Resolution Unit**

Energy resolution units can be set for three settings:

- W/VAr/VA
- KW/KVAr/KVA
- MW/MVAr/MVA

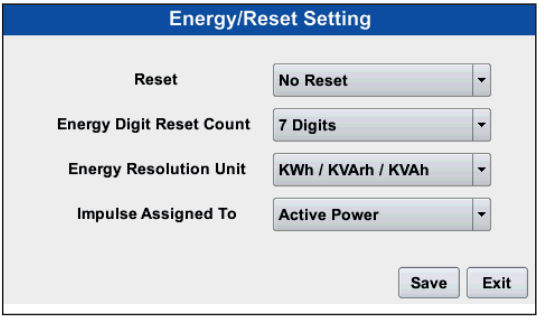
For system power 30 MVA or above, the resolution unit can only set to KW/KVAr/KVA. By default energy resolution is set as KW/KVAr/KVA.

➢ **Impulse Assigned To**

Depending on nominal system power, the numbers 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 the impulses corresponding to nominal system energy by default impulse operates on Active energy.

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

➢ **Energy/Reset Setting Screen**

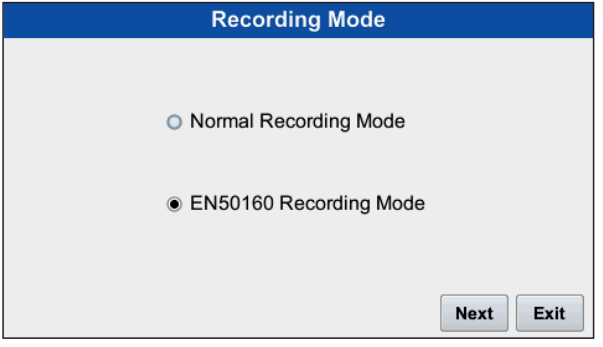


➢ **Recording Mode**

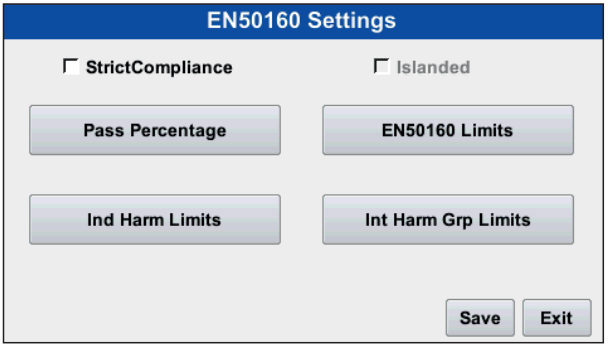
Recording mode can be set either as Normal Power Quality or EN50160 Power Quality. EN50160 has further two settings which are Strict Compliance and Islanded mode.

In strict compliance, the limits of parameters specified under EN50160 are fixed. User cannot change the limits of the parameters.

Recording Mode Selection Screen



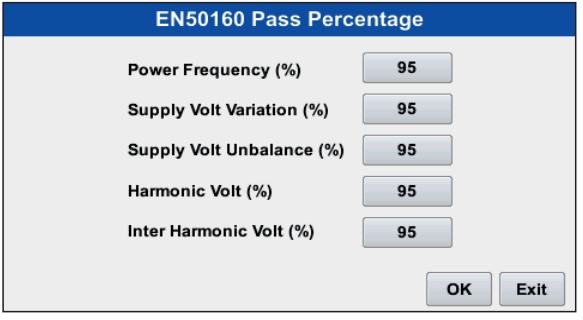
En50160 Mode Selection Screen



The nominal frequency of the supply voltage is 50/60 Hz. But for system with no synchronous connection to an interconnected system(Eg: supply system on certain islands) there is certain relaxation on limits of frequency. When strict compliance Mode is disabled user can set pass percentage, EN50160 limits, individual harmonic percentage and group inter harmonic limits.

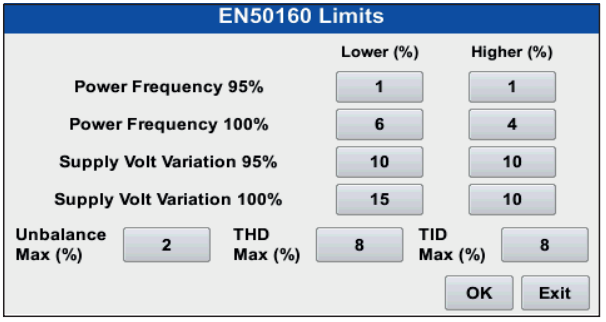
➢ **Pass Percentage**

Pass Percentage values for various parameters are specified. In this user can set the values of various parameter which will determine in report whether test is pass or fail.



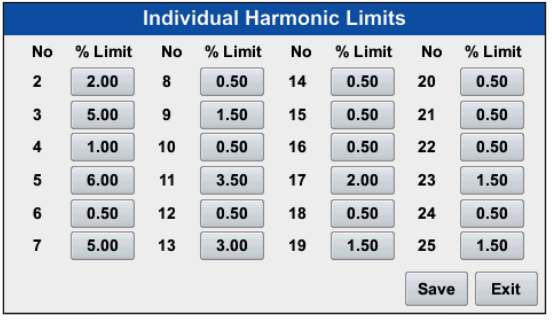
➢ **EN50160 Limits**

An EN50160 limit specifies the power frequency, voltage variation, unbalance voltage maximum and minimum deviation value. User can also specify the THD and TID maximum value limits. The limits of parameters should be greater than 0.01 and less than 100.



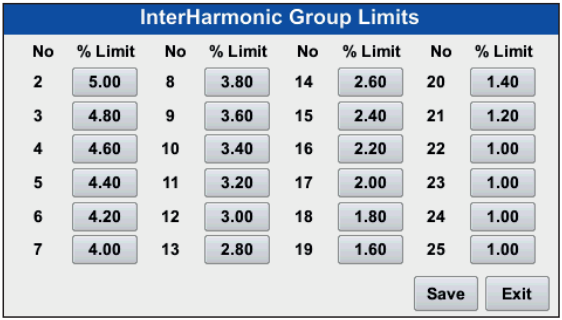
➢ **Individual Harmonic Limits**

It can set using following option. User can set individual harmonics limit up to 25th order. Eg: limits for 2nd harmonic is set to 2% then value measured should not exceed it's set limit. The limits of parameters should be greater than 0.01 and less than 100.



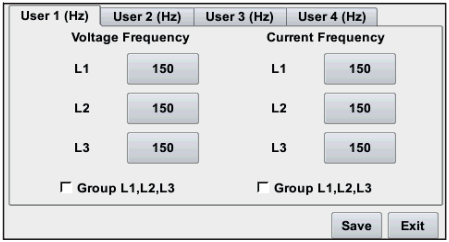
➢ **Inter Harmonic Group Limits**

Inter harmonics group limit is used to set inter harmonics group limit for group using this option. User can set value up to 25th number. option. The limits of parameters should be greater than 0.01 and less than 100. Eg: limits for 2nd harmonic group is set to 5% then value measured should not exceed it's set limit.



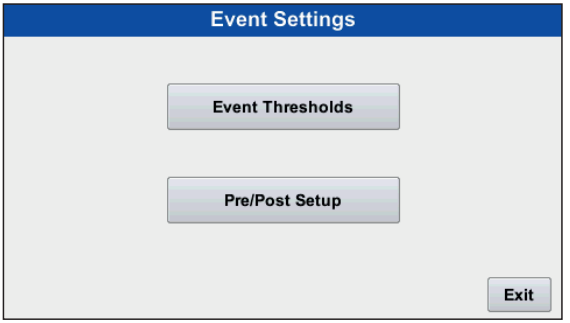
➢ **User Frequency**

User frequency setting is provided to set different frequencies for Voltage and Current of each phase. Four different configuration for frequencies can be set. User can click on Group L1,L2,L3 to set same frequency for each phase. This will provide voltage and current values for particular set frequencies in User Frequency tab in Meter. The value to be entered should be a multiple of 5 and should not be greater than 4160 value.



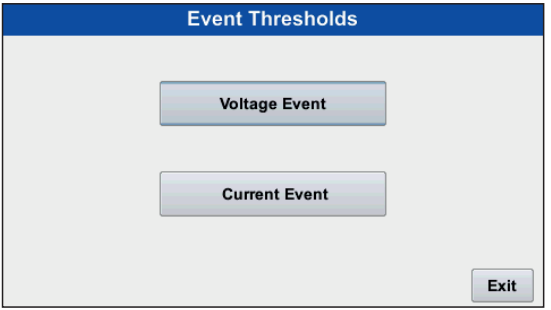
4.3 EVENT SETTINGS

Event setting enables the user to set threshold values for various events such as sag, swell and interruption. User can also configure pre-post waveform cycle which needs to be recorded when event occurs.



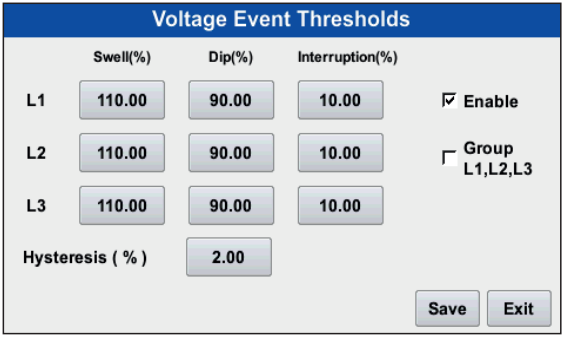
➢ **Event Thresholds**

In event thresholds, user can set voltage and current threshold for events. User can set threshold values for swell, dip and interruption event. User can set hysteresis for events.



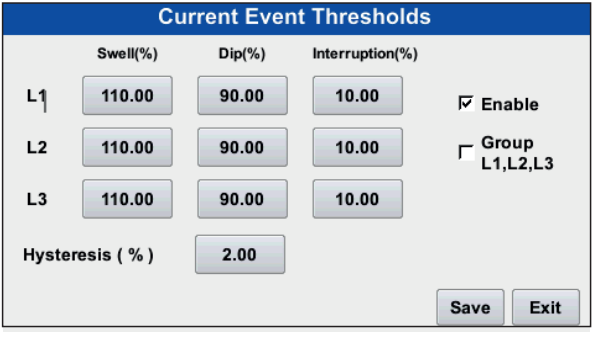
➢ **Voltage Event**

For voltage event, user can set threshold values for voltage dip, voltage swell and voltage interruption with hysteresis in percentage. Group L1,L2,L3 option is used to set common threshold values for all phases by selecting it. User can also disable all events threshold by unselecting Enable option. The threshold for particular event for particular phase can also be disabled.



➢ **Current Event**

For current event, we can set threshold values for current dip, current swell and current interruption with hysteresis in percentage. All features are same as voltage event.



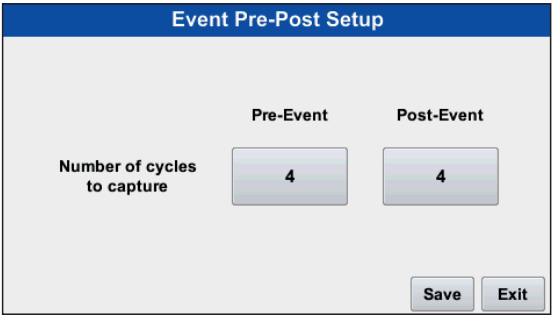
➢ **Limits of parameter**

Parameter	Limits
Interruption	1 to 10%
Dip	1 to 90%
Swell	110 to 150%
Hysteresis	1 to 20%

Note:
Swell(%)> Dip(%)>Interruption(%)

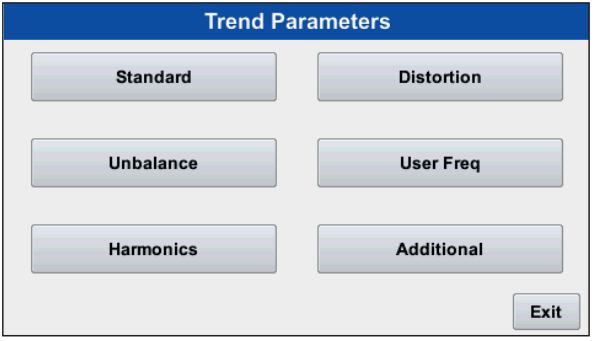
➢ **Pre/Post Setup**

In Pre/Post Setup, the number of cycles and RMS to be captured is determined. The pre count shows number of cycles before event occurance and post shows count after event occurance. Pre-Event count can be between 1 to 30 and Post-Event count can be between 1 to 30.



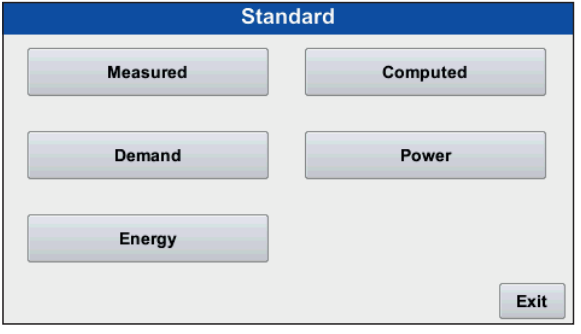
4.4 Trend Parameters

Trend parameters are enable/disable by using trend parameters setting. It consist of standard, distortion, harmonics, unbalance, user frequency and additional sub menus to set parameters.



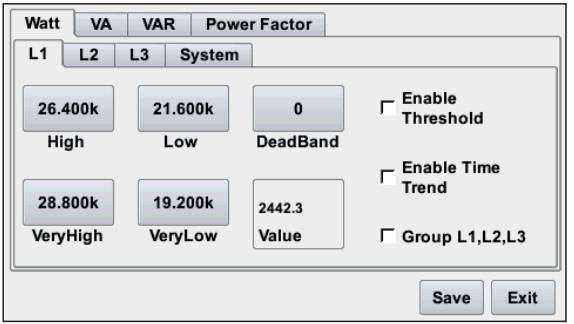
➢ **Standard**

In Standard tab of trend parameters, the parameters such as measured voltage, current, frequency, power, demand and energy can be set.



➢ **Power**

Power tab of standard parameter is used to set threshold for active, reactive and apparent power. User can set threshold for power factor also. **Enable Threshold** is used to enable threshold based trend display. **Enable Time Trend** is used to enable time based trend display. In this, based on trend interval set the trend graphs are generated after specified time interval. **Group L1,L2,L3** is used to set common limits for all phases. Very High, High, Low, Very Low and dead band specifies the trend limits for threshold based trend setting. Based on set limits the threshold based trend is plotted. Refer table no. 10 for trend parameters limit.



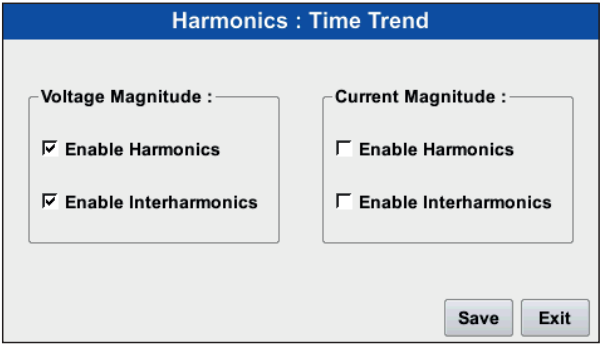
Note: Similarly the other parameters under

- Standard tab -Measured,computed, demand etc.
- Distortion tab - THD,TID,Crest factor,power
- Unbalance tab- V/I sequence,V/I unbalance,V/I imbalance
- User Frequency- Voltage ,Current
- Additional- Arithmetic sum,Vector sum,Coincident demand,Coincident PF

can be explained

➢ **Harmonics**

Harmonics and inter harmonics voltage and current magnitude time based trend can be enable or disable using this tab.



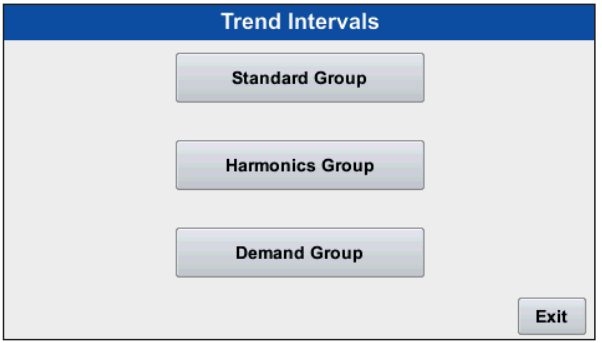
User can enable/ disable Harmonics and Inter Harmonics of Voltage and Current for trend display from Harmonics option in Trend Parameter Selection.

4.5 Trend Intervals

Trend interval is used to set the time period to capture the data to represent the trend of data over period of time.Trend interval is set for standard group,harmonic group and demand group.

Trend Interval screen

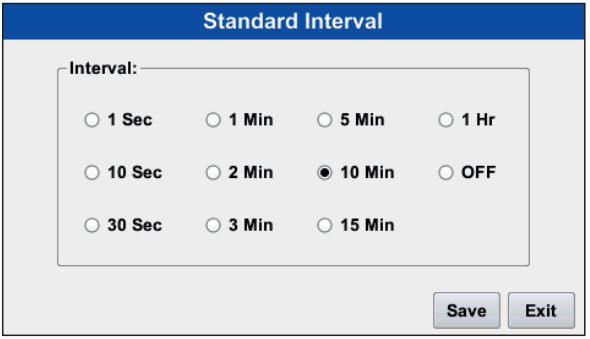
Trend interval is set for various group through this screen.



➢ **Standard Group**

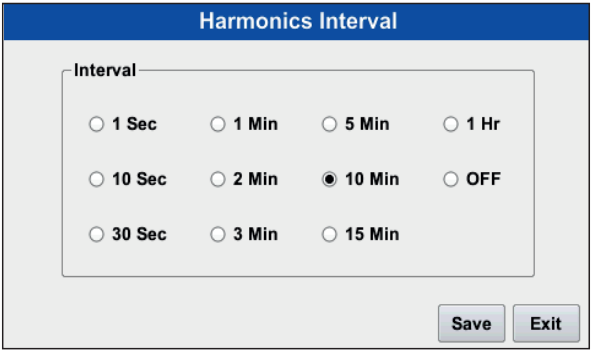
In standard group, the basic parameter such as voltage, current, power, energy etc are included. Using standard group trend interval, the trend interval can be set. It can be set to 1 Sec, 10 Sec, 30 Sec, 1 Min, 2 Min, 3 Min, 5 Min, 10 Min, 15 Min and 1 Hr. User can keep trend interval OFF too.

Standard Interval Screen



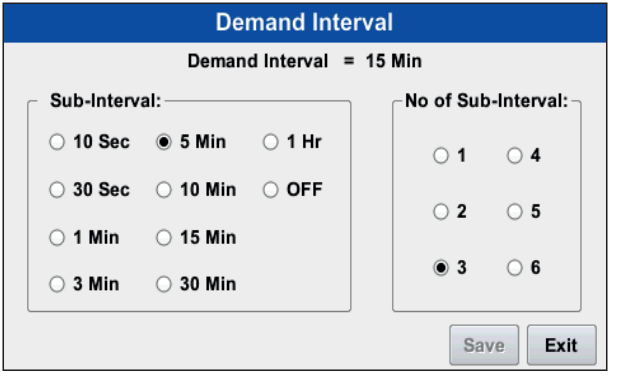
➢ **Harmonics Group**

In harmonic group, the trend interval can be set for THD, TID etc. for the harmonics trend. Similarly trend interval can be 1 Sec, 10 Sec, 30 Sec,1 Min,2 Min,3 Min, 5 Min, 10 Min, 15 Min and 1 Hr. User can keep trend interval OFF too.



➢ **Demand Group**

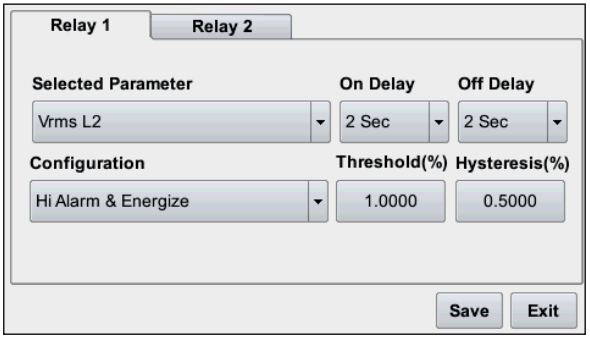
In demand group, the current or power demand are considered. So the trend interval for various demand can be set. User can set number of sub-interval for demand group. Based on the calculation from sub-interval and number of sub-interval, the demand trend interval is set.



4.6 Relay Setting

Relay setting is used to configure the relays for limit action. Parameters for which relay limit action is provided. It includes basic parameters, harmonic parameters, demand parameters. Relay limit action can be disabled by selecting 'None' as Selected Parameter. ON delay and OFF delay can be set for both relays. Hysterisis and threshold value for selected parameter can also be set. There are four different configuration for both relays.

Relay Setting Screen



- **Selected Parameter**
  In selected parameter, user can select the parameter depending on which relay limit action is required. User can select required parameter from specified list which include standard basic parameters, harmonic parameters and demand parameters using this option.
- **ON Delay**
  ON delay of the relay can be set between 1 Sec to 10 Sec. User can set different ON delay for both relays.
- **OFF Delay**
  OFF delay of the relay can be set between 1 Sec to 10 Sec. User can set different OFF delay for both relays.

- **Configuration**

  In configuration, we can configure relays to various configuration such as:

1. Hi Alarm & Energize
2. Hi Alarm & De-Energize
3. Low Alarm & Energize
4. Low Alarm & De-Energize.

- **Threshold**

  User can set threshold value for relays using this option.

- **Hysteresis**

  Hysteresis for parameters can be set from this option. Based on set hysteresis, the relay would energize or de-energize.

- **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.

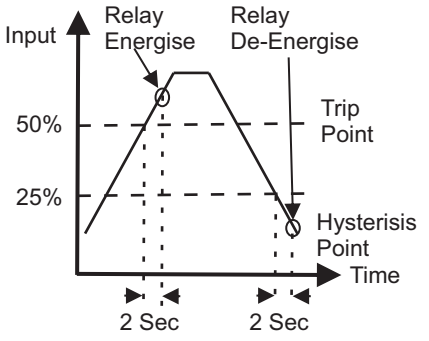
- **Lo Alarm**

  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.

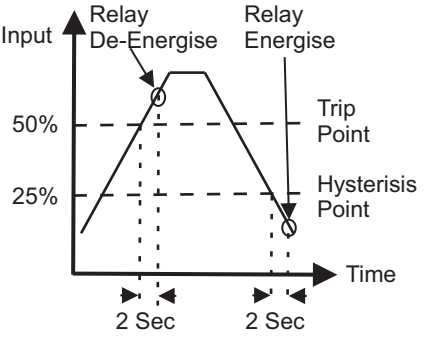
Note: Threshold and Hysteresis value depends on the selected parameter, for this refer table no.15.

Example of different configuration:
Parameter: Current
Trip Point = 50%
Hysteresis = 50% of trip point
Energising Delay= 2 Sec
De-Energising Delay = 2 Sec

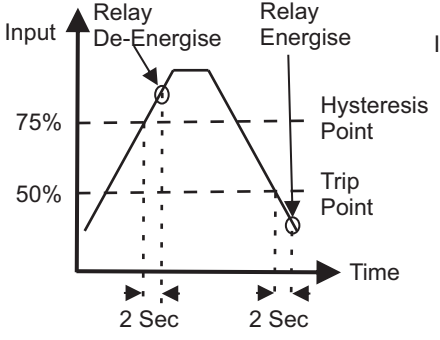
High Alarm & Energise Relay



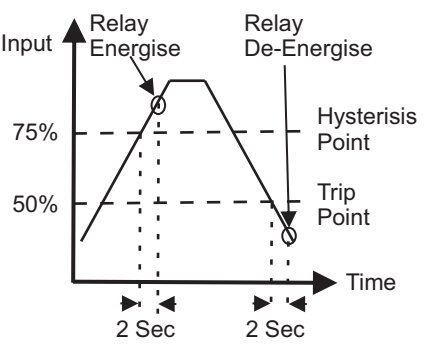
High Alarm & De-energise Relay



Low Alarm & Energise Relay



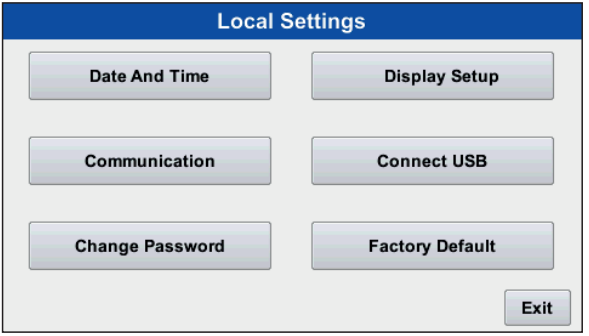
Low Alarm & De-energise Relay



4.7 Local Settings

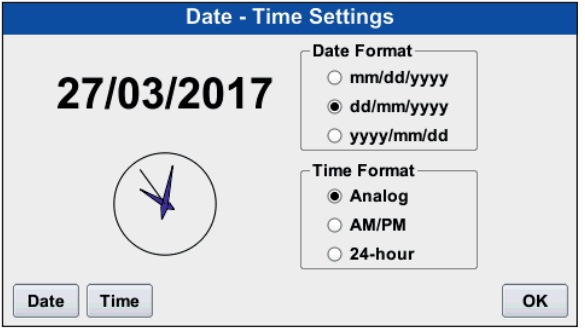
Local Settings is used to set Date & Time, Display configuration, Communication settings, factory default, Change Password and Connect USB as shown below.

Local Settings Screen



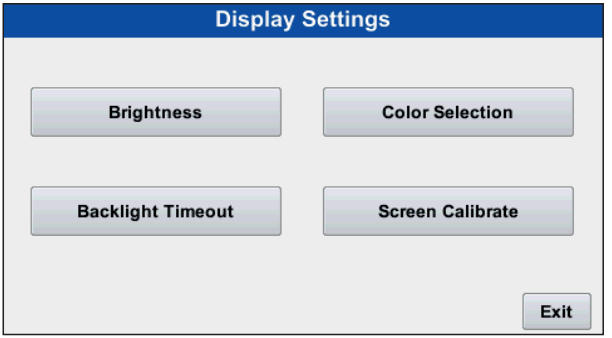
➢ **Date And Time**

User can set date and time from this option. User can set date and time format both.



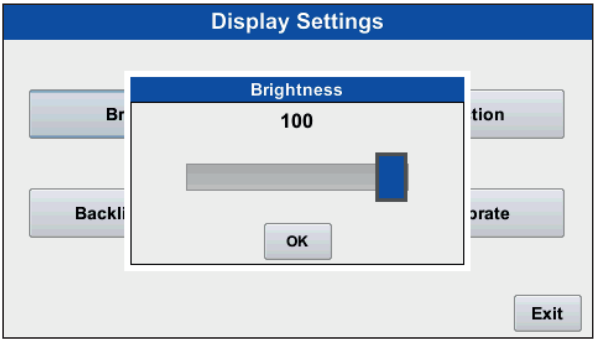
➢ **Display Settings**

Display settings are used to set back light timeout, brightness of screen, color selection for each phase for current and voltage and touch screen calibration.



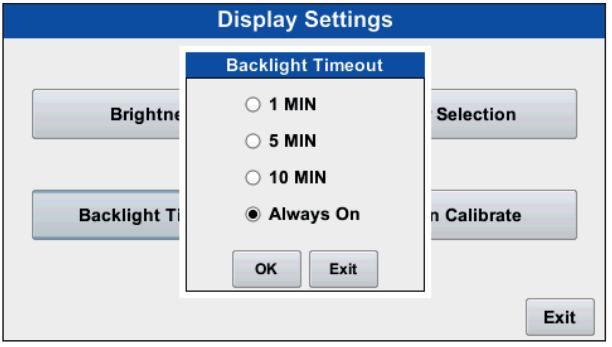
➢ **Brightness**

Brightness of the screen can be set using this option of display setting. It can be varied from 5 to 100 %.



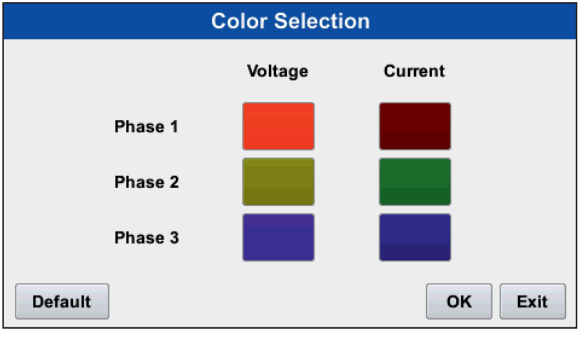
➢ **Back light Timeout**

In back light timeout, user can set back light timer for screen. User can set back light time as 1 Min, 5 Min, 10 Min and can keep it always ON. After set time the screen back light is turn OFF. User can turn ON screen by just touching it.

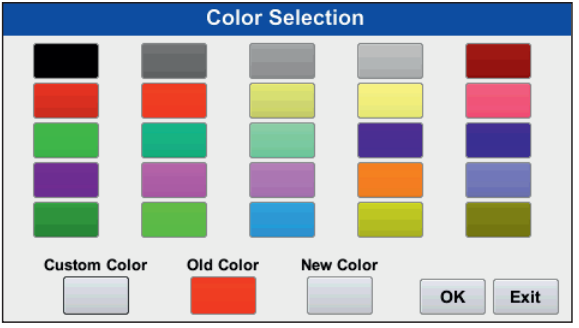


➢ **Color Selection**

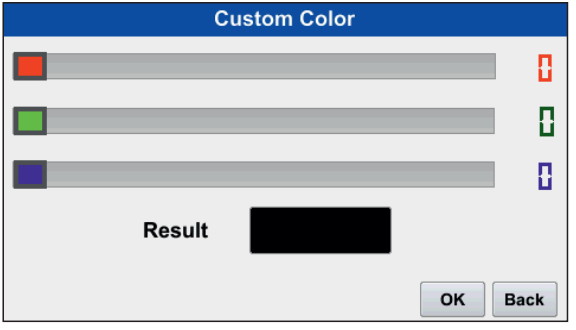
Color selection tab is used to assign color for each phase. The color effect is seen in Meter, Harmonics, Scope, Phasor, Events. The parameters associated with respective phases are represented with that particular color.



User can select particular color for each phase from some fix ed defined colors by clicking on the phase color tab on previous screen. It displays the old and new color also.

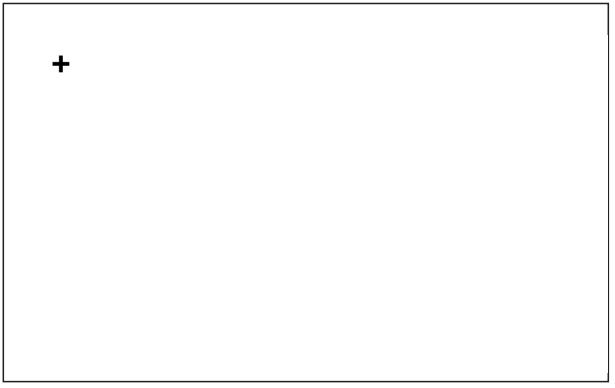


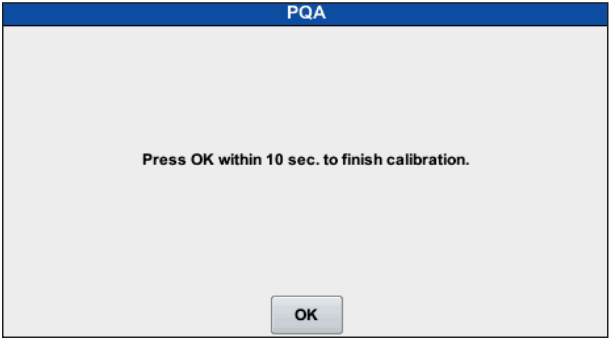
User can also customize the color by clicking on Custom Color. In custom color, the user can set the R-G-B value to obtain particular color.



➢ **Screen Calibrate**

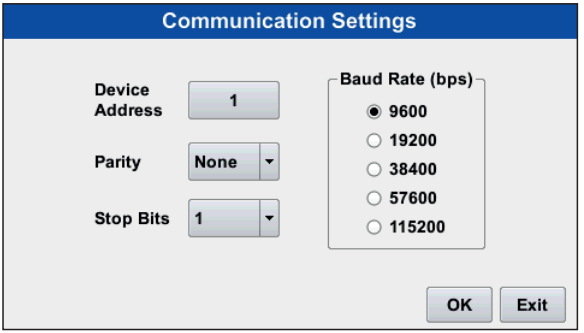
In screen calibrate, the touch screen calibration is done by touching each + mark on the screen. The '+' mark appears 5 times. If calibration is done properly then message box appears. The user has to press OK within 10 seconds to complete calibration.





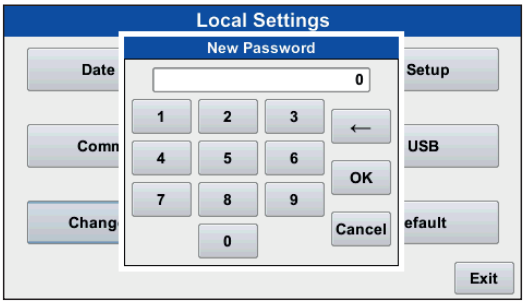
➢ **Communication**

In communication setting, user can assign device address(1 to 247), parity(even or odd), number of stop bits(1 or 2) and baud rate of data transfer.



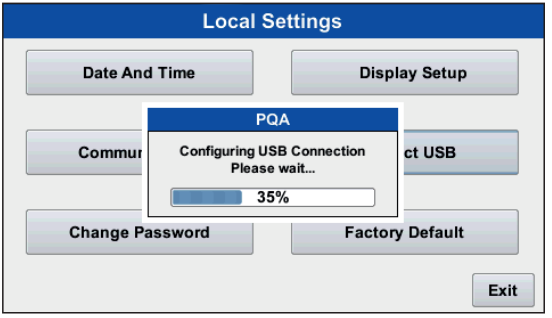
➢ **Change Password**

Change password is used to change the password to enter the settings or record tab. By default the password is”0000”.password must be of 4 digits.



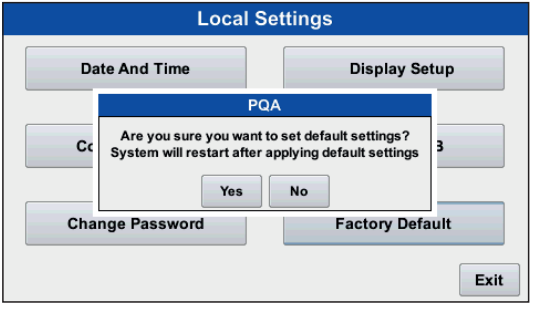
➢ **Connect USB**

For USB communication, user has to click on connect USB option. After that configuration window will be displayed, when it reaches to 100% USB is configured and connection between computer and meter is established.



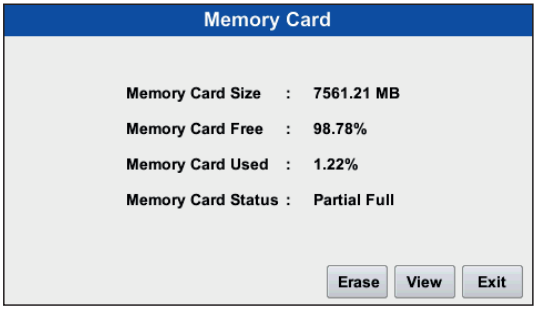
➢ **Factory Default**

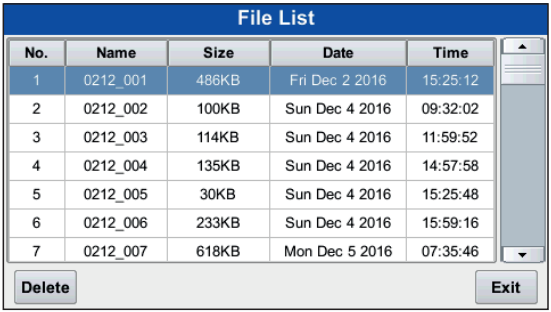
Factory default is used to factory reset the device. After selecting default option, the device automatically restarts. The stored data on memory card is retained.



4.8 Memory Card

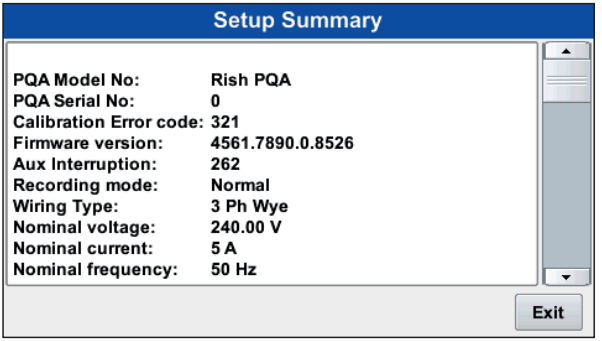
Memory card option shows the total memory card size, free memory space, memory space used and memory card status. User can erase the complete data of the memory card. User can also view files recorded in memory card. User can delete particular file from view option.





4.9 Setup Summary

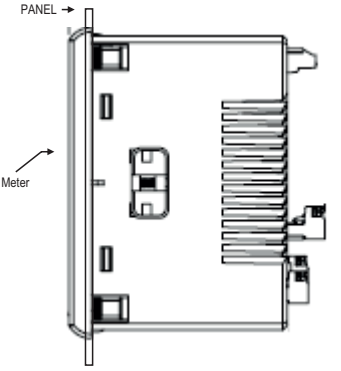
Setup summary provides information about our device configuration. User gets information about PQA Model No, Recording mode, Wiring Type, Nominal Voltage, Nominal Current and Nominal frequency. It also gives data about CT/PT setting, Event threshold, trend interval etc. It provides complete setting configuration summary in a single pack.



Chapter 5
Installation Settings

5.1 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 -10 to 55 ^{0}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.**

5.2 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.

5.3 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 $3mm^2$ x 2 diameter cables.

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

5.4 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.

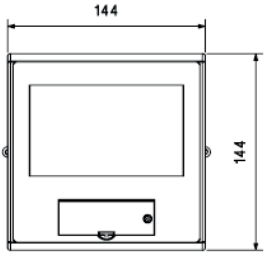
5.5 Fusing

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

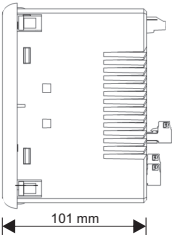
5.6 Earth/Ground Connections

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

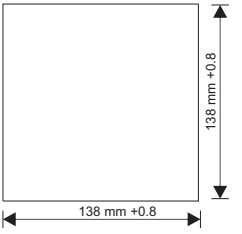
5.7 Case Dimension and Panel Cut Out



Front View

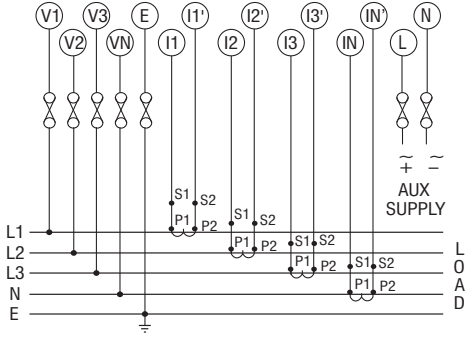


Side View

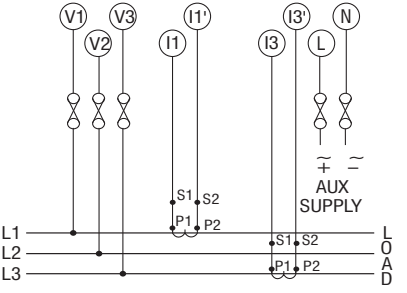


Panel Cutout

5.8 Connection diagram

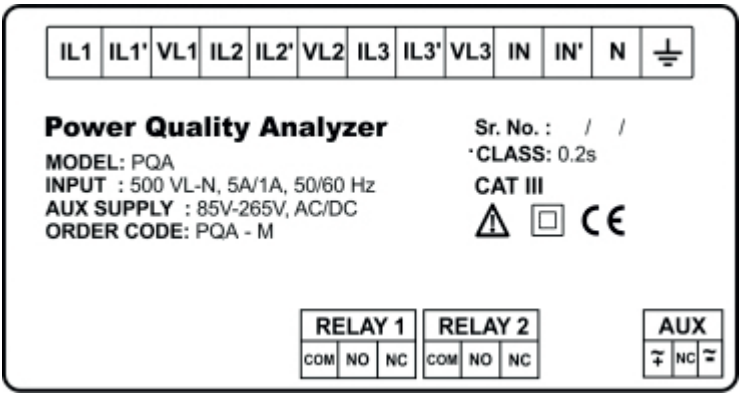


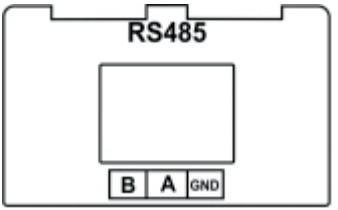
a) 3 Phase 4 Wire



b) 3 Phase 3 Wire

5.9 Terminal diagram





APPENDIX A: Technical Specification

Parameter	Measurement Method	Uncertainty	Measuring Range
Power Frequency	1 s and 10 s	±10 mHZ	42.5 Hz ~ 57.5 Hz / 51 Hz ~ 69 Hz
Magnitude of the supply voltage	10 / 12 cycle	±0.1% of Udin	10 % ~ 150 % of Udin
Input Current	10 / 12 cycle	±0.2% of Nominal	0.1-200% of Nominal
Dips and swells	Urms (1/2)	Amplitude: ±2% of Udin Duration: 1 + 1 cycle	+/- 0.2% of Nominal
Interruptions	Urms (1/2)	Duration: 1 + 1 cycle	duration > 2.5 cycles
Voltage/Current Unbalance	10 / 12 cycle	±0.15%	0% - 5% of U1
Voltage harmonics 1 to 63rd(Harmonics Grouping)	10 / 12 cycle	IEC 61000-4-7 class II ±5% Um ±0.15% Unom	10% ~ 200% of class 3 of IEC 61000-2-4 Um ≥ 3%Unom Um < 3% Unom
Current harmonics 1 to 63rd(Harmonics Grouping)	10 / 12 cycle	IEC 61000-4-7 class II ±5% Im ±0.5% Inom	10% ~ 200% of class 3 of IEC 61000-2-4 Im ≥ 10% Inom Im < 10% Inom
Voltage interharmonics 1 to 63rd(Interharmonics Grouping)	10 / 12 cycle	±10% Um ±0.30% Unom	10% ~ 200% of class 3 of IEC 61000-2-4 Um ≥ 3% Unom Um < 3% Unom

Parameter	Measurement Method	Uncertainty	Measuring Range
Current interharmonics 1 to 63rd(Harmonics Grouping)	10 / 12 cycle	±10% Im ±1% Inom	10% ~ 200% of class 3 of IEC 61000-2-4 Im ≥ 10% Inom Im < 10% Inom

Note: Unom / Inom : Nominal Voltage / Current (TRMS),
Um / Im : Measured Harmonic Voltage / Current
10 cycle for 50 Hz and 12 cycle for 60 Hz.
Reference channel for frequency detection is U1.

Parameter	Range	Accuracy
Nominal Input Voltage	100-866V(L-L),57.7-500V(L-N)	
System PT Primary Values	100V(L-L) to 9999kV(L-L)	On site Programmable
Measuring Range	10V for 500V(L-N)	
Volts (AC)	10-150% of Nominal	+/- 0.2% of Nominal
Vpeak	7Vpk to 707.1 (L-N)	+/- 5% of Nominal
Max. continuous input voltage	750V(L-N),1.3kV(L-L)	
Crest Factor (Voltage)	2.12 at Nominal	
Nominal Input Current	1A / 5A	
System CT Primary Values	1A to 9999A	On site Programmable
Starting Current	1mA for 1A, 5mA for 5A	
Amps (AC)	0.1 -200 % of Nominal	+/- 0,2% of Nominal
Apeak	0.0014Ipk to 14.14Ipk	+/- 5% of Nominal
Crest Factor (Current)	2.8 at Nominal	
Frequency (50 / 60 Hz)	45 Hz to 66 Hz	+ / 0.15%
Power Active (W) Apparent (VA) Reactive (VAr) Power Factor		 +/- 0.2 % of Nominal +/- 0.2 % of Nominal +/- 1% of Nominal 1

Parameter	Range	Accuracy
Eight Channel Sampling Rate	50kHz Per Channel	
Udin	230V L-N / 400V L-L	
Unbalance Volts Amps	 0 to 5% 0 to 20 %	 +/- 1% +/- 1%
Energy kWh kVArh kVAh		Class 0.2S as per IEC 62053-22 Class 2 as per IEC 62053-23 0.2

Parameter	Range
Applicable Standards Power Quality EMC Immunity Safety IP for Water & dust Pollution Degree Installation Catagory High Voltage Test	 EN50160 IEC 61326-1 IEC 61000-4-3 IEC 61010-1-2010(Permanently Connected) (IP 54 for Front) IEC 60529 2 CAT III 300V 3kV AC (1 minute between all circuit)
Auxiliary Supply External Aux Aux Supply Frequency	 85 - 265 AC-DC 50 / 60 Hz (+ / - 10%)
VA Burden Nominal Input Voltage Burden Nominal Input Current Burden Auxiliary Supply Burden	 < 0.2 VA approx per phase < 0.2 VA approx per phase <15 VA approx
Enviromental Conditions, Other Info Operating Temperature Storage Temparature Relative humidity Shock Vibration Temparature Co-efficient	 -20 to 70 Degree Celcius -40 to 85 Degree Celcius 0-95 % Non Condensing 15g in 3 planes 10...150...10 Hz, 0,15mm amplitude 0.05% per Degree Celcius

Parameter	Range
Real Time Clock (RTC) uncertainty:	±1 Sec/Day (23°C ± 1°C) (Trimmable through display or Modbus)
Display update rate: Response time to step input	 1 sec approx.
Interfaces: Impulse Led Relay Output Load Capacity Contact ModBus / RTU USB SD card interface	 At front of the instrument. Configured as limit. 240 V AC ,5 A Change over contact, bistable RS485, max. 1200m Baud rate: 9.6k, 19.2k, 38.4k, 57k, 115.2k bps At front side of instrument MicroSD Up to 8 GB (Maximum event recorded per file is 4000)

APPENDIX B: PQ Parameter Calculations

Description	Abbreviation	Formula	Units
Zero Sequence	U0	$V0_a = \frac{1}{3}[V_1 + V_2 + V_3]$	None
Positive Sequence	U1	$V1_a = \frac{1}{3}[V_1 + aV_2 + a^2V_3]$	None
Negative Sequence	U2	$V2_a = \frac{1}{3}[V_1 + a^2V_2 + aV_3]$	None
Unbalance	U2/U1	$\frac{U2}{U1}$	None
Unbalance	U0/U1	$\frac{U0}{U1}$	None
Imbalance	RMS/Avg RMS	$Max\ of\ imbalance$	%
Imbalance	V/I Imbalance	$\frac{\lvert V_{aRms\_avg} - RMS\rvert}{RMS_{Avg}} * 100$	%

where, $a = -\frac{1}{2} + j\frac{\sqrt{3}}{2}$

Description	Abbreviation	Formula	Units
VA Vector Total Fund	Vector Sum VA	$VA_{vect\_fund\_total} = \sqrt{W_{fund-tot}^2 + VAR_{fund-tot}^2}$	VA
VA Arithmetic Fundamental Total	Fund Arithmetic Sum VA	$VA_{1\ fund} + VA_{2\ fund} + VA_{3\ fund}$	VA
Vector Sum Power Factor	Vect Sum PF	$\frac{W_{tot}}{VA_{tot\ -\ vector}}$	None
Arithmetic Sum Power Factor	Arithmetic Sum PF	$\left\lvert \frac{W_{tot}}{VA_{tot\ -\ arithmetic}} \right\rvert$	None
Arithmetic Sum Displacement Power Factor	Arithmetic Sum DPF	$\left\lvert \frac{W_{tot}}{VA_{tot\ -\ arithmetic\_fund}} \right\rvert$ VA derived from DFT fundamental	None
Vector Sum Displacement Power Factor	Vector Sum DPF	$\left\lvert \frac{W_{tot\_fund}}{VA_{tot\ -\ vector\_fund}} \right\rvert$ VA derived from DFT fundamental	None

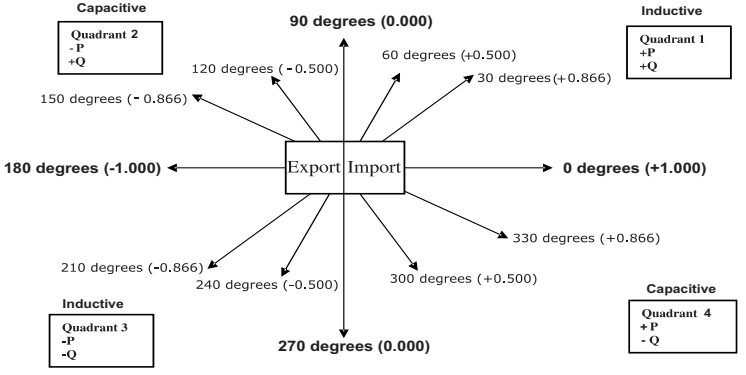
Description	Abbreviation	Formula	Units
Total Voltage Harmonic Distortion Normalized to the fundamental	VTHD Fund (%)	$\frac{\sqrt{V_{H2}^2 + V_{H3}^2 + \ldots\ldots V_{H63}^2}}{V_{Hfund}} * 100$ Per 61000-4-7	%
Total Current Harmonic Distortion Normalized to the fundamental	ITHD Fund (%)	$\frac{\sqrt{I_{H2}^2 + I_{H3}^2 + \ldots\ldots I_{H63}^2}}{I_{Hfund}} * 100$ Per 61000-4-7	%
Total Voltage Inter Harmonic Distortion Normalized to the fundamental	VTID Fund (%)	$\frac{\sqrt{V_{Hig2}^2 + V_{Hig3}^2 + \ldots\ldots V_{Hig63}^2}}{HV_{fund}} * 100$ HigV is voltage Inter-Harmonic Group	%
Total Current Inter Harmonic Distortion Normalized to the fundamental	ITID Fund (%)	$\frac{\sqrt{I_{Hig2}^2 + I_{Hig3}^2 + \ldots\ldots I_{Hig63}^2}}{HI_{fund}} * 100$	%
Total Voltage Harmonic Distortion Root Sum of Squares(RSS)	VTHD RSS (%)	$\sqrt{V_{H2}^2 + V_{H3}^2 + \ldots\ldots V_{H63}^2}$	%
Total Voltage Inter Harmonic Distortion Root Sum of Squares(RSS)	VTID RSS (%)	$\sqrt{V_{Hig2}^2 + V_{Hig3}^2 + \ldots\ldots V_{Hig63}^2}$	%

Description	Abbreviation	Formula	Units
Total Odd Voltage Harmonic Distortion Normalized to the fundamental	VOHD	$\frac{\sqrt{V_{H3}^2 + V_{H5}^2 + \ldots\ldots V_{H63}^2}}{V_{Hfund}} * 100$	%
Total Even Voltage Harmonic Distortion Normalized to the fundamental	VEHD	$\frac{\sqrt{V_{H2}^2 + V_{H4}^2 + \ldots\ldots V_{H62}^2}}{V_{Hfund}} * 100$	%
Total Current Odd Harmonic Distortion Normalized to the fundamental	IOHD	$\frac{\sqrt{I_{H3}^2 + I_{H5}^2 + \ldots\ldots I_{H63}^2}}{V_{Hfund}} * 100$	%
Total Current Even Harmonic Distortion Normalized to the fundamental	HIEHD	$\frac{\sqrt{I_{H2}^2 + I_{H4}^2 + \ldots\ldots I_{H62}^2}}{V_{Hfund}} * 100$	%
VA Power Vector sum	VA_{vector_tot}	$VA_{Arith\_tot} = \sqrt{W_{tot}^2 + VAR_{tot\_fund}^2}$	VA
VA Power Arithmetic sum	VA_{arith_tot}	$VA_{vect\_Tot} = VA_1 + VA_2 + VA_3$	VA

Description	Abbreviation	Formula	Units
Total Harmonic Unsigned Power	Unsigned(W)	$\sum_{2}^{63} \lvert V_n * I_n * Cos\varnothing \rvert$	Watts
Total Harmonic signed Power	Signed(W)	$\left\lvert \sum_{2}^{63} [V_n * I_n * Cos\varnothing] \right\rvert$	Watts

APPENDIX C: Phasor diagram

Quadrant 1: 0° to 90°
Quadrant 2: 90° to 180°
Quadrant 3: 180° to 270°
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 the instrument displays Active power (P)with " + " (positive sign) , the connection is " **Import** " .

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

SECTION B
Chapter 6 : Interface definition

6.1 Introduction

This instrument is a 144 x 144mm Digital measuring system for measurement of important electrical parameters like AC Voltage, AC Current, Frequency, Power, energy(Active/Reactive/Apparent). The instrument integrates accurate measurement of voltage and current harmonics upto 63rd order. It can also measure unbalance nature of system. It can measure demand parameter of the system. It is capable of recording events for both voltage and current. It can record record data and also create report in En50160 mode. It also provides graphical interface for displaying waveform and phasors on the screen. It can provide trend information over period of time.

The front panel has a 5'' Touch screen through which user can move across the available measurement readings and configure the product settings.

An operation via standard RS 485 is possible. Through this optional interface all the above mentioned parameters can be configured and programmed. For bus service it is essential that device address, baud rate and parity should be configured properly.

This document specifies only the interface between a master device and power quality analyser for electrical variable through MODBUS over Rs485.

6.2 Communication Parameter Selection

After entering in the Communication in Local Settings menu, following parameters are displayed:

6.2.1 Device Address
6.2.2 Parity
6.2.3 Stop Bits
6.2.4 Baud Rate

6.2.1 RS 485 Device Address

This option is used to set device address for instrument. This is accessed through communication settings in device. The allowable range of address is 1 to 247.

6.2.2 RS 485 Parity Bit Selection

This option is used to set parity bit. The parity bit has three options: Even Parity, Odd Parity and none parity.

6.2.3 RS 485 Stop Bits

This option is used to set number of stop bits. The stop bits can be: 1 or 2.

6.2.4 RS 485 Baud Rate

This option is used to set baud rate for communication. Five Option are available: 9600, 19200, 38400, 57600 and 115200.

6.3 RS 485 Modbus Output

This instrument supports MODBUS (RS 485) RTU protocol(2 wire). Connection should be made using twisted pair shielded cable. All ''A'' and ''B'' connections are daisy chained together. The screens should also be connected to the ''Gnd'' terminal. To avoid the possibility of loop currents, an Earth connection should be made at one point on network. Loop (Ring) topology does not require any termination load. Line topology may or may not require terminating loads depending on the type and length of cable used. The impedance of the termination load should match the impedance of the cable and be at both ends of line. The cable should be terminated at each end with a 120 ohm(1/4 Watt Min) resistor.

RS 485 network supports maximum length of 1,2KM. Including the master, a maximum of 32 instruments can be connected in RS 485 network. The permissible address range for the instrument is between 1 and 247 for 32 instruments. Broadcast Mode (address 0) is not allowed.

The maximum latency time for the instrument is 200ms ie. this is the amount of time that can pass before the first response character is output.

After sending any query through software(of the Master), it must allow 50ms of time to elapse before assuming that the instrument is not going to respond. If slave does not respond within 50ms, Master can ignore the previous query and can issue fresh query to the slave.

The Each byte in RTU mode has following format:

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

Communication Baud Rate is user selectable from the front panel between 9600, 19200, 38400, 57600 and 115200 bps.

Function code :

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

Exception Cases: An exception code will be generated when the instrument receives Modbus query with valid parity & error check but which contains some other error (e.g. Attempt to set floating point variable to an invalid value). The response generated will be "Function Code'' Ored with HEX(80H). The exception codes are listed below

01	Illegal Function	This function code is not supported by the instrument.
02	Illegal Data Address	Attempt to access an invalid address or an attempt to read or write part of a floating point value
03	Illegal Data Value	Attempt to set a floating point variable to an invalid value.
04	Slave Device Failure	An error occured so that slave device has failed to communicate
06	Slave Device Busy	The slave is engaged in processing a long duration program command, the master should retransmit the message when the slave is free.

6.3.1 Accessing 3 X register for reading measured values:

Two consecutive 16 bit registers represent one parameter. Refer **TABLE 7** for the addresses of 3X registers (Parameters measured by the instruments). Each parameter is held in the 3X registers.Modbus Code 04 is used to access all parameters.

Example :

To read parameter ,

Volts 3 : Start address= 04 (Hex) Number of registers = 02

Note : Number of registers = Number of parameters x 2

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

Query :

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

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address low : Least significant 8 bits of starting address of the parameter requested.

Number of register Hi : Most significant 8 bits of Number of registers requested.

Number of register Lo : Least significant 8 bits of Number of registers requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Response: Volt3 (219.25V)

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

Byte Count : Total number of data bytes received.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Table No:7- 3X Register Address

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30001	01	Vrms L1	00	00	✓	✓
30003	02	Vrms L2	00	02	✓	✓
30005	03	Vrms L3	00	04	✓	✓
30007	04	Irms L1	00	06	✓	✓
30009	05	Irms L2	00	08	✓	✓
30011	06	Irms L3	00	0A	✓	✓
30013	07	Active Power Watt L1	00	0C	✓	×
30015	08	Active Power Watt L2	00	0E	✓	×
30017	09	Active Power Watt L3	00	10	✓	×
30019	10	Apparent Power VA L1	00	12	✓	×
30021	11	Apparent Power VA L2	00	14	✓	×
30023	12	Apparent Power VA L3	00	16	✓	×
30025	13	Reactive Power VAR L1	00	18	✓	×
30027	14	Reactive Power VAR L2	00	1A	✓	×
30029	15	Reactive Power VAR L3	00	1C	✓	×
30031	16	True Power Factor L1	00	1E	✓	×
30033	17	True Power Factor L2	00	20	✓	×
30035	18	True Power Factor L3	00	22	✓	×
30037	19	Current-Voltage Ph Angle L1	00	24	✓	✓
30039	20	Current-Voltage Ph Angle L2	00	26	✓	×
30041	21	Current-Voltage Ph Angle L3	00	28	✓	✓
30043	22	System Voltage	00	2A	✓	✓
30045	23	Voltage Sum	00	2C	✓	✓
30047	24	System Current	00	2E	✓	✓
30049	25	Current Sum	00	30	✓	✓

TABLE 7 : Continued...

Address No.	Parameter (Register)	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30051	26	Watt Avg	00	32	✓	✓
30053	27	Watt sum	00	34	✓	✓
30055	28	VA Avg	00	36	✓	✓
30057	29	VA sum	00	38	✓	✓
30059	30	VAR Avg	00	3A	✓	✓
30061	31	VAR sum	00	3C	✓	✓
30063	32	PF Avg	00	3E	✓	✓
30065	33	PF sum	00	40	✓	×
30067	34	Phase angle Avg	00	42	✓	✓
30069	35	Phase angle sum	00	44	✓	×
30071	36	Frequency	00	46	✓	✓
30073	37	Forward Watt Hr Total	00	48	✓	✓
30075	38	Reverse Watt Hr Total	00	4A	✓	✓
30077	39	Forward VAR Hr Total	00	4C	✓	✓
30079	40	Reverse VAR Hr Total	00	4E	✓	✓
30081	41	VAHrs Total	00	50	✓	✓
30083	42	Reserved				
30085	43	W Demand (Import)	00	54	✓	✓
30087	44	W Max Demand (Import)	00	56	✓	✓
30089	45	W Demand (Export)	00	58	✓	✓
30091	46	W Max Demand (Export)	00	5A	✓	✓
30093	47	VAR Demand (Import)	00	5C	✓	✓
30095	48	VAR Max Demand (Import)	00	5E	✓	✓
30097	49	VAR Demand (Export)	00	60	✓	✓
30099	50	VAR Max Demand (Export)	00	62	✓	✓
30101	51	VA Demand	00	64	✓	✓
30103	52	VA Max Demand	00	66	✓	✓
30105	53	Current Demand	00	68	✓	✓
30107	54	Current Max Demand	00	6A	✓	✓
30109	55	Forward Whr Overflow count	00	6C	✓	✓
30111	56	Forward Whr Total	00	6E	✓	✓

TABLE 7: Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30113	57	Reverse Watt Overflow count	00	70	✓	✓
30115	58	Reverse Whr Total	00	72	✓	✓
30117	59	Forward VAR Overflow count	00	74	✓	✓
30119	60	Forward VARHr Total	00	76	✓	✓
30121	61	Reverse VAR Overflow count	00	78	✓	✓
30123	62	Reverse VARHr Total	00	7A	✓	✓
30125	63	VA Overflow count	00	7C	✓	✓
30127	64	VA Hr Total	00	7E	✓	✓
30133	67	System Max Voltage	00	84	✓	✓
30135	68	System Min Voltage	00	86	✓	✓
30141	71	System Max Current	00	8C	✓	✓
30143	72	System Min Current	00	8E	✓	✓
30145	73	Wh Import depending on update rate	00	90	✓	✓
30147	74	Wh Export depending on update rate	00	92	✓	✓
30149	75	VARh Import depending on update rate	00	94	✓	✓
30151	76	VARh Export depending on update rate	00	96	✓	✓
30153	77	Vah Export depending on update rate	00	98	✓	✓
30171	86	RTC Minute	00	AA	✓	✓
30173	87	RTC Hour	00	AC	✓	✓
30175	88	RTC Date	00	AE	✓	✓
30177	89	RTC Month	00	B0	✓	✓
30179	90	RTC Year	00	B2	✓	✓
30201	101	Vrms L12	00	C8	✓	✓
30203	102	Vrms L23	00	CA	✓	✓
30205	103	Vrms L32	00	CC	✓	✓
30207	104	VTHD Percent Fund L1	00	CE	✓	✓
30209	105	VTHD Percent Fund L2	00	D0	✓	✓

TABLE 7 Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30211	106	VTHD Percent Fund L3	00	D2	✓	✓
30213	107	ITHD Percent Fund L1	00	D4	✓	✓
30215	108	ITHD Percent Fund L2	00	D6	✓	✓
30217	109	ITHD Percent Fund L3	00	D8	✓	✓
30219	110	System Voltage THD(%)	00	DA	✓	✓
30221	111	System Current THD(%)	00	DC	✓	✓
30225	113	I Neutral	00	E0	✓	✓
30501	251	Vrms L1	01	F4	✓	✓
30503	252	Vrms L2	01	F6	✓	✓
30505	253	Vrms L3	01	F8	✓	✓
		Reserved				
30509	255	Irms L1	01	FC	✓	✓
30511	256	Irms L2	01	FE	✓	✓
30513	257	Irms L3	02	00	✓	✓
		Reserved				
30517	259	Vpeak L1	02	04	✓	✓
30519	260	Vpeak L2	02	06	✓	✓
30521	261	Vpeak L3	02	08	✓	✓
		Reserved				
30525	263	Ipeak L1	02	0C	✓	✓
30527	264	Ipeak L2	02	0E	✓	✓
30529	265	Ipeak L3	02	10	✓	✓
		Reserved				
30533	267	Vcrest Factor L1	02	14	✓	✓
30535	268	Vcrest Factor L2	02	16	✓	✓
30537	269	Vcrest Factor L3	02	18	✓	✓
		Reserved				
30541	271	Icrest Factor L1	02	1C	✓	✓
30543	272	Icrest Factor L2	02	1E	✓	✓
30545	273	Icrest Factor L3	02	20	✓	✓

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
		Reserved				
30549	275	Active Power Watt L1	02	24	✓	×
30551	276	Active Power Watt L2	02	26	✓	×
30553	277	Active Power Watt L3	02	28	✓	×
		Reserved				
30557	279	Apparent Power VA L1	02	2C	✓	×
30559	280	Apparent Power VA L2	02	2E	✓	×
30561	281	Apparent Power VA L3	02	30	✓	×
		Reserved				
30565	283	Reactive Power VAR L1	02	34	✓	×
30567	284	Reactive Power VAR L2	02	36	✓	×
30569	285	Reactive Power VAR L3	02	38	✓	×
		Reserved				
30573	287	Arithmetic sum VA	02	3C	✓	×
30575	288	Vector Sum VA	02	3E	✓	✓
30577	289	Fundamental Arith Sum VA	02	40	✓	×
30579	290	Fundamental Vector Sum VA	02	42	✓	✓
30581	291	True Power Factor L1	02	44	✓	×
30583	292	True Power Factor L2	02	46	✓	×
30585	293	True Power Factor L3	02	48	✓	×

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30597	299	Vector Sum PF	02	54	✓	✓
30599	300	Vector Sum DPF	02	56	✓	✓
30601	301	Arithmetic Sum PF	02	58	✓	×
30603	302	Arithmetic Sum DPF	02	5A	✓	×
30609	305	Average PF Peak Watt Demand	02	60	✓	✓
30611	306	Average PF Peak VAR Demand	02	62	✓	✓
30613	307	Average PF Peak VA Demand	02	64	✓	✓
30623	312	VAHrs L1	02	6E	✓	×
30625	313	VAHrs L2	02	70	✓	×
30627	314	VAHrs L3	02	72	✓	×
30639	320	Forward WHr L1	02	7E	✓	×
30641	321	Forward WHr L2	02	80	✓	×
30643	322	Forward WHr L3	02	82	✓	×
30647	324	Forward VARHr L1	02	86	✓	×
30649	325	Forward VARHr L2	02	88	✓	×
30651	326	Forward VARHr L3	02	8A	✓	×
30655	328	Reverse WHr L1	02	8E	✓	×
30657	329	Reverse WHr L2	02	90	✓	×
30659	330	Reverse WHr L3	02	92	✓	×
30663	332	Reverse VARHr L1	02	96	✓	×
30665	333	Reverse VARHr L2	02	98	✓	×
30667	334	Reverse VARHr L3	02	9A	✓	×
30671	336	Active Power Demand	02	9E	✓	✓

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30673	337	Apparent Power Demand	02	A0	✓	✓
30675	338	Reactive Power Demand	02	A2	✓	✓
30677	339	RMS Current L1 Demand	02	A4	✓	✓
30679	340	RMS Current L2 Demand	02	A6	✓	✓
30681	341	RMS Current L3 Demand	02	A8	✓	✓
30685	343	RMS Current Demand Avg	02	AC	✓	✓
30709	355	VA Demand at max Watt Demand	02	C4	✓	✓
30711	356	VAR Demand at max Watt Demand	02	C6	✓	✓
30713	357	Watt Demand at max VAR Demand	02	C8	✓	✓
30715	358	VA Demand at Max VAR Demand	02	CA	✓	✓
30717	359	VAR Demand at max VA Demand	02	CC	✓	✓
30719	360	Watt Demand at max VA Demand	02	CE	✓	✓
30721	361	VTHD Percent Fund L1	02	D0	✓	✓
30723	362	VTHD Percent Fund L2	02	D2	✓	✓
30725	363	VTHD Percent Fund L3	02	D4	✓	✓
30729	365	ITHD Percent Fund L1	02	D8	✓	✓
30731	366	ITHD Percent Fund L2	02	DA	✓	×
30733	367	ITHD Percent Fund L3	02	DC	✓	✓
30737	369	VTHD RSS L1	02	E0	✓	✓
30739	370	VTHD RSS L2	02	E2	✓	✓
30741	371	VTHD RSS L3	02	E4	✓	✓
30745	373	ITHD RSS L1	02	E8	✓	✓
30747	374	ITHD RSS L2	02	EA	✓	×
30749	375	ITHD RSS L3	02	EC	✓	✓
30753	377	VTID Percent Fund L1	02	F0	✓	✓
30755	378	VTID Percent Fund L2	02	F2	✓	✓
30757	379	VTID Percent Fund L3	02	F4	✓	✓
30761	381	ITID Percent Fund L1	02	F8	✓	✓

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P3W
			High Byte	Low Byte		
30763	382	ITID Percent Fund L2	02	FA	✓	×
30765	383	ITID Percent Fund L3	02	FC	✓	✓
30769	385	VTID RSS L1	03	00	✓	✓
30771	386	VTID RSS L2	03	02	✓	✓
30773	387	VTID RSS L3	03	04	✓	✓
30777	389	ITID RSS L1	03	08	✓	✓
30779	390	ITID RSS L2	03	0A	✓	×
30781	391	ITID RSS L3	03	0C	✓	✓
30785	393	User 1 Freq V L1	03	10	✓	✓
30787	394	User 1 Freq V L2	03	12	✓	✓
30789	395	User 1 Freq V L3	03	14	✓	✓
30793	397	User 2 Freq V L1	03	18	✓	✓
30795	398	User 2 Freq V L2	03	1A	✓	✓
30797	399	User 2 Freq V L3	03	1C	✓	✓
30801	401	User 3 Freq V L1	03	20	✓	✓
30803	402	User 3 Freq V L2	03	22	✓	✓
30805	403	User 3 Freq V L3	03	24	✓	✓
30809	405	User 4 Freq V L1	03	28	✓	✓
30811	406	User 4 Freq V L2	03	2A	✓	✓
30813	407	User 4 Freq V L3	03	2C	✓	✓
30817	409	User 1 Freq I L1	03	30	✓	✓
30819	410	User 1 Freq I L2	03	32	✓	×
30821	411	User 1 Freq I L3	03	34	✓	✓
30825	413	User 2 Freq I L1	03	38	✓	✓
30827	414	User 2 Freq I L2	03	3A	✓	×
30829	415	User 2 Freq I L3	03	3C	✓	✓
30833	417	User 3 Freq I L1	03	40	✓	✓
30835	418	User 3 Freq I L2	03	42	✓	×

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30837	419	User 3 Freq I L3	03	44	✓	✓
30841	421	User 4 Freq I L1	03	48	✓	✓
30843	422	User 4 Freq I L2	03	4A	✓	×
30845	423	User 4 Freq I L3	03	4C	✓	✓
30857	429	Power Signed L1	03	58	✓	×
30859	430	Power Signed L2	03	5A	✓	×
30861	431	Power Signed L3	03	5C	✓	×
30865	433	Power Unsigned L1	03	60	✓	×
30867	434	Power Unsigned L2	03	62	✓	×
30869	435	Power Unsigned L3	03	64	✓	×
30905	453	Phase Angle L1	03	88	✓	✓
30907	454	Phase Angle L2	03	8A	✓	×
30909	455	Phase Angle L3	03	8C	✓	✓
30913	457	Positive Sequence Voltage	03	90	✓	✓
30915	458	Negative Sequence Voltage	03	92	✓	✓
30917	459	Zero Sequence Voltage	03	94	✓	×
30919	460	Positive Sequence Current	03	96	✓	×
30921	461	Negative Sequence Current	03	98	✓	×
30923	462	Zero Sequence Current	03	9A	✓	×
30925	463	V Unbalance RMS/RMS_Avg	03	9C	✓	✓
30927	464	V Unbalance S2/S1	03	9E	✓	✓
30929	465	V Unbalance S0/S1	03	A0	✓	×
30931	466	I Unbalance RMS/RMS_Avg	03	A2	✓	×
30933	467	I Unbalance S2/S1	03	A4	✓	×
30935	468	I Unbalance S0/S1	03	A6	✓	×
30937	469	Vrms Imbalance L1	03	A8	✓	✓

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
30939	470	Vrms Imbalance L2	03	AA	✓	✓
30941	471	Vrms Imbalance L3	03	AC	✓	✓
30945	473	Irms Imbalance L1	03	B0	✓	×
30947	474	Irms Imbalance L2	03	B2	✓	×
30949	475	Irms Imbalance L3	03	B4	✓	×
31059	529	Average Frequency 10 Sec.	04	22	✓	✓
31061	531	Frequency	04	24	✓	✓
31063	532	Active Power Watt Total	04	26	✓	✓
31065	533	Apparent Power VA Total	04	28	✓	✓
31067	534	Reactive Power VAR Total	04	2A	✓	✓
31069	535	True Power Factor Total	04	2C	✓	✓
31075	538	VA Hrs Total	04	32	✓	✓
31079	540	Forward WHr Total	04	36	✓	✓
31081	541	Forward VARHr Total	04	38	✓	✓
31083	542	Reverse WHr Total	04	3A	✓	✓
31085	543	Reverse VARHr Total	04	3C	✓	✓
31087	544	Vrms Imbalance Max	04	3E	✓	✓
31089	545	Irms Imbalance Max	04	40	✓	✓
31091	546	System Parameter Voltage	04	42	✓	✓
31093	547	System Parameter Current	04	44	✓	✓
31095	548	System Parameter Frequency	04	46	✓	✓
31097	549	Watt Average	04	48	✓	✓
31099	550	VA Average	04	4A	✓	✓
31101	551	VAR Average	04	4C	✓	✓
31103	552	Phase Sequence	04	4E	✓	✓
31107	554	Voltage Phase Angle L1	04	52	✓	✓
31109	555	Voltage Phase Angle L2	04	54	✓	✓

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
31111	556	Voltage Phase Angle L3	04	56	✓	✓
31115	558	Current Phase Angle L1	04	5A	✓	✓
31117	559	Current Phase Angle L2	04	5C	✓	×
31119	560	Current Phase Angle L3	04	5E	✓	✓
31123	562	Vrms L12	04	62	✓	×
31125	563	Vrms L23	04	64	✓	×
31127	564	Vrms L31	04	66	✓	×
31159	580	Forward Watt Overflow Count	04	86	✓	✓
31161	581	Reverse Watt Overflow Count	04	88	✓	✓
31163	582	Forward VAR Overflow Count	04	8A	✓	✓
31165	583	Reverse VAR Overflow Count	04	8C	✓	✓
31167	584	VA Overflow Count	04	8E	✓	✓
31169	585	Active Import Demand	04	90	✓	✓
31171	586	Active Export Demand	04	92	✓	✓
31173	587	Reactive Import Demand	04	94	✓	✓
31175	588	Reactive Export Demand	04	96	✓	✓
31177	589	Apparent Power Demand	04	98	✓	✓
31179	590	Active Import Demand Max	04	9A	✓	✓
31181	591	Active Export Demand Max	04	9C	✓	✓
31183	592	Reactive Import Demand Max	04	9E	✓	✓
31185	593	Reactive Export Demand Max	04	A0	✓	✓
31187	594	VA Demand Max	04	A2	✓	✓
31189	595	System Current Max Demand	04	A4	✓	✓

TABLE 7: Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
31501	751	Voltage THD L1	05	DC	✓	✓
31503	752	Voltage TID L1	05	DE	✓	✓
31505	753	Voltage Odd THD Percent L1	05	E0	✓	✓
31507	754	Voltage Even THD Percent L1	05	E2	✓	✓
31509	755	Harmonic Nominal Frequency	05	E4	✓	✓
31511	756	Zero Order Harmonic Voltage L1	05	E6	✓	✓
31513	757	1st Order Harmonic Voltage L1	05	E8	✓	✓
.....	.....	.....	.....	.....	.....	.....
31635	818	62nd Order Harmonic Voltage L1	06	62	✓	✓
31637	819	63rd Order Harmonic Voltage L1	06	64	✓	✓
31639	820	Current THD L1	06	66	✓	✓
31641	821	Current TID L1	06	68	✓	✓
31643	822	Current Odd THD Percent L1	06	6A	✓	✓
31645	823	Current Even THD Percent L1	06	6C	✓	✓
31647	824	Harmonic Nominal Frequency	06	6E	✓	✓
31649	825	Zero Order Harmonic Current L1	06	70	✓	✓
31651	826	1st Order Harmonic Current L1	06	72	✓	✓
.....	.....	.....	.....	.....	.....	.....
31773	887	62nd Order Harmonic Current L1	06	EC	✓	✓
31775	888	63rd Order Harmonic Current L1	06	EE	✓	✓
31777	889	Zero Order Harmonic Power L1	06	F0	✓	✓
31779	890	1st Order Harmonic Power L1	06	F2	✓	✓
.....	.....	.....	.....	.....	.....	.....
31903	952	63rd Order Harmonic Power L1	07	6E	✓	✓

Note: Harmonics addresses start from 31501

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
31905	953	Zero Order Harm Vtg Phase Angle	07	70	✓	✓
31907	954	1st Order Harm Vtg Phase Angle	07	72	✓	✓
.....	.....	.....	.....	.....	.....	.....
32031	1016	63rd Order Harm Vtg Phase Angle	07	EE	✓	✓
32033	1017	Zero Order Harm Curr Phase Angle	07	F0	✓	✓
32035	1018	1st Order Harm Curr Phase Angle	07	F2	✓	✓
.....	.....	.....	.....	.....	.....	.....
32159	1080	63rd Order Harm Curr Phase Angle	08	6E	✓	✓
32501	1251	Voltage THD	08	70	✓	✓
32503	1252	Voltage TID	08	72	✓	✓
32505	1253	Voltage Odd THD Percent	08	74	✓	✓
32507	1254	Voltage Even THD Percent	08	76	✓	✓
32509	1255	Harmonic Nominal Frequency	08	78	✓	✓
32511	1256	Voltage Magnitude of zero order Int.Harm	08	7A	✓	✓
32513	1257	Voltage Magnitude of 1st order Int.Harm	08	7C		
.....	.....	.....	.....	.....	.....	.....
34149	2075	Voltage Magnitude of 819th order Int.Harm	10	34	✓	✓
EN50160						
34501	2251	Power Freq 95 Percent Comp	11	94	✓	✓
34503	2252	Power Freq 100 Percent Comp	11	96	✓	✓
34505	2253	Supply Voltage Comp L1	11	98	✓	✓
34507	2254	Supply Voltage Comp L2	11	9A	✓	✓
34509	2255	Supply Voltage Comp L3	11	9C	✓	✓
34513	2257	Supply voltage 100 Percent L1	11	9E	✓	✓

Note: Inter Harmonics addresses start from 32501

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
34515	2258	Supply voltage 100 Percent L2	11	A0	✓	✓
34517	2259	Supply voltage 100 Percent L3	11	A2	✓	✓
34521	2261	Supply voltage Unbalance Comp	11	A6	✓	✓
34523	2262	1st Order Harmonic Volt L1	11	A8	✓	✓
34525	2263	2nd Order Harmonic Volt L1	11	AA	✓	✓
.....	.....	.....	.....	.....	.....	.....
34571	2286	25th Order Harmonic Volt L1	11	DA	✓	✓
34573	2287	1st Order Harmonic Volt L2	11	DC	✓	✓
34575	2288	2nd Order Harmonic Volt L2	11	DE	✓	✓
.....	.....	.....	.....	.....	.....	.....
34621	2311	25th Order Harmonic Volt L2	12	0C	✓	✓
34623	2312	1st Order Harmonic Volt L3	12	0E	✓	✓
34623	2313	2nd Order Harmonic Volt L3	12	10	✓	✓
.....	.....	.....	.....	.....	.....	.....
34671	2336	25th Order Harmonic Volt L3	12	3E	✓	✓
34723	2362	1st Order Inter-Harmonic Volt L1	12	72	✓	✓
34725	2362	2nd Order Inter-Harmonic Volt L1	12	74	✓	✓
.....	.....	.....	.....	.....	.....	.....
34771	2386	25th Order Inter-Harmonic Volt L1	12	A2	✓	✓
34773	2387	1st Order Inter-Harmonic Volt L2	12	A4	✓	✓
34775	2388	2nd Order Inter-Harmonic Volt L2	12	A6	✓	✓
.....	.....	.....	.....	.....	.....	.....
34821	2411	25th Order Inter-Harmonic Volt L2	12	D4	✓	✓
34823	2412	1st Order Inter-Harmonic Volt L3	12	D6	✓	✓

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
34825	2413	2nd Order Inter-Harmonic Volt L3	12	D8	✓	✓
.....	.....	.....	.....		.....	.....
34871	2436	25th Order Inter-Harmonic Volt L3	13	06	✓	✓
34925	2463	Dip Count Depth0 Per[0]	13	3C	✓	✓
34927	2464	Dip Count Depth0 Per[1]	13	3E	✓	✓
34929	2465	Dip Count Depth0 Per[2]	13	40	✓	✓
34931	2466	Dip Count Depth0 Per[3]	13	42	✓	✓
34933	2467	Dip Count Depth0 Per[4]	13	44	✓	✓
34935	2468	Dip Count Depth0 Per[5]	13	46	✓	✓
34941	2471	Dip Count Depth10 Per[0]	13	4C	✓	✓
34943	2472	Dip Count Depth10 Per[1]	13	4E	✓	✓
34945	2473	Dip Count Depth10 Per[2]	13	50	✓	✓
34947	2474	Dip Count Depth10 Per[3]	13	52	✓	✓
34949	2475	Dip Count Depth10 Per[4]	13	54	✓	✓
34951	2476	Dip Count Depth10 Per[5]	13	56	✓	✓
34957	2479	Dip Count Depth15 Per[0]	13	5C	✓	✓
34959	2480	Dip Count Depth15 Per[1]	13	5E	✓	✓
34961	2481	Dip Count Depth15 Per[2]	13	60	✓	✓
34963	2482	Dip Count Depth15 Per[3]	13	62	✓	✓
34965	2483	Dip Count Depth15 Per[4]	13	64	✓	✓
34967	2484	Dip Count Depth15 Per[5]	13	66	✓	✓
34973	2487	Dip Count Depth30 Per[0]	13	6C	✓	✓
34975	2488	Dip Count Depth30 Per[1]	13	6E	✓	✓
34977	2489	Dip Count Depth30 Per[2]	13	70	✓	✓

TABLE 7 : Continued...

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex		3P 4W	3P 3W
			High Byte	Low Byte		
34979	2490	Dip Count Depth30 Per[3]	13	72	✓	✓
34981	2491	Dip Count Depth30 Per[4]	13	74	✓	✓
34983	2492	Dip Count Depth30 Per[5]	13	76	✓	✓
34989	2495	Dip Count Depth60 Per[0]	13	7C	✓	✓
34991	2496	Dip Count Depth60 Per[1]	13	7E	✓	✓
34993	2497	Dip Count Depth60 Per[2]	13	80	✓	✓
34995	2498	Dip Count Depth60 Per[3]	13	82	✓	✓
34997	2499	Dip Count Depth60 Per[4]	13	84	✓	✓
34999	2500	Dip Count Depth60 Per[5]	13	86	✓	✓
35005	2503	Interrupt Count Depth99 Per[0]	13	8C	✓	✓
35007	2504	Interrupt Count Depth99 Per[1]	13	8E	✓	✓
35021	2511	Swell Count Range110 Per[0]	13	9E	✓	✓
35023	2512	Swell Count Range110 Per[1]	13	A0	✓	✓
35025	2513	Swell Count Range110 Per[2]	13	A2	✓	✓
35027	2514	Swell Count Range110 Per[3]	13	A4	✓	✓
35037	2519	Swell Count Range120 Per[0]	13	AC	✓	✓
35039	2520	Swell Count Range120 Per[1]	13	AE	✓	✓
35041	2521	Swell Count Range120 Per[2]	13	B0	✓	✓
35043	2522	Swell Count Range120 Per[3]	13	B2	✓	✓

6.3.2 Accessing 4 X register for reading and writing measured values:

Two consecutive 16 bit registers represent one parameter. Refer **TABLE 8** for the addresses of 4X registers (Parameters measured by the instruments). Each parameter is held in the 4X registers. Modbus Code 03 is used to access all parameter and code 16 is used to write/change the setting.

Example :

To read parameter,

System Type : Start address = 17x7A (Hex) Number of registers = 02

Note : Number of registers = Number of parameters x 2

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

Query :

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

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address low : Least significant 8 bits of starting address of the parameter requested.

Number of register Hi : Most significant 8 bits of Number of registers requested.

Number of register Lo : Least significant 8 bits of Number of registers requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Response:

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

Byte Count : Total number of data bytes received.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

TABLE 8 : 4 X register addresses

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46003	1	Reserved	R/Wp	17	72
46005	2	Energy Resolution	R/Wp	17	74
46007	3	System Voltage	R	17	76
46009	4	System Current	R	17	78
46011	5	System Type	R/Wp	17	7A
46015	7	Reset Parameters	R/Wp	17	7E
46019	9	RS 485 Set-up Code	R/Wp	17	82
46021	10	Node Address	R/Wp	17	84
46033	16	PT Primary, 4 Wire System	R/Wp	17	90
46035	17	CT Primary,4 Wire System	R/Wp	17	92
46037	18	System Power	R	17	94
46039	19	Energy Digit Reset Count	R/Wp	17	96
46041	20	Register Order	R/Wp	17	98
46043	21	CT Secondary,4 Wire System	R/Wp	17	9A
46045	22	PT Secondary,4 Wire System	R/Wp	17	9C
46049	24	Limit 1 Parameter select	R/Wp	17	A0
46051	25	Limit 1 Trip Select	R/Wp	17	A2
46053	26	Limit 1 Hysteresis	R/Wp	17	A4
46055	27	Limit 1 Delay (On)	R/Wp	17	A6
46057	28	Limit 1 Delay (Off)	R/Wp	17	A8
46061	30	Limit 2 parameter select	R/Wp	17	AC
46063	31	Limit 2 Trip Select	R/Wp	17	AE
46065	32	Limit 2 Hysteresis	R/Wp	17	B0

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46067	33	Limit 2 Delay (On)	R/Wp	17	B2
46069	34	Limit 2 Delay (Off)	R/Wp	17	B4
46071	35	Password	R/Wp	17	B6
46073	36	Limit 1 Configuration	R/Wp	17	B8
46075	37	Limit 2 Configuration	R/Wp	17	BA
46081	40	Energy Update Rate	R/Wp	17	C0
46083	41	Harmonic Data	R/Wp	17	C2
46085	42	Inter Harmonic Data	R/Wp	17	C4
46087	43	Impulse Selection	R/Wp	17	C6
46089	44	Harm_Inter Harm NO Relay 1	R/Wp	17	C8
46091	45	Harm_Inter Harm NO Relay 2	R/Wp	17	CA
46157	78	Date Format	R/Wp	18	0C
46159	79	Time Format	R/Wp	18	0E
46161	80	Clock Sec	R/Wp	18	10
46163	81	Clock Min	R/Wp	18	12
46165	82	Clock Hour	R/Wp	18	14
46167	83	Clock Date	R/Wp	18	16
46169	84	Clock Month	R/Wp	18	18
46171	85	Clock Year	R/Wp	18	1A
46173	86	Brightness	R/Wp	18	1C
46185	92	Red color code of Ph Vtg 1	R/Wp	18	28
46187	93	Green color code of Ph Vtg 1	R/Wp	18	2A
46189	94	Blue color code of Ph Vtg 1	R/Wp	18	2C

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46191	95	Red color code of Ph Vtg 2	R/Wp	18	2E
46193	96	Green color code of Ph Vtg 2	R/Wp	18	30
46195	97	Blue color code of Ph Vtg 2	R/Wp	18	32
46197	98	Red color code of Ph Vtg 3	R/Wp	18	34
46199	99	Green color code of Ph Vtg 3	R/Wp	18	36
46201	100	Blue color code of Ph Vtg 3	R/Wp	18	38
46203	101	Red color code of Ph Curr 1	R/Wp	18	3A
46205	102	Green color code of Ph Curr 1	R/Wp	18	3C
46207	103	Blue color code of Ph Curr 1	R/Wp	18	3E
46209	104	Red color code of Ph Curr 2	R/Wp	18	40
46211	105	Green color code of Ph Curr 2	R/Wp	18	42
46213	106	Blue color code of Ph Curr 2	R/Wp	18	44
46215	107	Red color code of Ph Curr 3	R/Wp	18	46
46217	108	Green color code of Ph Curr 3	R/Wp	18	48
46219	109	Blue color code of Ph Curr 3	R/Wp	18	4A
46221	110	Nominal Frequency	R/Wp	18	4C
46223	111	Recording Mode Selection	R/Wp	18	4E
46225	112	User 1 Freq V L1	R/Wp	18	50
46227	113	User 1 Freq V L2	R/Wp	18	52
46229	114	User 1 Freq V L3	R/Wp	18	54
46233	116	User 2 Freq V L1	R/Wp	18	58
46235	117	User 2 Freq V L2	R/Wp	18	5A
46237	118	User 2 Freq V L3	R/Wp	18	5C

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46241	120	User 3 Freq V L1	R/Wp	18	60
46243	121	User 3 Freq V L2	R/Wp	18	62
46245	122	User 3 Freq V L3	R/Wp	18	64
46249	124	User 4 Freq V L1	R/Wp	18	68
46251	125	User 4 Freq V L2	R/Wp	18	6A
46253	126	User 4 Freq V L3	R/Wp	18	6C
46257	128	User 1 Freq I L1	R/Wp	18	70
46259	129	User 1 Freq I L2	R/Wp	18	72
46261	130	User 1 Freq I L3	R/Wp	18	74
46265	132	User 2 Freq I L1	R/Wp	18	78
46267	133	User 2 Freq I L2	R/Wp	18	7A
46269	134	User 2 Freq I L3	R/Wp	18	7C
46273	136	User 3 Freq I L1	R/Wp	18	7E
46275	137	User 3 Freq I L2	R/Wp	18	80
46277	138	User 3 Freq I L3	R/Wp	18	82
46281	140	User 4 Freq I L1	R/Wp	18	84
46283	141	User 4 Freq I L2	R/Wp	18	86
46285	142	User 4 Freq I L3	R/Wp	18	88
46289	144	Voltage Event thershold enable	R/Wp	18	90
46291	145	Vrms Hysteresis	R/Wp	18	92
46293	146	Vrms L1 Swell(%)	R/Wp	18	94
46295	147	Vrms L1 Dip(%)	R/Wp	18	96
46297	148	Vrms L1 Interrruption(%)	R/Wp	18	98

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46299	149	Vrms L2 Swell(%)	R/Wp	18	9A
46301	150	Vrms L2 Dip(%)	R/Wp	18	9C
46303	151	Vrms L2 Interruption(%)	R/Wp	18	9E
46305	152	Vrms L3 Swell(%)	R/Wp	18	A0
46307	153	Vrms L3 Dip(%)	R/Wp	18	A2
46309	154	Vrms L3 Interruption(%)	R/Wp	18	A4
46317	158	Current event Thershold enable	R/Wp	18	AC
46319	159	Irms Hysteresis	R/Wp	18	AE
46321	160	Irms Swell(%)	R/Wp	18	B0
46323	161	Irms L1 Dip(%)	R/Wp	18	B2
46325	162	Irms L1 Interruption(%)	R/Wp	18	B4
46327	163	Irms L2 Swell(%)	R/Wp	18	B6
46329	164	Irms L2 Dip(%)	R/Wp	18	B8
46331	165	Irms L2 Interruption(%)	R/Wp	18	BA
46333	166	Irms L3 Swell(%)	R/Wp	18	BC
46335	167	Irms L3 Dip(%)	R/Wp	18	BE
46337	168	Irms L3 Interruption(%)	R/Wp	18	C0
46353	176	No. of cycles to capture Pre event	R/Wp	18	D0
46355	177	No. of cycles to capture Post event	R/Wp	18	D2
46357	178	Measured Vrms L1 Enable Threshold	R/Wp	18	D4
46359	179	Measured Vrms L1 Time Trend Enable	R/Wp	18	D6
46361	180	Measured Vrms L1 Very High	R/Wp	18	D8

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46363	181	Measured Vrms L1 High	R/Wp	18	DA
46365	182	Measured Vrms L1 Low	R/Wp	18	DC
46367	183	Measured Vrms L1 Very Low	R/Wp	18	DE
46369	184	Measured Vrms L1 Dead Band	R/Wp	18	E0
46371	185	Measured Vrms L2 Enable Threshold	R/Wp	18	E2
46373	186	Measured Vrms L2 Time Trend Enable	R/Wp	18	E4
46375	187	Measured Vrms L2 Very High	R/Wp	18	E6
46377	188	Measured Vrms L2 High	R/Wp	18	E8
46379	189	Measured Vrms L2 Low	R/Wp	18	EA
46381	190	Measured Vrms L2 Very Low	R/Wp	18	EC
46383	191	Measured Vrms L2 Dead Band	R/Wp	18	EE
46385	192	Measured Vrms L3 Enable Threshold	R/Wp	18	F0
46387	193	Measured Vrms L3 Time Trend Enable	R/Wp	18	F2
46389	194	Measured Vrms L3 Very High	R/Wp	18	F4
46391	195	Measured Vrms L3 High	R/Wp	18	F6
46393	196	Measured Vrms L3 Low	R/Wp	18	F8
46395	197	Measured Vrms L3 Very Low	R/Wp	18	FA
46397	198	Measured Vrms L3 Dead Band	R/Wp	18	FC
46413	206	Measured Irms L1 Enable Threshold	R/Wp	19	0C
46415	207	Measured Irms L1 Time Trend Enable	R/Wp	19	0E
46417	208	Measured Irms L1 Very High	R/Wp	19	10
46419	209	Measured Irms L1 High	R/Wp	19	12
46421	210	Measured Irms L1 Low	R/Wp	19	14

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46423	211	Measured Irms L1 Very Low	R/Wp	19	16
46425	212	Measured Irms L1 Dead Band	R/Wp	19	18
46427	213	Measured Irms L2 Enable Threshold	R/Wp	19	1A
46429	214	Measured Irms L2 Time Trend Enable	R/Wp	19	1C
46431	215	Measured Irms L2 Very High	R/Wp	19	1E
46433	216	Measured Irms L2 High	R/Wp	19	20
46435	217	Measured Irms L2 Low	R/Wp	19	22
46437	218	Measured Irms L2 Very Low	R/Wp	19	24
46439	219	Measured Irms L2 Dead Band	R/Wp	19	26
46441	220	Measured Irms L3 Enable Threshold	R/Wp	19	28
46443	221	Measured Irms L3 Time Trend Enable	R/Wp	19	2A
46445	222	Measured Irms L3 Very High	R/Wp	19	2C
46447	223	Measured Irms L3 High	R/Wp	19	2E
46449	224	Measured Irms L3 Low	R/Wp	19	30
46451	225	Measured Irms L3 Very Low	R/Wp	19	32
46453	226	Measured Irms L3 Dead Band	R/Wp	19	34
46469	234	Measured Frequency Enable Threshold	R/Wp	19	44
46471	235	Measured Frequency Time Trend Enable	R/Wp	19	46
46473	236	Measured Frequency Very High	R/Wp	19	48
46475	237	Measured Frequency High	R/Wp	19	4A
46477	238	Measured Frequency Low	R/Wp	19	4C
46479	239	Measured Frequency Very Low	R/Wp	19	4E
46481	240	Measured Frequency Dead Band	R/Wp	19	50

TABLE 8: Continued ...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46483	241	Computed Vrms L12 Enable Threshold	R/Wp	19	52
46485	242	Computed Vrms L12 Time Trend Enable	R/Wp	19	54
46487	243	Computed Vrms L12 Very High	R/Wp	19	56
46489	244	Computed Vrms L12 High	R/Wp	19	58
46491	245	Computed Vrms L12 Low	R/Wp	19	5A
46493	246	Computed Vrms L12 Very Low	R/Wp	19	5C
46495	247	Computed Vrms L12 Dead Band	R/Wp	19	5E
46497	248	Computed Vrms L23 Enable Threshold	R/Wp	19	60
46499	249	Computed Vrms L23 Time Trend Enable	R/Wp	19	62
46501	250	Computed Vrms L23 Very High	R/Wp	19	64
46503	251	Computed Vrms L23 High	R/Wp	19	66
46505	252	Computed Vrms L23 Low	R/Wp	19	68
46507	253	Computed Vrms L23 Very Low	R/Wp	19	6A
46509	254	Computed Vrms L23 Dead Band	R/Wp	19	6C
46511	255	Computed Vrms L31 Enable Threshold	R/Wp	19	6E
46513	256	Computed Vrms L31 Time Trend Enable	R/Wp	19	70
46515	257	Computed Vrms L31 Very High	R/Wp	19	72
46517	258	Computed Vrms L31 High	R/Wp	19	74
46519	259	Computed Vrms L31 Low	R/Wp	19	76
46521	260	Computed Vrms L31 Very Low	R/Wp	19	78
46523	261	Computed Vrms L31 Dead Band	R/Wp	19	7A
46525	262	Active Power L1 Enable Threshold	R/Wp	19	7C
46527	263	Active Power L1 Time Trend Enable	R/Wp	19	7E

TABLE 8: Continued ...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46529	264	Active Power L1 Very High	R/Wp	19	80
46531	265	Active Power L1 High	R/Wp	19	82
46533	266	Active Power L1 Low	R/Wp	19	84
46535	267	Active Power L1 Very Low	R/Wp	19	86
46537	268	Active Power L1 Dead Band	R/Wp	19	88
46539	269	Active Power L2 Enable Threshold	R/Wp	19	8A
46541	270	Active Power L2 Time Trend Enable	R/Wp	19	8C
46543	271	Active Power L2 Very High	R/Wp	19	8E
46545	272	Active Power L2 High	R/Wp	19	90
46547	273	Active Power L2 Low	R/Wp	19	92
46549	274	Active Power L2 Very Low	R/Wp	19	94
46551	275	Active Power L2 Dead Band	R/Wp	19	96
46553	276	Active Power L3 Enable threshold	R/Wp	19	98
46555	277	Active Power L3 Time Trend Enable	R/Wp	19	9A
46557	278	Active Power L3 Very High	R/Wp	19	9C
46559	279	Active Power L3 High	R/Wp	19	9E
46561	280	Active Power L3 Low	R/Wp	19	A0
46563	281	Active Power L3 Very Low	R/Wp	19	A2
46565	282	Active Power L3 Dead Band	R/Wp	19	A4
46581	290	Active Power system Enable threshold	R/Wp	19	B4
46583	291	Active Power System Time Trend Enable	R/Wp	19	B6
46585	292	Active Power system Very High	R/Wp	19	B8
46587	293	Active Power system High	R/Wp	19	BA

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46589	294	Active Power system Low	R/Wp	19	BC
46591	295	Active Power system Very Low	R/Wp	19	BE
46593	296	Active Power system Dead Band	R/Wp	19	C0
46595	297	Apparent Power L1 Enable Threshold	R/Wp	19	C2
46597	298	Apparent Power L1 Time Trend Enable	R/Wp	19	C4
46599	299	Apparent Power L1 Very High	R/Wp	19	C6
46601	300	Apparent Power L1 High	R/Wp	19	C8
46603	301	Apparent Power L1 Low	R/Wp	19	CA
46605	302	Apparent Power L1 Very Low	R/Wp	19	CC
46607	303	Apparent Power L1 Dead Band	R/Wp	19	CE
46609	304	Apparent Power L2 Enable threshold	R/Wp	19	D0
46611	305	Apparent Power L2 Time Trend Enable	R/Wp	19	D2
46613	306	Apparent Power L2 Very High	R/Wp	19	D4
46615	307	Apparent Power L2 High	R/Wp	19	D6
46617	308	Apparent Power L2 Low	R/Wp	19	D8
46619	309	Apparent Power L2 Very Low	R/Wp	19	DA
46621	310	Apparent Power L2 Dead Band	R/Wp	19	DC
46623	311	Apparent Power L3 Enable threshold	R/Wp	19	DE
46625	312	Apparent Power L3 Time Trend Enable	R/Wp	19	E0
46627	313	Apparent Power L3 Very High	R/Wp	19	E2
46629	314	Apparent Power L3 High	R/Wp	19	E4
46631	315	Apparent Power L3 Low	R/Wp	19	E6
46633	316	Apparent Power L3 Very Low	R/Wp	19	E8

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46635	317	Apparent Power L3 Dead Band	R/Wp	19	EA
46651	325	Apparent Power System Enable Threshold	R/Wp	19	FA
46653	326	Apparent Power System Time Trend Enable	R/Wp	19	FC
46655	327	Apparent Power System Very High	R/Wp	19	FE
46657	328	Apparent Power System High	R/Wp	1A	00
46659	329	Apparent Power System Low	R/Wp	1A	02
46661	330	Apparent Power System Very Low	R/Wp	1A	04
46663	331	Apparent Power System Dead Band	R/Wp	1A	06
46665	332	Reactive Power L1 Threshold Trend Enable	R/Wp	1A	08
46667	333	Reactive Power L1 Time Trend Enable	R/Wp	1A	0A
46669	334	Reactive Power L1 Very High	R/Wp	1A	0C
46671	335	Reactive Power L1 High	R/Wp	1A	0E
46673	336	Reactive Power L1 Low	R/Wp	1A	10
46675	337	Reactive Power L1 Very Low	R/Wp	1A	12
46677	338	Reactive Power L1 Dead Band	R/Wp	1A	14
46679	339	Reactive Power L2 Enable Threshold	R/Wp	1A	16
46681	340	Reactive Power L2 Time Trend Enable	R/Wp	1A	18
46683	341	Reactive Power L2 Very High	R/Wp	1A	1A
46685	342	Reactive Power L2 High	R/Wp	1A	1C
46687	343	Reactive Power L2 Low	R/Wp	1A	1E
46689	344	Reactive Power L2 Very Low	R/Wp	1A	20
46691	345	Reactive Power L2 Dead Band	R/Wp	1A	22
46693	346	Reactive Power L2 Threshold Trend Enable	R/Wp	1A	24

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46695	347	Reactive Power L3 Time Trend Enable	R/Wp	1A	26
46697	348	Reactive Power L3 Very High	R/Wp	1A	28
46699	349	Reactive Power L3 High	R/Wp	1A	2A
46701	350	Reactive Power L3 Low	R/Wp	1A	2C
46703	351	Reactive Power L3 Very Low	R/Wp	1A	2E
46705	352	Reactive Power L3 Dead Band	R/Wp	1A	30
46721	360	Reactive Power System Enable Threshold	R/Wp	1A	40
46723	361	Reactive Power System Time Trend Enable	R/Wp	1A	42
46725	362	Reactive Power System Very High	R/Wp	1A	44
46727	363	Reactive Power System High	R/Wp	1A	46
46729	364	Reactive Power SystemLow	R/Wp	1A	48
46731	365	Reactive Power system Very Low	R/Wp	1A	4A
46733	366	Reactive Power System Dead Band	R/Wp	1A	4C
46735	367	True Power Factor L1 Enable Threshold	R/Wp	1A	4E
46737	368	True Power Factor L1 Time Trend Enable	R/Wp	1A	50
46739	369	True Power Factor L1 Very High	R/Wp	1A	52
46741	370	True Power Factor L1 High	R/Wp	1A	54
46743	371	True Power Factor L1 Low	R/Wp	1A	56
46745	372	True Power Factor L1 Very Low	R/Wp	1A	58
46747	373	True Power Factor L1 Dead Band	R/Wp	1A	5A
46749	374	True Power Factor L2 Enable Threshold	R/Wp	1A	5C
46751	375	True Power Factor L2 Time Trend Enable	R/Wp	1A	5E
46753	376	True Power Factor L2 Very High	R/Wp	1A	60

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46755	377	True Power Factor L2 High	R/Wp	1A	62
46757	378	True Power Factor L2 Low	R/Wp	1A	64
46759	379	True Power Factor L2 Very Low	R/Wp	1A	66
46761	380	True Power Factor L2 Dead Band	R/Wp	1A	68
46763	381	True Power Factor L3 Threshold Trend Enable	R/Wp	1A	6A
46765	382	True Power Factor L3 Time Trend Enable	R/Wp	1A	6C
46767	383	True Power Factor L3 Very High	R/Wp	1A	6E
46769	384	True Power Factor L3 High	R/Wp	1A	70
46771	385	True Power Factor L3 Low	R/Wp	1A	72
46773	386	True Power Factor L3 Very Low	R/Wp	1A	74
46775	387	True Power Factor L3 Dead Band	R/Wp	1A	76
46791	395	True Power Factor System Enable Threshold	R/Wp	1A	86
46793	396	True Power Factor System Time Trend Enable	R/Wp	1A	88
46795	397	True Power Factor System Very High	R/Wp	1A	8A
46797	398	True Power Factor System High	R/Wp	1A	8C
46799	399	True Power Factor System Low	R/Wp	1A	8E
46801	400	True Power Factor System Very Low	R/Wp	1A	90
46803	401	True Power Factor System Dead Band	R/Wp	1A	92
46805	402	Active Power Demand Threshold Trend Enable	R/Wp	1A	94
46807	403	Active Power Demand Time Trend Enable	R/Wp	1A	96
46809	404	Active Power Demand Very High	R/Wp	1A	98
46811	405	Active Power Demand High	R/Wp	1A	9A
46813	406	Active Power Demand Low	R/Wp	1A	9C

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46815	407	Active Power Demand Very Low	R/Wp	1A	9E
46817	408	Active Power Demand Dead Band	R/Wp	1A	A0
46819	409	Apparent Power Demand Enable threshold	R/Wp	1A	A2
46821	410	Apparent Power Demand Time Trend Enable	R/Wp	1A	A4
46823	411	Apparent Power Demand Very High	R/Wp	1A	A6
46825	412	Apparent Power Demand High	R/Wp	1A	A8
46827	413	Apparent Power Demand Low	R/Wp	1A	AA
46829	414	Apparent Power Demand Very Low	R/Wp	1A	AC
46831	415	Apparent Power Demand Dead Band	R/Wp	1A	AE
46833	416	Reactive Power Demand Threshold Trend Enable	R/Wp	1A	B0
46835	417	Reactive Power Demand Time Trend Enable	R/Wp	1A	B2
46837	418	Reactive Power Demand Very High	R/Wp	1A	B4
46839	419	Reactive Power Demand High	R/Wp	1A	B6
46841	420	Reactive Power Demand Low	R/Wp	1A	B8
46843	421	Reactive Power Demand Very Low	R/Wp	1A	BA
46845	422	Reactive Power Demand Dead Band	R/Wp	1A	BC
46847	423	RMS Current Demand L1 Enable Threshold	R/Wp	1A	BE
46849	424	RMS Current Demand L1 Time Trend Enable	R/Wp	1A	C0
46851	425	RMS Current Demand L1 Very High	R/Wp	1A	C2
46853	426	RMS Current Demand L1 High	R/Wp	1A	C4
46855	427	RMS Current Demand L1 Low	R/Wp	1A	C6
46857	428	RMS Current Demand L1 Very Low	R/Wp	1A	C8
46859	429	RMS Current Demand L1 Dead Band	R/Wp	1A	CA

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46861	430	RMS Current Demand L2 Enable Threshold	R/Wp	1A	CC
46863	431	RMS Current Demand L2 Time Trend Enable	R/Wp	1A	CE
46865	432	RMS Current Demand L2 Very High	R/Wp	1A	D0
46867	433	RMS Current Demand L2 High	R/Wp	1A	D2
46869	434	RMS Current Demand L2 Low	R/Wp	1A	D4
46871	435	RMS Current Demand L2 Very Low	R/Wp	1A	D6
46873	436	RMS Current Demand L2 Dead Band	R/Wp	1A	D8
46875	437	RMS Current Demand L2 Threshold Trend Enable	R/Wp	1A	DA
46877	438	RMS Current Demand L2 Time Trend Enable	R/Wp	1A	DC
46879	439	RMS Current Demand L3 Very High	R/Wp	1A	DE
46881	440	RMS Current Demand L3 High	R/Wp	1A	E0
46883	441	RMS Current Demand L3 Low	R/Wp	1A	E2
46885	442	RMS Current Demand L3 Very Low	R/Wp	1A	E4
46887	443	RMS Current Demand L3 Dead Band	R/Wp	1A	E6
46903	451	RMS Current Demand Average Enable Threshold	R/Wp	1A	F6
46905	452	RMS Current Demand Average Time Trend Enable	R/Wp	1A	F8
46907	453	RMS Current Demand Average Very High	R/Wp	1A	FA
46909	454	RMS Current Demand Average High	R/Wp	1A	FC
46911	455	RMS Current Demand Average Low	R/Wp	1A	FE
46913	456	RMS Current Demand Average Very Low	R/Wp	1B	00
46915	457	RMS Current Demand Average Dead Band	R/Wp	1B	02
46917	458	Forward Whr L1 Enable Threshold	R/Wp	1B	04
46919	459	Forward Whr L1 Time Trend Enable	R/Wp	1B	06

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46921	460	Forward Whr L1 Very High	R/Wp	1B	08
46923	461	Forward Whr L1 High	R/Wp	1B	0A
46925	462	Forward Whr L1 Low	R/Wp	1B	0C
46927	463	Forward Whr L1 Very Low	R/Wp	1B	0E
46929	464	Forward Whr L1 Dead Band	R/Wp	1B	10
46931	465	Forward Whr L2 Threshold Trend Enable	R/Wp	1B	12
46933	466	Forward Whr L2 Time Trend Enable	R/Wp	1B	14
46935	467	Forward Whr L2 Very High	R/Wp	1B	16
46937	468	Forward Whr L2 High	R/Wp	1B	18
46939	469	Forward Whr L2 Low	R/Wp	1B	1A
46941	470	Forward Whr L2 Very Low	R/Wp	1B	1C
46943	471	Forward Whr L2 Dead Band	R/Wp	1B	1E
46945	472	Forward Whr L3 Enable Threshold	R/Wp	1B	20
46947	473	Forward Whr L3 Time Trend Enable	R/Wp	1B	22
46949	474	Forward Whr L3 Very High	R/Wp	1B	24
46951	475	Forward Whr L3 High	R/Wp	1B	26
46953	476	Forward Whr L3 Low	R/Wp	1B	28
46955	477	Forward Whr L3 Very Low	R/Wp	1B	2A
46957	478	Forward Whr L3 Dead Band	R/Wp	1B	2C
46973	486	Forward Whr System Enable Threshold	R/Wp	1B	3C
46975	487	Forward Whr System Time Trend Enable	R/Wp	1B	3E
46977	488	Forward Whr Total Very High	R/Wp	1B	40
46979	489	Forward Whr Total High	R/Wp	1B	42

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
46981	490	Forward Whr Total Low	R/Wp	1B	44
46983	491	Forward Whr Total Very Low	R/Wp	1B	46
46985	492	Forward Whr Total Dead Band	R/Wp	1B	48
46987	493	Forward VARHr L1 Threshold Trend Enable	R/Wp	1B	4A
46989	494	Forward VARHr L1 Time Trend Enable	R/Wp	1B	4C
46991	495	Forward VARHr L1 Very High	R/Wp	1B	4E
46993	496	Forward VARHr L1 High	R/Wp	1B	50
46995	497	Forward VARHr L1 Low	R/Wp	1B	52
46997	498	Forward VARHr L1 Very Low	R/Wp	1B	54
46999	499	Forward VARHr L1 Dead Band	R/Wp	1B	56
47001	500	Forward VARHr L2 Enable Threshold	R/Wp	1B	58
47003	501	Forward VARHr L2 Time Trend Enable	R/Wp	1B	5A
47005	502	Forward VARHr L2 Very High	R/Wp	1B	5C
47007	503	Forward VARHr L2 High	R/Wp	1B	5E
47009	504	Forward VARHr L2 Low	R/Wp	1B	60
47011	505	Forward VARHr L2 Very Low	R/Wp	1B	62
47013	506	Forward VARHr L2 Dead Band	R/Wp	1B	64
47015	507	Forward VARHr L3 T Enable Threshold	R/Wp	1B	66
47017	508	Forward VARHr L3 Time Trend Enable	R/Wp	1B	68
47019	509	Forward VARHr L3 Very High	R/Wp	1B	6A
47021	510	Forward VARHr L3 High	R/Wp	1B	6C
47023	511	Forward VARHr L3 Low	R/Wp	1B	6E
47025	512	Forward VARHr L3 Very Low	R/Wp	1B	70

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47027	513	Forward VARHr L3 Dead Band	R/Wp	1B	72
47043	521	Forward VARHr Total Threshold Trend Enable	R/Wp	1B	82
47045	522	Forward VARHr Total Time Trend Enable	R/Wp	1B	84
47047	523	Forward VARHr Total Very High	R/Wp	1B	86
47049	524	Forward VARHr Total High	R/Wp	1B	88
47051	525	Forward VARHr Total Low	R/Wp	1B	8A
47053	526	Forward VARHr Total Very Low	R/Wp	1B	8C
47055	527	Forward VARHr Total Dead Band	R/Wp	1B	8E
47057	528	Reverse WHr L1 Threshold Trend Enable	R/Wp	1B	90
47059	529	Reverse Whr L1 Time Trend Enable	R/Wp	1B	92
47061	530	Reverse Whr L1 Very High	R/Wp	1B	94
47063	531	Reverse Whr L1 High	R/Wp	1B	96
47065	532	Reverse Whr L1 Low	R/Wp	1B	98
47067	533	Reverse Whr L1 Very Low	R/Wp	1B	9A
47069	534	Reverse Whr L1 Dead Band	R/Wp	1B	9C
47071	535	Reverse Whr L2 Threshold Trend Enable	R/Wp	1B	9E
47073	536	Reverse Whr L2 Time Trend Enable	R/Wp	1B	A0
47075	537	Reverse Whr L2 Very High	R/Wp	1B	A2
47077	538	Reverse Whr L2 High	R/Wp	1B	A4
47079	539	Reverse Whr L2 Low	R/Wp	1B	A6
47081	540	Reverse Whr L2 Very Low	R/Wp	1B	A8
47083	541	Reverse Whr L2 Dead Band	R/Wp	1B	AA
47085	542	Reverse Whr L3 Enable Threshold	R/Wp	1B	AC

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47087	543	Reverse Whr L3 Time Trend Enable	R/Wp	1B	AE
47089	544	Reverse Whr L3 Very High	R/Wp	1B	B0
47091	545	Reverse Whr L3 High	R/Wp	1B	B2
47093	546	Reverse Whr L3 Low	R/Wp	1B	B4
47095	547	Reverse Whr L3 Very Low	R/Wp	1B	B6
47097	549	Reverse Whr L3 Dead Band	R/Wp	1B	B8
47113	556	Reverse Whr Total Threshold Trend Enable	R/Wp	1B	C8
47115	557	Reverse Whr Total Time Trend Enable	R/Wp	1B	CA
47117	558	Reverse Whr Total Very High	R/Wp	1B	CC
47119	559	Reverse Whr Total High	R/Wp	1B	CE
47121	560	Reverse Whr Total Low	R/Wp	1B	D0
47123	561	Reverse Whr Total Very Low	R/Wp	1B	D2
47125	562	Reverse Whr Total Dead Band	R/Wp	1B	D4
47127	563	Reverse VARHr L1 Enable Threshold	R/Wp	1B	D6
47129	564	Reverse VARHr L1 Time Trend Enable	R/Wp	1B	D8
47131	565	Reverse VARHr L1 Very High	R/Wp	1B	DA
47133	566	Reverse VARHr L1 High	R/Wp	1B	DC
47135	567	Reverse VARHr L1 Low	R/Wp	1B	DE
47137	568	Reverse VARHr L1 Very Low	R/Wp	1B	E0
47139	569	Reverse VARHr L1 Dead Band	R/Wp	1B	E2
47141	570	Reverse VARHr L2 Enable Threshold	R/Wp	1B	E4
47143	571	Reverse VARHr L2 Time Trend Enable	R/Wp	1B	E6
47145	572	Reverse VARHr L2 Very High	R/Wp	1B	E8

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47147	573	Reverse VARHr L2 High	R/Wp	1B	EA
47149	574	Reverse VARHr L2 Low	R/Wp	1B	EC
47151	575	Reverse VARHr L2 Very Low	R/Wp	1B	EE
47153	576	Reverse VARHr L2 Dead Band	R/Wp	1B	F0
47155	577	Reverse VARHr L3 Enable Threshold	R/Wp	1B	F2
47157	578	Reverse VARHr L3 Time Trend Enable	R/Wp	1B	F4
47159	579	Reverse VARHr L3 Very High	R/Wp	1B	F6
47161	580	Reverse VARHr L3 High	R/Wp	1B	F8
47163	581	Reverse VARHr L3 Low	R/Wp	1B	FA
47165	582	Reverse VARHr L3 Very Low	R/Wp	1B	FC
47167	583	Reverse VARHr L3 Dead Band	R/Wp	1B	FE
47183	591	Reverse VARHr Total Enable Threshold	R/Wp	1C	0E
47185	592	Reverse VARHr Total Time Trend Enable	R/Wp	1C	10
47187	593	Reverse VARHr Total Very High	R/Wp	1C	12
47189	594	Reverse VARHr Total High	R/Wp	1C	14
47191	595	Reverse VARHr Total Low	R/Wp	1C	16
47193	596	Reverse VARHr Total Very Low	R/Wp	1C	18
47195	597	Reverse VARHr Total Dead Band	R/Wp	1C	1A
47197	598	VAHrs L1 Enable Threshold	R/Wp	1C	1C
47199	599	VAHrs L1 Time Trend Enable	R/Wp	1C	1E
47201	600	VAHrs L1 Very High	R/Wp	1C	20
47203	601	VAHrs L1 High	R/Wp	1C	22
47205	602	VAHrs L1 Low	R/Wp	1C	24

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47207	603	VAHrs L1 Very Low	R/Wp	1C	26
47209	604	VAHrs L1 Dead Band	R/Wp	1C	28
47211	605	VAHrs L2 Threshold Trend Enable	R/Wp	1C	2A
47213	606	VAHrs L2 Time Trend Enable	R/Wp	1C	2C
47215	607	VAHrs L2 Very High	R/Wp	1C	2E
47217	608	VAHrs L2 High	R/Wp	1C	30
47219	609	VAHrs L2 Low	R/Wp	1C	32
47221	610	VAHrs L2 Very Low	R/Wp	1C	34
47223	611	VAHrs L2 Dead Band	R/Wp	1C	36
47225	612	VAHrs L3 Enable Threshold	R/Wp	1C	38
47227	613	VAHrs L3 Time Trend Enable	R/Wp	1C	3A
47229	614	VAHrs L3 Very High	R/Wp	1C	3C
47231	615	VAHrs L3 High	R/Wp	1C	3E
47233	616	VAHrs L3 Low	R/Wp	1C	40
47235	617	VAHrs L3 Very Low	R/Wp	1C	42
47237	618	VAHrs L3 Dead Band	R/Wp	1C	44
47253	626	VAHrs Total Enable Threshold	R/Wp	1C	54
47255	627	VAHrs Total Time Trend Enable	R/Wp	1C	56
47257	628	VAHrs Total Very High	R/Wp	1C	58
47259	629	VAHrs Total High	R/Wp	1C	5A
47261	630	VAHrs Total Low	R/Wp	1C	5C
47263	631	VAHrs Total Very Low	R/Wp	1C	5E
47265	632	VAHrs Total Dead Band	R/Wp	1C	60

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47267	633	Power Signed L1 Enable Threshold	R/Wp	1C	62
47269	634	Power Signed L1 Time Trend Enable	R/Wp	1C	64
47271	635	Power Signed L1 Very High	R/Wp	1C	66
47273	636	Power Signed L1 High	R/Wp	1C	68
47275	637	Power Signed L1 Low	R/Wp	1C	6A
47277	638	Power Signed L1 Very Low	R/Wp	1C	6C
47279	639	Power Signed L1 Dead Band	R/Wp	1C	6E
47281	640	Power Signed L2 Threshold Trend Enable	R/Wp	1C	70
47283	641	Power Signed L2 Time Trend Enable	R/Wp	1C	72
47285	642	Power Signed L2 Very High	R/Wp	1C	74
47287	643	Power Signed L2 High	R/Wp	1C	76
47289	644	Power Signed L2 Low	R/Wp	1C	78
47291	645	Power Signed L2 Very Low	R/Wp	1C	7A
47293	646	Power Signed L2 Dead Band	R/Wp	1C	7C
47295	647	Power Signed L3 Threshold Trend Enable	R/Wp	1C	7E
47297	648	Power Signed L3 Time Trend Enable	R/Wp	1C	80
47299	649	Power Signed L3 Very High	R/Wp	1C	82
47301	650	Power Signed L3 High	R/Wp	1C	84
47303	651	Power Signed L3 Low	R/Wp	1C	86
47305	652	Power Signed L3 Very Low	R/Wp	1C	88
47307	653	Power Signed L3 Dead Band	R/Wp	1C	8A
47323	661	Power Unsigned L1 Enable Threshold	R/Wp	1C	9A
47325	662	Power Unsigned L1 Time Trend Enable	R/Wp	1C	9C

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47327	663	Power Unsigned L1 Very High	R/Wp	1C	9E
47329	664	Power Unsigned L1 High	R/Wp	1C	A0
47331	665	Power Unsigned L1 Low	R/Wp	1C	A2
47333	666	Power Unsigned L1 Very Low	R/Wp	1C	A4
47335	667	Power Unsigned L1 Dead Band	R/Wp	1C	A6
47337	668	Power Unsigned L2 Threshold Trend Enable	R/Wp	1C	A8
47339	669	Power Unsigned L2 Time Trend Enable	R/Wp	1C	AA
47341	670	Power Unsigned L2 Very High	R/Wp	1C	AC
47343	671	Power Unsigned L2 High	R/Wp	1C	AE
47345	672	Power Unsigned L2 Low	R/Wp	1C	B0
47347	673	Power Unsigned L2 Very Low	R/Wp	1C	B2
47349	674	Power Unsigned L2 Dead Band	R/Wp	1C	B4
47351	675	Power Unsigned L3 Threshold Trend Enable	R/Wp	1C	B6
47353	676	Power Unsigned L3 Time Trend Enable	R/Wp	1C	B8
47355	677	Power Unsigned L3 Very High	R/Wp	1C	BA
47357	678	Power Unsigned L3 High	R/Wp	1C	BC
47359	679	Power Unsigned L3 Low	R/Wp	1C	BE
47361	680	Power Unsigned L3 Very Low	R/Wp	1C	C0
47363	681	Power Unsigned L3 Dead Band	R/Wp	1C	C2
47379	689	Vcrest Factor L1 Enable Threshold	R/Wp	1C	D2
47381	690	Vcrest Factor L1 Time Trend Enable	R/Wp	1C	D4
47383	691	Vcrest Factor L1 Very High	R/Wp	1C	D6
47385	692	Vcrest Factor L1 High	R/Wp	1C	D8

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47387	693	Vcrest Factor L1 Low	R/Wp	1C	DA
47389	694	Vcrest Factor L1 Very Low	R/Wp	1C	DC
47391	695	Vcrest Factor L1 Dead Band	R/Wp	1C	DE
47393	696	Vcrest Factor L2 Enable Threshold	R/Wp	1C	E0
47395	697	Vcrest Factor L2 Time Trend Enable	R/Wp	1C	E2
47397	698	Vcrest Factor L2 Very High	R/Wp	1C	E4
47399	699	Vcrest Factor L2 High	R/Wp	1C	E6
47401	700	Vcrest Factor L2 Low	R/Wp	1C	E8
47403	701	Vcrest Factor L2 Very Low	R/Wp	1C	EA
47405	702	Vcrest Factor L2 Dead Band	R/Wp	1C	EC
47407	703	Vcrest Factor L3 Enable Threshold	R/Wp	1C	EE
47409	704	Vcrest Factor L3 Time Trend Enable	R/Wp	1C	F0
47411	705	Vcrest Factor L3 Very High	R/Wp	1C	F2
47413	706	Vcrest Factor L3 High	R/Wp	1C	F4
47415	707	Vcrest Factor L3 Low	R/Wp	1C	F6
47417	708	Vcrest Factor L3 Very Low	R/Wp	1C	F8
47419	709	Vcrest Factor L3 Dead Band	R/Wp	1C	FA
47435	717	Icrest Factor L1 Enable Threshold	R/Wp	1D	0A
47437	718	Icrest Factor L1 Time Trend Enable	R/Wp	1D	0C
47439	719	Icrest Factor L1 Very High	R/Wp	1D	0E
47441	720	Icrest Factor L1 High	R/Wp	1D	10
47443	721	Icrest Factor L1 Low	R/Wp	1D	12
47445	722	Icrest Factor L1 Very Low	R/Wp	1D	14

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47447	723	Icrest Factor L1 Dead Band	R/Wp	1D	16
47449	724	Icrest Factor L2 Threshold Trend Enable	R/Wp	1D	18
47451	725	Icrest Factor L2 Time Trend Enable	R/Wp	1D	1A
47453	726	Icrest Factor L2 Very High	R/Wp	1D	1C
47455	727	Icrest Factor L2 High	R/Wp	1D	1E
47457	728	Icrest Factor L2 Low	R/Wp	1D	20
47459	729	Icrest Factor L2 Very Low	R/Wp	1D	22
47461	730	Icrest Factor L2 Dead Band	R/Wp	1D	24
47463	731	Icrest Factor L3 .Enable Threshold	R/Wp	1D	26
47465	732	Icrest Factor L3 Time Trend Enable	R/Wp	1D	28
47467	733	Icrest Factor L3 Very High	R/Wp	1D	2A
47469	734	Icrest Factor L3 High	R/Wp	1D	2C
47471	735	Icrest Factor L3 Low	R/Wp	1D	2E
47473	736	Icrest Factor L3 Very Low	R/Wp	1D	30
47475	737	Icrest Factor L3 Dead Band	R/Wp	1D	32
47491	745	VTID Percent Fund L1 Enable Threshold	R/Wp	1D	42
47493	746	VTID Percent Fund L1 Time Trend Enable	R/Wp	1D	44
47495	747	VTID Percent Fund L1 Very High	R/Wp	1D	46
47497	748	VTID Percent Fund L1 High	R/Wp	1D	48
47499	749	VTID Percent Fund L1 Low	R/Wp	1D	4A
47501	750	VTID Percent Fund L1 Very Low	R/Wp	1D	4C
47503	751	VTID Percent Fund L1 Dead Band	R/Wp	1D	4E
47505	752	VTID Percent Fund L2 Enable threshold	R/Wp	1D	50

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47507	753	VTID Percent Fund L2 Time Trend Enable	R/Wp	1D	52
47509	754	VTID Percent Fund L2 Very High	R/Wp	1D	54
47511	755	VTID Percent Fund L2 High	R/Wp	1D	56
47513	756	VTID Percent Fund L2 Low	R/Wp	1D	58
47515	757	VTID Percent Fund L2 Very Low	R/Wp	1D	5A
47517	758	VTID Percent Fund L2 Dead Band	R/Wp	1D	5C
47519	759	VTID Percent Fund L3 Enable Threshold	R/Wp	1D	5E
47521	760	VTID Percent Fund L3 Time Trend Enable	R/Wp	1D	60
47523	761	VTID Percent Fund Very High	R/Wp	1D	62
47525	762	VTID Percent Fund L3 High	R/Wp	1D	64
47527	763	VTID Percent Fund L3 Low	R/Wp	1D	66
47529	764	VTID Percent Fund L3 Very Low	R/Wp	1D	68
47531	765	VTID Percent Fund L3 Dead Band	R/Wp	1D	6A
47547	773	VTID RSS L1 Enable threshold	R/Wp	1D	7A
47549	774	VTID RSS L1 Time Trend Enable	R/Wp	1D	7C
47551	775	VTID RSS L1 Very High	R/Wp	1D	7E
47553	776	VTID RSS L1 High	R/Wp	1D	80
47555	777	VTID RSS L1 Low	R/Wp	1D	82
47557	778	VTID RSS L1 Very Low	R/Wp	1D	84
47559	779	VTID RSS L1 Dead Band	R/Wp	1D	86
47561	780	VTID RSS L2 Enable Threshold	R/Wp	1D	88
47563	781	VTID RSS L2 Time Trend Enable	R/Wp	1D	8A
47565	782	VTID RSS L2 Very High	R/Wp	1D	8C

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47567	783	VTID RSS L2 High	R/Wp	1D	8E
47569	784	VTID RSS L2 Low	R/Wp	1D	90
47571	785	VTID RSS L2 Very Low	R/Wp	1D	92
47573	786	VTID RSS L2 Dead Band	R/Wp	1D	94
47575	787	VTID RSS L3 Enable Threshold	R/Wp	1D	96
47577	788	VTID RSS L3 Time Trend Enable	R/Wp	1D	98
47579	789	VTID RSS L3 Very High	R/Wp	1D	9A
47581	790	VTID RSS L3 High	R/Wp	1D	9C
47583	791	VTID RSS L3 Low	R/Wp	1D	9E
47585	792	VTID RSS L3 Very Low	R/Wp	1D	A0
47587	793	VTID RSS L3 Dead Band	R/Wp	1D	A2
47603	801	ITID Percent Fund L1 Enable Threshold	R/Wp	1D	B2
47605	802	ITID Percent Fund L1 Time Trend Enable	R/Wp	1D	B4
47607	803	ITID Percent Fund L1 Very High	R/Wp	1D	B6
47609	804	ITID Percent Fund L1 High	R/Wp	1D	B8
47611	805	ITID Percent Fund L1 Low	R/Wp	1D	BA
47613	806	ITID Percent Fund L1 Very Low	R/Wp	1D	BC
47615	807	ITID Percent Fund L1 Dead Band	R/Wp	1D	BE
47617	808	ITID Percent Fund L2 Enable Threshold	R/Wp	1D	C0
47619	809	ITID Percent Fund L2 Time Trend Enable	R/Wp	1D	C2
47621	810	ITID Percent Fund L2 Very High	R/Wp	1D	C4
47623	811	ITID Percent Fund L2 High	R/Wp	1D	C6
47625	812	ITID Percent Fund L2 Low	R/Wp	1D	C8

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47627	813	ITID Percent Fund L2 Very Low	R/Wp	1D	CA
47629	814	ITID Percent Fund L2 Dead Band	R/Wp	1D	CC
47631	815	ITID Percent Fund L3 Enable Threshold	R/Wp	1D	CE
47633	816	ITID Percent Fund L3 Time Trend Enable	R/Wp	1D	D0
47635	817	ITID Percent Fund L3 Very High	R/Wp	1D	D2
47637	818	ITID Percent Fund L3 High	R/Wp	1D	D4
47639	819	ITID Percent Fund L3 Low	R/Wp	1D	D6
47641	820	ITID Percent Fund L3 Very Low	R/Wp	1D	D8
47643	821	ITID Percent Fund L3 Dead Band	R/Wp	1D	DA
47659	829	ITID RSS L1 Enable Threshold	R/Wp	1D	EA
47661	830	ITID RSS L1 Time Trend Enable	R/Wp	1D	EC
47663	831	ITID RSS L1 Very High	R/Wp	1D	EE
47665	832	ITID RSS L1 High	R/Wp	1D	F0
47667	833	ITID RSS L1 Low	R/Wp	1D	F2
47669	834	ITID RSS L1 Very Low	R/Wp	1D	F4
47671	835	ITID RSS L1 Dead Band	R/Wp	1D	F6
47673	836	ITID RSS L2 Enable Threshold	R/Wp	1D	F8
47675	837	ITID RSS L2 Time Trend Enable	R/Wp	1D	FA
47677	838	ITID RSS L2 Very High	R/Wp	1D	FC
47679	839	ITID RSS L2 High	R/Wp	1D	FE
47681	840	ITID RSS L2 Low	R/Wp	1E	00
47683	841	ITID RSS L2 Very Low	R/Wp	1E	02
47685	842	ITID RSS L2 Dead Band	R/Wp	1E	04

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47687	843	ITID RSS L3 Enable Threshold	R/Wp	1E	06
47689	844	ITID RSS L3 Time Trend Enable	R/Wp	1E	08
47691	845	ITID RSS L3 Very High	R/Wp	1E	0A
47693	846	ITID RSS L3 High	R/Wp	1E	0C
47695	847	ITID RSS L3 Low	R/Wp	1E	0E
47697	848	ITID RSS L3 Very Low	R/Wp	1E	10
47699	849	ITID RSS L3 Dead Band	R/Wp	1E	12
47715	857	VTHD Percent Fund L1 Enable Threshold	R/Wp	1E	22
47717	858	VTHD Percent Fund L1 Time Trend Enable	R/Wp	1E	24
47719	859	VTHD Percent Fund L1 Very High	R/Wp	1E	26
47721	860	VTHD Percent Fund L1 High	R/Wp	1E	28
47723	861	VTHD Percent Fund L1 Low	R/Wp	1E	2A
47725	862	VTHD Percent Fund L1 Very Low	R/Wp	1E	2C
47727	863	VTHD Percent Fund L1 Dead Band	R/Wp	1E	2E
47729	864	VTHD Percent Fund L2 Enable Threshold	R/Wp	1E	30
47731	865	VTHD Percent Fund L2 Time Trend Enable	R/Wp	1E	32
47733	866	VTHD Percent Fund L2 Very High	R/Wp	1E	34
47735	867	VTHD Percent Fund L2 High	R/Wp	1E	36
47737	868	VTHD Percent Fund L2 Low	R/Wp	1E	38
47739	869	VTHD Percent Fund L2 Very Low	R/Wp	1E	3A
47741	870	VTHD Percent Fund L2 Dead Band	R/Wp	1E	3C
47743	871	VTHD Percent Fund L3 Enable Threshold	R/Wp	1E	3E
47745	872	VTHD Percent Fund L3 Time Trend Enable	R/Wp	1E	40

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47747	873	VTHD Percent Fund L3 Very High	R/Wp	1E	42
47749	874	VTHD Percent Fund L3 High	R/Wp	1E	44
47751	875	VTHD Percent Fund L3 Low	R/Wp	1E	46
47753	876	VTHD Percent Fund L3 Very Low	R/Wp	1E	48
47755	877	VTHD Percent Fund L3 Dead Band	R/Wp	1E	4A
47771	885	VTHD RSS L1 Enable Threshold	R/Wp	1E	5A
47773	886	VTHD RSS L1 Time Trend Enable	R/Wp	1E	5C
47775	887	VTHD RSS L1 Very High	R/Wp	1E	5E
47777	888	VTHD RSS L1 High	R/Wp	1E	60
47779	889	VTHD RSS L1 Low	R/Wp	1E	62
47781	890	VTHD RSS L1 Very Low	R/Wp	1E	64
47783	891	VTHD RSS L1 Dead Band	R/Wp	1E	66
47785	892	VTHD RSS L2 Threshold Trend Enable	R/Wp	1E	68
47787	893	VTHD RSS L2 Time Trend Enable	R/Wp	1E	6A
47789	894	VTHD RSS L2 Very High	R/Wp	1E	6C
47791	895	VTHD RSS L2 High	R/Wp	1E	6E
47793	896	VTHD RSS L2 Low	R/Wp	1E	70
47795	897	VTHD RSS L2 Very Low	R/Wp	1E	72
47797	898	VTHD RSS L2 Dead Band	R/Wp	1E	74
47799	899	VTHD RSS L3 Enable Threshold	R/Wp	1E	76
47801	900	VTHD RSS L3 Time Trend Enable	R/Wp	1E	78
47803	901	VTHD RSS L3 Very High	R/Wp	1E	7A
47805	902	VTHD RSS L3 High	R/Wp	1E	7C

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47807	903	VTHD RSS L3 Low	R/Wp	1E	7E
47809	904	VTHD RSS L3 Very Low	R/Wp	1E	80
47811	905	VTHD RSS L3 Dead Band	R/Wp	1E	82
47827	913	ITHD Percent Fund L1 Enable Threshold	R/Wp	1E	92
47829	914	ITHD Percent Fund L1 Time Trend Enable	R/Wp	1E	94
47831	915	ITHD Percent Fund L1 Very High	R/Wp	1E	96
47833	916	ITHD Percent Fund L1 High	R/Wp	1E	98
47835	917	ITHD Percent Fund L1 Low	R/Wp	1E	9A
47837	918	ITHD Percent Fund L1 Very Low	R/Wp	1E	9C
47839	919	ITHD Percent Fund L1 Dead Band	R/Wp	1E	9E
47841	920	ITHD Percent Fund L2 Enable Threshold	R/Wp	1E	A0
47843	921	ITHD Percent Fund L2 Time Trend Enable	R/Wp	1E	A2
47845	922	ITHD Percent Fund L2 Very High	R/Wp	1E	A4
47847	923	ITHD Percent Fund L2 High	R/Wp	1E	A6
47849	924	ITHD Percent Fund L2 Low	R/Wp	1E	A8
47851	925	ITHD Percent Fund L2 Very Low	R/Wp	1E	AA
47853	926	ITHD Percent Fund L2 Dead Band	R/Wp	1E	AC
47855	927	ITHD Percent Fund L3 Enable Threshold	R/Wp	1E	AE
47857	928	ITHD Percent Fund L3 Time Trend Enable	R/Wp	1E	B0
47859	929	ITHD Percent Fund L3 Very High	R/Wp	1E	B2
47861	930	ITHD Percent Fund L3 High	R/Wp	1E	B4
47863	931	ITHD Percent Fund L3 Low	R/Wp	1E	B6
47865	932	ITHD Percent Fund L3 Very Low	R/Wp	1E	B8

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47867	933	ITHD Percent Fund L3 Dead Band	R/Wp	1E	BA
47883	941	ITHD RSS L1 Enable Threshold	R/Wp	1E	CA
47885	942	ITHD RSS L1 Time Trend Enable	R/Wp	1E	CC
47887	943	ITHD RSS L1 Very High	R/Wp	1E	CE
47889	944	ITHD RSS L1 High	R/Wp	1E	D0
47891	945	ITHD RSS L1 Low	R/Wp	1E	D2
47893	946	ITHD RSS L1 Very Low	R/Wp	1E	D4
47895	947	ITHD RSS L1 Dead Band	R/Wp	1E	D6
47897	948	ITHD RSS L2 Enable Threshold	R/Wp	1E	D8
47899	949	ITHD RSS L2 Time Trend Enable	R/Wp	1E	DA
47901	950	ITHD RSS L2 Very High	R/Wp	1E	DC
47903	951	ITHD RSS L2 High	R/Wp	1E	DE
47905	952	ITHD RSS L2 Low	R/Wp	1E	E0
47907	953	ITHD RSS L2 Very Low	R/Wp	1E	E2
47909	954	ITHD RSS L2 Dead Band	R/Wp	1E	E4
47911	955	ITHD RSS L3 EnableThreshold	R/Wp	1E	E6
47913	956	ITHD RSS L3 Time Trend Enable	R/Wp	1E	E8
47915	957	ITHD RSS L3 Very High	R/Wp	1E	EA
47917	958	ITHD RSS L3 High	R/Wp	1E	EC
47919	959	ITHD RSS L3 Low	R/Wp	1E	EE
47921	960	ITHD RSS L3 Very Low	R/Wp	1E	F0
47923	961	ITHD RSS L3 Dead Band	R/Wp	1E	F2
47995	997	Voltage Harmonic Magnitude Enable	R/Wp	1F	3A

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
47997	998	Voltage Inter Harmonic Group Magnitude Enable	R/Wp	1F	3C
47999	999	Current Harmonic Magnitude Enable	R/Wp	1F	3E
48001	1000	Current Inter Harmonic Group Magnitude Enable	R/Wp	1F	40
48003	1001	Positive Sequence Voltage Threshold Trend Enable	R/Wp	1F	42
48005	1002	Positive Sequence Voltage Time Trend Enable	R/Wp	1F	44
48007	1003	Positive Sequence Voltage Very High	R/Wp	1F	46
48009	1004	Positive Sequence Voltage High	R/Wp	1F	48
48011	1005	Positive Sequence Voltage Low	R/Wp	1F	4A
48013	1006	Positive Sequence Voltage Very Low	R/Wp	1F	4C
48015	1007	Positive Sequence Voltage Dead Band	R/Wp	1F	4E
48017	1008	Negative Sequence Voltage Threshold Trend Enable	R/Wp	1F	50
48019	1009	Negative Sequence Voltage Time Trend Enable	R/Wp	1F	52
48021	1010	Negative Sequence Voltage Very High	R/Wp	1F	54
48023	1011	Negative Sequence Voltage High	R/Wp	1F	56
48025	1012	Negative Sequence Voltage Low	R/Wp	1F	58
48027	1013	Negative Sequence Voltage Very Low	R/Wp	1F	5A
48029	1014	Negative Sequence Voltage Dead Band	R/Wp	1F	5C
48031	1015	Zero Sequence Voltage Threshold Trend Enable	R/Wp	1F	5E
48033	1016	Zero Sequence Voltage Time Trend Enable	R/Wp	1F	60
48035	1017	Zero Sequence Voltage Very High	R/Wp	1F	62
48037	1018	Zero Sequence Voltage High	R/Wp	1F	64
48039	1019	Zero Sequence Voltage Low	R/Wp	1F	66
48041	1020	Zero Sequence Voltage Very Low	R/Wp	1F	68

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48043	1021	Zero Sequence Voltage Dead Band	R/Wp	1F	6A
48045	1022	Positive Sequence Current Enable Threshold	R/Wp	1F	6C
48047	1023	Positive Sequence Current Time Trend Enable	R/Wp	1F	6E
48049	1024	Positive Sequence Current Very High	R/Wp	1F	70
48051	1025	Positive Sequence Current High	R/Wp	1F	72
48053	1026	Positive Sequence Current Low	R/Wp	1F	74
48055	1027	Positive Sequence Current Very Low	R/Wp	1F	76
48057	1028	Positive Sequence Current Dead Band	R/Wp	1F	78
48059	1029	Negative Sequence Current Enable Threshold	R/Wp	1F	7A
48061	1030	Negative Sequence Current Time Trend Enable	R/Wp	1F	7C
48063	1031	Negative Sequence Current Very High	R/Wp	1F	7E
48065	1032	Negative Sequence Current High	R/Wp	1F	80
48067	1033	Negative Sequence Current Low	R/Wp	1F	82
48069	1034	Negative Sequence Current Very Low	R/Wp	1F	84
48071	1035	Negative Sequence Current Dead Band	R/Wp	1F	86
48073	1036	Zero Sequence Current Threshold Trend Enable	R/Wp	1F	88
48075	1037	Zero Sequence Current Time Trend Enable	R/Wp	1F	8A
48077	1038	Zero Sequence Current Very High	R/Wp	1F	8C
48079	1039	Zero Sequence Current High	R/Wp	1F	8E
48081	1040	Zero Sequence Current Low	R/Wp	1F	90
48083	1041	Zero Sequence Current Very Low	R/Wp	1F	92
48085	1042	Zero Sequence Current Dead Band	R/Wp	1F	94
48087	1043	V Unbalance RMS/RMS Avg Enable Threshold	R/Wp	1F	96

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48089	1044	V Unbalance RMS/RMS Avg Time Trend Enable	R/Wp	1F	98
48091	1045	V Unbalance RMS/RMS Avg Very High	R/Wp	1F	9A
48093	1046	V Unbalance RMS/RMS Avg High	R/Wp	1F	9C
48095	1047	V Unbalance RMS/RMS Avg Low	R/Wp	1F	9E
48097	1048	V Unbalance RMS/RMS Avg Very Low	R/Wp	1F	A0
48099	1049	V Unbalance RMS/RMS Avg Dead Band	R/Wp	1F	A2
48101	1050	Unbalance S2/S1 Threshold Trend Enable	R/Wp	1F	A4
48103	1051	Unbalance S2/S1 Time Trend Enable	R/Wp	1F	A6
48105	1052	Unbalance S2/S1 Very High	R/Wp	1F	A8
48107	1053	Unbalance S2/S1 High	R/Wp	1F	AA
48109	1054	Unbalance S2/S1 Low	R/Wp	1F	AC
48111	1055	Unbalance S2/S1 Very Low	R/Wp	1F	AE
48113	1056	Unbalance S2/S1 Dead Band	R/Wp	1F	B0
48115	1057	Unbalance S0/S1 Threshold Trend Enable	R/Wp	1F	B2
48117	1058	Unbalance S0/S1 Time Trend Enable	R/Wp	1F	B4
48119	1059	Unbalance S0/S1 Very High	R/Wp	1F	B6
48121	1060	Unbalance S0/S1 High	R/Wp	1F	B8
48123	1061	Unbalance S0/S1 Low	R/Wp	1F	BA
48125	1062	Unbalance S0/S1 Very Low	R/Wp	1F	BC
48127	1063	Unbalance S0/S1 Dead Band	R/Wp	1F	BE
48129	1064	I Unbalance RMS/RMS Avg Threshold Trend Enable	R/Wp	1F	C0
48131	1065	I Unbalance RMS/RMS Avg Time Trend Enable	R/Wp	1F	C2
48133	1066	I Unbalance RMS/RMS Avg Very High	R/Wp	1F	C4

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48135	1067	I Unbalance RMS/RMS Avg High	R/Wp	1F	C6
48137	1068	I Unbalance RMS/RMS Avg Low	R/Wp	1F	C8
48139	1069	I Unbalance RMS/RMS Avg Very Low	R/Wp	1F	CA
48141	1070	I Unbalance RMS/RMS Avg Dead Band	R/Wp	1F	CC
48143	1071	I Unbalance S2/S1 Threshold Trend Enable	R/Wp	1F	CE
48145	1072	I Unbalance S2/S1 Time Trend Enable	R/Wp	1F	D0
48147	1073	I Unbalance S2/S1 Very High	R/Wp	1F	D2
48149	1074	I Unbalance S2/S1 High	R/Wp	1F	D4
48151	1075	I Unbalance S2/S1 Low	R/Wp	1F	D6
48153	1076	I Unbalance S2/S1 Very Low	R/Wp	1F	D8
48155	1077	I Unbalance S2/S1 Dead Band	R/Wp	1F	DA
48157	1078	I Unbalance S0/S1 Threshold Trend Enable	R/Wp	1F	DC
48159	1079	I Unbalance S0/S1 Time Trend Enable	R/Wp	1F	DE
48161	1080	I Unbalance S0/S1 Very High	R/Wp	1F	E0
48163	1081	I Unbalance S0/S1 High	R/Wp	1F	E2
48165	1082	I Unbalance S0/S1 Low	R/Wp	1F	E4
48167	1083	I Unbalance S0/S1 Very Low	R/Wp	1F	E6
48169	1084	I Unbalance S0/S1 Dead Band	R/Wp	1F	E8
48171	1085	Vrms Imbalance L1 Threshold Trend Enable	R/Wp	1F	EA
48173	1086	Vrms Imbalance L1 Time Trend Enable	R/Wp	1F	EC
48175	1087	Vrms Imbalance L1 Very High	R/Wp	1F	EE
48177	1088	Vrms Imbalance L1 High	R/Wp	1F	F0
48179	1089	Vrms Imbalance L1 Low	R/Wp	1F	F2

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48181	1090	Vrms Imbalance L1 Very Low	R/Wp	1F	F4
48183	1091	Vrms Imbalance L1 Dead Band	R/Wp	1F	F6
48185	1092	Vrms Imbalance L2 Threshold Trend Enable	R/Wp	1F	F8
48187	1093	Vrms Imbalance L2Time Trend Enable	R/Wp	1F	FA
48189	1094	Vrms Imbalance L2 Very High	R/Wp	1F	FC
48191	1095	Vrms Imbalance L2 High	R/Wp	1F	FE
48193	1096	Vrms Imbalance L2 Low	R/Wp	20	00
48195	1097	Vrms Imbalance L2 Very Low	R/Wp	20	02
48197	1098	Vrms Imbalance L2 Dead Band	R/Wp	20	04
48199	1099	Vrms Imbalance L3 Threshold Trend Enable	R/Wp	20	06
48201	1100	Vrms Imbalance L3 Time Trend Enable	R/Wp	20	08
48203	1101	Vrms Imbalance L3 Very High	R/Wp	20	0A
48205	1102	Vrms Imbalance L3 High	R/Wp	20	0C
48207	1103	Vrms Imbalance L3 Low	R/Wp	20	0E
48209	1104	Vrms Imbalance L3 Very Low	R/Wp	20	10
48211	1105	Vrms Imbalance L3 Dead Band	R/Wp	20	12
48213	1106	Vrms Imbalance Maximum Threshold Trend Enable	R/Wp	20	14
48215	1107	Vrms Imbalance Maximum Time Trend Enable	R/Wp	20	16
48217	1108	Vrms Imbalance Maximum Very High	R/Wp	20	18
48219	1109	Vrms Imbalance Maximum High	R/Wp	20	1A
48221	1110	Vrms Imbalance Maximum Low	R/Wp	20	1C
48223	1111	Vrms Imbalance Maximum Very Low	R/Wp	20	1E
48225	1112	Vrms Imbalance Maximum Dead Band	R/Wp	20	20

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48227	1113	Irms Imbalance L1 Threshold Trend Enable	R/Wp	20	22
48229	1114	Irms Imbalance L1 Time Trend Enable	R/Wp	20	24
48231	1115	Irms Imbalance L1 Very High	R/Wp	20	26
48233	1116	Irms Imbalance L1 High	R/Wp	20	28
48235	1117	Irms Imbalance L1 Low	R/Wp	20	2A
48237	1118	Irms Imbalance L1 Very Low	R/Wp	20	2C
48239	1119	Irms Imbalance L1 Dead Band	R/Wp	20	2E
48241	1120	Irms Imbalance L2 Threshold Trend Enable	R/Wp	20	30
48243	1121	Irms Imbalance L2 Time Trend Enable	R/Wp	20	32
48245	1122	Irms Imbalance L2 Very High	R/Wp	20	34
48247	1123	Irms Imbalance L2 High	R/Wp	20	36
48249	1124	Irms Imbalance L2 Low	R/Wp	20	38
48251	1125	Irms Imbalance L2 Very Low	R/Wp	20	3A
48253	1126	Irms Imbalance L2 Dead Band	R/Wp	20	3C
48255	1127	Irms Imbalance L3 Threshold Trend Enable	R/Wp	20	3E
48257	1128	Irms Imbalance L3 Time Trend Enable	R/Wp	20	40
48259	1129	Irms Imbalance L3 Very High	R/Wp	20	42
48261	1130	Irms Imbalance L3 High	R/Wp	20	44
48263	1131	Irms Imbalance L3 Low	R/Wp	20	46
48265	1132	Irms Imbalance L3 Very Low	R/Wp	20	48
48267	1133	Irms Imbalance L3 Dead Band	R/Wp	20	4A
48269	1134	Irms Imbalance Max Threshold Trend Enable	R/Wp	20	4C
48271	1135	Irms Imbalance Max Time Trend Enable	R/Wp	20	4E

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48273	1136	Irms Imbalance Max Very High	R/Wp	20	50
48275	1137	Irms Imbalance Max High	R/Wp	20	52
48277	1138	Irms Imbalance Max Low	R/Wp	20	54
48279	1139	Irms Imbalance Max Very Low	R/Wp	20	56
48281	1140	Irms Imbalance Max Dead Band	R/Wp	20	58
48283	1141	Arithmetic Sum PF Threshold Trend Enable	R/Wp	20	5A
48285	1142	Arithmetic Sum PF Time Trend Enable	R/Wp	20	5C
48287	1143	Arithmetic Sum PF Very High	R/Wp	20	5E
48289	1144	Arithmetic Sum PF High	R/Wp	20	60
48291	1145	Arithmetic Sum PF Low	R/Wp	20	62
48293	1146	Arithmetic Sum PF Very Low	R/Wp	20	64
48295	1147	Arithmetic Sum PF Dead Band	R/Wp	20	66
48297	1148	Arithmetic Sum DPF Threshold Trend Enable	R/Wp	20	68
48299	1149	Arithmetic Sum DPF Time Trend Enable	R/Wp	20	6A
48301	1150	Arithmetic Sum DPF Very High	R/Wp	20	6C
48303	1151	Arithmetic Sum DPF High	R/Wp	20	6E
48305	1152	Arithmetic Sum DPF Low	R/Wp	20	70
48307	1153	Arithmetic Sum DPF Very Low	R/Wp	20	72
48309	1154	Arithmetic Sum DPF Dead Band	R/Wp	20	74
48311	1155	Arithmetic sum VA Threshold Trend Enable	R/Wp	20	76
48313	1156	Arithmetic sum VA Time Trend Enable	R/Wp	20	78
48315	1157	Arithmetic sum VA High	R/Wp	20	7A
48317	1158	Arithmetic sum VA High	R/Wp	20	7C

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48319	1159	Arithmetic sum VA Low	R/Wp	20	7E
48321	1160	Arithmetic VA sum Very Low	R/Wp	20	80
48323	1161	Arithmetic VA sum Dead Band	R/Wp	20	82
48325	1162	Fund Arithmetic Sum VA Threshold Trend Enable	R/Wp	20	84
48327	1163	Fund Arithmetic Sum VA Time Trend Enable	R/Wp	20	86
48329	1164	Fund Arithmetic Sum VA Very High	R/Wp	20	88
48331	1165	Fund Arithmetic Sum VA High	R/Wp	20	8A
48333	1166	Fund Arithmetic Sum VA Low	R/Wp	20	8C
48335	1167	Fund Arithmetic Sum VA Very Low	R/Wp	20	8E
48337	1168	Fund Arithmetic Sum VA Dead Band	R/Wp	20	90
48339	1169	Vector Sum PF Threshold Trend Enable	R/Wp	20	92
48341	1170	Vector Sum PF Time Trend Enable	R/Wp	20	94
48343	1171	Vector Sum PF Very High	R/Wp	20	96
48345	1172	Vector Sum PF High	R/Wp	20	98
48347	1173	Vector Sum PF Low	R/Wp	20	9A
48349	1174	Vector Sum PF Very Low	R/Wp	20	9C
48351	1175	Vector Sum PF Dead Band	R/Wp	20	9E
48353	1176	Vector Sum DPF Threshold Trend Enable	R/Wp	20	A0
48355	1177	Vector Sum DPF Time Trend Enable	R/Wp	20	A2
48357	1178	Vector Sum DPF Very High	R/Wp	20	A4
48359	1179	Vector Sum DPF High	R/Wp	20	A6
48361	1180	Vector Sum DPF Low	R/Wp	20	A8
48363	1181	Vector Sum DPF Very Low	R/Wp	20	AA

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48365	1182	Vector Sum DPF Dead Band	R/Wp	20	AC
48367	1183	Vector Sum VA Threshold Trend Enable	R/Wp	20	AE
48369	1184	Vector Sum VA Time Trend Enable	R/Wp	20	B0
48371	1185	Vector Sum VA Very High	R/Wp	20	B2
48373	1186	Vector Sum VA High	R/Wp	20	B4
48375	1187	Vector Sum VA Low	R/Wp	20	B6
48377	1188	Vector Sum VA Very Low	R/Wp	20	B8
48379	1189	Vector Sum VA Dead Band	R/Wp	20	BA
48381	1190	Fund Vector Sum VA Threshold Trend Enable	R/Wp	20	BC
48383	1191	Fund Vector Sum VA Time Trend Enable	R/Wp	20	BE
48385	1192	Fund Vector Sum VA Very High	R/Wp	20	C0
48387	1193	Fund Vector Sum VA High	R/Wp	20	C2
48389	1194	Fund Vector Sum VA Low	R/Wp	20	C4
48391	1195	Fund Vector Sum VA Very Low	R/Wp	20	C6
48393	1196	Fund Vector Sum VA Dead Band	R/Wp	20	C8
48507	1253	VA Demand at max VAR Demand Threshold Trend Enable	R/Wp	21	3A
48509	1254	VA Demand at max VAR Demand Time Trend Enable	R/Wp	21	3C
48511	1255	VA Demand at max VAR Demand Very High	R/Wp	21	3E
48513	1256	VA Demand at max VAR Demand High	R/Wp	21	40
48515	1257	VA Demand at max VAR Demand Low	R/Wp	21	42

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48517	1258	VA Demand at max VAR Demand Very Low	R/Wp	21	44
48519	1259	VA Demand at max VAR Demand Dead Band	R/Wp	21	46
48521	1260	VA Demand at max Watt Demand Threshold Trend Enable	R/Wp	21	48
48523	1261	VA Demand at max Watt Demand Time Trend Enable	R/Wp	21	4A
48525	1262	VA Demand at max Watt Demand Very High	R/Wp	21	4C
48527	1263	VA Demand at max Watt Demand High	R/Wp	21	4E
48529	1264	VA Demand at max Watt Demand Low	R/Wp	21	50
48531	1265	VA Demand at max Watt Demand Very Low	R/Wp	21	52
48533	1266	VA Demand at max Watt Demand Dead Band	R/Wp	21	54
48535	1267	VAR Demand at max VA Demand Threshold Trend Enable	R/Wp	21	56
48537	1268	VAR Demand at max VA Demand Time Trend Enable	R/Wp	21	58
48539	1269	VAR Demand at max VA Demand Very High	R/Wp	21	5A
48541	1270	VAR Demand at max VA Demand High	R/Wp	21	5C
48543	1271	VAR Demand at max VA Demand Low	R/Wp	21	5E
48545	1272	VAR Demand at max VA Demand Very Low	R/Wp	21	60
48547	1273	VAR Demand at max VA Demand Dead Band	R/Wp	21	62
48549	1274	VAR Demand at max Watt Demand Threshold Trend Enable	R/Wp	21	64
48551	1275	VAR Demand at max Watt Demand Time Trend Enable	R/Wp	21	66
48553	1276	VAR Demand at max Watt Demand Very High	R/Wp	21	68
48555	1277	VAR Demand at max Watt Demand High	R/Wp	21	6A
48557	1278	VAR Demand at max Watt Demand Low	R/Wp	21	6C
48559	1279	VAR Demand at max Watt Demand Very Low	R/Wp	21	6E
48561	1280	VAR Demand at max Watt Demand Dead Band	R/Wp	21	70

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48563	1281	Watt Demand at max VA Demand Threshold Trend Enable	R/Wp	21	72
48565	1282	Watt Demand at max VA Demand Time Trend Enable	R/Wp	21	74
48567	1283	Watt Demand at max VA Demand Very High	R/Wp	21	76
48569	1284	Watt Demand at max VA Demand High	R/Wp	21	78
48571	1285	Watt Demand at max VA Demand Low	R/Wp	21	7A
48573	1286	Watt Demand at max VA Demand Very Low	R/Wp	21	7C
48575	1287	Watt Demand at max VA Demand Dead Band	R/Wp	21	7E
48577	1288	Watt Demand at max VAR Demand Threshold Trend Enable	R/Wp	21	80
48579	1289	Watt Demand at max VAR Demand Time Trend Enable	R/Wp	21	82
48581	1290	Watt Demand at max VAR Demand Very High	R/Wp	21	84
48583	1291	Watt Demand at max VAR Demand High	R/Wp	21	86
48585	1292	Watt Demand at max VAR Demand Low	R/Wp	21	88
48587	1293	Watt Demand at max VAR Demand Very Low	R/Wp	21	8A
48589	1294	Watt Demand at max VAR Demand Dead Band	R/Wp	21	8C
48633	1316	Average PF at max Watt Demand Threshold Trend Enable	R/Wp	21	B8
48635	1317	Average PF at max Watt Demand Time Trend Enable	R/Wp	21	BA
48637	1318	Average PF at max Watt Demand Very High	R/Wp	21	BC
48639	1319	Average PF at max Watt Demand High	R/Wp	21	BE
48641	1320	Average PF at max Watt Demand Low	R/Wp	21	C0
48643	1321	Average PF at max Watt Demand Very Low	R/Wp	21	C2
48645	1322	Average PF at max Watt Demand Dead Band	R/Wp	21	C4

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48647	1323	Average PF at max VAR Demand Threshold Trend Enable	R/Wp	21	C6
48649	1324	Average PF at max VAR Demand Time Trend Enable	R/Wp	21	C8
48651	1325	Average PF at max VAR Demand Very High	R/Wp	21	CA
48653	1326	Average PF at max VAR Demand High	R/Wp	21	CC
48655	1327	Average PF at max VAR Demand Low	R/Wp	21	CE
48657	1328	Average PF at max VAR Demand Very Low	R/Wp	21	D0
48659	1329	Average PF at max VAR Demand Dead Band	R/Wp	21	D2
48661	1330	Average PF at max VA Demand Threshold Trend Enable	R/Wp	21	D4
48663	1331	Average PF at max VA Demand Time Trend Enable	R/Wp	21	D6
48665	1332	Average PF at max VA Demand Very High	R/Wp	21	D8
48667	1333	Average PF at max VA Demand High	R/Wp	21	DA
48669	1334	Average PF at max VA Demand Low	R/Wp	21	DC
48671	1335	Average PF at max VA Demand Very Low	R/Wp	21	DE
48673	1336	Average PF at max VA Demand Dead Band	R/Wp	21	E0
48675	1337	User 1 Frequency V L1 Threshold Trend Enable	R/Wp	21	E2
48677	1338	User 1 Frequency V L1 Time Trend Enable	R/Wp	21	E4
48679	1339	User 1 Frequency V L1 Very High	R/Wp	21	E6
48681	1340	User 1 Frequency V L1 High	R/Wp	21	E8
48683	1341	User 1 Frequency V L1 Low	R/Wp	21	EA
48685	1342	User 1 Frequency V L1 Very Low	R/Wp	21	EC
48687	1343	User 1 Frequency V L1 Dead Band	R/Wp	21	EE
48689	1344	User 2 Frequency V L1 Threshold Trend Enable	R/Wp	21	F0

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48691	1345	User 2 Frequency V L1 Time Trend Enable	R/Wp	21	F2
48693	1346	User 2 Frequency V L1 Very High	R/Wp	21	F4
48695	1347	User 2 Frequency V L1 High	R/Wp	21	F6
48697	1348	User 2 Frequency V L1Low	R/Wp	21	F8
48699	1349	User 2 Frequency V L1 Very Low	R/Wp	21	FA
48701	1350	User 2 Frequency V L1 Dead Band	R/Wp	21	FC
48703	1351	User 3 Frequency V L1 Threshold Trend Enable	R/Wp	21	FE
48705	1352	User 3 Frequency V L1 Time Trend Enable	R/Wp	22	00
48707	1353	User 3 Frequency V L1 Very High	R/Wp	22	02
48709	1354	User 3 Frequency V L1 High	R/Wp	22	04
48711	1355	User 3 Frequency V L1 Low	R/Wp	22	06
48713	1356	User 3 Frequency V L1 Very Low	R/Wp	22	08
48715	1357	User 3 Frequency V L1 Dead Band	R/Wp	22	0A
48717	1358	User 4 Frequency V L1 Threshold Trend Enable	R/Wp	22	0C
48719	1359	User 4 Frequency V L1 Time Trend Enable	R/Wp	22	0E
48721	1360	User 4 Frequency V L1 Very High	R/Wp	22	10
48723	1361	User 4 Frequency V L1 High	R/Wp	22	12
48725	1362	User 4 Frequency V L1 Low	R/Wp	22	14
48727	1363	User 4 Frequency V L1 Very Low	R/Wp	22	16
48729	1364	User 4 Frequency V L1 Dead Band	R/Wp	22	18
48731	1365	User1 Frequency V L2 Threshold Trend Enable	R/Wp	22	1A
48733	1366	User1 Frequency V L2 Time Trend Enable	R/Wp	22	1C
48735	1367	User1 Frequency V L2 Very High	R/Wp	22	1E
48737	1368	User1 Frequency V L2High	R/Wp	22	20

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48739	1369	User1 Frequency V L2 Low	R/Wp	22	22
48741	1370	User1 Frequency V L2 Very Low	R/Wp	22	24
48743	1371	User1 Frequency V L2 Dead Band	R/Wp	22	26
48745	1372	User 2 Frequency V L2 Threshold Trend Enable	R/Wp	22	28
48747	1373	User 2 Frequency V L2 Time Trend Enable	R/Wp	22	2A
48749	1374	User 2 Frequency V L2 Very High	R/Wp	22	2C
48751	1375	User 2 Frequency V L2 High	R/Wp	22	2E
48753	1376	User 2 Frequency V L2 Low	R/Wp	22	30
48755	1377	User 2 Frequency V L2 Very Low	R/Wp	22	32
48757	1378	User 2 Frequency V L2 Dead Band	R/Wp	22	34
48759	1379	User 2 Frequency V L2 Threshold Trend Enable	R/Wp	22	36
48761	1380	User 2 Frequency V L2 Time Trend Enable	R/Wp	22	38
48763	1381	User 2 Frequency V L2 Very High	R/Wp	22	3A
48765	1382	User 2 Frequency V L2 High	R/Wp	22	3C
48767	1383	User 2 Frequency V L2 Low	R/Wp	22	3E
48769	1384	User 2 Frequency V L2 Very Low	R/Wp	22	40
48771	1385	User 2 Frequency V L2 Dead Band	R/Wp	22	42
48773	1386	User 4 Frequency V L2 Threshold Trend Enable	R/Wp	22	44
48775	1387	User 4 Frequency V L2 Time Trend Enable	R/Wp	22	46
48777	1388	User 4 Frequency V L2 Very High	R/Wp	22	48
48779	1389	User 4 Frequency V L2 High	R/Wp	22	4A
48781	1390	User4 Frequency V L2 V Ch B Low	R/Wp	22	4C
48783	1391	User4 Frequency V L2 Very Low	R/Wp	22	4E

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48785	1392	User 4 Frequency V L2 Dead Band	R/Wp	22	50
48787	1393	User 1 Frequency V L3 Threshold Trend Enable	R/Wp	22	52
48789	1394	User 1 Frequency V L3 Time Trend Enable	R/Wp	22	54
48791	1395	User 1 Frequency V L3 Very High	R/Wp	22	56
48793	1396	User 1 Frequency V L3 High	R/Wp	22	58
48795	1397	User 1 Frequency V L3 Low	R/Wp	22	5A
48797	1398	User 1 Frequency V L3 Very Low	R/Wp	22	5C
48799	1399	User 1 Frequency V L3 Dead Band	R/Wp	22	5E
48801	1400	User 2 Frequency V L3 Threshold Trend Enable	R/Wp	22	60
48803	1401	User 2 Frequency V L3 Time Trend Enable	R/Wp	22	62
48805	1402	User 2 Frequency V L3 Very High	R/Wp	22	64
48807	1403	User 2 Frequency V L3 High	R/Wp	22	66
48809	1404	User 2 Frequency V L3 Low	R/Wp	22	68
48811	1405	User 2 Frequency V L3 Very Low	R/Wp	22	6A
48813	1406	User 2 Frequency V L3 Dead Band	R/Wp	22	6C
48815	1407	User 3 Frequency V L3 Threshold Trend Enable	R/Wp	22	6E
48817	1408	User 3 Frequency V L3 Time Trend Enable	R/Wp	22	70
48819	1409	User 3 Frequency V L3 Very High	R/Wp	22	72
48821	1410	User 3 Frequency V L3 High	R/Wp	22	74
48823	1411	User 3 Frequency V L3 Low	R/Wp	22	76
48825	1412	User 3 Frequency V L3 Very Low	R/Wp	22	78
48827	1413	User 3 Frequency V L3 Dead Band	R/Wp	22	7A
48829	1414	User 4 Frequency V L3 Threshold Trend Enable	R/Wp	22	7C

TABLE 8 : Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48831	1415	User 4 Frequency V L3 Time Trend Enable	R/Wp	22	7E
48833	1416	User 4 Frequency V L3 Very High	R/Wp	22	80
48835	1417	User 4 Frequency V L3 High	R/Wp	22	82
48837	1418	User 4 Frequency V L3 Low	R/Wp	22	84
48839	1419	User 4 Frequency V L3 Very Low	R/Wp	22	86
48841	1420	User 4 Frequency V L3 Dead Band	R/Wp	22	88
48899	1449	User 1 Frequency I L3 Threshold Trend Enable	R/Wp	22	C2
48901	1450	User 1 Frequency I L3 Time Trend Enable	R/Wp	22	C4
48903	1451	User 1 Frequency I L3 Very High	R/Wp	22	C6
48905	1452	User 1 Frequency I L3 High	R/Wp	22	C8
48907	1453	User 1 Frequency I Low	R/Wp	22	CA
48909	1454	User 1 Frequency I Very Low	R/Wp	22	CC
48911	1455	User 1 Frequency I Dead Band	R/Wp	22	CE
48913	1456	User 2 Frequency I Threshold Trend Enable	R/Wp	22	D0
48915	1457	User 2 Frequency I Time Trend Enable	R/Wp	22	D2
48917	1458	User 2 Frequency I Very High	R/Wp	22	D4
48919	1459	User 2 Frequency I High	R/Wp	22	D6
48921	1460	User 2 Frequency I Low	R/Wp	22	D8
48923	1461	User 2 Frequency I Very Low	R/Wp	22	DA
48925	1462	User 2 Frequency I Dead Band	R/Wp	22	DC
48927	1463	User 3 Frequency I Threshold Trend Enable	R/Wp	22	DE
48929	1464	User 3 Frequency I Time Trend Enable	R/Wp	22	E0

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48933	1466	User 3 Frequency I High	R/Wp	22	E4
48935	1467	User 3 Frequency I Low	R/Wp	22	E6
48937	1468	User 3 Frequency I Very Low	R/Wp	22	E8
48939	1469	User 3 Frequency I Dead Band	R/Wp	22	EA
48941	1470	User 4 Frequency I L1 Threshold Trend Enable	R/Wp	22	EC
48943	1471	User 4 Frequency I L1 Time Trend Enable	R/Wp	22	EE
48945	1472	User 4 Frequency I L1 Very High	R/Wp	22	F0
48947	1473	User 4 Frequency I L1 High	R/Wp	22	F2
48949	1474	User 4 Frequency I L1 Low	R/Wp	22	F4
48951	1475	User 4 Frequency I L1 Very Low	R/Wp	22	F6
48953	1476	User 4 Frequency I L1 Dead Band	R/Wp	22	F8
48955	1477	User 1 Frequency I L2 Threshold Trend Enable	R/Wp	22	FA
48957	1478	User 1 Frequency I L2 Time Trend Enable	R/Wp	22	FC
48959	1479	User 1 Frequency I L2 Very High	R/Wp	22	FE
48961	1480	User 1 Frequency I L2 High	R/Wp	23	00
48963	1481	User 1 Frequency I L2 Low	R/Wp	23	02
48965	1482	User 1 Frequency I L2 Very Low	R/Wp	23	04
48967	1483	User 1 Frequency I L2 Dead Band	R/Wp	23	06
48969	1484	User 2 Frequency I L2 Threshold Trend Enable	R/Wp	23	08
48971	1485	User 2 Frequency I L2 Time Trend Enable	R/Wp	23	0A
48973	1486	User 2 Frequency I L2 Very High	R/Wp	23	0C
48975	1487	User 2 Frequency I L2 High	R/Wp	23	0E
48977	1488	User 2 Frequency I L2 Low	R/Wp	23	10

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
48979	1489	User 2 Frequency I L2 Very Low	R/Wp	23	12
48981	1490	User 2 Frequency I L2 Dead Band	R/Wp	23	14
48983	1491	User 3 Frequency I L2 Threshold Trend Enable	R/Wp	23	16
48985	1492	User 3 Frequency I L2 Time Trend Enable	R/Wp	23	18
48987	1493	User 3 Frequency I L2 Very High	R/Wp	23	1A
48989	1494	User 3 Frequency I L2 High	R/Wp	23	1C
48991	1495	User 3 Frequency I L2 Low	R/Wp	23	1E
48993	1496	User 3 Frequency I L2 Very Low	R/Wp	23	20
48995	1497	User 3 Frequency I L2 Dead Band	R/Wp	23	22
48997	1498	User 4 Frequency I L2 Threshold Trend Enable	R/Wp	23	24
48999	1499	User 4 Frequency I L2 Time Trend Enable	R/Wp	23	26
49001	1500	User 4 Frequency I L2 Very High	R/Wp	23	28
49003	1501	User 4 Frequency I L2 High	R/Wp	23	2A
49005	1502	User 4 Frequency I L2 Low	R/Wp	23	2C
49007	1503	User 4 Frequency I L2 Very Low	R/Wp	23	2E
49009	1504	User 4 Frequency I L2 Dead Band	R/Wp	23	30
49011	1505	User 1 Frequency I L3 Threshold Trend Enable	R/Wp	23	32
49013	1506	User 1 Frequency I L3 Time Trend Enable	R/Wp	23	34
49015	1507	User 1 Frequency I L3 Very High	R/Wp	23	36
49017	1508	User 1 Frequency I L3 High	R/Wp	23	38
49019	1509	User 1 Frequency I L3 Low	R/Wp	23	3A
49021	1510	User 1 Frequency I L3 Very Low	R/Wp	23	3C
49023	1511	User 1 Frequency I L3 Dead Band	R/Wp	23	3E

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
49025	1512	User 2 Frequency I L3 Threshold Trend Enable	R/Wp	23	40
49027	1513	User 2 Frequency I L3 Time Trend Enable	R/Wp	23	42
49029	1514	User 2 Frequency I L3 Very High	R/Wp	23	44
49031	1515	User 2 Frequency I L3 High	R/Wp	23	46
49033	1516	User 2 Frequency I L3 Low	R/Wp	23	48
49035	1517	User 2 Frequency I L3 Very Low	R/Wp	23	4A
49037	1518	User 2 Frequency I L3 Dead Band	R/Wp	23	4C
49039	1519	User 3 Frequency I L3 Threshold Trend Enable	R/Wp	23	4E
49041	1520	User 3 Frequency I L3 Time Trend Enable	R/Wp	23	50
49043	1521	User 3 Frequency I L3 Very High	R/Wp	23	52
49045	1522	User 3 Frequency I L3 High	R/Wp	23	54
49047	1523	User 3 Frequency I L3 Low	R/Wp	23	56
49049	1524	User 3 Frequency I L3 Very Low	R/Wp	23	58
49051	1525	User 3 Frequency I L3 Dead Band	R/Wp	23	5A
49053	1526	User 4 Frequency I L3 Threshold Trend Enable	R/Wp	23	5C
49055	1527	User 4 Frequency I L3 Time Trend Enable	R/Wp	23	5E
49057	1528	User 4 Frequency I L3 Very High	R/Wp	23	60
49059	1529	User 4 Frequency I L3 High	R/Wp	23	62
49061	1530	User 4 Frequency I L3 Low	R/Wp	23	64
49063	1531	User 4 Frequency I L3 Very Low	R/Wp	23	66
49065	1532	User Frequency4 I L3 Dead Band	R/Wp	23	68
49123	1561	Trend Intervals. Demand Sub Interval	R/Wp	23	A2

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
49125	1562	. No. of Demand Sub Interval	R/Wp	23	A4
49127	1563	Trend Intervals. Standard	R/Wp	23	A6
49131	1565	Trend Intervals. Harmonics	R/Wp	23	AA
49149	1574	En50160 Strict Compliance Mode Selection	R/Wp	23	BC
49151	1575	En50160 Islanded Mode Selection	R/Wp	23	BE
49153	1576	Power Frequency Pass percentage	R/Wp	23	C0
49155	1577	Supply Voltage Variation Pass percentage	R/Wp	23	C2
49157	1578	Supply Voltage Unbalance Pass percentage	R/Wp	23	C4
49159	1579	Harmonic Voltage Pass percentage	R/Wp	23	C6
49161	1580	Inter Harmonic Voltage Pass percentage	R/Wp	23	C8
49163	1581	Power Frequency 95% Minimum(%)	R/Wp	23	CA
49165	1582	Power Frequency 95% Maximum(%)	R/Wp	23	CC
49167	1583	Power Frequency 100% Minimum(%)	R/Wp	23	CE
49169	1584	Power Frequency 100% Maximum(%)	R/Wp	23	D0
49171	1585	Supply Voltage Variation 95% Minimum(%)	R/Wp	23	D2
49173	1586	Supply Voltage Variation 95% Maximum(%)	R/Wp	23	D4
49175	1587	Supply Voltage Variation 100% Minimum(%)	R/Wp	23	D6
49177	1588	Supply Voltage Variation 100% Maximum(%)	R/Wp	23	D8
49179	1589	Unbalance Maximum(%)	R/Wp	23	DA
49181	1590	THD Maximum(%)	R/Wp	23	DC
49183	1591	TID Maximum(%)	R/Wp	23	DE
49185	1592	Individual Harmonic Limits 2	R/Wp	23	E0
49187	1593	Individual Harmonic Limits 3	R/Wp	23	E2

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
49189	1594	Individual Harmonic Limits 4	R/Wp	23	E4
49191	1595	Individual Harmonic Limits 5	R/Wp	23	E6
49193	1596	Individual Harmonic Limits 6	R/Wp	23	E8
49195	1597	Individual Harmonic Limits 7	R/Wp	23	EA
49197	1598	Individual Harmonic Limits 8	R/Wp	23	EC
49199	1599	Individual Harmonic Limits 9	R/Wp	23	EE
49201	1600	Individual Harmonic Limits 10	R/Wp	23	F0
49203	1601	Individual Harmonic Limits 11	R/Wp	23	F2
49205	1602	Individual Harmonic Limits 12	R/Wp	23	F4
49207	1603	Individual Harmonic Limits 13	R/Wp	23	F6
49209	1604	Individual Harmonic Limits 14	R/Wp	23	F8
49211	1605	Individual Harmonic Limits 15	R/Wp	23	FA
49213	1606	Individual Harmonic Limits 16	R/Wp	23	FC
49215	1607	Individual Harmonic Limits 17	R/Wp	23	FE
49217	1608	Individual Harmonic Limits 18	R/Wp	24	00
49219	1609	Individual Harmonic Limits 19	R/Wp	24	02
49221	1610	Individual Harmonic Limits 20	R/Wp	24	04
49223	1611	Individual Harmonic Limits 21	R/Wp	24	06
49225	1612	Individual Harmonic Limits 22	R/Wp	24	08
49227	1613	Individual Harmonic Limits 23	R/Wp	24	0A
49229	1614	Individual Harmonic Limits 24	R/Wp	24	0C
49231	1615	Individual Harmonic Limits 25	R/Wp	24	0E
49233	1616	Group Inter Harmonic Limits 2	R/Wp	24	10

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
49235	1617	Group Inter Harmonic Limits 3	R/Wp	24	12
49237	1618	Group Inter Harmonic Limits 4	R/Wp	24	14
49239	1619	Group Inter Harmonic Limits 5	R/Wp	24	16
49241	1620	Group Inter Harmonic Limits 6	R/Wp	24	18
49243	1621	Group Inter Harmonic Limits 7	R/Wp	24	1A
49245	1622	Group Inter Harmonic Limits 8	R/Wp	24	1C
49247	1623	Group Inter Harmonic Limits 9	R/Wp	24	1E
49249	1624	Group Inter Harmonic Limits 10	R/Wp	24	20
49251	1625	Group Inter Harmonic Limits 11	R/Wp	24	22
49253	1626	Group Inter Harmonic Limits 12	R/Wp	24	24
49255	1627	Group Inter Harmonic Limits 13	R/Wp	24	26
49257	1628	Group Inter Harmonic Limits 14	R/Wp	24	28
49259	1629	Group Inter Harmonic Limits 15	R/Wp	24	2A
49261	1630	Group Inter Harmonic Limits 16	R/Wp	24	2C
49263	1631	Group Inter Harmonic Limits 17	R/Wp	24	2E
49265	1632	Group Inter Harmonic Limits 18	R/Wp	24	30
49267	1633	Group Inter Harmonic Limits 19	R/Wp	24	32
49269	1634	Group Inter Harmonic Limits 20	R/Wp	24	34
49271	1635	Group Inter Harmonic Limits 21	R/Wp	24	36
49273	1636	Group Inter Harmonic Limits 22	R/Wp	24	38
49275	1637	Group Inter Harmonic Limits 23	R/Wp	24	3A
49277	1638	Group Inter Harmonic Limits 24	R/Wp	24	3C
49279	1639	Group Inter Harmonic Limits 25	R/Wp	24	3E

TABLE 8: Continued...

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
49283	1656	Model Number	R/Wp	24	42
49293	1661	Serial Number	R/Wp	24	4C
49303	1666	Front End Version	R/Wp	24	56
49305	1667	Back End Version	R/Wp	24	58
49307	1668	DSP Version	R/Wp	24	5A
49309	1669	PIC Version	R/Wp	24	5C
49311	1670	Firmware Version	R/Wp	24	5E

Table 9: Explanation For 4 X Registers

Address	Parameter	Description
46005	Energy Resolution	This address is used to set energy resolution in Wh, kWh & MWh. Write one of the following value to this address. 1=Energy in Wh 2=Energy in Kwh 3=Energy in Mwh But for system power greater than equal to 30 MVA, Wh resolution cannot be set.
46007	System Voltage	This address is read only and displays System Voltage.
46009	System Current	This address is read only and displays System Current.
46011	System Type	This address is used to set the system type. Write one of the following value to this address. 2= 3 Phase 3 Wire, 3= 3 Phase 4 Wire
46015	Reset Parameter	This address is used to reset different parameters. Write specific value to this register to reset the corresponding parameter. Writing any other value will return an error. Following are the values to reset various data. 1: Energy Reset 2: Demand Reset 4: Minimum and Maximum Reset 8: Reset All 16: Factory Default
46019	Rs485 Set-Up Code	This address is used to set the baud rate, Parity, Number of stop bits. Refer to TABLE 14 for details.

Table 9 : Continued

Address	Paramter	Description
46021	Node Address	This address is used to set device address between 1 to 247.
46033	PT Primary	This address allows the user to set PT Primary value. The settable range is 100 VL-L to 9999 kVL-L for 3 phase, 3 wire system type & 57VL-N to 9999 KVL-L for 3 phase 4 wire.But also depends on the per phase 1700 MVA restriction of power combined with CT Primary.
46035	CT Primary	This address allows the user to set CT Primary value. The settable range is 1 to 9999A for both system type. It also depends on the per phase 1700 MVA restriction of power combined with PT Primary.
46037	System Power	System power is (Read only) is the nominal system power based on the values of nominal system voltage and current.
46039	Energy Digit Reset Count	This address is used to set Energy Digit Reset Count. Energy count can be configured to reset in between 7 to 9.
46041	Register Order	Word Order controls the order in which Meter receives or sends floating - point numbers:- normal or reversed register order . In normal mode, the two registers that make up a floating point numbers are sent most significant bytes first. In reversed register mode , the two registers that make up a floating point numbers are sent least significant bytes first. To set the mode, write the value ‘ 2141.0’ into this register-the instrument will detect the order used to send this value and set that order for all ModBus transaction involving floating point numbers.

Table 9: Continued

Address	Paramter	Description
46043	CT Secondary	This address is used to read and write the CT secondary value. Write one of the following values to this address. 1: 1A CT secondary 5: 5A CT secondary writing any other value will return an error.
46045	PT Secondary	This address is used to read and write the PT secondary value. The settable range is 57V to 500V(L-N) for 3phase, 4 wire system & 100V to 867V(L-L) for 3phase, 3wire system.
46049	Limit 1 Parameter Select	This address is used to assign the parameter to relay 1.refer table no. 15 for parameter number.
46051	Limit 1 Trip Point	This address is used to set the trip point in %. refer table 15 for High alarm and low alarm value Writing any other value will return an error.
46053	Limit 1 Hysteresis	This address is used to set the hysteresis between 0.5 to 50.0%. Writing any other value will return an error.
46055	Limit 1 Delay (on)	This address is used to set the Energizing delay between 1 to 10 . Writing any other value will return an error.
46057	Limit 1 Delay (off)	This address is used to set the De-Energizing delay between 1 to 10 . Writing any other value will return an error.
46061	Limit 2 Parameter Select	This address is used to assign the parameter to relay 2.refer table no. 15 for parameter number.
Note:Limit 2 delay (on) , Limit 2 delay (Off),Limit 2 Hysteresis settings are done in similar manner as limit1 settings.		

Table 9 : Continued

Address	Parameter	Discription
46071	Password	This address is used to set & reset the password. Valid Range of Password can be set is 0000 - 9999 . 1) If password lock is present & if this location is read it will return zero. 2) If Password lock is absent & if this location is read it will return One. 3) If password lock is present & to disable this lock first send valid password to this location then write “0000” to this location 4) If password lock is present & to modify 4X parameter first send valid password to this location so that 4X parameter will be accessible for modification. 5) If for in any of the above case invalid password is send then meter will return exceptional error 2.
46073	Limit 1 Configuration	This address is used to set configuration for Relay 1. see Table no. 13 .Writing any other value will return error.
46081	Energy update rate	This address is used to specify update rate of energy in corresponding 3X register. The valid values for update rate are from 1 to 60 mins. Writing any other value will return an error.

Note: limit 2 configuration settings are same as limit 1 configuration ,for limit 2 configuration 46075 address is used.

Table 9: Continued

Address	Parameter	Discription
46083	Harmonic Data	See Table 17 for harmonic Data for setting
46085	InterHarmonic Data	See Table 18 for Interharmonic Data for setting.
46087	Impulse Selection	This address is used to assign impulse to following parameters by writing: 1: Active energy 2: Apparent energy 3: Reactive energy
46089	Harmonic / Interharmonic Number Relay 1	This address is used to configure relay for particular harmonic or interharmonic order for relay 1. valid range is 1 to 63.
46091	Harmonic / Interharmonic Number Relay 2	This address is used to configure relay for particular harmonic or interharmonic order for relay 2. valid range is 1 to 63
46157	Date Format	This address is used to set various date format. Following format are allowed by writing corresponding value. 1= month/date/year (mm/dd/yyyy) 2=date/month/year (dd/mm/yyyy) 3=Year/month/date (yyyy/mm/dd)

Table 9 : Continued

Address	Parameter	Discription
46159	Time Format	This address is used to set various time format. Following format are allowed by writing corresponding value. 2=AM/PM 3=24 Hour
46161	Clock sec	This address is used to set the seconds parameter of clock.
46163	Clock Min	This address is used to set the minute parameter of clock.
46165	Clock hour	This address is used to set the hour parameter of clock.
46167	Clock Date	This address is used to set date parameter of clock.
46169	Clock Month	This address is used to set month parameter of clock.
46171	Clock Year	This address is used to set Year parameter of clock.
46173	Brightness	This address is used to set brightness of screen in percentage. valid range is 5 to 100%.
46185	Red color code of VL1	This address is used to set or read the red component of color used to display phase 1 parameter. The valid range is 0 to 255.
46187	Green color code of VL1	This address is used to set or read Green component of color used to display phase 1 parameter. The valid range is 0 to 255.
46189	Blue color code of VL1	This address is used to set or read Blue component of color used to display phase 1 parameter. The valid range is 0 to 255.

Table 9: Continued

Address	Parameter	Discription
46191	Red color code of VL2	This address is used to set or read the red component of color used to display phase 2 parameters. The valid range is 0 to 255.
46193	Green color code of VL2	This address is used to set or read the Green component of color used to display phase 2 parameters. The valid range is 0 to 255.
46195	Blue color code of VL2	This address is used to set or read the Blue component of color used to display phase 2 parameters. The valid range is 0 to 255.
46197	Red color code of VL3	This address is used to set or read the Red component of color used to display phase 3 parameters. The valid range is 0 to 255.
46199	Green color code of VL3	This address is used to set or read the Green component of color used to display phase 3 parameters. The valid range is 0 to 255.
46201	Blue color code of VL3	This address is used to set or read the Blue component of color used to display phase 3 parameters. The valid range is 0 to 255.
Note: Similarly user can set for red,green,blue color code for IL1,IL2,IL3		
46221	Nominal Frequency	This address is used to set or read nominal Frequency. It can be 50 or 60 Hz.
46223	Recording Mode	This address is used to set recording mode. Valid modes are 1: Basic Mode 2: EN50160 mode
46225	User 1 Frequency V L1	This address is used to set or read User 1 Frequency for Voltage V L1. Note: Similarly user can set for V L2 and V L3 for all user frequencies at corresponding address. Frequency must be in multiple of 5 and should not be greater than 4160..

Table 9: Continued

Address	Parameter	Discription
46257	User1 Frequency I L1	This address is used to set or read User 1 Frequency for Current I L1. Note: Similarly we can set for I L2 and I L3 for all user frequencies at corresponding address. Valid range is same as voltage user frequency.
46289	Voltage Event Threshold Enable	This address is used to enable voltage event for swell, dips, interruption. 0: Disable 1:Enable
46291	Vrms V Hysteresis.	This address is used to set or read the hysteresis value for voltage event .valid range is 1% to 20%
46293	Vrms VL1 Swell threshold	This address is used to set or read the threshold value for swell of VL1.Valid range is 110 to150%
46295	Vrms VL1 Dip threshold	This address is used to set or read the threshold value for dip event of VL1.Valid range is 90 to1%
46297	Vrms VL1 Intr threshold	This address is used to set or read the threshold value for interruption of VL1.Valid range is 10 to 1%
46317	Current Event Threshold Enable	This address is used to enable current event for swell, dips, interruption. 0: Disable 1:Enable
46319	Irms Hysteresis	This address is used to set or read the hysteresis value for current event .valid range is 1% to 20%
46321	Irms IL1 Swell threshold	This address is used to set or read the threshold value for swell of IL1.Valid range is 110 to150%
46323	Irms IL1 Dip threshold	This address is used to set or read the threshold value for dip event of IL1.Valid range is 90 to1%
46325	Irms IL1 Intr. threshold	This address is used to set or read the threshold value for interruption of IL1.Valid range is 10 to 1%

Table 9: Continued

Address	Parameter	Discription
46353	No. of cycles to capture Pre event	This address is used to set or read the pre trigger cycles to be observed in waveform. The value can be set between 1 to 30.
46355	No. of cycles to capture Post event	This address is used to set or read the post trigger cycles to be observed in waveform. The value can be set between 1 to 30.
46357	Vrms VL1 threshold trend enable	This address is used to enable voltage threshold trend. 1= Enable 0= Disable
46359	Vrms VL1 time trend enable	This address is used to enable voltage time trend. 1= Enable 0= Disable
46361	Measured Vrms VL1 Very High	This address is used to set the very high limit for threshold based trend. For limits refer table 10.
46363	Measured Vrms VL1 High	This address is used to set the high limit for threshold based trend. For limits refer table 10.
46365	Measured Vrms VL1 Low	This address is used to set the low limit for threshold based trend. for limits refer table 10.
46367	Measured Vrms VL1 Very Low	This address is used to set the very low limit for threshold based trend. For limits refer table 10.
46369	Measured Vrms VL1 Dead Band	This address is used to set dead band limit for threshold based trend. For limits refer table 10.
Note: All trend parameter settings is done in similar manner as above. Limits are viewed in Table 10.		

Table 9: Continued

Address	Parameter	Discription
49123	Trend interval Demand sub interval	This address is used to set Demand sub interval, subinterval can set only in seconds . user can set value as 0,10,30,60,180,300,600,900,1800,3600.
49125	No. of subinterval	This address is used to set no. of Demand sub interval, user can set value between 1 to 6
49127	Trend interval standard	This address is used to set standard interval, Interval can set only in seconds . user can set value as 0,10,30,60,180,300,600,900,1800,3600.
49131	Trend Interval harmonics	This address is used to set interval for harmonics interval can set only in seconds . user can set value as 0,10,30,60,180,300,600,900,1800,3600.
49149	En50160 strict compliance	This address is used to enable strict complaince mode of std En50160. 0: Enable 1: disable Note :When Strict compliance mode selected user cannot assign pass percentage and limits

Table 9: Continued

Address	Parameter	Discription
49151	En50160 Islanded Mode	This address is used to enable Islanded mode of std En50160. 0: Enable 1: disable Note :When Strict compliance mode selected then user cannot enable Islanded mode
49153	Power Frequency pass percentage	This address is used to read or set the power frequency for islanded mode.Valid range is >0.01 to <100
49155	Supply Voltage Variation pass percentage	This address is used to read or set supply voltage variation percentage.Valid range is >0.01 to< 100.
49157	Supply voltage unbalance pass percentage	This address is used to read or set supply voltage unbalance percentage.Valid range is >0.01 to< 100
49159	Harmonic Voltage pass percentage	This address is used to read or set harmonic voltage percentage.Valid range is >0.01 to< 100
49161	Interharmonic Voltage pass percentage	This address is used to read or set interharmonic voltage percentage.Valid range is >0.01 to< 100
49163	Power Frequency 95% Lower	This address is used to read or set Power frequency min limit value. Valid range is >0.01 to< 100 note : Limit set at pass percentage will be shown on display title.
49165	Power Frequency 95% Higher	This address is used to read or set Power Frequency Max limit value.Valid range is >0.01 to< 100 note : Limit set at pass percentage will be shown on display title.

Table 9: Continued

Address	Parameter	Discription
49167	Power Frequency 100% Lower	This address is used to read or set Power Frequency 100% Min limit value.
49169	Power Frequency 100% Higher	This address is used to read or set Power Frequency 100% Max limit value.
49171	Supply voltge variation 95% Lower	This address is used to read or set supply voltage min limit value. note : Limit set at pass percentage will be shown on display title.
49173	Supply voltage variation 95% Higher	This address is used to read or set supply voltage max limit value. note : Limit set at pass percentage will be shown on display title.
49175	Supply voltage variation 100% Lower	This address is used to read or set supply voltage 100% min limit value.

Table 9: Continued

Address	Parameter	Discription
49177	Supply voltage variation 100% Higher	This address is used to read or set supply voltage variation 100 % max limit value.valid range is >0.01 to< 100.
49179	Unbalance Max	This address is used to read or set unbalance max limit value.Valid range is >0.01 to< 100.
49181	THD Max(%)	This address is used to read or set THD Max(%) limit value Valid range is >0.01 to< 100
49183	TID Max(%)	This address is used to read or set TID Max(%) limit value.Valid range is >0.01 to< 100
49185	Individual harmonic Limit 2	This address is used to read or set individual harmonic limit for harmonic number 2.Valid range is >0.01 to< 100
Note: Similar to above, we can set value for individual harmonic number upto 25.		
49233	Group Interharmonic Limit 2	This address is used to set or read the group interharmonic limit for interharmonic group number 2.Valid range is >0.01 to< 100.
Note: Similar to above, we can set value for group interharmonic number upto 25.		
49283	Model number	This address shows model number.
49293	Serial number	This address shows serial number.
49303	Front end version	This address shows front end version
49305	Back end Version	This address shows Back end version
49307	DSP version	This address shows DSP version
49309	PIC version	This address shows PIC version
49311	Firmware version	This address shows Firmware version

Table 10: Limit Table For Trend Parameters

Parameter	Very High	High	Low	Very Low	Dead Band
Voltage RMS	<=PT Primary*1.5	>=PT Primary	< PT Primary	>=0	<=PT Primary*0.2
Current RMS	<=PT Primary*2	>=CT Primary	< CT Primary	>=0	<=CT Primary*0.2
Frequency	<=70	>=Nominal Frequency	< Nominal Frequency	>=40	<=Nominal Freq*0.2
Computed Voltage	<=PT Primary*1.5* 1.7320	>=PT Primary*1.7320	< PT Primary* 1.7320	>=0	<=PT Primary*0.2
Active Power(Watt)	<=PT Primary*CT Primary*2*1.5	>=PT Primary*CT Primary	< PT Primary*CT Primary	>=0	<=PT Primary*CT Primary*0.2
Total Active Power	<=PT Primary*CT Primary*2*1.5* (Mult_Factor)	>=PT Primary*CT Primary*(Mult_Factor)	< PT Primary*CT Primary*(Mult_Factor)	>=0	<=PT Primary*CT Primary*(Mult_Factor)*0.2

Note: (Mult_Factor)=3(For 3 Phase 4 Wire)
(Mult_Factor)=1.732050808(For 3 Phase 3 Wire)

Note: Very High > High > Low > Very Low

Table 10 : Continued

Parameter	Very High	High	Low	Very Low	Dead Band
Apparent Power(VA)	<=PT Primary*CT Primary*2*1.5	>=PT Primary*CT Primary	< PT Primary*CT Primary	>=0	<=PT Primary*CT Primary*0.2
Total Apparent Power	<=PT Primary*CT Primary*2*1.5* (Mult_Factor)	>=PT Primary*CT Primary*(Mult_ Factor)	< PT Primary*CT Primary*(Mult_F actor)	>=0	<=PT Primary*CT Primary*(Mult _Factor)*0.2
Reactive Power(VAR)	<=PT Primary*CT Primary*2*1.5	>=PT Primary*CT Primary	< PT Primary*CT Primary	>=0	<=PT Primary*CT Primary*0.2
Total Reactive Power	<=PT Primary*CT Primary*2*1.5* (Mult_Factor)	>=PT Primary*CT Primary*(Mult_ Factor)	< PT Primary*CT Primary*(Mult_F actor)	>=0	<=PT Primary*CT Primary*(Mult _Factor)*0.2
Power Factor	>1	-	-	< -1	>0.2
Total power factor	> 1	-	-	< -1	> 0.6

Note: Very High > High > Low > Very Low

Note: (Mult_Factor)=3(For 3 Phase 4 Wire)
(Mult_Factor)=1.732050808(For 3 Phase 3 Wire)

Table 10: Continued

Parameter	Very High	High	Low	Very Low	Dead Band
Active(Watt) Demand	<=PT Primary*CT Primary*2*1.5 *(Mult_Factor)	>=PT Primary*CT Primary*(Mult _Factor)	< PT Primary*CT Primary*(Mult _Factor)	>=0	<=PT Primary*CT Primary*(Mult _Factor)*0.2
Apparent (VA) Demand	<=PT Primary*CT Primary*2*1.5 *(Mult_Factor)	>=PT Primary*CT Primary*(Mult _Factor)	< PT Primary*CT Primary*(Mult _Factor)	>=0	<=PT Primary*CT Primary*(Mult _Factor)*0.2
Reactive (VAR) Demand	<=PT Primary*CT Primary*2*1.5 *(Mult_Factor)	>=PT Primary*CT Primary*(Mult _Factor)	< PT Primary*CT Primary*(Mult _Factor)	>=0	<=PT Primary*CT Primary*(Mult _Factor)*0.2
Current Demand	<=CT Primary*2	>=CT Primary	< CT Primary	>=0	<=CT Primary*0.2
Energy	-	-	-	-	-
Signed Power	-	-	-	-	-

Note: Very High > High > Low > Very Low

Note: (Mult_Factor)=3(For 3 Phase 4 Wire)
(Mult_Factor)=1.732050808(For 3 Phase 3 Wire)

Table 10: Continued

Parameter	Very High	High	Low	Very Low	Dead Band
Unsigned Power	-	-	-	-	-
Voltage Crest Factor	< 1.8	-	-	-	< 0.2*1.8
Current Crest Factor	<3	-	-	-	< 0.2*3
Voltage TID % Fund	< 100	-	-	-	<0.2*100
Voltage TID RSS	<=PT Primary*1.5	>=PT Primary	< PT Primary	>=0	<=PT Primary*0.2
Current TID % Fund	< 100	-	-	-	< 0.2*100
Current TID RSS	<=CT Primary*2	>=CT Primary	< CT Primary	>=0	<=CT Primary*0.2
Voltage THD % Fund	< 100	-	-	-	<0.2*100
Voltage THD RSS	<=PT Primary*1.5	>=PT Primary	< PT Primary	>=0	<=PT Primary*0.2

Note: (Mult_Factor)=3(For 3 Phase 4 Wire)
(Mult_Factor)=1.732050808(For 3 Phase 3 Wire)

Table 10: Continued

Parameter	Very High	High	Low	Very Low	Dead Band
Current THD RSS	<=CT Primary *2	>=CT Primary	< CT Primary	>=0	<=CT Primary*0.2
Positive Sequence Voltage	<=PT Primary*1.5	>=PT Primary	< PT Primary	>=0	<=PT Primary*0.2
Negative Sequence Voltage	<=PT Primary*1.5	>=PT Primary	< PT Primary	>=0	<=PT Primary*0.2
Zero Sequence Voltage	<=PT Primary*1.5	>=PT Primary	< PT Primary	>=0	<=PT Primary*0.2
Positive Sequence Current	<=CT Primary*2	>=CT Primary	< CT Primary	>=0	<=CT Primary*0.2
Negative Sequence Current	<=CT Primary*2	>=CT Primary	< CT Primary	>=0	<=CT Primary*0.2
Zero Sequence Current	<=CT Primary*2	>=CT Primary	< CT Primary	>=0	<=CT Primary*0.2

Note: Very High > High > Low > Very Low

Note: (Mult_Factor)=3(For 3 Phase 4 Wire)
(Mult_Factor)=1.732050808(For 3 Phase 3 Wire)

Table 10: Continued

Parameter	Very High	High	Low	Very Low	Dead Band
Voltage Unbalance RMS/RMS_Avg	-	-	> 0	-	>0
Voltage Unbalance S2/S1	-	-	> 0	-	>0
Voltage Unbalance S0/S1	-	-	> 0	-	>0
Current Unbalance RMS/RMS_Avg	-	-	> 0	-	>0
Current Unbalance S2/S1	-	-	> 0	-	>0
Current Unbalance S0/S1	-	-	> 0	-	>0

Note: Very High > High > Low > Very Low

Note: (Mult_Factor)=3(For 3 Phase 4 Wire)
(Mult_Factor)=1.732050808(For 3 Phase 3 Wire)

Table 10: Continued

Parameter	Very High	High	Low	Very Low	Dead Band
Voltage Imbalance Max (%)	-	-	> 0	-	>0
Current Imbalance Max (%)	-	-	> 0	-	>0
User Frequency	<=PT Primary*1.5	>=PT Primary	< PT Primary	>=0	<=PT Primary*0.2
User Frequency Current	<=CT Primary*2	>=CT Primary	< CT Primary	>=0	<=CT Primary*0.2
Arithmetic Sum Power Factor	< 1	-	-	> -1	< 0.2
Arithmetic Sum Distortion Power Factor	< 1	-	-	> -1	< 0.2

Note: Very High > High > Low > Very Low

Note: (Mult_Factor)=3(For 3 Phase 4 Wire)
(Mult_Factor)=1,732050808(For 3 Phase 3 Wire)

Table 10 : Continued

Parameter	Very High	High	Low	Very Low	Dead Band
Arithmetic Sum VA	<=PT Primary*CT Primary*2* 1.5* (Mult_Factor)	>=PT Primary* CT Primary * (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)
Fund Arithmetic Sum VA	<=PT Primary*CT Primary*2* 1.5* (Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)
Vector Sum Power Factor	< 1	-	-	> -1	< 0.2
Vector Sum Distortion Power Factor	< 1	-	-	> -1	< 0.2
Vector Sum VA	<=PT Primary*CT Primary*2*1.5* (Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)
Fund Vector Sum VA	<=PT Primary*CT Primary*2* 1.5* (Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)

Table 10: Continued

Parameter	Very High	High	Low	Very Low	Dead Band
VA Demand at Max VAr	<=PT Primary*CT Primary*2*1.5*(Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)
VA Demand at Max watt	<=PT Primary*CT Primary*2*1.5* (Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)
VAr Demand at Max VA	<=PT Primary*CT Primary*2*1.5* (Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)
VAr Demand at Max watt	<=PT Primary*CT Primary*2*1.5* (Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)
Watt Demand at max VA	<=PT Primary*CT Primary*2*1.5* (Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)

Table 10: Continued

Parameter	Very High	High	Low	Very Low	Dead Band
Watt Demand at max VAr	<=PT Primary*CT Primary*2*1.5*(Mult_Factor)	>=PT Primary*CT Primary* (Mult_Factor)	< PT Primary*CT Primary* (Mult_Factor)	>=0	<=PT Primary*CT Primary*0.2* (Mult_Factor)

Note: Very High > High > Low > Very Low

Note: (Mult_Factor)=3(For 3 Phase 4 Wire)
(Mult_Factor)=1.732050808(For 3 Phase 3 Wire)

Parameter	Very High	High	Low	Very Low	Dead Band
Average PF at Max watt demand	< 1	-	-	> -1	< 0.2
Average PF at Max VAr demand	< 1	-	-	> -1	< 0.2
Average PF at Max VA demand	< 1	-	-	> -1	< 0.2

Note: Very High > High > Low > Very Low

TABLE 11 : User Assignable 3X Data Registers

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
35501	Assignable Reg 1	15	7C
35503	Assignable Reg 2	15	7E
35505	Assignable Reg 3	15	80
35507	Assignable Reg 4	15	82
35509	Assignable Reg 5	15	84
35511	Assignable Reg 6	15	86
35513	Assignable Reg 7	15	88
35515	Assignable Reg 8	15	8A
35517	Assignable Reg 9	15	8C
35519	Assignable Reg 10	15	8E
35521	Assignable Reg 11	15	90
35523	Assignable Reg 12	15	92
35525	Assignable Reg 13	15	94
35527	Assignable Reg 14	15	96
35529	Assignable Reg 15	15	98
35531	Assignable Reg 16	15	9A
35533	Assignable Reg 17	15	9C
35535	Assignable Reg 18	15	9E
35537	Assignable Reg 19	15	A0
35539	Assignable Reg 20	15	A2

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
35541	Assignable Reg 21	15	A4
35543	Assignable Reg 22	15	A6
35545	Assignable Reg 23	15	A8
35547	Assignable Reg 24	15	AA
35549	Assignable Reg 25	15	AC
35551	Assignable Reg 26	15	AE
35553	Assignable Reg 27	15	B0
35555	Assignable Reg 28	15	B2
35557	Assignable Reg 29	15	B4
35559	Assignable Reg 30	15	B6
35561	Assignable Reg 31	15	B8
35563	Assignable Reg 32	15	BA
35565	Assignable Reg 33	15	BC
35567	Assignable Reg 34	15	BE
35569	Assignable Reg 35	15	C0
35571	Assignable Reg 36	15	C2
35573	Assignable Reg 37	15	C4
35575	Assignable Reg 38	15	C6
35577	Assignable Reg 39	15	C8
35579	Assignable Reg 40	15	CA

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
35581	Assignable Reg 41	15	CC
35583	Assignable Reg 42	15	CE
35585	Assignable Reg 43	15	D0
35587	Assignable Reg 44	15	D2
35589	Assignable Reg 45	15	D4
35591	Assignable Reg 46	15	D6
35593	Assignable Reg 47	15	D8
35595	Assignable Reg 48	15	DA
35597	Assignable Reg 49	15	DC
35599	Assignable Reg 50	15	DE
35601	Assignable Reg 51	15	E0
35603	Assignable Reg 52	15	E2
35605	Assignable Reg 53	15	E4
35607	Assignable Reg 54	15	E6
35609	Assignable Reg 55	15	E8
35611	Assignable Reg 56	15	EA
35613	Assignable Reg 57	15	EC
35615	Assignable Reg 58	15	EE
35617	Assignable Reg 59	15	F0
35619	Assignable Reg 60	15	F2

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
35621	Assignable Reg 61	15	F4
35623	Assignable Reg 62	15	F6
35625	Assignable Reg 63	15	F8
35627	Assignable Reg 64	15	FA
35629	Assignable Reg 65	15	FC
35631	Assignable Reg 66	15	FE
35633	Assignable Reg 67	16	00
35635	Assignable Reg 68	16	02
35637	Assignable Reg 69	16	04
35639	Assignable Reg 70	16	06
35641	Assignable Reg 71	16	08
35643	Assignable Reg 72	16	0A
35645	Assignable Reg 73	16	0C
35647	Assignable Reg 74	16	0E
35649	Assignable Reg 75	16	10
35651	Assignable Reg 76	16	12
35653	Assignable Reg 77	16	14
35655	Assignable Reg 78	16	16
35657	Assignable Reg 79	16	18
35659	Assignable Reg 80	16	1A

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
35661	Assignable Reg 81	16	1C
35663	Assignable Reg 82	16	1E
35665	Assignable Reg 83	16	20
35667	Assignable Reg 84	16	22
35669	Assignable Reg 85	16	24
35671	Assignable Reg 86	16	26
35673	Assignable Reg 87	16	28
35675	Assignable Reg 88	16	2A
35677	Assignable Reg 89	16	2C
35679	Assignable Reg 90	16	2E
35681	Assignable Reg 91	16	30
35683	Assignable Reg 92	16	32
35685	Assignable Reg 93	16	34
35687	Assignable Reg 94	16	36
35689	Assignable Reg 95	16	38
35691	Assignable Reg 96	16	3A
35693	Assignable Reg 97	16	3C
35695	Assignable Reg 98	16	3E
35697	Assignable Reg 99	16	40
35699	Assignable Reg 100	16	42

TABLE 12: User Assignable 4X Mapped Data Registers

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
49501	Assignable Reg 1	25	1C
49502	Assignable Reg 2	25	1D
49503	Assignable Reg 3	25	1E
49504	Assignable Reg 4	25	1F
49505	Assignable Reg 5	25	20
49506	Assignable Reg 6	25	21
49507	Assignable Reg 7	25	22
49508	Assignable Reg 8	25	23
49509	Assignable Reg 9	25	24
49510	Assignable Reg 10	25	25
49511	Assignable Reg 11	25	26
49512	Assignable Reg 12	25	27
49513	Assignable Reg 13	25	28
49514	Assignable Reg 14	25	29
49515	Assignable Reg 15	25	2A
49516	Assignable Reg 16	25	2B
49517	Assignable Reg 17	25	2C
49518	Assignable Reg 18	25	2D
49519	Assignable Reg 19	25	2E
49520	Assignable Reg 20	25	2F

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
49521	Assignable Reg 21	25	30
49522	Assignable Reg 22	25	31
49523	Assignable Reg 23	25	32
49524	Assignable Reg 24	25	33
49525	Assignable Reg 25	25	34
49526	Assignable Reg 26	25	35
49527	Assignable Reg 27	25	36
49528	Assignable Reg 28	25	37
49529	Assignable Reg 29	25	38
49530	Assignable Reg 30	25	39
49531	Assignable Reg 31	25	3A
49532	Assignable Reg 32	25	3B
49533	Assignable Reg 33	25	3C
49534	Assignable Reg 34	25	3D
49535	Assignable Reg 35	25	3E
49536	Assignable Reg 36	25	3F
49537	Assignable Reg 37	25	40
49538	Assignable Reg 38	25	41
49539	Assignable Reg 39	25	42
49540	Assignable Reg 40	25	43

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
49541	Assignable Reg 41	25	44
49542	Assignable Reg 42	25	45
49543	Assignable Reg 43	25	46
49544	Assignable Reg 44	25	47
49545	Assignable Reg 45	25	48
49546	Assignable Reg 46	25	49
49547	Assignable Reg 47	25	4A
49548	Assignable Reg 48	25	4B
49549	Assignable Reg 49	25	4C
49550	Assignable Reg 50	25	4D
49551	Assignable Reg 51	25	4E
49552	Assignable Reg 52	25	4F
49553	Assignable Reg 53	25	50
49554	Assignable Reg 54	25	51
49555	Assignable Reg 55	25	52
49556	Assignable Reg 56	25	53
49557	Assignable Reg 57	25	54
49558	Assignable Reg 58	25	55
49559	Assignable Reg 59	25	56
49560	Assignable Reg 60	25	57

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
49561	Assignable Reg 61	25	58
49562	Assignable Reg 62	25	59
49563	Assignable Reg 63	25	5A
49564	Assignable Reg 64	25	5B
49565	Assignable Reg 65	25	5C
49566	Assignable Reg 66	25	5D
49567	Assignable Reg 67	25	5E
49568	Assignable Reg 68	25	5F
49569	Assignable Reg 69	25	60
49570	Assignable Reg 70	25	61
49571	Assignable Reg 71	25	62
49572	Assignable Reg 72	25	63
49573	Assignable Reg 73	25	64
49574	Assignable Reg 74	25	65
49575	Assignable Reg 75	25	66
49576	Assignable Reg 76	25	67
49577	Assignable Reg 77	25	68
49578	Assignable Reg 78	25	69
49579	Assignable Reg 79	25	6A
49580	Assignable Reg 80	25	6B

Address (Register)	Assignable Register	Modbus Start Address (Hex)	
		High Byte	Low Byte
49581	Assignable Reg 81	25	6C
49582	Assignable Reg 82	25	6D
49583	Assignable Reg 83	25	6E
49584	Assignable Reg 84	25	6F
49585	Assignable Reg 85	25	70
49586	Assignable Reg 86	25	71
49587	Assignable Reg 87	25	72
49588	Assignable Reg 88	25	73
49589	Assignable Reg 89	25	74
49590	Assignable Reg 90	25	75
49591	Assignable Reg 91	25	76
49592	Assignable Reg 92	25	77
49593	Assignable Reg 93	25	78
49594	Assignable Reg 94	25	79
49595	Assignable Reg 95	25	7A
49596	Assignable Reg 96	25	7B
49597	Assignable Reg 97	25	7C
49598	Assignable Reg 98	25	7D
49599	Assignable Reg 99	25	7E
49600	Assignable Reg 100	25	7F

Example:

Assigning parameter to user assignable registers

To access the voltage 2(3x address 0X0002) and power factor 1(3x address 0x001E) through user assignable register assign these addresses to 4x register 0X251C and 0X251E.

Assigning Query

Device Address	01(Hex)
Function code	10(Hex)
Starting address Hi	25(Hex)
Starting address Lo	1C(Hex)
Number Of register Hi	00(Hex)*
Number Of register lo	02(Hex)*
Byte Count	04(Hex)
Data register -1 High byte	00Hex)
Data register -1 low byte	02(Hex)
Data register -2 High byte	00(Hex)
Data register -2 low byte	1E(Hex)
CRC Low	8B(Hex)
CRC High	02(Hex)

} Voltage 2 * (3X Address 0x0002)

} Power Factor 1 *(3X Address 0x001E)

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

Response:

Device Address	01 (Hex)
Function Code	10 (Hex)
Start Address High	25 (Hex)
Start Address Low	1C (Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02 (Hex)
CRC Low	8B (Hex)
CRC High	02 (Hex)

Reading Parameter Data Through User Assignable Register

In assigning query voltage 2 and power factor 1 parameters were assigned to 0x157C and 0x157E. So to read voltage2 and power factor1 data reading query should be as below.

Assigning Query:

Device Address	01 (Hex)
Function Code	04 (Hex)
Start Address High	15 (Hex)
Start Address Low	7C(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	04 (Hex)*
CRC Low	34 (Hex)
CRC High	1D (Hex)

* Note : Two consecutive 16 bit register represent one parameter ,since two parameter are requested four registers are required.

Start Address High: Most significant 8 bits of starting address of user assignable register.

Start Address Low: Least significant 8 bits of starting address of user assignable register.

Number of Register Hi: Most significant 8 bits of Number of registers requested.

Number of Register Lo: Least significant 8 bits of Number of registers requested.

Response :

(Volt2 = 219.30 / Power Factor1 = 1.0)

Device Address	01 (Hex)	
Function Code	04 (Hex)	
Byte count	08 (Hex)	
Data Register-1High Byte	00 (Hex)	Voltage 2 Data
Data Register-1 Low Byte	00 (Hex)	
Data Register-2 High Byte	00 (Hex)	
Data Register-2 Low Byte	00 (Hex)	
Data Register-3 High Byte	3F (Hex)	Power Factor 1Data
Data Register-3 Low Byte	80 (Hex)	
Data Register-4 High Byte	00 (Hex)	
Data Register-4 Low Byte	00 (Hex)	
CRC Low	29 (Hex)	
CRC High	F1(Hex)	

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

1) Assign starting addresses(**TABLE 1**) of parameters of interest to "User assignable mapping registers" in a sequence in which they are to be accessed (see section "**Assigning Parameter to User Assignable Registers"**).
2) Once the parameters are mapped, data can be acquired by using "User assignable data register" Starting address . i.e to access data of Voltage2, Power factor1,Wh import, Frequency send query with starting address 0x5501 with number of register 8 or individually parameters can be accessed. For example, if voltage2 is to be accessed use starting address 0x5501. (See section **Reading Parameter data through User Assignable Registers).**

TABLE 13:Limit 1 & Limit 2 Configuration Select

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

TABLE 14 : RS 485 Set-up Code

Baud Rate	Parity	Stop Bit	Decimal Value
9600	NONE	01	0
9600	NONE	02	1
9600	EVEN	01	2
9600	ODD	01	3
19200	NONE	01	4
19200	NONE	02	5
19200	EVEN	01	6
19200	ODD	01	7
38400	NONE	01	8
38400	NONE	02	9

Baud Rate	Parity	Stop Bit	Decimal Value
38400	EVEN	01	10
38400	ODD	01	11
57600	NONE	01	12
57600	NONE	02	13
57600	EVEN	01	14
57600	ODD	01	15
115200	NONE	01	16
115200	NONE	02	17
115200	EVEN	01	18
115200	ODD	01	19

Table 15: Relay Limit Table

Parameter No	Parameter	3P 3W	3P 4W	Range	
				Low alarm	High alarm
0	None	✓	✓	-	-
1	Relay Manual OFF Operation	✓	✓	-	-
2	Relay Manual ON Operation	✓	✓	-	-
251	Vrms L1	✓	✓	1-130%	1-150%
252	Vrms L2	✓	✓	1-130%	1-150%
253	Vrms L3	✓	✓	1-130%	1-150%
254	Vrms EN	✓	✓	1-130%	1-150%
255	Irms L1	✓	✓	1-180%	1-200%
256	Irms L2	✓	✓	1-180%	1-200%
257	Irms L3	✓	✓	1-180%	1-200%
258	Irms Neutral	✓	✓	1-180%	1-200%
259	Vpeak L1	✓	✓	1-130%	1-150%
260	Vpeak L2	✓	✓	1-130%	1-150%
261	Vpeak L3	✓	✓	1-130%	1-150%
262	Vpeak LN	✓	✓	1-130%	1-150%
263	Ipeak L1	✓	✓	1-180%	1-200%
264	Ipeak L2	✓	✓	1-180%	1-200%
265	Ipeak L3	✓	✓	1-180%	1-200%
266	Peak Neutral Current	✓	✓	1-180%	1-200%
267	Vcrest Factor L1	✓	✓	1-40	1-40
268	Vcrest Factor L2	✓	✓	1-40	1-40
269	Vcrest Factor L3	✓	✓	1-40	1-40
271	Icrest Factor L1	✓	✓	1-40	1-40
272	Icrest Factor L2	✓	✓	1-40	1-40
273	Icrest Factor L3	✓	✓	1-40	1-40
275	Active Power Watt L1	✗	✓	1-250%	1-300%
276	Active Power Watt L2	✗	✓	1-250%	1-300%

Table 15: Continued

Parameter No	Parameter	3P 3W	3P 4W	Range	
				Low alarm	High alarm
277	Active Power Watt L3	✗	✓	1-250%	1-300%
279	Apparent Power VA L1	✗	✓	1-250%	1-300%
280	Apparent Power VA L2	✗	✓	1-250%	1-300%
281	Apparent Power VA L3	✗	✓	1-250%	1-300%
283	Reactive Power VAR L1	✗	✓	1-250%	1-300%
284	Reactive Power VAR L2	✗	✓	1-250%	1-300%
285	Reactive Power VAR L3	✗	✓	1-250%	1-300%
287	Arithmetic VA	✗	✓	1-250%	1-300%
288	Vector Sum VA	✓	✓	1-250%	1-300%
289	Fundamental Arithmetic Sum VA	✗	✓	1-250%	1-300%
290	Fundamental Vector Sum VA	✗	✓	1-250%	1-300%
291	True Power Factor L1	✗	✓	10-90%	10-90%
292	True Power Factor L2	✗	✓	10-90%	10-90%
293	True Power Factor L3	✗	✓	10-90%	10-90%
299	Vector Sum Power Factor	✓	✓	10-90%	10-90%
300	Vector Sum Distortion Power Factor	✓	✓	10-90%	10-90%
301	Arithmatic sum PF	✗	✓	10-90%	10-90%
302	Arithmatic sum DPF	✗	✓	10-90%	10-90%
305	Average Power Factor At Max Watt Demand	✓	✓	10-90%	10-90%

Table 15: Continued

Parameter No	Parameter	3P 3W	3P 4W	Range	
				3P3W	3P4W
306	Average Power Factor At Max VAR Demand	✓	✓	10-90%	10-90%
307	Average Power Factor At Max VA Demand	✓	✓	10-90%	10-90%
339	RMS Current Demand L1	✓	✓	1-200%	1-200%
340	RMS Current Demand L2	✓	✓	1-200%	1-200%
341	RMS Current Demand L3	✓	✓	1-200%	1-200%
343	RMS Current Demand Average	✓	✓	1-200%	1-200%
355	VA Demand At Max Watt Demand	✓	✓	1-300%	1-300%
356	VAR Demand At Max Watt Demand	✓	✓	1-300%	1-300%
357	Watt Demand At Max VAR Demand	✓	✓	1-300%	1-300%
358	VA Demand At Max VAR Demand	✓	✓	1-300%	1-300%
359	VAR Demand At Max VA Demand	✓	✓	1-300%	1-300%
360	Watt Demand At Max VA Demand	✓	✓	1-300%	1-300%
361	VTHD(%) Fund L1	✓	✓	1-100%	1-100%
362	VTHD(%) Fund L2	✓	✓	1-100%	1-100%
363	VTHD(%) Fund L3	✓	✓	1-100%	1-100%
365	ITHD(%) Fund L1	✓	✓	1-100%	1-100%
366	ITHD(%) Fund L2	✘	✓	1-100%	1-100%
367	ITHD(%) Fund L3	✓	✓	1-100%	1-100%
369	VTHD RSS L1	✓	✓	1-150%	1-150%
370	VTHD RSS L2	✓	✓	1-150%	1-150%
371	VTHD RSS L3	✓	✓	1-150%	1-150%
373	ITHD RSS L1	✓	✓	1-200%	1-200%
374	ITHD RSS L2	✘	✓	1-200%	1-200%
375	ITHD RSS L3	✓	✓	1-200%	1-200%
377	VTID(%) Fund L1	✓	✓	1-100%	1-100%
378	VTID(%) Fund L2	✓	✓	1-100%	1-100%
379	VTID(%) Fund L3	✓	✓	1-100%	1-100%

Table 15: Continued

Parameter No	Parameter	3P 3W	3P 4W	Range	
				Low alarm	High alarm
381	ITID(%) Fund L1	✓	✓	1-100%	1-100%
382	ITID(%) Fund L2	✓	✓	1-100%	1-100%
383	ITID(%) Fund L3	✓	✓	1-100%	1-100%
385	VTID RSS L1	✓	✓	1-130%	1-150%
386	VTID RSS L2	✓	✓	1-130%	1-150%
387	VTID RSS L3	✓	✓	1-130%	1-150%
389	ITID RSS L1	✓	✓	1-180%	1-200%
390	ITID RSS L2	✘	✓	1-180%	1-200%
391	ITID RSS L3	✓	✓	1-180%	1-200%
393	User Frequency1 V L1	✓	✓	1-180%	1-150%
394	User Frequency1 V L2	✓	✓	1-130%	1-150%
395	User Frequency1 V L3	✓	✓	1-130%	1-150%
397	User Frequency2 V L1	✓	✓	1-130%	1-150%
398	User Frequency2 V L2	✓	✓	1-130%	1-150%
399	User Frequency2 V L3	✓	✓	1-130%	1-150%
401	User Frequency3 V L1	✓	✓	1-130%	1-150%
402	User Frequency3 V L2	✓	✓	1-130%	1-150%
403	User Frequency3 V L3	✓	✓	1-130%	1-150%
405	User Frequency4 V L1	✓	✓	1-130%	1-150%
406	User Frequency4 V L2	✓	✓	1-130%	1-150%
407	User Frequency4 V L3	✓	✓	1-130%	1-150%
409	User Frequency1 I L1	✓	✓	1-180%	1-200%
410	User Frequency1 I L2	✘	✓	1-180%	1-200%
411	User Frequency1 I L3	✓	✓	1-180%	1-200%
413	User Frequency2 I L1	✓	✓	1-180%	1-200%
414	User Frequency2 I L2	✘	✓	1-180%	1-200%
415	User Frequency2 I L3	✓	✓	1-180%	1-200%

Table 15: Continued

Parameter No	Parameter	3P 3W	3P 4W	Range	
				Low alarm	High alarm
417	User Frequency3 I L1	✓	✓	1-180%	1-200%
418	User Frequency3 I L2	✘	✓	1-180%	1-200%
419	User Frequency3 I L3	✓	✓	1-180%	1-200%
421	User Frequency4 I L1	✓	✓	1-180%	1-200%
422	User Frequency4 I L2	✘	✓	1-180%	1-200%
423	User Frequency4 I L3	✓	✓	1-180%	1-200%
429	Power Signed Ph1	✘	✓	1-250%	1-300%
430	Power Signed Ph2	✘	✓	1-250%	1-300%
431	Power Signed Ph3	✘	✓	1-250%	1-300%
433	Power Unsigned Ph1	✘	✓	1-250%	1-300%
434	Power Unsigned Ph2	✘	✓	1-250%	1-300%
435	Power Unsigned Ph3	✘	✓	1-250%	1-300%
457	Positive Sequence Voltage	✓	✓	1-130%	1-150%
458	Negative Sequence Voltage	✓	✓	1-130%	1-150%
459	Zero Sequence Voltage	✘	✓	1-130%	1-150%
460	Positive Sequence Current	✘	✓	1-130%	1-200%
461	Negative Sequence Current	✘	✓	1-130%	1-200%
462	Zero Sequence Current	✘	✓	1-180%	1-200%
463	V Unbalance RMS/RMS_Avg	✓	✓	1-180%	1-200%
464	V Unbalance S2/S1	✓	✓	-	-
465	V Unbalance S0/S1	✘	✓	-	-
466	I Unbalance RMS/RMS_Avg	✘	✓	1-180%	1-200%
467	I Unbalance S2/S1	✘	✓	-	-
468	I Unbalance S0/S1	✘	✓	-	-
469	Vrms Imbalance L1	✓	✓	1-180%	1-200%
470	Vrms Imbalance L2	✓	✓	1-180%	1-200%
471	Vrms Imbalance L3	✓	✓	1-180%	1-200%
473	Irms Imbalance L1	✘	✓	1-180%	1-200%

Table 15: Continued

Parameter No	Parameter	3P 3W	3P 4W	Range	
				Low alarm	High alarm
474	Irms Imbalance L2	✘	✓	1-180%	1-200%
475	Irms Imbalance L3	✘	✓	1-180%	1-200%
531	Frequency	✓	✓	10-90%	10-90%
532	Active Power Watt Total	✓	✓	1-250%	1-300%
533	Apparent Power VA Total	✓	✓	1-250%	1-300%
534	Reactive Power VAR Total	✓	✓	1-250%	1-300%
535	True Power Factor Total	✓	✓	10-90%	10-90%
544	Vrms Imbalance Max	✓	✓	1-180%	1-200%
545	Irms Imbalance Max	✘	✓	1-180%	1-200%
546	System Parameter V	✓	✓	1-130%	1-150%
547	System Parameter I	✓	✓	1-180%	1-200%
548	System Parameter Frequency	✓	✓	10-90%	10-90%
549	Watt Average	✓	✓	1-250%	1-300%
550	VA Average	✓	✓	1-250%	1-300%
551	VAR Average	✓	✓	1-250%	1-300%
552	Phase Sequence	✓	✓	Refer Table No: 16	
554	Voltage Phase Angle L1	✓	✓	10-90%	10-90%
555	Voltage Phase Angle L2	✓	✓	10-90%	10-90%
556	Voltage Phase Angle L3	✓	✓	10-90%	10-90%
558	Current Phase Angle L1	✓	✓	10-90%	10-90%
559	Current Phase Angle L2	✘	✓	10-90%	10-90%
560	Current Phase Angle L3	✓	✓	10-90%	10-90%
562	Vrms L12	✘	✓	1-130%	1-150%
563	Vrms L23	✘	✓	1-130%	1-150%
564	Vrms L31	✘	✓	1-130%	1-150%
585	W Demand(Import)	✓	✓	1-250%	1-300%
586	W Demand(Export)	✓	✓	1-250%	1-300%
587	VAR Demand(Import)	✓	✓	1-250%	1-300%
588	VAR Demand(Export)	✓	✓	1-250%	1-300%

Table 15: Continued

Parameter No	Parameter	3P 3W	3P 4W	Range	
				Low alarm	High alarm
589	VA Demand	✓	✓	1-250%	1-300%
590	W MAX Demand(Import)	✓	✓	1-250%	1-300%
591	W MAX Demand(Export)	✓	✓	1-250%	1-300%
592	VAR MAX Demand(Import)	✓	✓	1-250%	1-300%
593	VAR MAX Demand(Export)	✓	✓	1-250%	1-300%
594	VA MAX Demand	✓	✓	1-250%	1-300%
595	Current MAX Demand	✓	✓	1-180%	1-200%
596	Current Demand Sum	✓	✓	1-180%	1-200%
597	Power Factor Average	✓	✓	10-90%	10-90%
598	Volt-Curr Phase Angle Phase 1	✓	✓	10-90%	10-90%
599	Volt-Curr Phase Angle Phase 2	✗	✓	10-90%	10-90%
600	Volt-Curr Phase Angle Phase 3	✓	✓	10-90%	10-90%
601	Volt-Curr Phase Angle Average	✓	✓	10-90%	10-90%
602	System Voltage THD(%)	✓	✓	1-100%	1-100%
603	System Current THD(%)	✓	✓	1-100%	1-100%
750	Voltage THD(%) Odd L1	✓	✓	1-100%	1-100%
751	Voltage THD(%) Even L1	✓	✓	1-100%	1-100%
752	Current THD(%) Odd L1	✓	✓	1-100%	1-100%
753	Current THD(%) Even L1	✓	✓	1-100%	1-100%
754	Voltage THD(%) Odd L2	✓	✓	1-100%	1-100%
755	Voltage THD(%) Even L2	✓	✓	1-100%	1-100%
756	Current THD(%) Odd L2	✗	✓	1-100%	1-100%
757	Current THD(%) Even L2	✗	✓	1-100%	1-100%
758	Voltage THD(%) Odd L3	✓	✓	1-100%	1-100%
759	Voltage THD(%) Even L3	✓	✓	1-100%	1-100%
760	Current THD(%) Odd L3	✓	✓	1-100%	1-100%
761	Current THD(%) Even L3	✓	✓	1-100%	1-100%
762	Voltage Harmonic Magnitude L1	✓	✓	1-130%	1-150%
763	Voltage Harmonic Magnitude L2	✓	✓	1-130%	1-150%
764	Voltage Harmonic Magnitude L3	✓	✓	1-130%	1-150%

Table 15: Continued

Parameter No	Parameter	3P 3W	3P 4W	Range	
				Low alarm	High alarm
765	Current Harmonic Magnitude L1	✓	✓	1-180%	1-200%
766	Current Harmonic Magnitude L2	✗	✓	1-180%	1-200%
767	Current Harmonic Magnitude L3	✓	✓	1-180%	1-200%
768	Power Harmonic Magnitude L1	✓	✓	1-250%	1-300%
769	Power Harmonic Magnitude L2	✗	✓	1-250%	1-300%
770	Power Harmonic Magnitude L3	✓	✓	1-250%	1-300%
771	Voltage Inter Harmonic Magnitude L1	✓	✓	1-130%	1-150%
772	Voltage Inter Harmonic Magnitude L2	✗	✓	1-130%	1-150%
773	Voltage Inter Harmonic Magnitude L3	✓	✓	1-130%	1-150%
774	Current Inter Harmonic Magnitude L1	✓	✓	1-180%	1-200%
775	Current Inter Harmonic Magnitude L2	✗	✓	1-180%	1-200%
776	Current Inter Harmonic Magnitude L3	✓	✓	1-180%	1-200%

Table 16: Parameter Selection For Phase Sequence (Relay Limit)

Parameter Selection	Parameter Value	3P 4W	3P 3W
Disable	0	✓	✓
Normal	1	✓	NA
Reverse	2	✓	NA
Phase Error	3	✓	NA
I/P Absent	4	✓	✓

Example: For Phase Sequence(3P 4W) and Input Status(3P 3W), if user wants to configure relay for phase sequence or input status then by entering above corresponding parameter value, user can configure relay in different modes(i.e. Disable, Normal, Reverse, Phase Error or I/P Absent).

Table 17: Harmonic Data

Parameter	3 Phase, 4 Wire	3 Phase, 3 Wire
Harmonic Data	Harmonic Data Phase L1=0	Harmonic Data Phase L1=0
	Harmonic Data Phase L2=1	Harmonic Data Phase L2=1
	Harmonic Data Phase L3=2	Harmonic Data Phase L3=2
Harmonic Group Data	Harmonic Group Data Phase L1=3	Harmonic Group Data Phase L1=3
	Harmonic Group Data Phase L2=4	Harmonic Group Data Phase L2=4
	Harmonic Group Data Phase L3=5	Harmonic Group Data Phase L3=5
Harmonic Sub Group Data	Harmonic Sub Group Data Phase L1=6	Harmonic Sub Group Data Phase L1=6
	Harmonic Sub Group Data Phase L2=7	Harmonic Sub Group Data Phase L2=7
	Harmonic Sub Group Data Phase L3=8	Harmonic Sub Group Data Phase L3=8

Table 18: Inter Harmonic Data

Parameter	3 Phase, 4 Wire	3 Phase, 3 Wire
Voltage Interharmonic Data	Voltage Interharmonic Data Phase L1=0	Voltage Interharmonic Data Phase L1=0
	Voltage Interharmonic Data Phase L2=1	Voltage Interharmonic Data Phase L2 =1
	Voltage Interharmonic Data Phase L3=2	Voltage Interharmonic Data Phase L3=2
Current Interharmonic Data	Current Interharmonic Data Phase L1 =3	Current Interharmonic Data Phase L1 =3
	Current Interharmonic Data Phase L2=4	Current Interharmonic Data Phase L3 = 5
	Current Interharmonic Data Phase L3=5	
Voltage Interharmonic Group Data	Voltage Interharmonic Group Data Phase L1 =6	Voltage Interharmonic Group Data Phase L1=6
	Voltage Interharmonic Group Data Phase L2 =7	Voltage Interharmonic Group Data Phase L2 =7
	Voltage Interharmonic Group Data Phase L3=8	Voltage Interharmonic Group Data Phase L3=8

Table 18 :Continued..

Parameter	3 Phase, 4 Wire	3 Phase, 3 Wire
Current Interharmonic Group Data	Current Interharmonic Group Data Phase L1 =9	Current Interharmonic Group Data Phase L1=9
	Current Interharmonic Group Data Phase L2 =10	Current Interharmonic Group Data Phase L3=11
	Current Interharmonic Group Data Phase L3=11	
Voltage Interharmonic Sub Group Data	Voltage Interharmonic Sub Group Data Phase L1=12	Voltage Interharmonic Sub Group Data Phase L1=12
	Voltage Interharmonic Sub Group Data Phase L2=13	Voltage Interharmonic Sub Group Data Phase L2 =13
	Voltage Interharmonic Sub Group Data Phase L3=14	Voltage Interharmonic Sub Group Data Phase L3=14
Current Interharmonic Sub Group Data	Current Interharmonic Sub Group Data Phase L1=15	Current Interharmonic Sub Group Data Phase L1=15
	Current Interharmonic Sub Group Data Phase L2=16	Current Interharmonic Sub Group Data Phase L3=17
	Current Interharmonic Sub Group Data Phase L3=17	

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