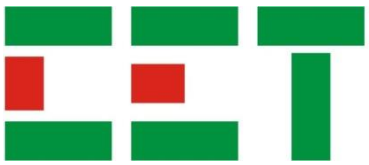
iMeter 8

Advanced Power Quality Analyzer

User Manual

Version: 1.0A

June 8, 2020



The information contained in this Manual is believed to be accurate at the time of publication; however, CET assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice. Please consult CET or your local representative for latest product specifications.

Standards Compliance

CE

DANGER

This symbol indicates the presence of danger that may result in severe injury or death and permanent equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.

CAUTION

This symbol indicates the potential of personal injury or equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.

DANGER

Failure to observe the following instructions may result in severe injury or death and/or equipment damage.

- Installation, operation and maintenance of the meter should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.
- Ensure that all incoming AC power and other power sources are turned OFF before performing any work on the meter.
- Before connecting the meter to the power source, check the label on top of the meter to ensure that it is equipped with the appropriate power supply, and the correct voltage and current input specifications for your application.
- During normal operation of the meter, hazardous voltages are present on its terminal strips and throughout the connected potential transformers (PT) and current transformers (CT). PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuits energized. Follow standard safety precautions while performing any installation or service work (i.e. removing PT fuses, shorting CT secondaries, etc.).
- Do not use the meter for primary protection functions where failure of the device can cause fire, injury or death. The meter should only be used for shadow protection if needed.
- Under no circumstances should the meter be connected to a power source if it is damaged.
- To prevent potential fire or shock hazard, do not expose the meter to rain or moisture.
- Setup procedures must be performed only by qualified personnel familiar with the instrument and its associated electrical equipment.
- DO NOT open the instrument under any circumstances.

Limited warranty

- CET Electric Technology (CET) offers the customer a minimum of 12-month functional warranty on the meter for faulty parts or workmanship from the date of dispatch from the distributor. This warranty is on a return to factory for repair basis.
- CET does not accept liability for any damage caused by meter malfunctions. CET accepts no responsibility for the suitability of the meter to the application for which it was purchased.
- Failure to install, set up or operate the meter according to the instructions herein will void the warranty.
- Only CET's duly authorized representative may open your meter. The unit should only be opened in a fully anti-static environment. Failure to do so may damage the electronic components and will void the warranty.

Table of Contents

Chapter 1 Introduction

This manual explains how to use the iMeter 8 Advanced Power Quality Analyzer. Throughout the manual, the term “meter” generally refers to all models.

This chapter provides an overview of the iMeter 8 and summarizes many of its key features.

1.1 Overview

The iMeter 8 is CET’s Advanced PQ Analyzer designed for the compliance monitoring market as it offers un-surpassed functionality by combining Class 0.2S Accuracy and advanced PQ Features in a 192x192x182.4mm housing with a high resolution, Color Dot-Matrix LCD display. The iMeter 8 complies with such standards as IEC 62053-22 Class 0.2S, IEC 61000-4-30 Ed.3 Class A Compliant, IEC 61000-4-15, IEC 61000-4-7, EN 50160 as well as IEC 61850 for Substation Automation. Further, it offers a large logging capacity with 8GB of on-board memory, extensive I/O, multiple Time Sync. methods, 2x100BaseT Ethernet and 2xRS-485 ports. In addition, it optionally provides 2xAO and 1xAI for different applications. These features likely make the iMeter 8 one of the most advanced PQ Analyzer for an intelligent Power Quality Monitoring System.

Following is a list of typical applications for the iMeter 8:

- PQ monitoring at HV, MV and LV Utility Substations
- Data Centers, Semiconductor Fabs, Heavy Industries
- 7x24 Automated Manufacturing Facilities
- Dips, Swells, Interruptions, Transients, Flickers and Harmonics monitoring
- Mains and Critical feeder monitoring
- IEC 61850 support for Substation Automation and Smart Grid
- Retrofit applications with Split-Core Current Probe (SCCP)

Contact CET Technical Support should you require further assistance with your application.

1.2 Features

Basic Features

- IEC 62053-22 Class 0.2S kWh metering with Multi-Tariff TOU
- True RMS @ 1024 samples/cycle sampling
- 8GB on-board log memory
- 7'' high-resolution Color Dot-Matrix Display @ 800x480
- Time Sync. via SNTP, IEEE 1588 (PTP), IRIG-B or GPS 1PPS output
- 256 Standard Setpoints and 16 HS Setpoint
- Dual 100BaseT Ethernet and two RS-485 ports

Power Quality Features

- IEC 61000-4-30 Edition 3 Class A Compliant
- IEC 61000-4-15, IEC 61000-4-7 and EN 50160 Reporting
- 2kHz to 150kHz Conducted Emission measurements
- Disturbance Direction Indicator
- Disturbance Waveform Recording
- Data Recording, Statistical Data Recording and ½ cycle RMS Recording
- Fault Capture up to 2,000V peak to peak
- Waveform recording in COMTRADE and PQDIF file format (Compatible with the PQ View software)

Front Panel Display and Web Interface

- True RMS Real-time, Harmonics, Power and Energy measurements
- Demands and Multi-Tariff TOU
- Max. & Min. Logs
- Sequence & Unbalance
- Real-time WF Capture of 3-phase Voltages and Currents
- Event Waveforms and ITIC/SEMI F47 Curves

- Harmonics & Interharmonics Histogram and Phasor Diagrams
- Device and SOE Logs, PQ Counters and I/O status
- Device Configuration and Diagnostics

Power Quality Metering

PQ Parameters as per IEC 61000-4-30 Ed.3 Compliant

- Power Frequency
- Magnitude of the Supply Voltage and Current
- Flicker
- Transients, Dips/Swells and Interruptions
- Supply Voltage Unbalance and Current Unbalance
- Mains Signalling Voltage on the Supply Voltage
- Rapid Voltage Changes
- Measurement of Underdeviation and Overdeviation parameters
- Harmonics and Interharmonics measurements for Voltage and Current
- 2kHz to 150kHz Conducted Emission measurements

Harmonic and Interharmonic measurements

- K-Factor for Current, Crest Factor for Current and Voltage
- U and I THD, TOHD, TEHD, TIHD, TOIHD, TEIHD and TH (RMS)
- U and I Individual Harmonics (%HD and RMS) from 2nd to 63$^{rd\,\#}$
- U and I Individual Interharmonics (%IHD and RMS) from 1st to 63$^{rd\,\#}$
- Total Harmonic P, Q, S and PF
- Harmonic P, Q, S and PF from 2nd to 63rd in RMS
- Harmonic Phase Angle from 2nd to 63$^{rd\,\#}$
- U and I DC Components
- Total Harmonic kWh, kvarh Import/Export/Net/Total
- Total Harmonic kWh, kvarh Import/Export from 2nd to 63rd

$^{\#}$ %HD and %IHD can be configured as % of Fundamental, % of U/I nominal or % of RMS

Conducted Emissions in the 2kHz to 150kHz Range

- Real-Time amplitude (150/180-Cycle) and the Max., Min., Avg. and CP95 values (in 1-min interval) for a total of 106 frequency segments for the 2-9kHz and 9-150kHz range are available via the Web Interface
- Display of the Daily Heat Map for the Max., Min., Avg. and CP95 values on the Web Interface

Sequence and Unbalance

- Zero, Positive and Negative Sequence Components
- U and I Unbalance based on Zero and Negative Sequence Components

Dips, Swells, Interruptions and Transient Recording

- Transients capture as short as 20us at 1024 samples @ 50Hz for sub-cycle disturbance such as capacitor switching and resonance phenomena
- Dips, Swells & Interruption detection @ 10ms (½ cycle at 50Hz)
- Trigger for DO, SOE Log, WFR, Disturbance WFR, RMS Recording and Alarm Email
- Display of ITIC or SEMI F47 plot as well as the Event Waveform on the Front Panel and Web Interface

Rapid Voltage Changes (RVC)

- Detection of a quick transition in RMS voltage between two steady state Voltage conditions

Inrush Current Monitoring

- Monitoring of the ½ cycle RMS Current and capturing of the Current waveforms associated with events such as motor starting and transformer being energized

Disturbance Direction Indicator

- Determine if a Dip Event is located upstream or downstream
- Pinpoint if the cause of the event is external or internal

Disturbance Waveform Recorder (DWR)

- 128 entries
- Simultaneous recording of all Voltage (U1-U4) and Current (I1-I5) Inputs
  - Initial Fault: 35 cycles @ 512 samples/cycle
  - Extended Fault: Up to 150 cycles @ 16 samples/cycle
  - Steady State: Up to 360s of 1-cycle absolute peak values
  - Post Fault: 15 cycles @ 512 samples/cycle

Real-Time Waveform Capture (WFC) and Waveform Recorder (WFR)

- Real-time WFC @ 128 samples/cycle x 4 cycles via Front Panel and Web Interface
- Adaptive WFR Enabled or Disabled with max. 128 entries
- Simultaneous capture of 3-phase Voltage and Current Inputs
- No. of Cycles x Samples/Cycles with programmable pre-fault cycles: 375x1024, 750x512, 1500x256, 3000x128
- Scheduled WFR with max. repetition of 10,000 times and programmable schedule from 1 to 1440 mins
- COMTRADE file format, downloadable from the on-board Web Server or FTP Server

RMS Recorder (RMSR)

- 128 entries
- 8 channels max., selectable U, I, P, Q, S, PF, Frequency, Freq. Deviation
- Recording Interval from 0.5 to 60 cycles
- Recording Depth @ 7200 samples per parameter
- Configurable pre-fault samples from 100 to 500
- 72 seconds of ½ cycle RMS recording @ 50Hz or 60 seconds @ 60Hz

PQ Event Counters

- Dips, Swells, Interruptions, Transients, Rapid Voltage Changes, Inrush Current, Mains Signaling Voltages and Total PQ Event Counters

Metering

Basic Measurements (1-second update)

- 3-phase U, I, P, Q, S and PF as well as U4, I4 and I5
- kWh, kvarh Import/Export/Net/Total and kVAh Total
- Frequency

High-speed Measurements

- 3-phase U, I, P, Q, S and PF as well as U4, I4 and I5 @ ½ cycle
- Frequency @ 1 cycle

Demands

- Present and Predicted Demand for 3-phase U, I, P, Q, S and PF as well as U4, I4, I5, Frequency
- Present Demand of 4-phase U & I THD/TOHD/TEHD, 4-phase Current K-factor, U2/U0 & I2/I0 Unbalance, Over & Under Deviation of Voltage and Frequency, 4-phase Fundamental Current
- Max./Min. values per Demand Interval
- Peak Demands for This Month and Last Month (or Before Last Reset and Since Last Reset)
- Demand Synchronization with DI

Multi-Tariff TOU capability

- Two independent sets of TOU Schedules, each supporting
  - Up to 12 Seasons
  - 90 Holidays or Alternate Days and 3 Weekdays
  - 20 Daily Profiles, each with 12 Periods in 15-minute intervals
  - 8 Tariffs, each providing the following information:
    - kWh/kvarh Import/Export and kVAh
    - kW/kvar Import/Export Peak Demands timestamped
    - Register rollover at 100,000,000,000.000 kXh or 1,000,000,000,000 (if **Energy Short Rollover** is enabled)
  - 12 Historical Logs for Energy and Max. Demand

Data and Event Recording

Non-Volatile Log Memory
- 8GB on-board Log Memory

Data Recorder (DR) Log
- 8 Standard DR Logs recording interval from 1s to 40 days for DR Log
- Up to 32 Parameters for each DR Log with programmable sources such as real-time measurements, Harmonics, Unbalance and Demand measurements
- Configurable Depth and Recording Offset
- Support FIFO or Stop-When-Full recording modes

Interval Energy Recorder (IER) and Accumulative Energy Recorder (AER)
- Both IER Log and AER Log support the recording of Total RMS kWh, kvarh Import/Export/Total/Net and kVAh, Total Fundamental and Total Harmonic kWh, kvarh Import/Export
- Recording interval from 1 minute to 65535 minutes
- Max. Recording Depth @ 65535 records
- Support FIFO and Stop-When-Full modes

Statistical Data Recorder (SDR) Log
- 16 SDR Logs of max. 64 parameters each
- Recording of the Max., Min., Avg. and CP95 for real-time measurements including U, I, P, Q, S, PF, Freq., Power, PF, Harmonics, Deviations and Unbalances
- Recording interval from 0 to 60 minutes
- 30 days @ 1-minute, 300 days @ 10-minute, 450-day @ 15-minute
- PQDIF file format, downloadable from the on-board FTP Server
- Support FIFO or Stop-When-Full mode

Max./Min. Recorder (MMR) Log
- 4 Max./Min. Recorders of 20 parameters each
- RMS/Fundamental/Harmonic/Interharmonic measurements, Demands, Deviations, Unbalances and Flicker
- Two transfer modes:
  - Manual: Max./Min. Since Last Reset/Before Last Reset
  - Auto: Max./Min. of This Month/Last Month

SOE Log
- 1024 FIFO events time-stamped to ±1ms resolution
- Setpoint events, I/O operations, Dips, Swells, Interruptions, Transients, Rapid Voltage Changes, Inrush Current, Mains Signalling Voltages, ...etc.
- Record the time and characteristic data of the Setpoint and PQ event

Device Log
- 1024 FIFO entries time-stamped to ±1ms resolution
- Power On/Off Records, Setup changes, Time Sync., Device Operations and Self-diagnostics

Setpoints

PQ Setpoints
- Transients
- Dips, Swells, Interruptions
- Rapid Voltage Changes
- Inrush Current
- Trigger DO, SOE Log, WFR, DWR, RMSR or Alarm Email

Control Setpoints
- 256 standard and 16 high-speed Setpoints
- Extensive monitoring sources including U, I, P, Q, S, Demand, Harmonics, Unbalances, Deviations, Flickers, Phase Reversal/Loss, AI, etc.
- Configurable thresholds and time delays
- Trigger DO, SOE Log, WFR, DWR, RMSR or Alarm Email

Digital Input Setpoints
- Provides control output actions in response to changes in Digital Input status
- Trigger DO, SOE Log, WFR, DWR, RMSR or Alarm Email

Inputs and Outputs

Digital Inputs
- Standard 8 or optional 16 channels
- Standard volts-free dry contact with 24VDC Internal Excitation
- Optional 110VAC/DC or 220VAC/DC External Excitation
- 1000Hz sampling for status monitoring with programmable debounce
- Pulse counting with programmable weight for each channel for collecting WAGES (Water, Air, Gas, Electricity, Steam) information
- Demand Synchronization and Tariff Switch based on DI Status

Digital Outputs
- Standard 4 or optional 8 channels Mechanical Relays for general purpose control or alarming
- Standard 4 SS Relays for Energy pulsing applications

Analog Inputs (Optional)
- Two channels 0/4-20mA DC input with programmable zero and full scales that can be used to measure external transducer signal

Analog Output (Optional)
- One Channel 0/4-20mA DC output with programmable zero and full scales

Communications

Ethernet Ports (P1, P2)
- Dual 10/100BaseT Ethernet Ports with RJ45 connector
- Protocols supported: Modbus TCP, HTTPS, SNTP, SMTP, FTP, IEC 61850
- Built-in password protected Web Server for easy data viewing, setup configuration and firmware upgrade
- Simultaneous client connections for 12xModbus TCP & 12xIEC 61580

RS-485 (P3, P4)
- Dual optically isolated RS-485 port with baud rate from 1.2 to 38.4 kbps
- Support Modbus RTU and Ethernet Gateway

Time Synchronization

- Battery-backed real-time clock @ 6ppm (≤ 0.5s/day)
- Time Sync. via Modbus RTU/TCP, SNTP, IEEE 1588 (PTP)
- Optional GPS/IRIG-B outputs

System Integration

PecStar iEMS
- The iMeter 8 is supported by CET's PecStar iEMS
- In addition, the iMeter 8 can be easily integrated into other 3rd party systems because of its support of multiple communications ports as well as different industry standard protocols such as Modbus and IEC 61850.

DiagSys
- Display of Real-time measurements, PQ Events, Waveforms and Statistical Trend charts
- Export of IER, AER and SDR Log as well as EN 50160 Reports
- Generation and Export of self-defined PQ Analysis Reports

3rd Party System Integration

- Easy integration into Substation Automation or Utility SCADA systems via Modbus RTU, Modbus TCP or IEC 61850
- The on-board, password-protected Web Server provides user-friendly access to its data and supports the configuration for most Setup parameters via a web browser without the use of proprietary software
- The on-board, password protected FTP Server allows logged data in CSV format and waveform records in PQDIF or COMTRADE format to be downloaded without any special software. The downloaded files can be subsequently viewed using software that supports the industry standard PQDIF and COMTRADE file formats

1.3 iMeter 8 Application in PQ Monitoring and Energy Management Systems

The iMeter 8 can be used to monitor 3P4W or 3P3W connected power system. Modbus communications allow real-time data, events, DI status, Data Logs, Waveform and other information to be transmitted to an Integrated Energy Management System such as PecStar® iEMS.

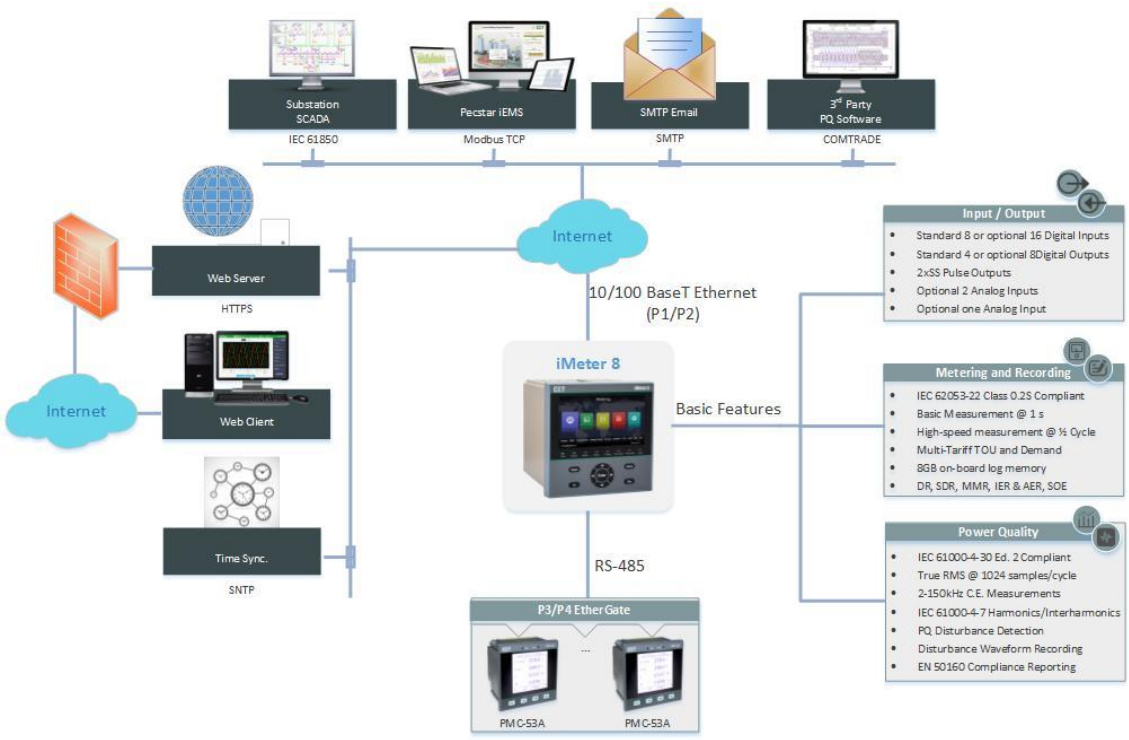


Figure 1-1 Typical Application

1.4 Getting more information

Additional information is available from CET via the following sources:

- Visit www.cet-global.com
- Contact your local representative
- Contact CET directly via email at support@cet-global.com

Chapter 2 Installation

Caution

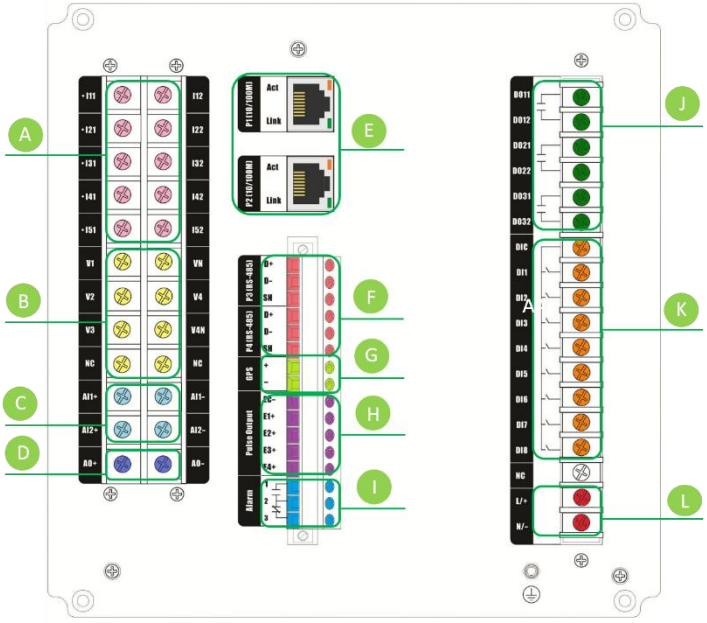
Installation of the iMeter 8 should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.

During the operation of the meter, hazardous voltages are present at the input terminals. Failure to observe precautions can result in serious or even fatal injury and equipment damage.

2.1 Appearance

1 Enclosure
2 7'' TFT Color LCD
3 LED Indicators
4 Buttons

Figure 2-1 Appearance



A Current Input terminals
B Voltage Input terminals
C AI terminals
D AO terminals
E 10/100BaseT Ethernet Ports
F RS-485 terminals
G GPS terminals
H Pulse Output terminals
I Alarm terminals
J DO terminals
K DI terminals
L Power Supply terminals

Figure 2-2 Rear Panel

2.2 Unit Dimensions

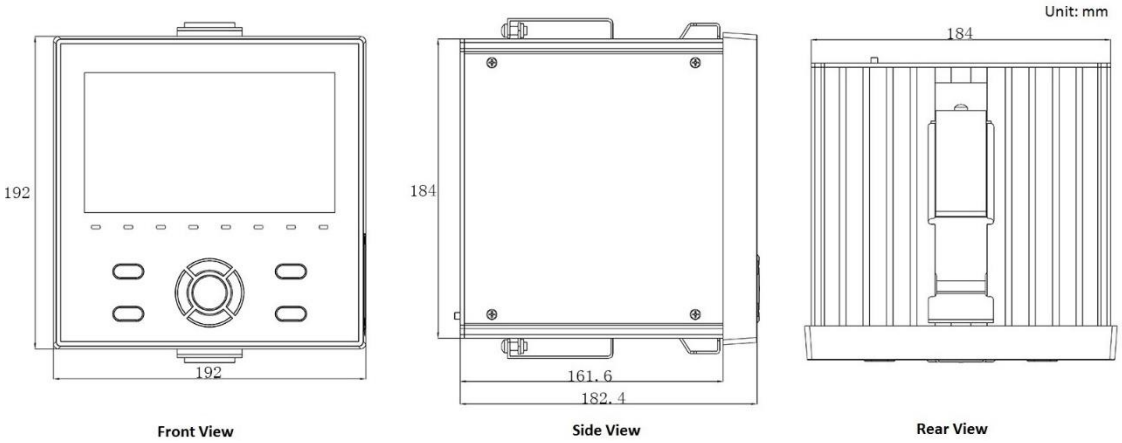


Figure 2-3 Unit Dimensions

2.3 Terminal Dimensions

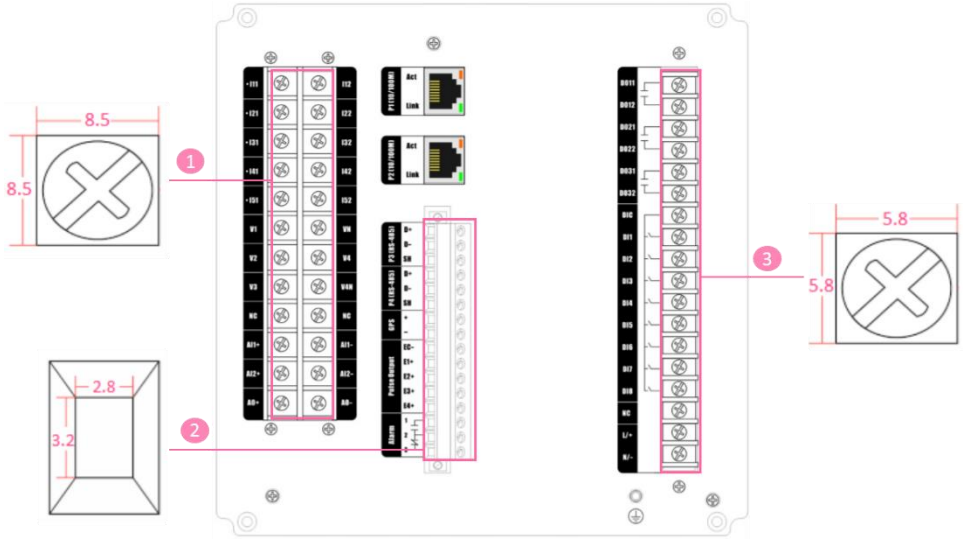


Figure 2-4 Terminal Dimensions

No.	Terminal	Terminal Dimensions	Wire Size	Max. Torque
1	Voltage/Current Input AI/AO	8.5mm x 8.5mm	1.0 mm^2 -2.5 mm^2 12-22AWG	18kgf.cm/M4 (15.6 lb-in)
2	RS-485/GPS Pulse Output/Alarm	2.8mm x 3.2mm	1.5mm^2 12-26AWG	5 kgf.cm/M3 (4.3 lb-in)
3	DI/DO Power Supply	5.8mm x 5.8mm	1.0 mm^2 -2.5 mm^2 14-22AWG	8.0 kgf.cm/M3 (6.9lb-in)

Table 2-1 Terminal Dimensions

2.4 Mounting

The iMeter 8 should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise sources.

Installation steps:

- Remove the mounting brackets from the meter
- Fit the meter through a 186mmx186mm cutout as shown in **Figure 2-5 Panel Cutout**
- Re-install and tighten the mounting brackets against the panel to secure the meter

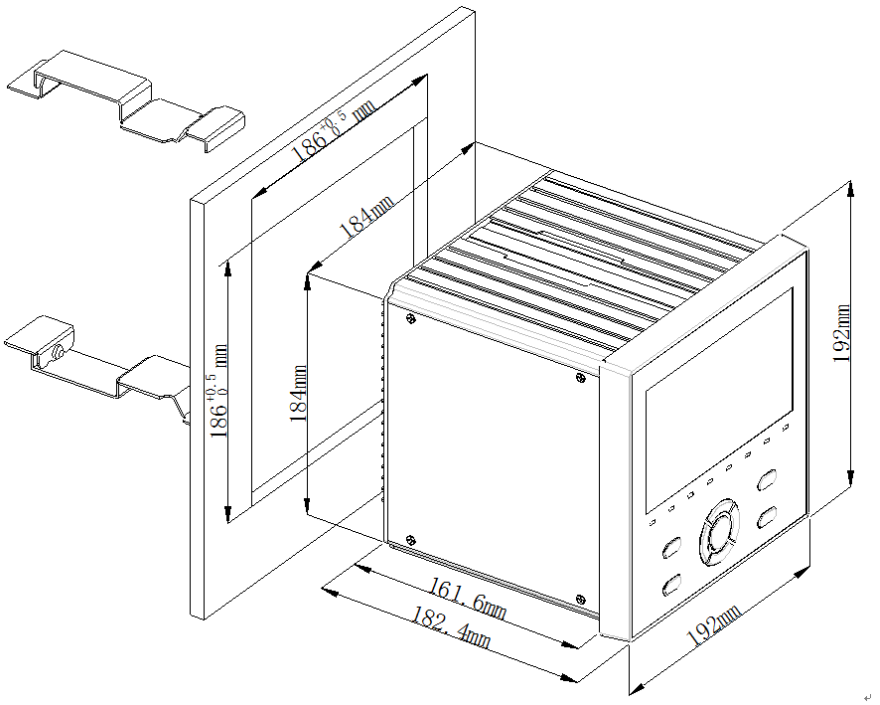


Figure 2-5 Panel Cutout

2.5 Wiring Connections

The iMeter 8 can satisfy almost any three or four phase power systems. Please read this section carefully before installation and choose the correct wiring method for your power system. The following wiring modes are supported:

- 3-phase 4-wire Wye Direct Connection
- 3-phase 4-wire Wye with 3PTs and 4CTs
- 3-phase 3-wire Grounded Wye Direct Connection
- 3-phase 3-wire Grounded Wye with 3PTs and 3CTs
- 3-phase 3-wire Grounded Delta Direct Connection
- 3-phase 3-wire Delta with 2PTs and 3CTs
- 3-phase 3-wire Delta with 2PTs and 2CTs

Caution

Under no circumstances should the PT secondary be shorted.

Under no circumstances should the CT secondary be open when the CT primary is energized. CT shorting blocks should be installed to allow for easy maintenance.

2.5.1 3-Phase 4-Wire Wye Direct Connection

Please consult the serial number label to ensure that the system phase voltage is less than or equal to the meter's voltage input specification. Set the **Wiring Mode** to **3P4W**.

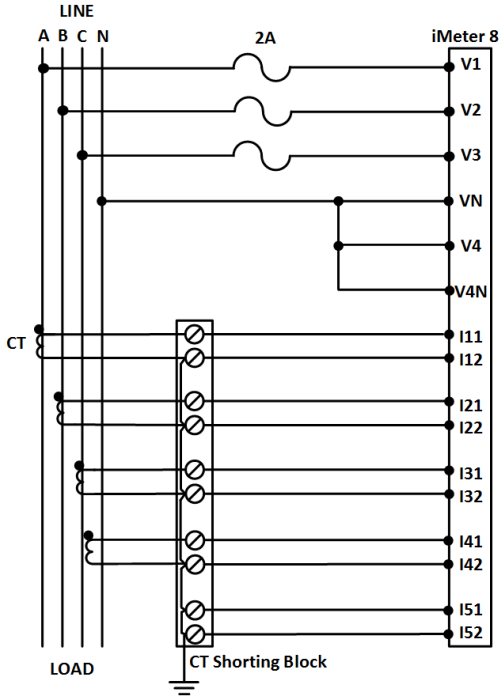


Figure 2-6 3-Phase 4-Wire Wye, no PTs, 4CTs

2.5.2 3-Phase 4-Wire Wye with 3PTs and 4CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's voltage input specification. Set the **Wiring Mode** to **3P4W**.

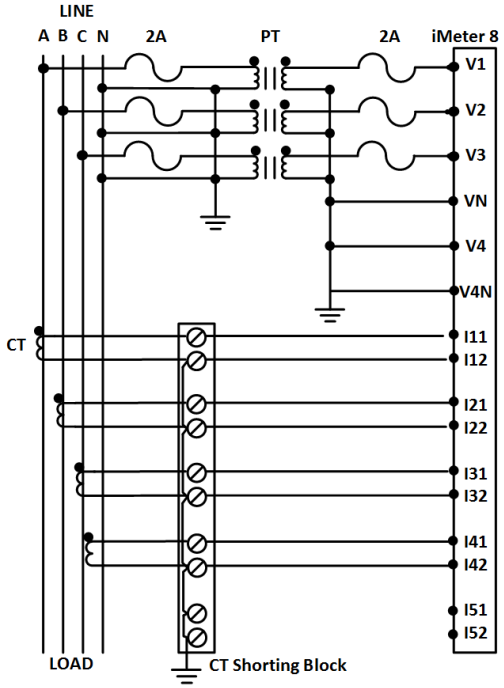


Figure 2-7 3-Phase 4-Wire Wye, 3PTs, 4CTs

2.5.3 3-Phase 3-Wire Grounded Wye Direct Connection

Please consult the serial number label to ensure that the system phase voltage is less than or equal to the meter's voltage input specification. Set the **Wiring Mode** to **3P4W**.

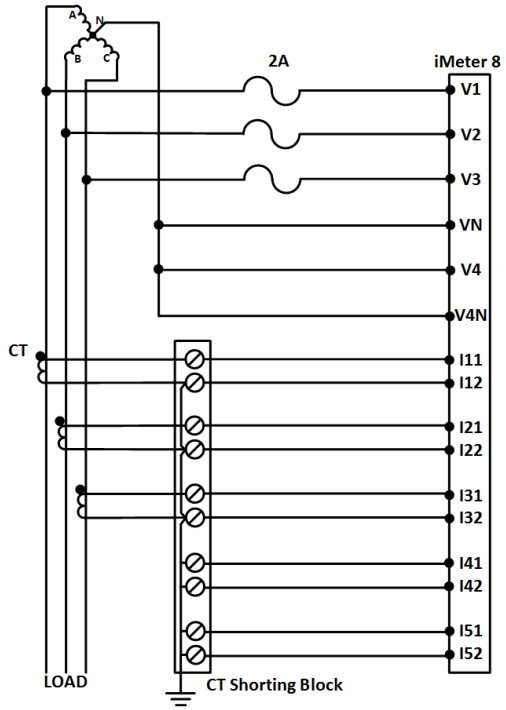


Figure 2-8 3-Phase 3-Wire Grounded Wye, Direct Connection

2.5.4 3-Phase 3-Wire Grounded Wye with 3PTs and 3CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's voltage input specification. Set the **Wiring Mode** to **3P4W**.

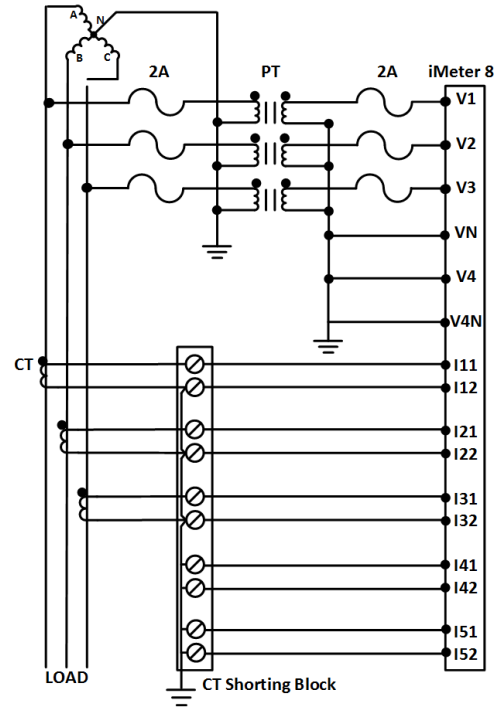


Figure 2-9 3-Phase 3-Wire Grounded Wye, 3PTs, 3CTs

2.5.5 3-Phase 3-Wire Delta Direct Connection

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's voltage input specification. Set the **Wiring Mode** to **3P3W**.

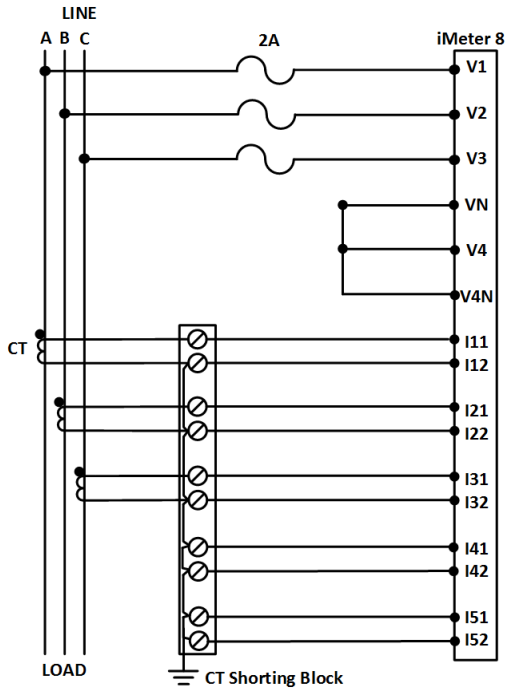


Figure 2-10 3-Phase 3-Wire Delta, no PTs, 3CTs

2.5.6 3-Phase 3-Wire Delta with 2PTs and 3CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's voltage input specification. Set the **Wiring Mode** to **3P3W**.

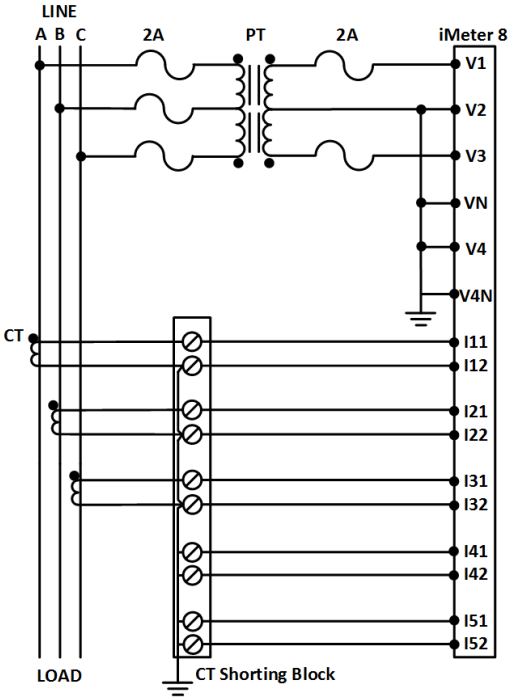


Figure 2-11 3-Phase 3-Wire Delta, 2PTs, 3CTs

2.5.7 3-Phase 3-Wire Delta with 2PTs and 2CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's voltage input specification. Set the **Wiring Mode** to **3P3W**.

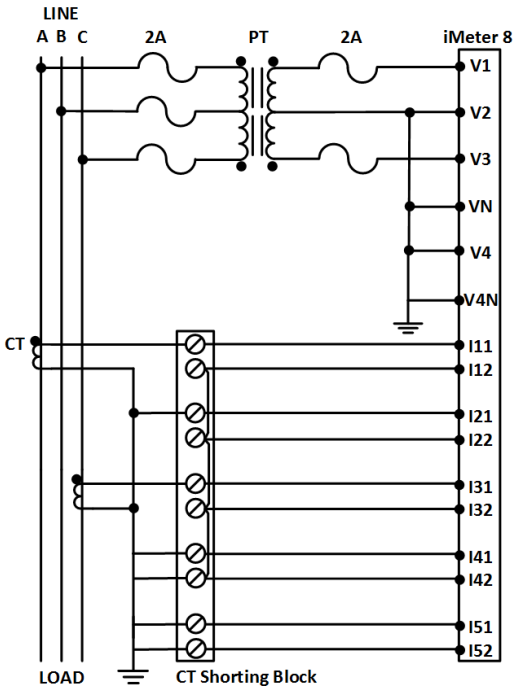


Figure 2-12 3-Phase 3-Wire Delta, 2PTs, 2CTs

2.6 Communications Wiring

2.6.1 Ethernet Port (10/100BaseT)

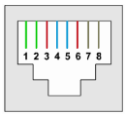
RJ45 Connector	Pin	Meaning
	1	Transmit Data+
	2	Transmit Data-
	3	Receive Data+
	4,5,7,8	NC
	6	Receive Data-

Table 2-2 RJ45 Connector Pin Description for 10/100BaseT Applications

2.6.2 RS-485 Port

The iMeter 8 provides two RS-485 ports and supports the Modbus RTU protocol. Up to 32 devices can be connected on a RS-485 bus. The overall length of the RS-485 cable connecting all devices should not exceed 1200m.

If the master station does not have a RS-485 communications port, a USB/RS-485 converter or Ethernet to RS-485 gateway with optically isolated outputs and surge protection should be used.

The following figure illustrates the RS-485 communications connections on the iMeter 8:

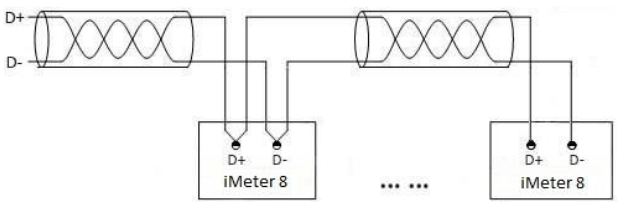
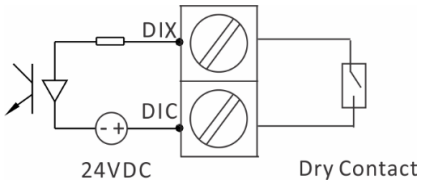


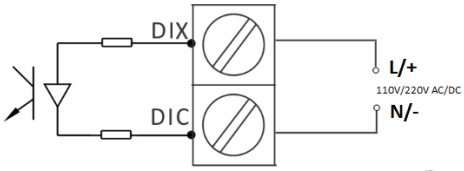
Figure 2-13 RS485 Communications Connections

2.7 Digital Input Wiring

The following figures illustrate the Digital Input connections on the iMeter 8:



24VDC Self-Excitation



110V/220V AC/DC External-Excitation

Figure 2-14 DI Connections

2.8 Digital Output Wiring

The following figure illustrates the Digital Output connections on the iMeter 8:

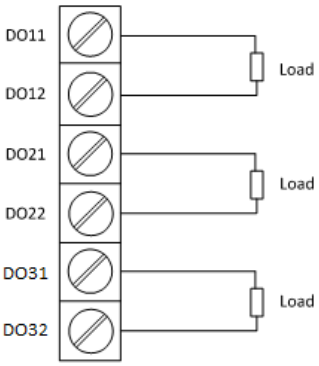


Figure 2-15 DO Connections

2.9 Pulse Output Wiring

The following figure illustrates the Pulse Output connections on the iMeter 8:

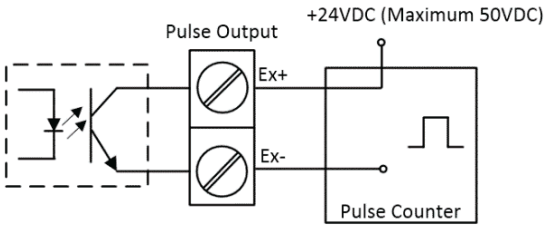


Figure 2-16 Pulse Output (Solid State Relay) Connections for Energy Pulsing

2.10 Analog Input Wiring

The following figure illustrates the Analog Input connections on the iMeter 8:

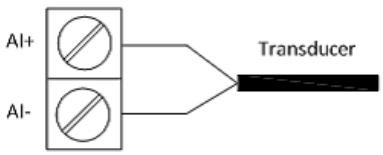


Figure 2-17 AI Connections

2.11 Analog Output Wiring

The following figure illustrates the Analog Output connections on the iMeter 8:

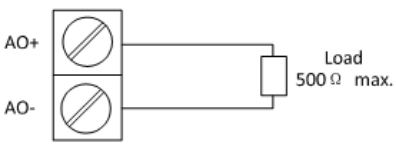


Figure 2-18 AO Connections

2.12 GPS Wiring

The GPS port on the iMeter 8 can be connected for GPS 1PPS Time Sync or IRIG-B Time Sync.

The following figures illustrate the GPS connections on the iMeter 8:

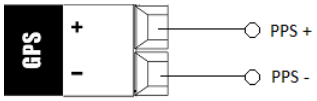


Figure 2-19 GPS 1PPS Time Sync.

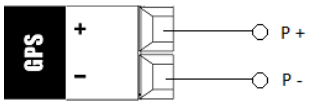


Figure 2-20 IRIG-B Time Sync.

2.13 Power Supply Wiring

For AC supply, connect the live wire to the L/+ terminal and the neutral wire to the N/- terminal.

For DC supply, connect the positive wire to the L/+ terminal and the negative wire to the N/- terminal.

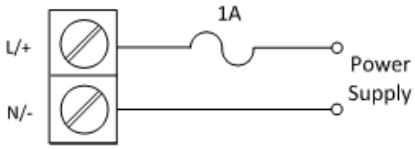


Figure 2-21 Power Supply Connections

2.14 Chassis Ground Wiring

Connect the G terminal to earth ground.

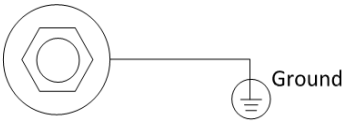


Figure 2-22 Chassis Ground connection

Chapter 3 User Interface

3.1 Front Panel Interface

The following screen capture shows the Metering display on the iMeter 8, which is equipped with a stunning, 800x480, TFT Color, LCD Display. There are eight LED indicators on the Front Panel for different parameters' status. The iMeter 8 also provides nine buttons for data display and setup configuration.

Figure 3-1 Main Display

3.1.1 Front Panel LED Indicators

There are eight LED indicators on the iMeter 8's Front Panel as described in the table below.

LED Indicator	Color	Status	Description
Run	Green	Blinking once per second	Device is running normally
		Off	Device is running abnormally
Comm.	Green	Blinking	Receiving or Transmitting data
		Off	No Communication
Alarm	Red	On	Hardware fault or Audit Log exceeds 90%
Harm.	Red	On	U THD/ITHD exceeds preset values
Flicker	Red	On	Plt or Pst exceeds preset value
Volt. Dev.	Red	On	Voltage Deviation exceeds preset value
Freq. Dev.	Red	On	Frequency Deviation exceeds preset value
Unb.	Red	On	U/I Unbalance exceeds preset value

Table 3-1 Front Panel LED Indicators

3.1.2 Front Panel Buttons

The iMeter 8's Front Panel has been designed with a 9-button user-friendly interface that allows users to quickly scroll through most of the available measurements.

Buttons	Metering/Power Quality/PQ Insight/Event Menu	Setup Menu
<▲> <▼> <◀> <▶>	In the **Main Menu** page, the four arrow buttons are used to move the cursor between different icons (**Categories**). The current cursor position is indicated by the highlighted **Category**'s description.	
	When inside a **Category** and under a particular **Sub-Menu**, the arrow buttons are used to navigate between **Pages**. • Pressing <▲> or <▼> shifts the cursor up/down in the sub-menu column. • Pressing <◀> and <▶> backward or forward to display different parameters. • Using <▲> or <▼> scrolls pages between individual harmonic or Interharmonic measurements for 1st to 63rd in the **Power/Harmonics** or **Interharmonic** sub-menu. • In the WFR page, using <◀> and <▶> buttons to select the target area and then pressing the <▲> or <▼> buttons to zoom in or zoom out the waveform.	• Before a parameter is selected, use the <◀>, <▶>, <▲> and <▼> buttons to navigate around and select the desired parameter for modification. • If a numeric parameter is already selected, pressing <▲> or <▼> increments or decrements a numeric value. • If an enumerated parameter is already selected, pressing <▲> or <▼> goes back or advances to last or next enumerated value in the selection list.

<Reset>	Pressing this button reset the LED indicators.	
<Home>	Pressing this button return k to the main page.	
<Enter>	• Before a **Category/Sub-menu** or operation is selected, pressing **<Enter>** enters the selected **Category/Sub-menu** or execute the chosen operation. • In the **Metering/RMS** summary page, press **<Enter>** to refresh the RMS data. • When in a record or event page, e.g. an EN50160 record page, pressing the **<Enter>** to display the details page.	• After changing the parameter, pressing **<Enter>** saves the new settings into memory.
<Fn>	• When inside a data display page, pressing **<Fn>** switches between **Large Font** and **Summary** page. • In the **Metering/Max.** or **Min.**, using the **<Fn>** button to scroll between different **Max.** or **Min.** measurements with timestamps.	N/A
<Esc>	• Pressing **<Esc>** returns to the previous level menu or page.	• Pressing **<Esc>** cancel the entered value.
<Fn> + <Enter>	Press this key combination to capture the current page.	

Table 3-2 Button Function

3.1.3 Front Panel Display

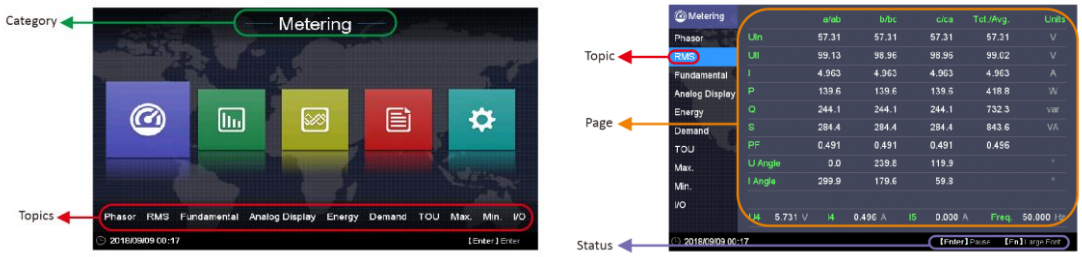


Figure 3-2 Hierarchy of Menu

The Front Panel Display allows users to view data and perform basic configuration. The main menu consists of 5 icons and each icon represents a **Category**: **Metering, Power Quality, PQ Insight, Events** and **Setup.** Each **Category** consists of sub-menus (**Topics**) for detailed data viewing or setup configuration. Each **Topic** may provide one or more **Pages** of measurement information. The **Status** bar indicates if there are additional measurements under a particular **Page** and how to get there. All data and setup parameters can be viewed without a password, but a valid **Front Panel Password** is required for making setup changes. The default **Front Panel Password** is 1.

The following figure provides an overview of the Front Panel User Interface.

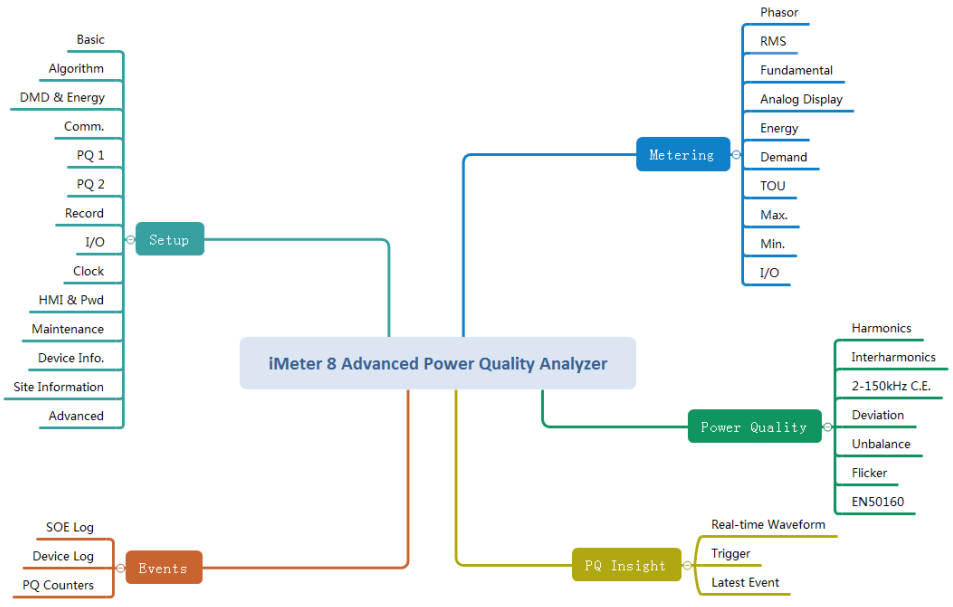


Figure 3-3 Overview of Front Panel

3.1.3.1 Metering

The **Metering** menu consists of **Phasor, RMS, Fundamental, Analog Display, Energy, Demand, TOU, Max., Min.** and **I/O.** The following sections provide an overview of this sub-menu.

Figure 3-4 Metering

3.1.3.1.1 Phasor

Enter the **Phasor** sub-menu and the following screen appears which displays the **Magnitude** and **Phase** information.

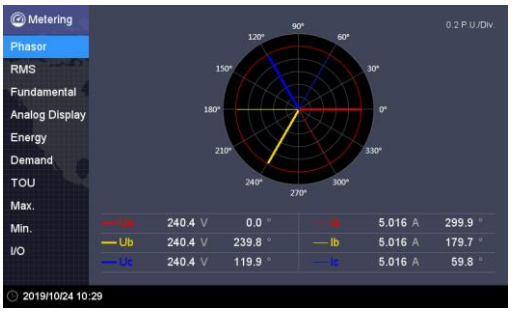


Figure 3-5 Phasor

3.1.3.1.2 RMS

Enter the **RMS** sub-menu and the following screen appears which displays the 3-Ø and Tot./Avg. RMS measurements updated @1s for Uln, Ull, I, P, Q, S and PF as well as 3-Ø U/I Angle, U4, I4, I5 and Frequency.

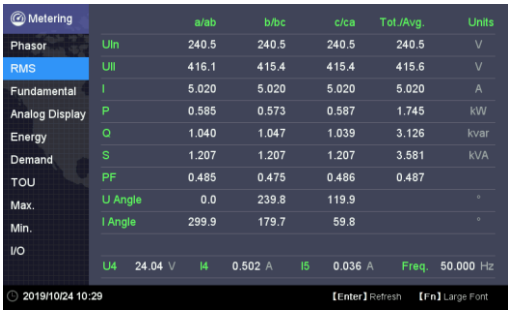


Figure 3-6 RMS

Press <**Enter**> to pause or refresh the data. Press <**Fn**> to enter the large font display, use <◀> or <▶> to scroll between different screens. Press <**Fn**> again to return to the **Summary** screen.

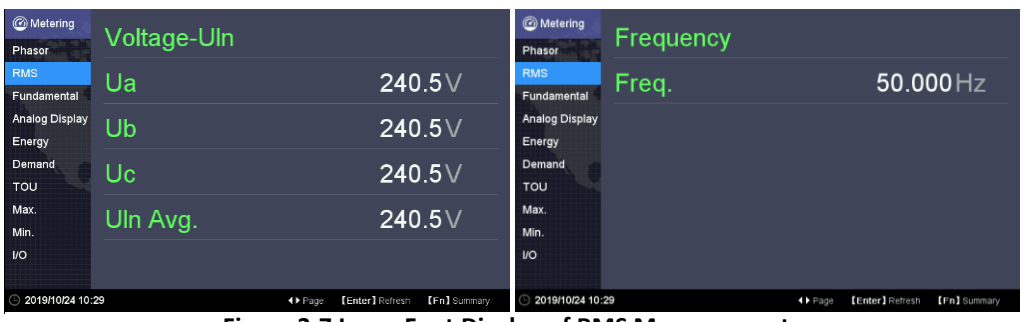


Figure 3-7 Large Font Display of RMS Measurements

3.1.3.1.3 Fundamental

Enter the **Fundamental** sub-menu and the following screen appears which displays 3-Ø and Tot./Avg. Fundamental measurements updated @1s for Uln, Ull, I, P, Q, S and dPF as well as 3-Ø U/I Angle, U4 and I4. Press **<Enter>** to pause or refresh the data.

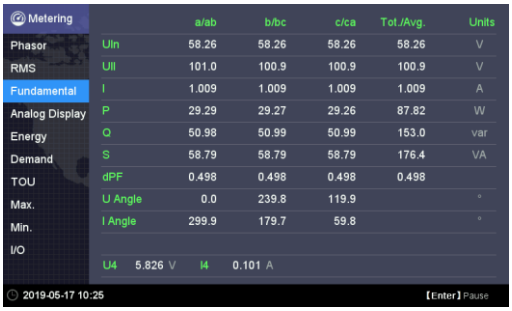


Figure 3-8 Fundamental Measurements

3.1.3.1.4 Analog Display

Enter the **Analog Display** sub-menu and the following screen appears which shows the Analog display as well as the Trend Curves for the per phase Uln, Ull and I.

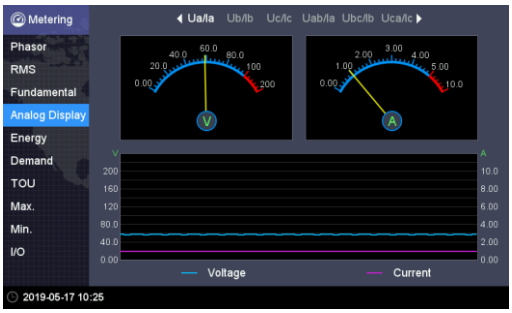


Figure 3-9 Analog Display

3.1.3.1.5 Energy

Enter the **Energy** sub-menu and the following screens are available which provides the measurements for kWh, kvarh Import/Export/Total/Net and kVA Total. Use <◀> or <▶> to scroll among **RMS, Fund.** and **Tot. Harm** measurements.

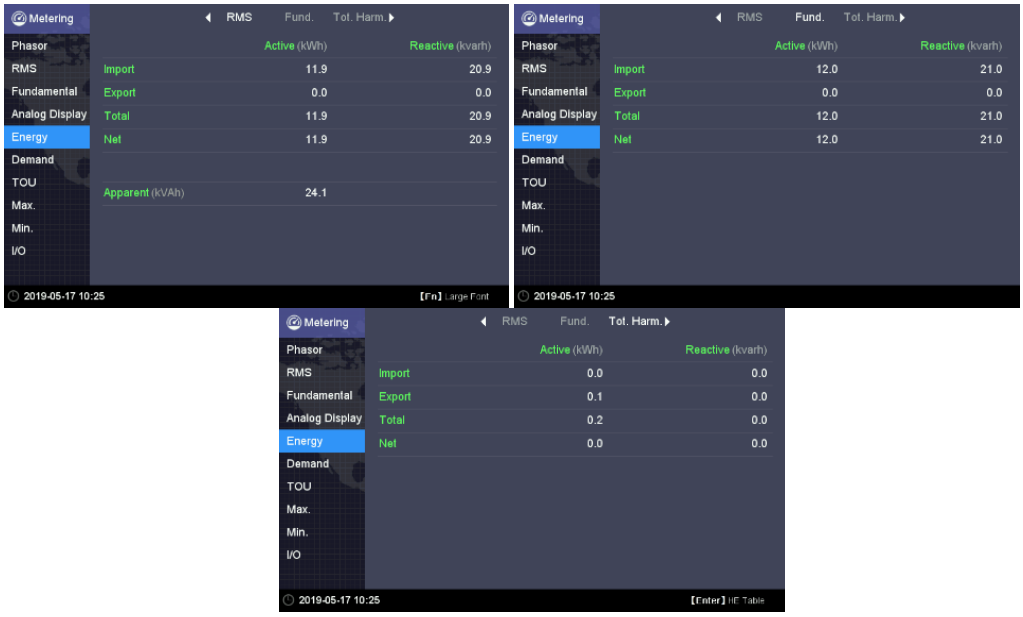


Figure 3-10 Energy Measurements

At the **RMS Energy** screen, press <**Fn**> to enter the large font display and then use <◀> or <▶> to scroll between the different screens. Press <**Fn**> again to return to **RMS Energy** screen.

Figure 3-11 Large Font Displays for RMS Energy Measurements

At the **Tot. Harm.** screen, press <**Enter**> to view the TH (Total Harmonic) and Individual Harmonic Energy (from H01 to H63) for kWh, kvarh Imp./Exp..

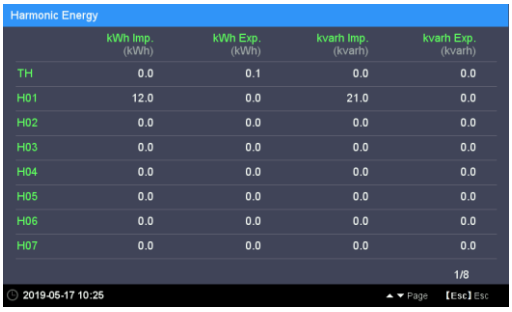
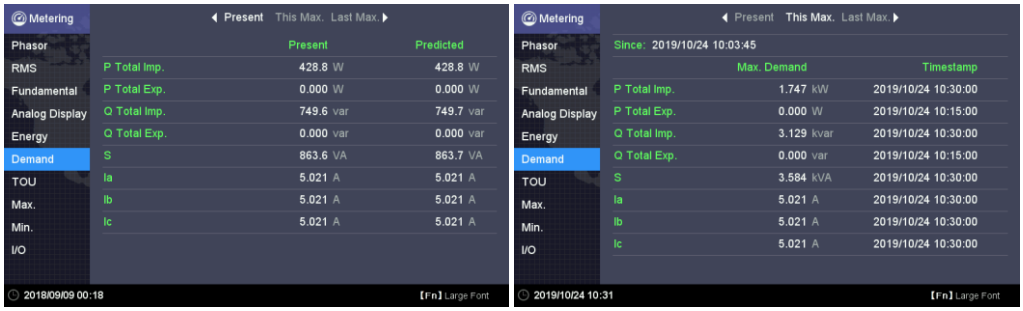


Figure 3-12 Energy Measurements

3.1.3.1.6 Demand

Enter the **Demand** sub-menu and the following screens are available which display the Present Demand, Predicted Demand, This Max. and Last Max. for P Total Imp./Exp., Q Total Imp./Exp., S and 3-Ø Current. Use <◀> or <▶> to scroll among **Present** (including **Present & Predicted Demand**), **This Max.** and **Last Max.** with their timestamps. Depending on the setting of the **Self-Read Time**, **This Max.** and **Last Max.** could mean the Max. Demand of This Month/Last Month or Since/Before the Last Reset.



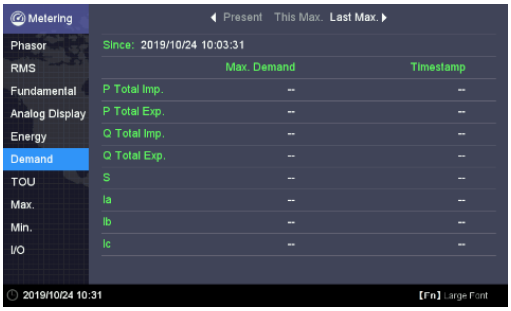


Figure 3-13 Demands Summary

Press <**Fn**> to enter the large font display and use <◀> or <▶> to scroll among different screens. Press <**Fn**> again to return to the **Summary** screen.

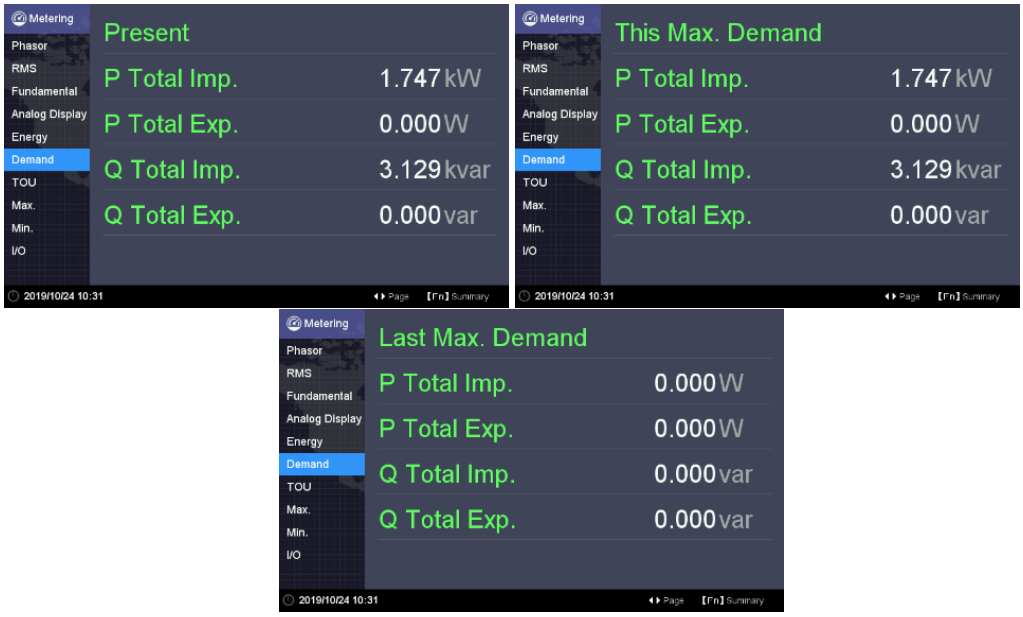


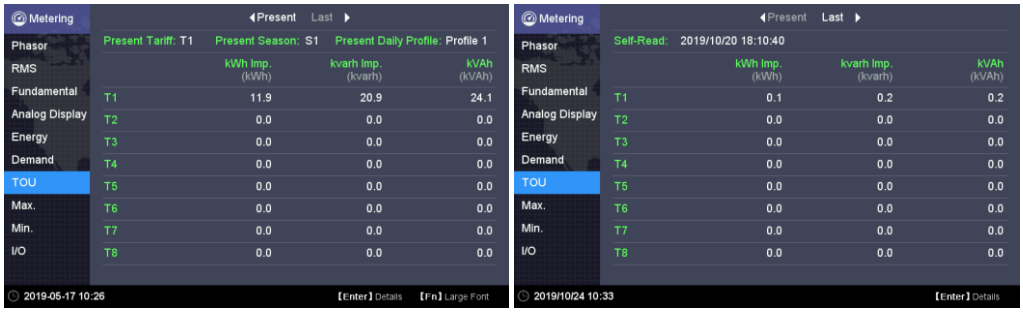
Figure 3-14 Present and Max. Demand Large Font Displays

3.1.3.1.7 TOU

Enter the **TOU** sub-menu and the following screens are available. Use <◀> or <▶> to scroll between **Present** and **Last** TOU Summary.

The **Present TOU Summary** screen displays the Present Tariff/Season/Daily Profile as well as the kWh/kvarh Imp./Exp.t and kVAh for the different Tariffs.

The **Last TOU Summary** screen displays the Self-Read Time for the Last TOU Log, the kWh, kvarh Imp./Exp. and kVAh for the different Tariffs.



Present TOU Summary **Last TOU Summary**

Figure 3-15 TOU Overview

Press <**Fn**> to enter to the large font page, use <◀> or <▶> to scroll between the different TOU parameters pages and press <**Fn**> again to return to summary page.

Figure 3-16 Large Font Display for TOU Measurement

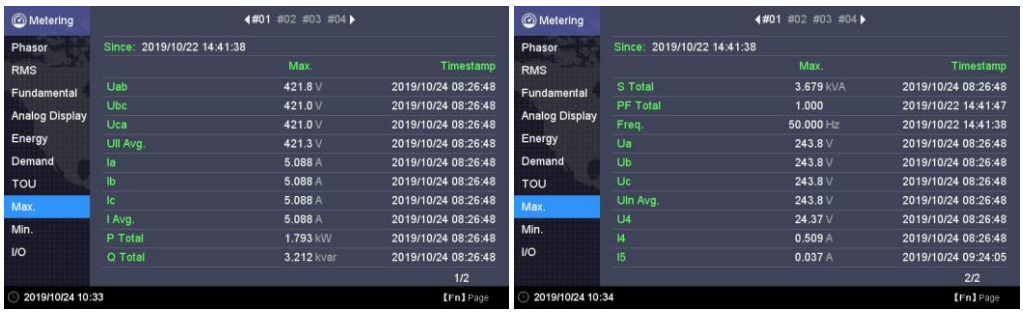
At the **Present/Last TOU Summary** screens, press <**Enter**> to view the details of the **Present** and **Last** TOU Log. Press <▲> or <▼> to scroll among **TOU Energy**, **P Max. DMD** and **Q Max. DMD** for the different Tariffs.

Figure 3-17 Present/Last TOU Details

3.1.3.1.8 Max./Min.

Enter the **Max.** or **Min.** sub-menu and the following screens are available which display the Max. or Min. measurements with timestamps.

Press <**Fn**> to scroll between the different **Max.** or **Min.** measurements. Use <◀> or <▶> to scroll among the 4 Max. or Min. Recorders.



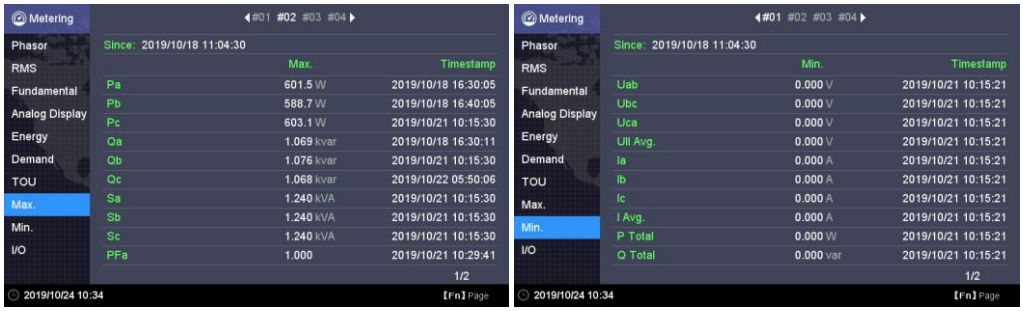


Figure 3-18 Max./Min. Measurements

3.1.3.1.9 I/O

Enter the **I/O** sub-menu and the following screens are available which display the DI Function and Status (or measurement). Use <◀> or <▶> to scroll between **DI, DO** and **AI** page. Please note that the **AI** page only available when the device is equipped with the corresponding options.

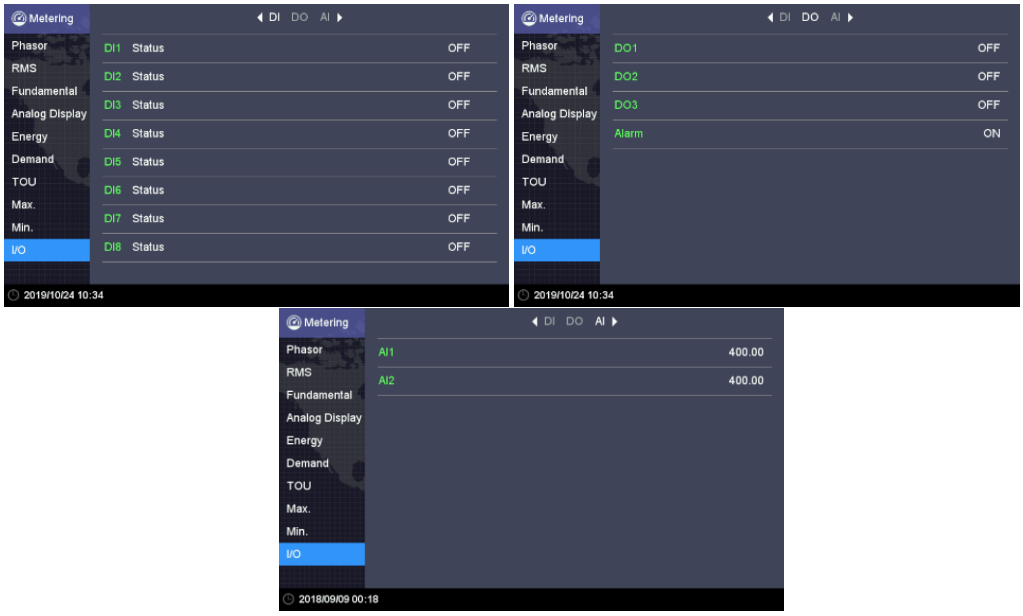


Figure 3-19 I/O

3.1.3.2 Power Quality

The **Power Quality** menu includes **Harmonics, Interharmonics, 2-150kHz C.E., Deviation, Unbalance, Flicker** and **EN50160.** The following sections provide a quick overview of these sub-menus.

Figure 3-20 Power Quality

3.1.3.2.1 Harmonic

Enter the **Harmonics** sub-menu and the following screen is available.

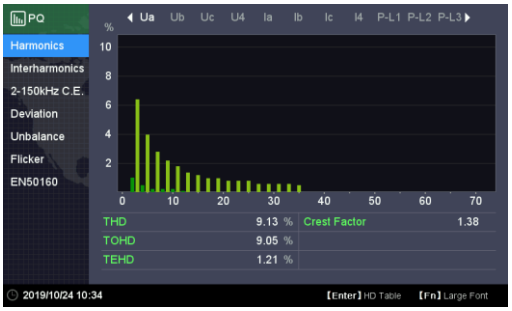


Figure 3-21 Harmonics Overview

Use <◀> or <▶> to scroll among the **Harmonics Overview** for the 4-Ø Voltages, 4-Ø Currents and 3-Ø Powers.

The Voltage Harmonics screen shows the Voltage Harmonic Spectrum, THD, TOHD, TEHD and Crest Factor while the Current Harmonics screen shows the Current Harmonic Spectrum, THD, TOHD, TEHD, Crest Factor, TDD, TDD Odd, TDD Even, and K-Factor. The Power Harmonics screen shows the Total Harmonic measurements for P, Q, S and PF.

At the **Harmonic** page, press <**Enter**> to view the Individual Harmonics and use <▼> or <▲> to view the Individual Harmonic measurements for 1st to 63rd, press the <**Esc**> to exit the Individual Harmonic page.

Figure 3-22 Individual Harmonics Measurements

At the **Voltage** or **Current Harmonics Overview** screen, press **<Fn>** to enter the large font page, use <◀> or <▶> to scroll between different screens and press <**Fn**> again to return to the previous level.

Figure 3-23 Large Font Display for Harmonic Measurement

3.1.3.2.2 Interharmonic

Enter the **Interharmonic** sub-menu and the following screens are available. Use <◀> or <▶> to scroll among the 4-Ø **Voltage** or **Current Harmonics**. Each screen provides the Interharmonic Spectrum, TIHD, TOIHD and TEIHD measurements.

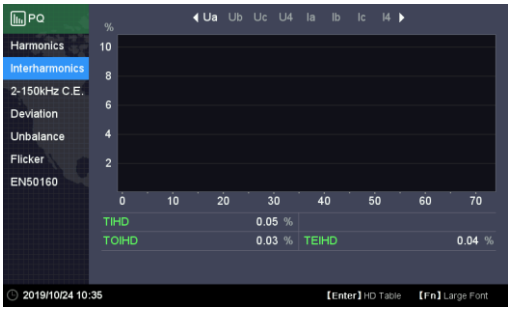


Figure 3-24 Interharmonics

At the **Voltage** or **Current Interharmonic** screens, press <**Enter**> to view the %IHD and RMS measurements for 4-Ø Voltages and Currents from IH01 to IH63.

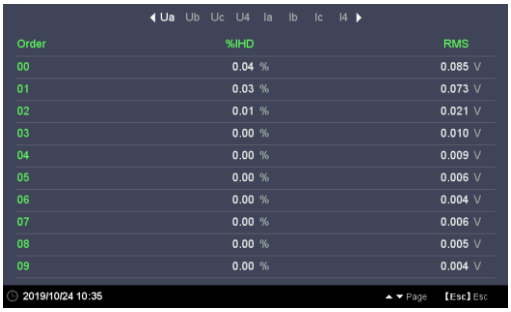


Figure 3-25 Interharmonics

At the **Voltage** or **Current Interharmonic** screens, press **<Fn>** to enter the large font page, use <◀> or <▶> to scroll between different screens and press <**Fn**> again to return to the previous level.

Figure 3-26 Power Quality

3.1.3.2.3 2-150kHz C.E.

Enter the **2-150kHz C.E.** sub-menu and the following screens are available which display Ua/Ub/Uc for the 2-9kHz and 9-150kHz range. Press <**Fn**> to scrolls between different pages.

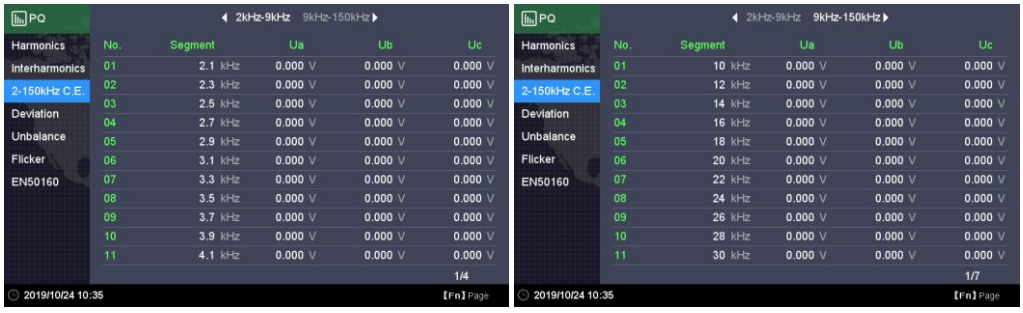


Figure 3-27 2-150kHz C.E.

3.1.3.2.4 Deviation

Enter the **Deviation** sub-menu and the following screen appears which displays the Over/Under Deviation measurements for 3-Ø Uln and Ull as well as the Frequency Deviation measurement.

Figure 3-28 Deviation

3.1.3.2.5 Unbalance

Enter the **Unbalance** sub-menu to display the Positive/Negative/Zero Sequence measurements for Voltage and Current as well as the Negative Sequence (U2/I2) and Zero Sequence (U0/I0) Unbalance measurements.

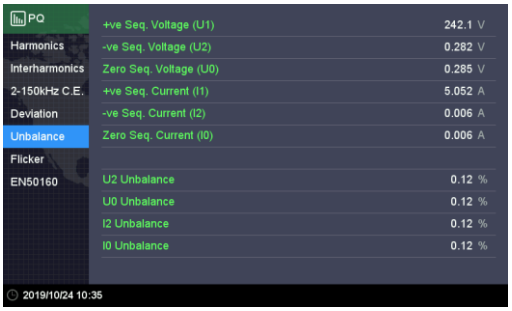


Figure 3-29 Unbalance

3.1.3.2.6 Flicker

Enter the **Flicker** sub-menu to display the Pst and Plt measurements for 3-Ø Voltages.

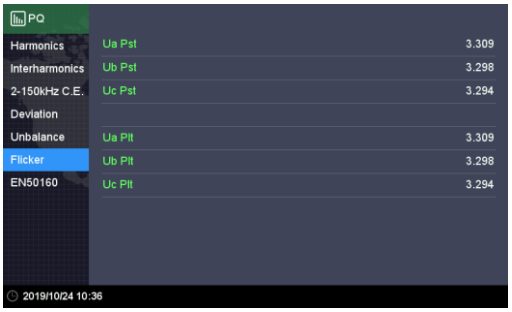


Figure 3-30 Flicker

3.1.3.2.7 EN50160

Enter the **EN50160** sub-menu to show the EN50160 Summary Report where ✅ indicates a positive conclusion while ❌ indicates a negative conclusion.

Figure 3-31 Summary EN50160 Report

Press <◀> or <▶> to select different period for the EN50160 Report.

Press <**Enter**> to display a particular EN50160 Summary Report and then press <▲> or <▼> to scroll up or down to select a particular parameter. Press <**Enter**> to display the summary details for the selected parameter.

The following screenshot provides an example of the summary details for Power Frequency.

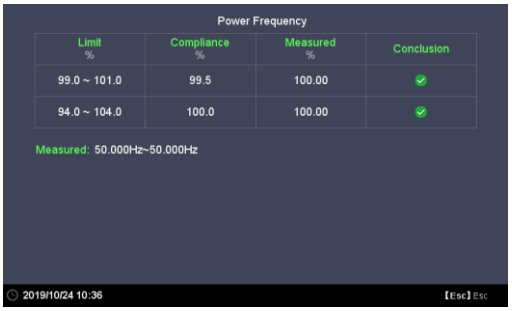


Figure 3-32 Power Frequency

3.1.3.3 PQ Insight

The **PQ Insight** menu mainly provides the Real-Time Waveform display.

Figure 3-33 PQ Insight Topic

This screen shows the Real-Time WFC for 3-Ø Voltages and Currents at 128 samples/cycle for 4 cycles that is updated every second. Press <**Enter**> to enter the display and then use <▲>, <▼>, <◀>, <▶> and <**Enter**> to navigate around the screen. One can toggle the display of a particular Voltage or Current Channel, **Pause**/**Refresh** the WFC update, manually trigger a WFR (Waveform Recorder), DWR (Disturbance Waveform Recorder), Transient, Interruption, Dips or Swells or check the details of the latest SOE event displayed at the left of the screen with ITIC/SEMI Curves and WFR/DWR waveforms.

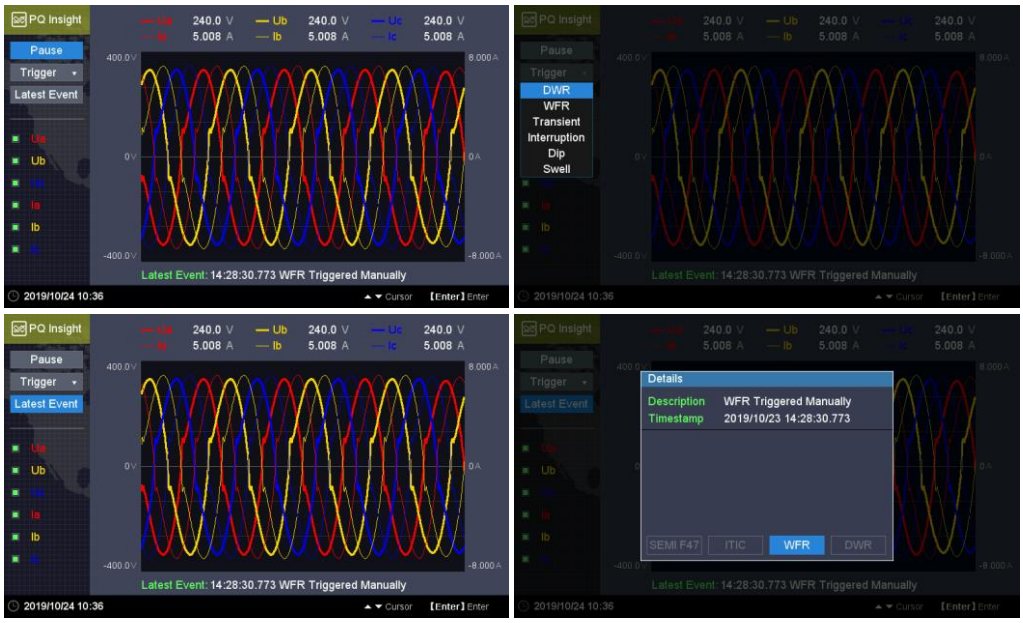


Figure 3-34 PQ Insight Pages

3.1.3.4 Events

The **Events** menu consists of **SOE Log, Device Log** and **PQ Counters.** The following section provides a quick overview of these screens.

Figure 3-35 Event Menu

3.1.3.4.1 SOE Log

Enter the **SOE Log** sub-menu and the following screen is available which displays up to 1024 events starting with the most recent events. Use <◀> or <▶> to quickly move through the pages. Press <**Enter**> to enter the display and then use <▲> or <▼> to scroll through the events list. Press <**Enter**> to select and view the event details.

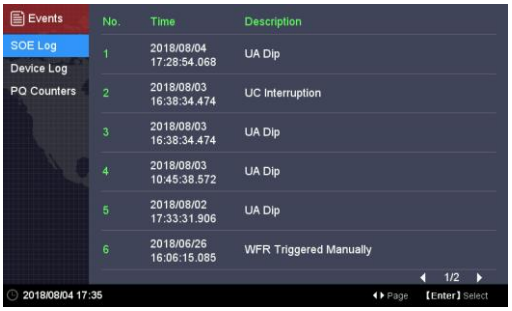


Figure 3-36 SOE Log

If the selected log is a PQ event, the **Details** dialog box may provide the options for displaying the SEMI F47/ITIC curves or the WFR and/or DWR waveform display. Press <◀> or <▶> to select the option and press <**Enter**> to select and view the respective display.

Figure 3-37 Event Detail and SEMI F47

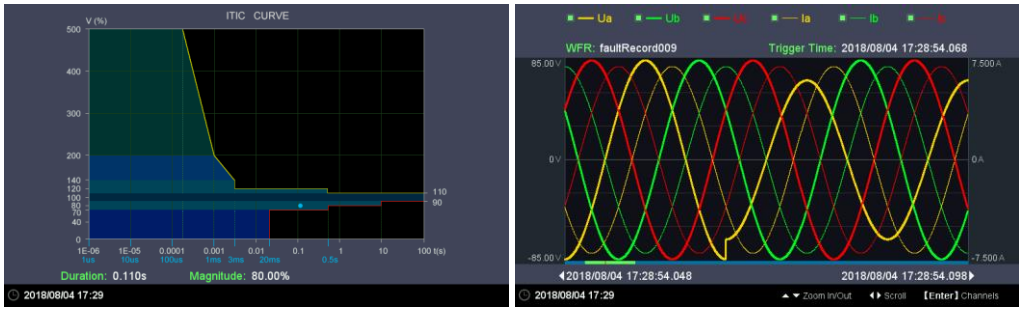


Figure 3-38 ITIC & WFR

The WFR page shows the detailed event and the timestamp. Press <**Enter**> to select which channels would

be displayed.

Inside the waveform display, press <▲> or <▼> to zoon in/out of the waveform or press <◀> or <▶> to scroll backward/forward of the waveform on the time scale.

3.1.3.4.2 Device Log

Enter the **Device Log** sub-menu and the following screen appears which displays up to 1024 events starting with the most recent event. Use <◀> or <▶> to quickly move through the pages.

Figure 3-39 Device Log

3.1.3.4.3 PQ Counters

Enter the **PQ Counters** sub-menu to display the different PQ Event counters.

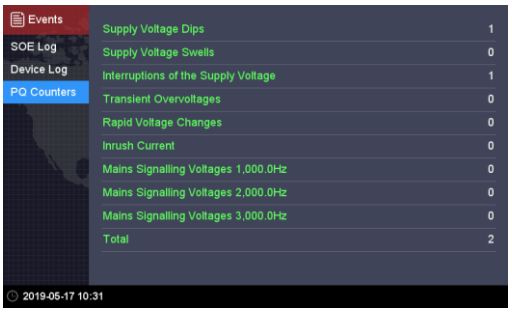


Figure 3-40 PQ Counters

3.1.3.5 Setup

The **Setup** menu consists of **Basic, Algorithm, DMD & Energy, Comm., PQ1, PQ2, Record, I/O, Clock, HMI &Pwd, Maintenance, Device Info., Site Info.** and **Advanced** sub-menus. The following sections provide a quick overview of these sub-menus.

Figure 3-41 Setup Menu

3.1.3.5.1 Basic

Enter the **Basic** sub-menu and the following screen appears. Use <◀>, <▶>, <▲>, <▼> to scroll through the different parameters. Press <**Enter**> to select the desired parameter. The **Front Panel Password** is required for any setup changes. Please refer to **3.2.4.5.1.1** for the setup range and the default values of the different parameters.

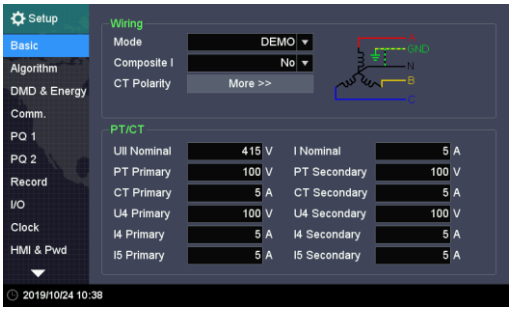


Figure 3-42 Basic Setup

3.1.3.5.2 Algorithm

Enter the **Algorithm** sub-menu and the following screens is available. Please refer to **Section 3.2.4.5.1.4** for the setup range and the default values.

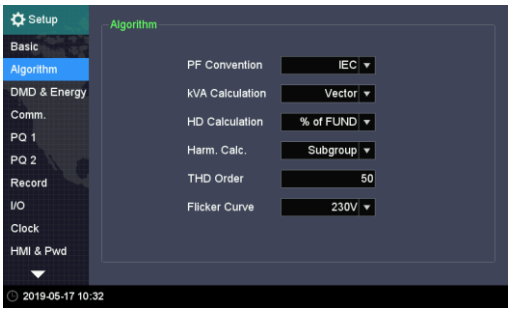


Figure 3-43 Algorithm Setup

3.1.3.5.3 DMD & Energy

Enter the **DMD & Energy** sub-menu and the following screen appears. Please refer to **Section 3.2.4.5.3.1** and **Section 3.2.4.5.3.2** for the setup range and the default values.

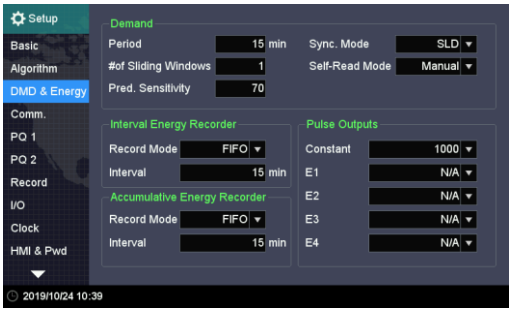


Figure 3-44 Dmd & Energy Setup

3.1.3.5.4 Comm.

Enter the **Comm.** sub-menu and the following screen appears. Please refer to **Section 3.2.4.5.1.2** for the setup range and the default values.

Figure 3-45 Comm. Setup

3.1.3.5.5 PQ 1 & PQ 2

Enter the **PQ 1** or **PQ 2** sub-menu and the following screen appears. Please refer to **Section 5.11.9** for

more information.

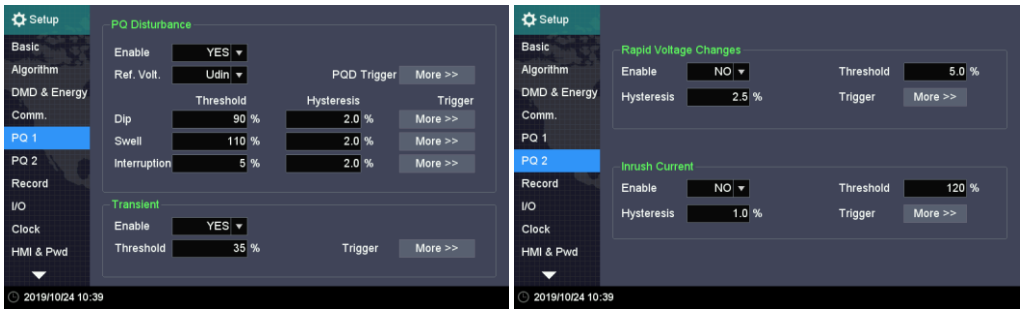


Figure 3-46 PQ Setup

3.1.3.5.6 Record

Enter the **Record** sub-menu and the following screen appears. Please refer to **Section 3.2.4.5.4** for more information.

Figure 3-47 Record Setup

3.1.3.5.7 I/O

Enter the **I/O** sub-menu and the following screen appears. Please refer to **Section 5.10.2** and **5.10.3** for more information.

Figure 3-48 I/O Setup

3.1.3.5.8 Clock

Enter the **Clock** sub-menu to display the Clock and Clock Source/SNTP settings. Please refer to **Section 3.2.4.5.1.3** for the range and default value.

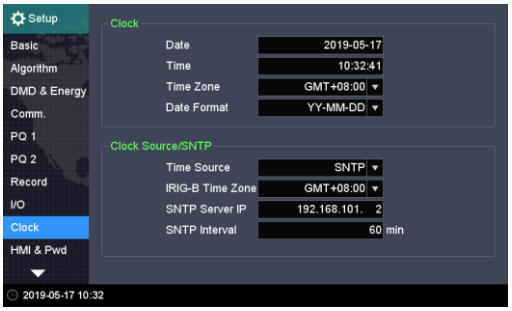


Figure 3-49 Clock Setup

3.1.3.5.9 HMI & Pwd

Enter the **HMI & Pwd** sub-menu to display the settings for the HMI & Language and Password. The current password is required to change the password.

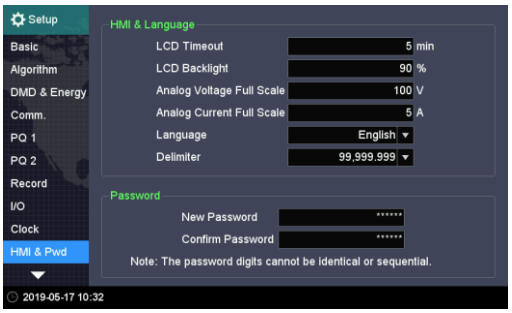


Figure 3-50 HMI & Pwd Setup

3.1.3.5.10 Maintenance

Enter the **Maintenance** sub-menu and the following screen appears which allows the manual control of DO and reset of the different groups of parameters.

Reset Perform the various reset operations.
DO Manual Operation Force DO On/Off or return DO to Normal control.

Figure 3-51 Maintenance

3.1.3.5.11 Device Info.

Enter the **Device Info.** sub-menu and the following screen appears.

Figure 3-52 Device Info.

3.1.3.5.12 Site Info.

Enter the **Site Info.** sub-menu and the following screen appears.

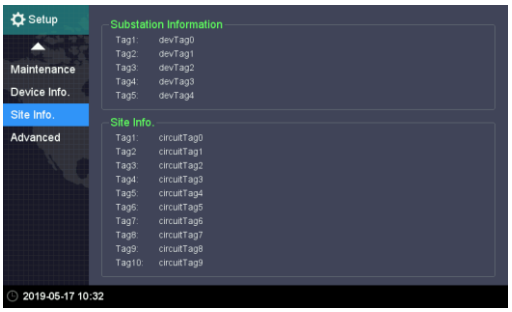


Figure 3-53 Site Info.

3.1.3.5.13 Advanced

Enter the **Advanced** sub-menu and the following screen appears. Please consult the qualified personnel before making changes to these settings.

Figure 3-54 Advanced Setup

3.2 On-board Web Interface

The iMeter 8's Web Interface is compatible with various Web Browsers which are listed in the table below.

Browser	Version
Internet Explorer	IE10 and above
Firefox	V24.0 and above
Google Chrome	V35.0 and above

Table 3-3 Supported Web Browsers

The default IP addresses of the iMeter 8's two Ethernet Ports are 192.168.0.100 and 192.168.1.100 for P1 and P2, respectively. Please make sure to configure the **IP Address**, **Subnet Mask** and **Default Gateway** such that it's on the same subnet as the PC that is being used to connect with the iMeter 8.

3.2.1 Setting PC's IP Address

To determine the PC's IP Address, click the Start icon, then the Settings button on Windows 10 (for other MS Windows systems, please refer to this link for more instructions).

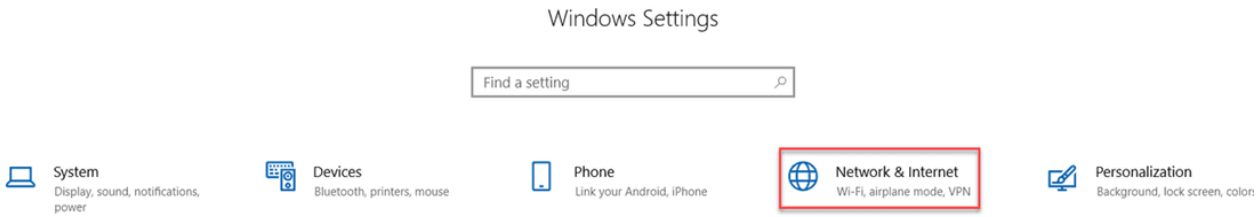


Figure 3-55 Settings-> Network & Internet

Click **Network & Internet**, select **Change adapter options** and then find the appropriate Ethernet connection.

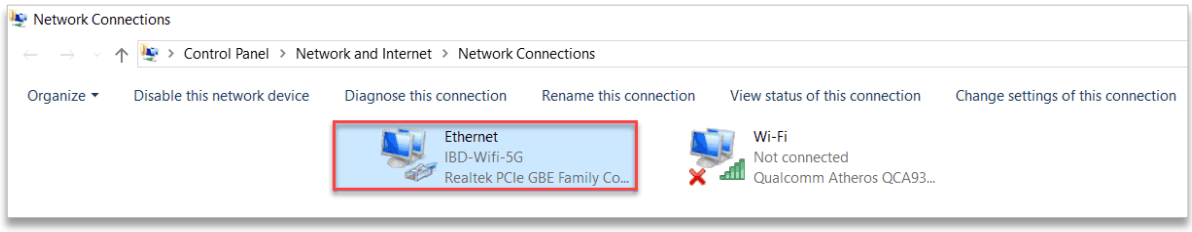


Figure 3-56 Network and Sharing Center

Right-click on it and select **Properties**. Then double-click on **Internet Protocol Version 4 (TCP/IPv4)** to show its IP configuration.

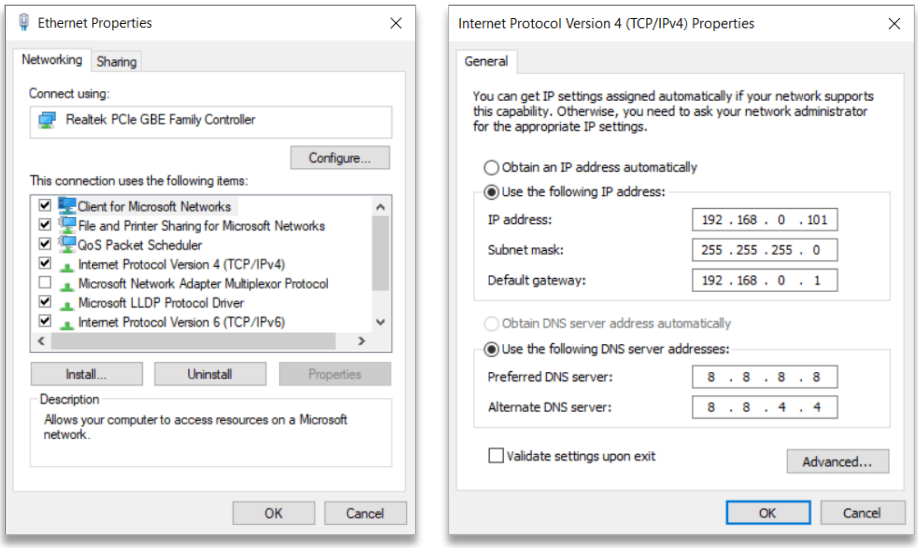


Figure 3-57 Setting PC's IP Address

3.2.2 Configure iMeter 8's IP Addresses

To configure the iMeter 8's IP Addresses, move the cursor to the **Setup** category, hit **<Enter>** and then the **Basic** topic appears. Hit **<▼>** to move from **Basic** to **Comm**. The IP Addresses can be modified by hitting **<Enter>** and going inside the page. Please note that P1 and P2 should not on the same network segment.

Figure 3-58 Configure iMeter 8's IP Address

3.2.3 Enabling Java Script in Google Chrome

Generally, the JavaScript in Google Chrome is enabled by default. Please refer to this section to turn on the JavaScript in Google Chrome if by any chance.

1) Open the settings on Google Chrome by clicking the menu icon in the upper right corner of the browser and choose **Settings** from selection popup.

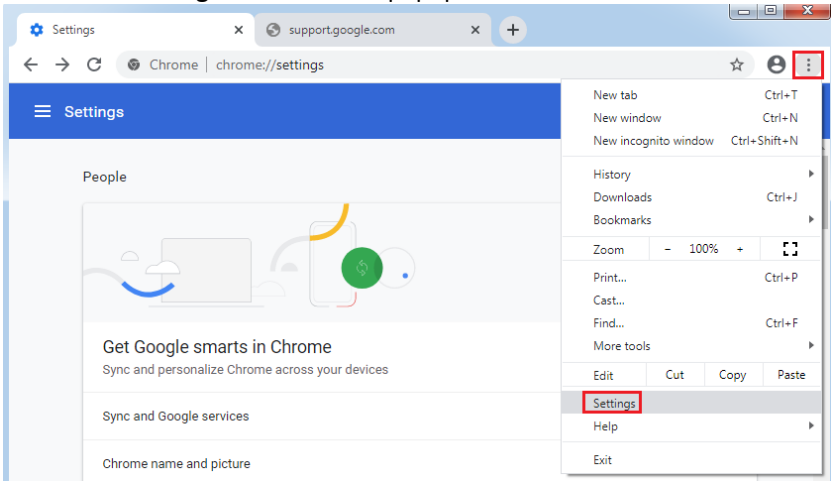


Figure 3-59 Open Setting page of Google Chrome

2) Scroll down to the bottom and tap on **Advanced** to get to the other side of Chrome settings.
3) Under the **Privacy and security,** scroll down to where you have **Site Settings** and click on it.

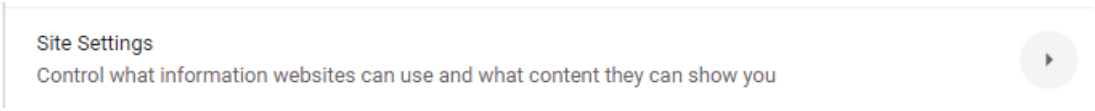


Figure 3-60 Find Site Settings of Google Chrome

4) Click the **JavaScript** and select option **Allow (recommended)** all sites to run JavaScript.

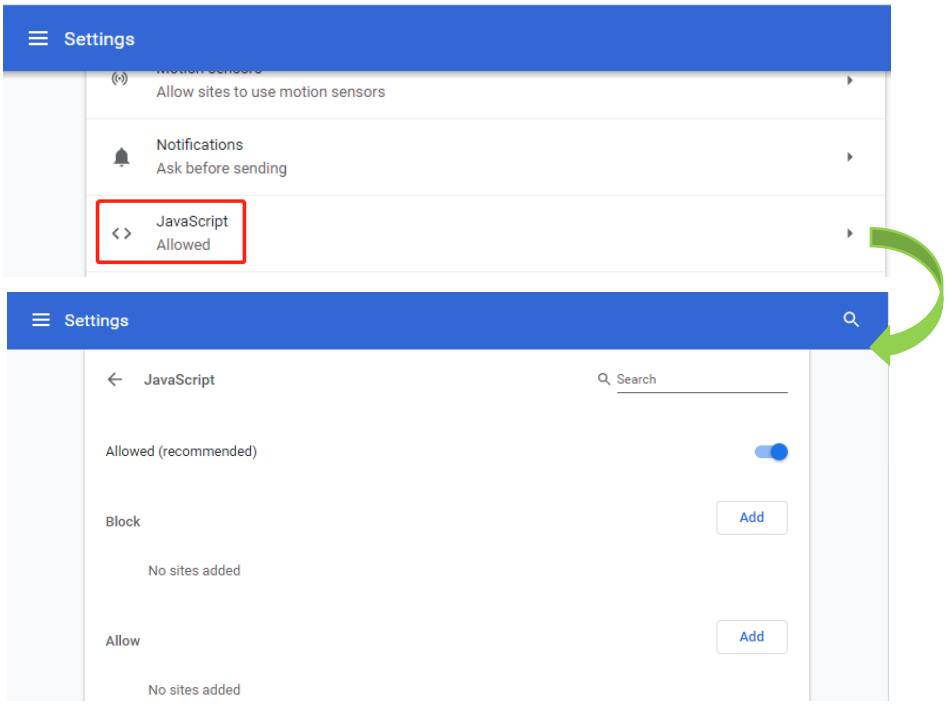


Figure 3-61 Enable JavaScript for Google Chrome

3.2.4 Accessing Web Interface

1) Enter the IP Address of the iMeter 8 in the Address area of **Google Chrome** and then press **<Enter>**.

Figure 3-62 Web Logon

2) The iMeter 8's Web Interface appears.

Figure 3-63 iMeter 8 Web Login Interface

The user is required to login to the Web interface to view data or change setup parameters. The figure below lists the different users and the corresponding authorities.

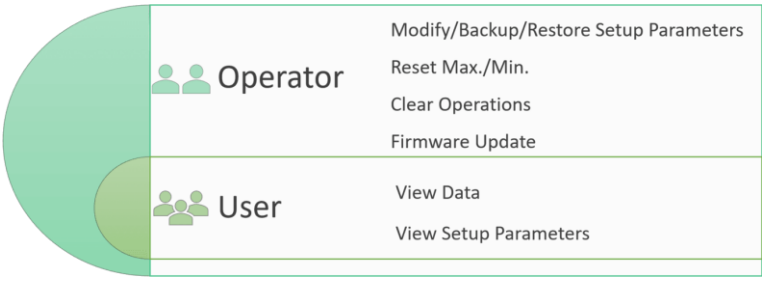


Figure 3-64 Authorities with their Permission Levels

As the figure shown, **Operator** has a higher permission than **User**. The default **Login Info.** of the operator and user accounts are listed below:

Account	Username	Password
Operator	operator	abcd1234-
User	user	abcd1234-

Table 3-4 Default Username and Password for Operator and User account

Please note that if the password is entered incorrectly for 6 times, the login access will be locked out for 3 minutes.

3) The iMeter 8's Web Interface appears after login. There are five items at the **Title Bar** - **PQ Insight**, **Metering, Power Quality, Events** and **Setup.**

Figure 3-65 Main Menu

4) The Web Interface's login password can be changed by clicking on the down arrow at the upper right –hand corner of the page and then selecting **Change Password** as shown below.

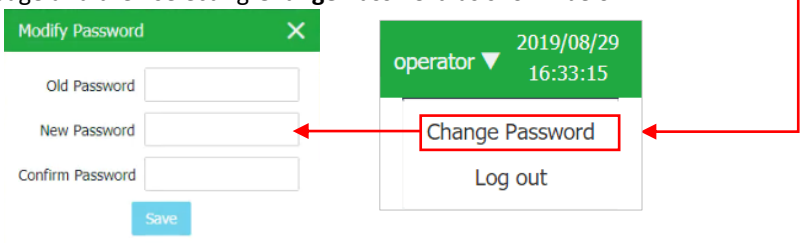


Figure 3-66 Change Web Interface Password

3.2.4.1 PQ Insight

The **Waveform** under **PQ Insight** menu is the first page displayed upon user login and includes following information and operations:

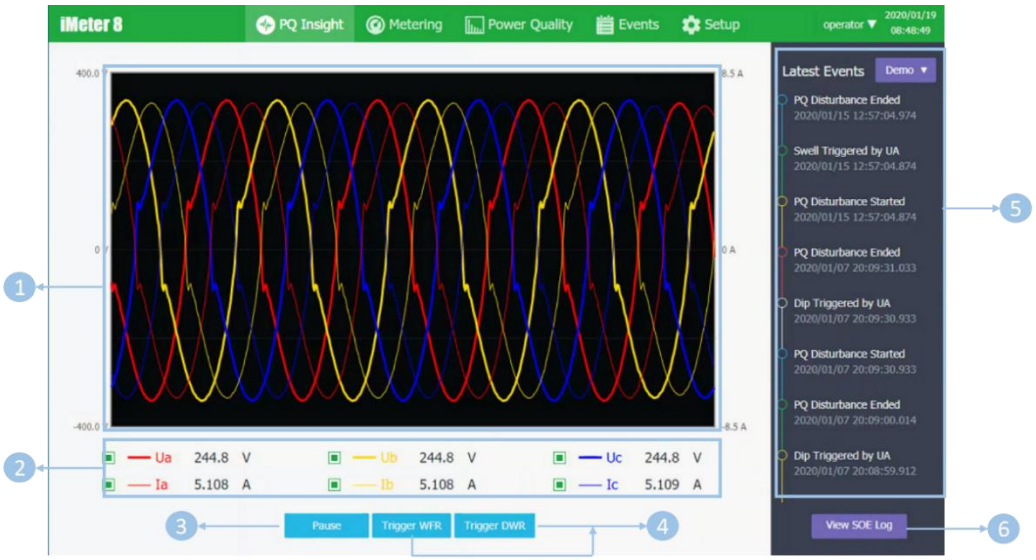


Figure 3-67 PQ Insight of Web Interface

1	Voltage & Current Waveforms	4	Manual Trigger WFR/DWR
2	Select/De-select Voltage/Current Channels	5	Latest 8 SOE Events
3	Toggle between <**Pause**> & <**Refresh**> for waveform update	6	Enter **SOE Log**

Table 3-5 PQ Insight

3.2.4.2 Metering

Click **Metering** on the **Title Bar** and its sub-menus appear on the left-hand pane which includes **Phasor**, **Basic, Energy, Demand, TOU, Max./Min.** and **I/O.** The following sections provide a quick overview for these sub-menus.

3.2.4.2.1 Phasor

Click **Phasor** on the left-hand pane and the following screen appears which displays the Phasor diagram, Magnitude and Phase Angles for Ua/Ub/Uc (3P4W) or Uab/Ubc/Uca (3P3W) and Ia/Ib/Ic as well as Frequency. Click **Export** to save the Phasor data to a .csv file at the default download folder of the Web Browser.

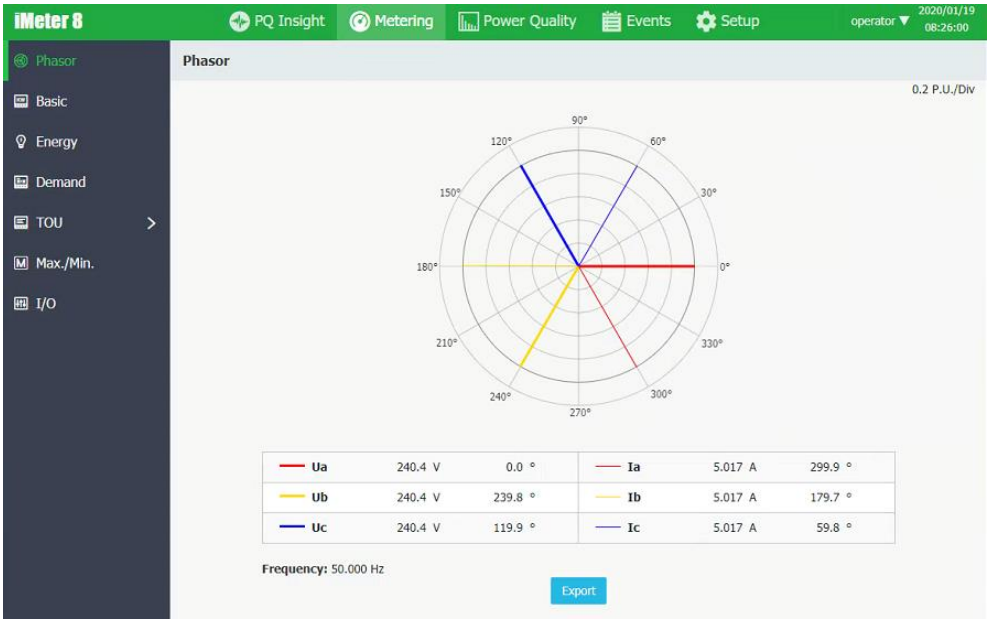


Figure 3-68 Phasor Interface

3.2.4.2.2 Basic

Click **Basic** on the left-hand pane and the following screen appears which shows the basic real-time readings for 3-Ø Voltages, Currents, Powers, Power Factors as well as U4, I4, I5 and Frequency. Click **Export** to save the data on this page to a .csv file at the default download folder of the Web Browser.

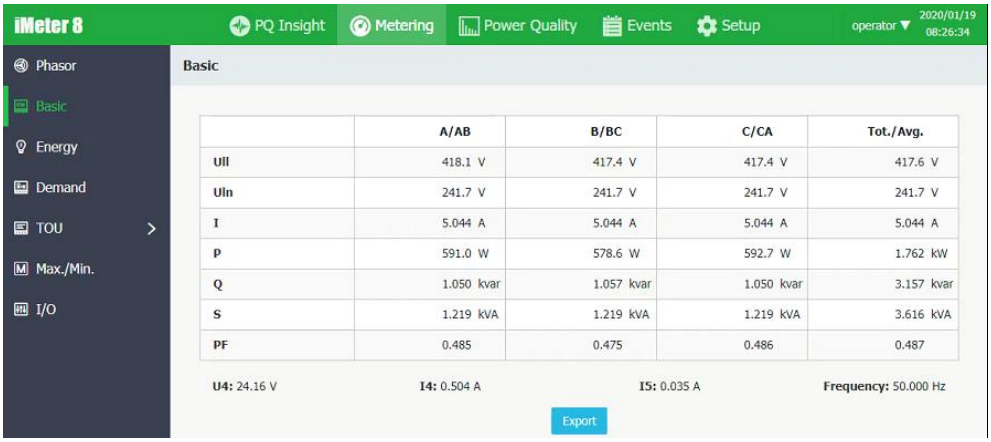


Figure 3-69 Basic Interface

3.2.4.2.3 Energy

Click **Energy** on the left-hand pane and the following screen appears which shows the **RMS, Fundamental** and **Harmonic** kWh/kvarh for **Import/Export/Net/Total** as well as **Total Apparent** Energy for the total of 3 Phases.

Click **Active** or **Reactive** from the drop-down list to switch between Active/Reactive Energy displays.

Click **Export** to save the Energy information to a .csv file at the default download folder.

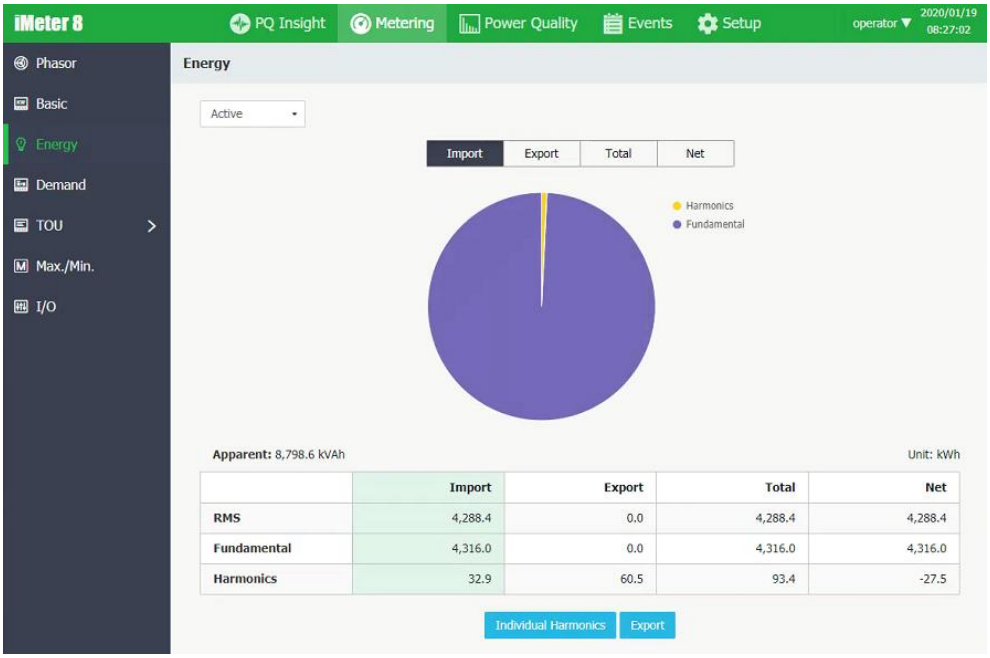


Figure 3-70 Energy Web Interface

Click **Individual Harmonics** and the following pages are available which display Harmonic Energy in spectrum or table format for kWh, kvarh Imp./Exp. by selecting **Spectrum** or **Table** from the top left drop-down list.

- **Spectrum** Move the mouse pointer over a particular histogram to show its harmonic order and value. Click on the **kWh Imp.**, **kWh Exp.**, **kvarh Imp.**, **kvarh Exp.** tab at the top to view the respective Harmonic Energy spectrum.

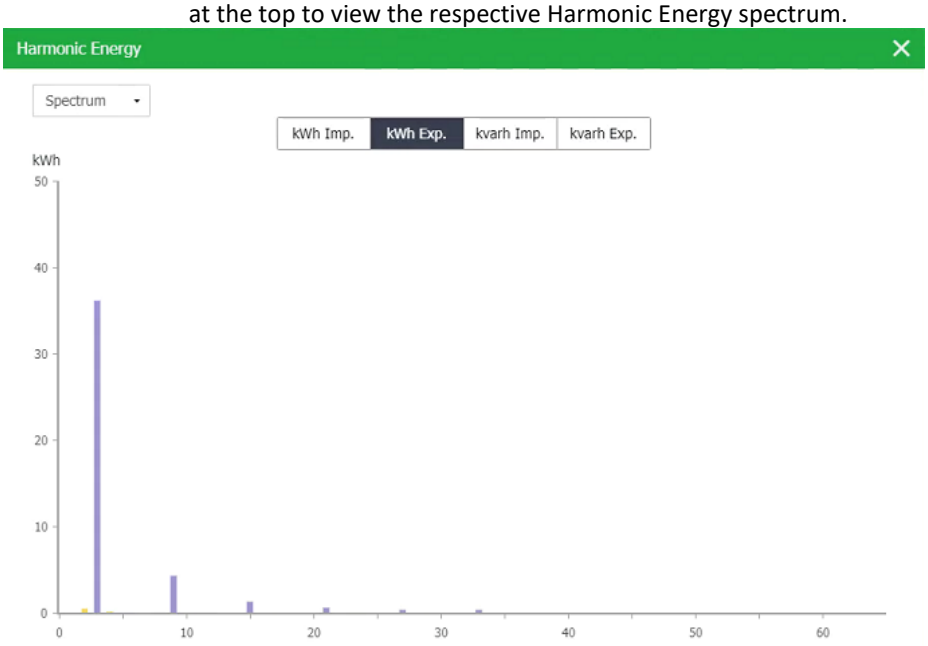
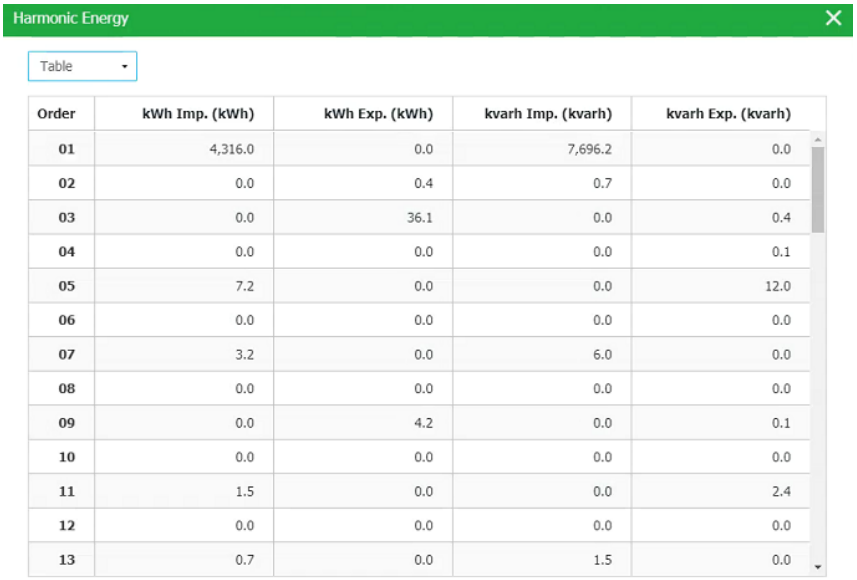


Figure 3-71 Spectrum Web Interface

- **Table**



Order	kWh Imp. (kWh)	kWh Exp. (kWh)	kvarh Imp. (kvarh)	kvarh Exp. (kvarh)
01	4,316.0	0.0	7,696.2	0.0
02	0.0	0.4	0.7	0.0
03	0.0	36.1	0.0	0.4
04	0.0	0.0	0.0	0.1
05	7.2	0.0	0.0	12.0
06	0.0	0.0	0.0	0.0
07	3.2	0.0	6.0	0.0
08	0.0	0.0	0.0	0.0
09	0.0	4.2	0.0	0.1
10	0.0	0.0	0.0	0.0
11	1.5	0.0	0.0	2.4
12	0.0	0.0	0.0	0.0
13	0.7	0.0	1.5	0.0

Figure 3-72 Individual Harmonics Web Interface

3.2.4.2.4 Demand

Click **Demand** on the left-hand pane and the following screen appears which shows the readings for **Demand** (Present Demand)**, Predicted** (Predicted Demand)**, This Max.** and **Last Max.**. Depending on the setting of the **Self-Read Time, This Max.** and **Last Max.** could mean the Max. Demand of This Month/Last Month or Since/Before Last Reset.

Move the mouse pointer over the readings for **This Max.** and **Last Max.** to show the corresponding timestamp.

Click **Export** to save the demand data on this page to a .csv file at the default download folder.

Click **Reset This Max.** (Available for **Operator** only) to manually reset the Max. Demand of This Month or Since Last Reset. It should be noted that it's not possible to manually reset the **Last Max.**, which is the Max. Demand of Last Month or Before Last Reset.

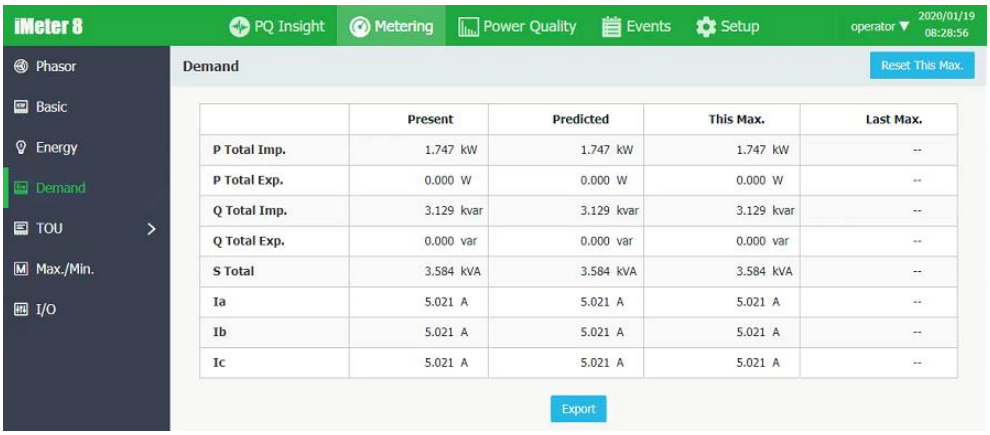


Figure 3-73 Demand Interface

3.2.4.2.5 TOU

Click **TOU** on the left-hand pane to view the **Real Time, Freeze Record** and **Historical Record** TOU information**.**

3.2.4.2.5.1 Real Time

The page displays the present TOU information, including Energy and Max. Demand for all 8 Tariffs. The **Present Schedule, Present Tariff, Present Season** and **Present Daily Profile** are displayed at the top of the page. Click **Switch Schedule** to manually switch between Schedules of TOU1 and TOU2.

- **Energy** Select from the drop-down list underneath Present Tariff to display the respective Tariff information for **kWh Imp.**, **kWh Exp.**, **kvarh Imp.**, **kvarh Exp.** and **kVAh**.

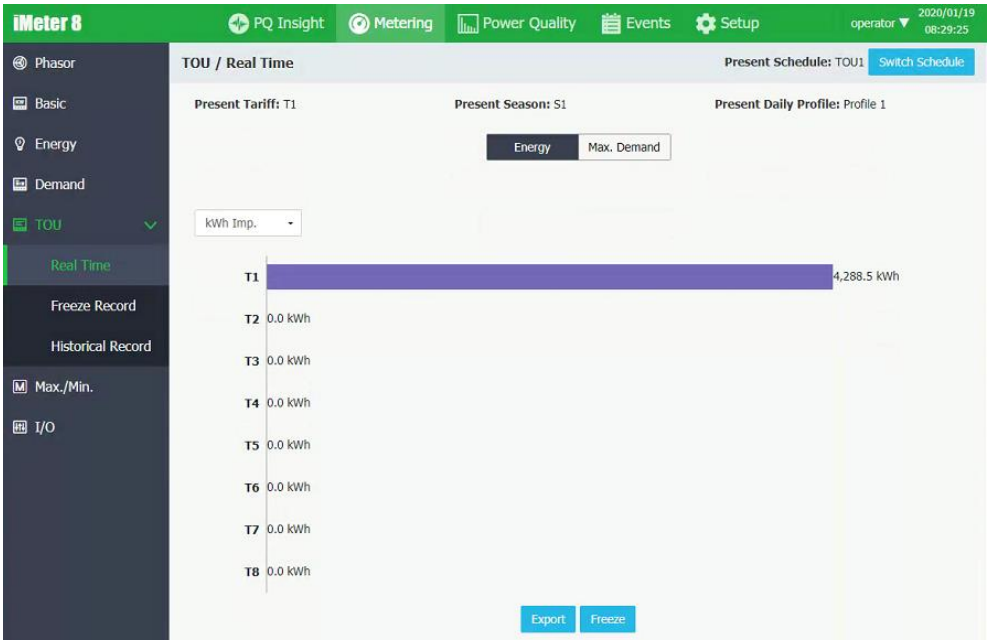


Figure 3-74 Real Time TOU Interfaces

- **Max. Demand** Select from the drop-down list underneath Present Tariff to display the respective Tariff information for **P Imp.**, **P Exp.**, **Q Imp**. and **Q Exp**.

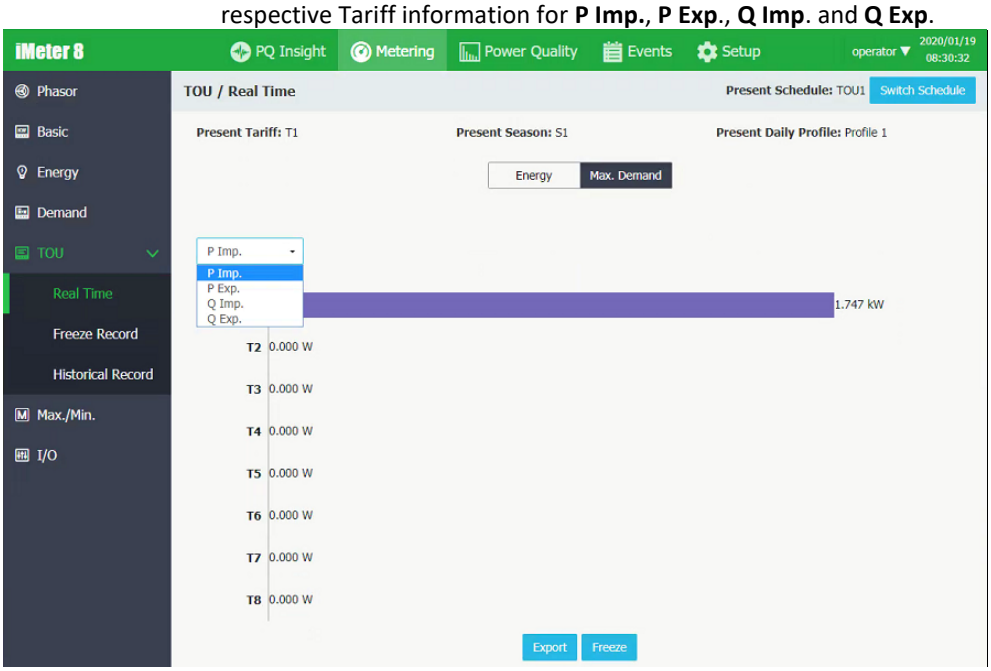


Figure 3-75 Real Time TOU Max. Demand

Click **Export** to save the Real Time TOU data to a .csv file at default download folder and click **Freeze** to take a momentary snapshot of the TOU Energy and Max. Demand.

3.2.4.2.5.2 Freeze Record

The iMeter 8 provides a **Freeze Record** with timestamp for the Energy and Max. Demand generated momentarily after the manual **Freeze** operation from the **TOU > Real Time** interface.

Click **Export** to save the **Freeze Record** data to a .csv file at the default download folder.

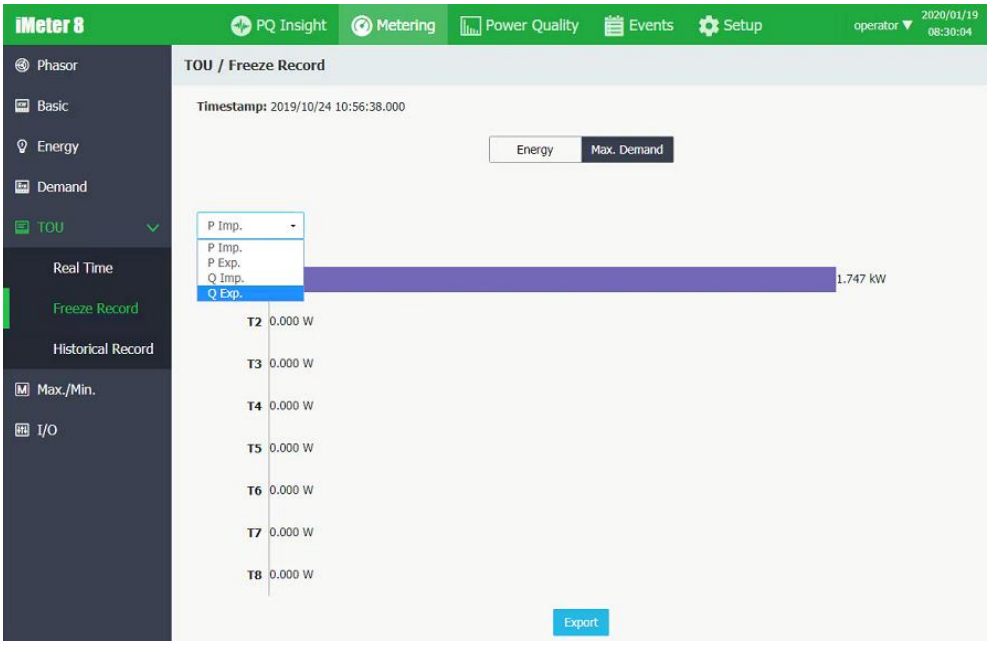


Figure 3-76 Freeze TOU Record Interfaces

3.2.4.2.5.3 Historical Record

The iMeter 8 can restore up to 12 Historical Records with timestamp based on the FIFO principle. The **Historical Record** includes PF Total, TOU Energy and Max. Demand for the 8 Tariffs. When the **TOU Record Self-Read Time** is set to **Auto**, the **Historical Record** is generated monthly at the pre-defined **Self-Read Time.** It can also be manually generated by clicking on the **Trigger TOU Recording** button at the top right. Click **Export** to save the currently displayed **Historical Record** to a .csv file at the default download folder.

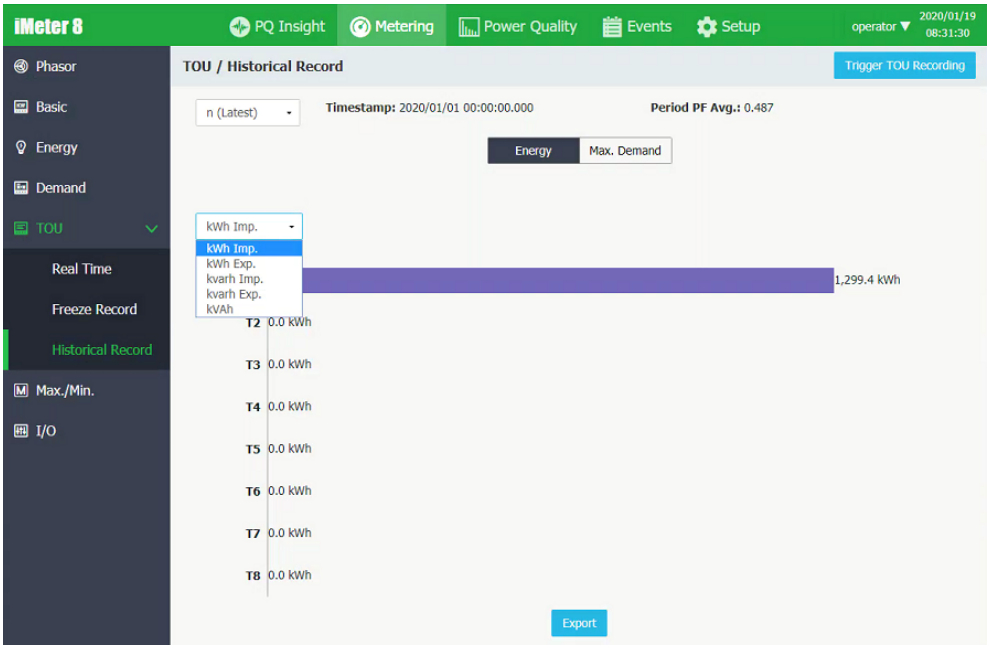


Figure 3-77 Historical Record TOU Record Interfaces

3.2.4.2.6 Max./Min.

Click **Max./Min.** on the left-hand pane and the following screen appears which displays the 4 Max./Min. Recorders.

Move the mouse pointer over the readings for **This Max.** and **Last Max.** to show the corresponding timestamp.

Click **Export** to save the specific group of **Max.** or **Min.** data displayed on the current page to a .csv file at

the default download folder.

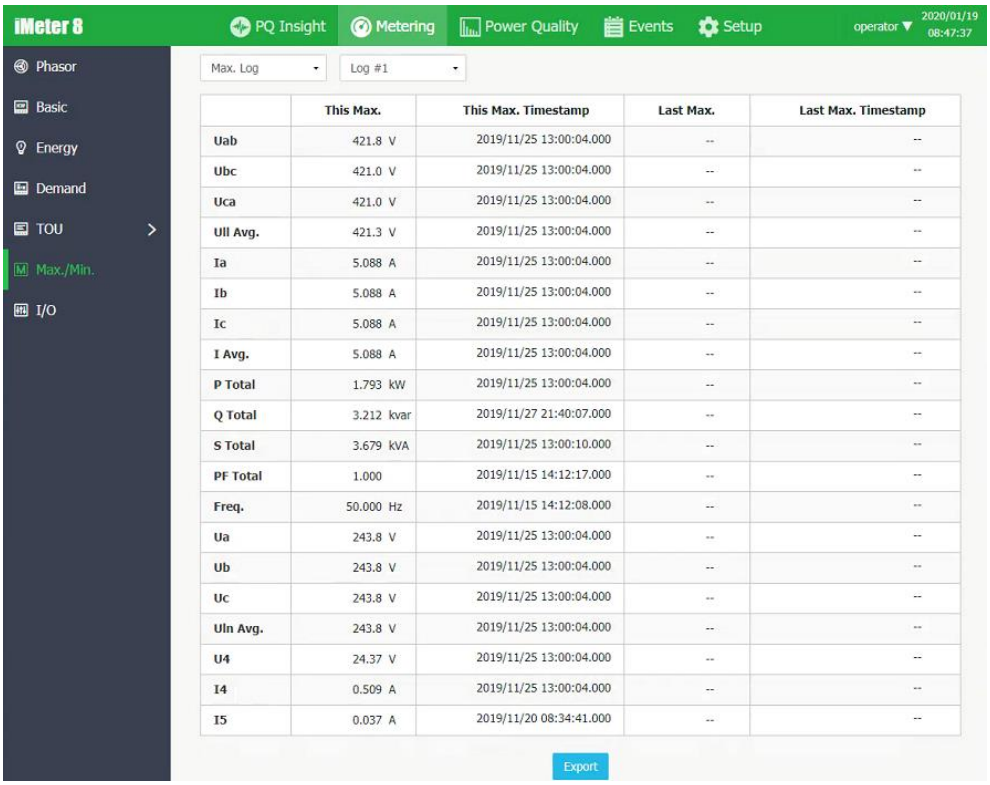


Figure 3-78 Max./Min. Interface

3.2.4.2.7 I/O

Click **I/O** on the left-hand pane and following screen appears which displays the I/O function and status.

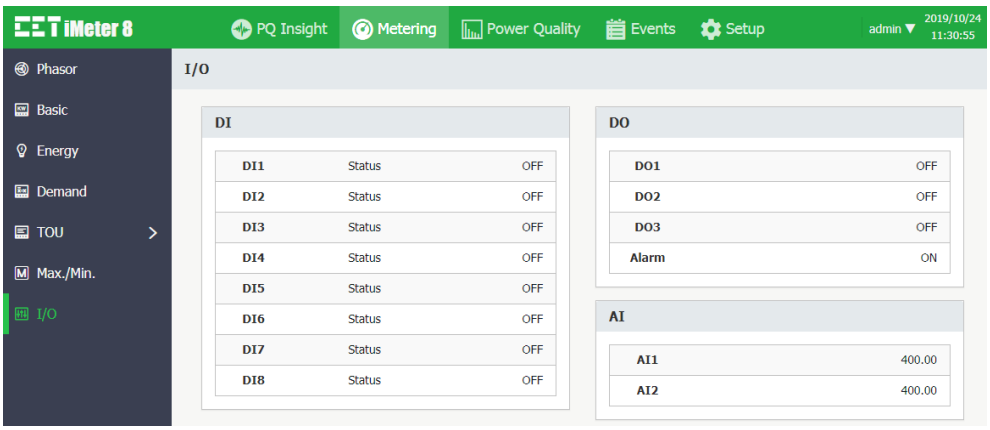


Figure 3-79 I/O Interface

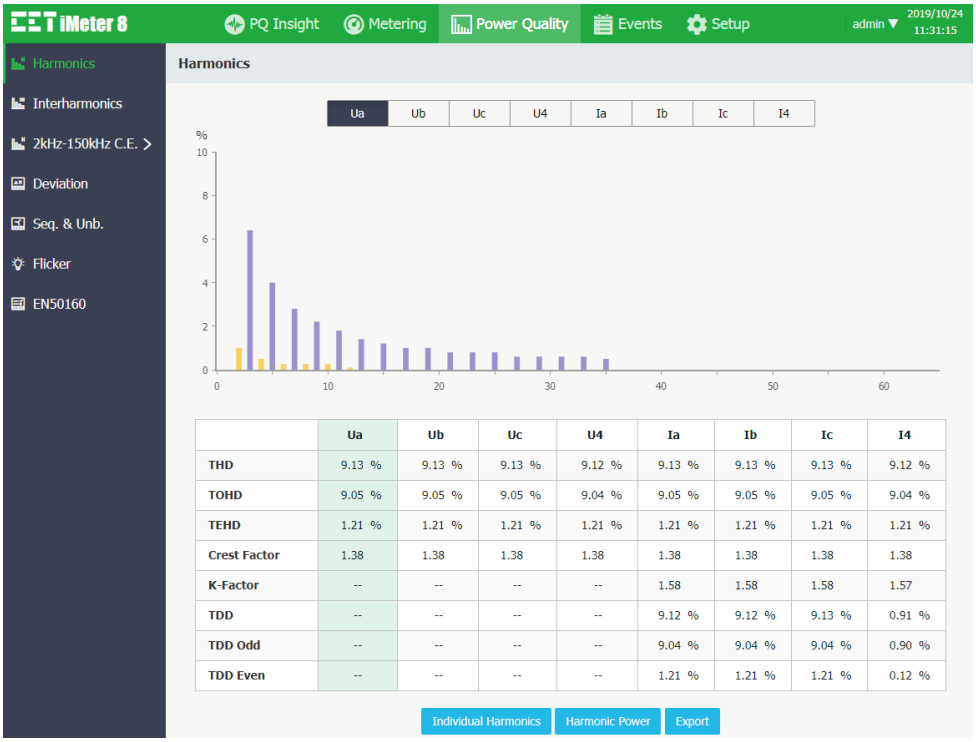
3.2.4.3 3.2.4.3 Power Quality

Click **Power Quality** at the **Title Bar** and its sub-menus appear on the left-hand pane which includes **Harmonics, Interhamonics, 2kHz-150kHz C.E.**, **Deviation, Seq. & Unb., Flicker** and **EN50160.** The following sections provide a quick overview of these web pages.

3.2.4.3.1 Harmonics

Click **Harmonics** on the left-hand pane and the following screen appears which displays the Spectrum for up to 63rd harmonic and the following parameter: **THD, TOHD, TEHD, Crest Factor, K-Factor, TDD, TDD Odd** and **TDD Even**.

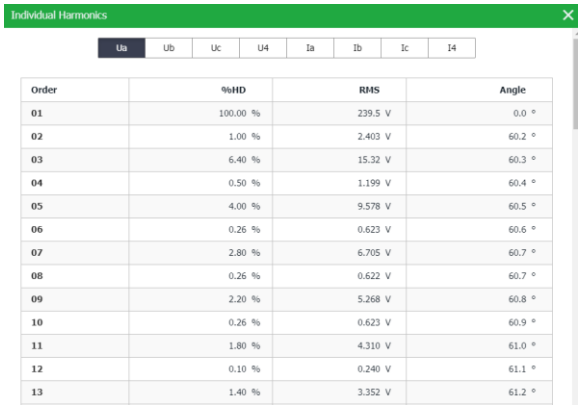
Click **Ua**, **Ub**, **Uc**, **U4**, **Ia**, **Ib**, **Ic** and **I4** tabs at the top of the page to view respective Harmonics data. Move the mouse pointer over a particular histogram to show its harmonic order and value.



	Ua	Ub	Uc	U4	Ia	Ib	Ic	I4
THD	9.13 %	9.13 %	9.13 %	9.12 %	9.13 %	9.13 %	9.13 %	9.12 %
TOHD	9.05 %	9.05 %	9.05 %	9.04 %	9.05 %	9.05 %	9.05 %	9.04 %
TEHD	1.21 %	1.21 %	1.21 %	1.21 %	1.21 %	1.21 %	1.21 %	1.21 %
Crest Factor	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38
K-Factor	--	--	--	--	1.58	1.58	1.58	1.57
TDD	--	--	--	--	9.12 %	9.12 %	9.13 %	0.91 %
TDD Odd	--	--	--	--	9.04 %	9.04 %	9.04 %	0.90 %
TDD Even	--	--	--	--	1.21 %	1.21 %	1.21 %	0.12 %

Figure 3-80 Harmonics Interface

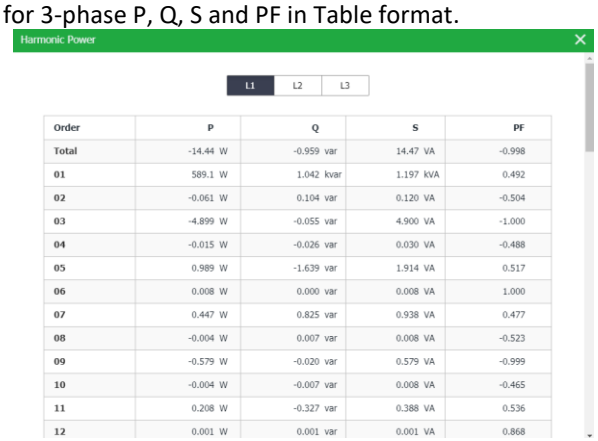
- Click **Individual Harmonics** at the bottom of the page to view the **%HD**, **RMS** and **Angle** for 4-phase Voltages and Currents in a Table format to view individual Harmonic data.



Order	%HD	RMS	Angle
01	100.00 %	239.5 V	0.0 °
02	1.00 %	2.403 V	60.2 °
03	6.40 %	15.32 V	60.3 °
04	0.50 %	1.199 V	60.4 °
05	4.00 %	9.578 V	60.5 °
06	0.26 %	0.623 V	60.6 °
07	2.80 %	6.705 V	60.7 °
08	0.26 %	0.622 V	60.7 °
09	2.20 %	5.268 V	60.8 °
10	0.26 %	0.623 V	60.9 °
11	1.80 %	4.310 V	61.0 °
12	0.10 %	0.240 V	61.1 °
13	1.40 %	3.352 V	61.2 °

Figure 3-81 %HD, RMS and Angle Interface

- Click **Harmonic Power** at the bottom of the page to display the individual harmonic measurements for 3-phase P, Q, S and PF in Table format.



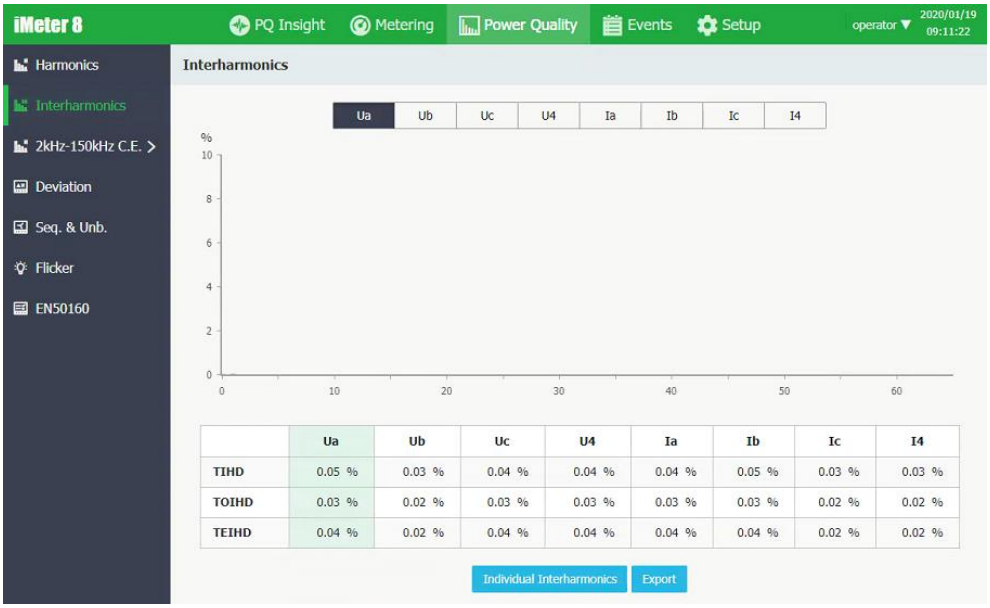
Order	P	Q	S	PF
Total	-14.44 W	-0.959 var	14.47 VA	-0.998
01	589.1 W	1.042 kvar	1.197 kVA	0.492
02	-0.061 W	0.104 var	0.120 VA	-0.504
03	-4.899 W	-0.055 var	4.900 VA	-1.000
04	-0.015 W	-0.026 var	0.030 VA	-0.488
05	0.989 W	-1.639 var	1.914 VA	0.517
06	0.008 W	0.000 var	0.008 VA	1.000
07	0.447 W	0.825 var	0.938 VA	0.477
08	-0.004 W	0.007 var	0.008 VA	-0.523
09	-0.579 W	-0.020 var	0.579 VA	-0.999
10	-0.004 W	-0.007 var	0.008 VA	-0.465
11	0.208 W	-0.327 var	0.388 VA	0.536
12	0.001 W	0.001 var	0.001 VA	0.868

Figure 3-82 Harmonic Power Interfaces

Click **Export** to export all the harmonic data to a .csv file at the default download folder.

3.2.4.3.2 Interharmonics

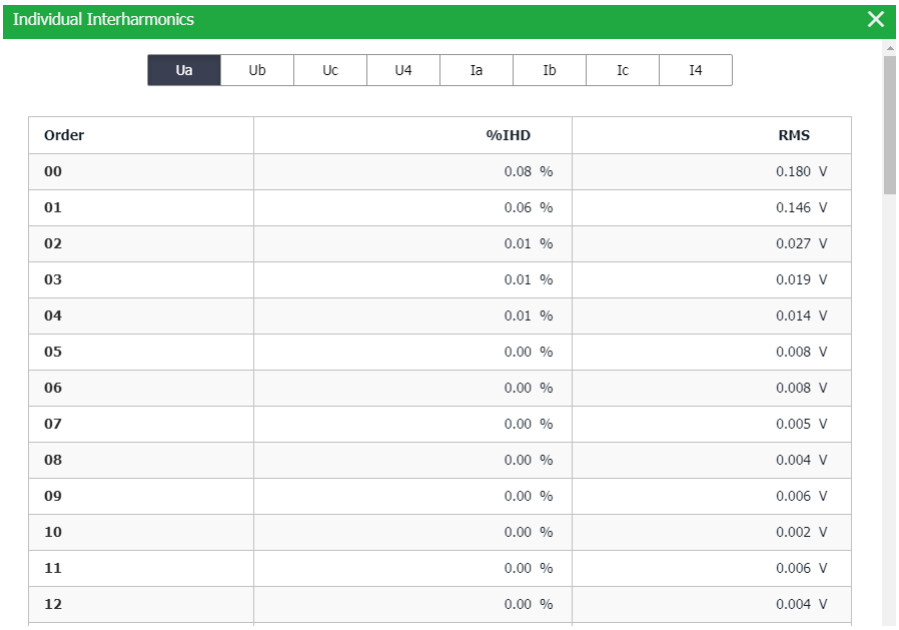
Click **Interharmonics** on the left-hand pane and the following screen appears which displays the Spectrum for up to 63rd interharmonics and **TIHD**, **TOIHD** and **TEIHD** for 4-phase Voltages and Currents. Move the mouse pointer over a particular histogram to show its interharmonic order and value.



	Ua	Ub	Uc	U4	Ia	Ib	Ic	I4
TIHD	0.05 %	0.03 %	0.04 %	0.04 %	0.04 %	0.05 %	0.03 %	0.03 %
TOIHD	0.03 %	0.02 %	0.03 %	0.03 %	0.03 %	0.03 %	0.02 %	0.02 %
TEIHD	0.04 %	0.02 %	0.04 %	0.04 %	0.04 %	0.04 %	0.02 %	0.02 %

Figure 3-83 Interharmonic Interface

Click **Individual Interharmonics** at the bottom of the page to view the data in a Table format.



Order	%IHD	RMS
00	0.08 %	0.180 V
01	0.06 %	0.146 V
02	0.01 %	0.027 V
03	0.01 %	0.019 V
04	0.01 %	0.014 V
05	0.00 %	0.008 V
06	0.00 %	0.008 V
07	0.00 %	0.005 V
08	0.00 %	0.004 V
09	0.00 %	0.006 V
10	0.00 %	0.002 V
11	0.00 %	0.006 V
12	0.00 %	0.004 V

Figure 3-84 Individual Interharmonics

Click **Export** to export all the Interharmonic data to a .csv file at the default download folder.

3.2.4.3.3 2kHz-150kHz C.E.

Click **2kHz-150kHz C.E.** on the left-hand pane to expand its sub-menu – **Real Time** and **Daily Heat Map.**

3.2.4.3.3.1 Real Time

Click **Real Time** on the left-hand pane and the following screen appears which displays realtime value at 3s for two frequency ranges: 2kHz~9kHz & 9kHz~150kHz which can be switched by clicking **2kHz~9kHz** and **9kHz~150kHz** tabs.

Click **Export** to export data displayed on the current page to a .csv file at the default download folder.

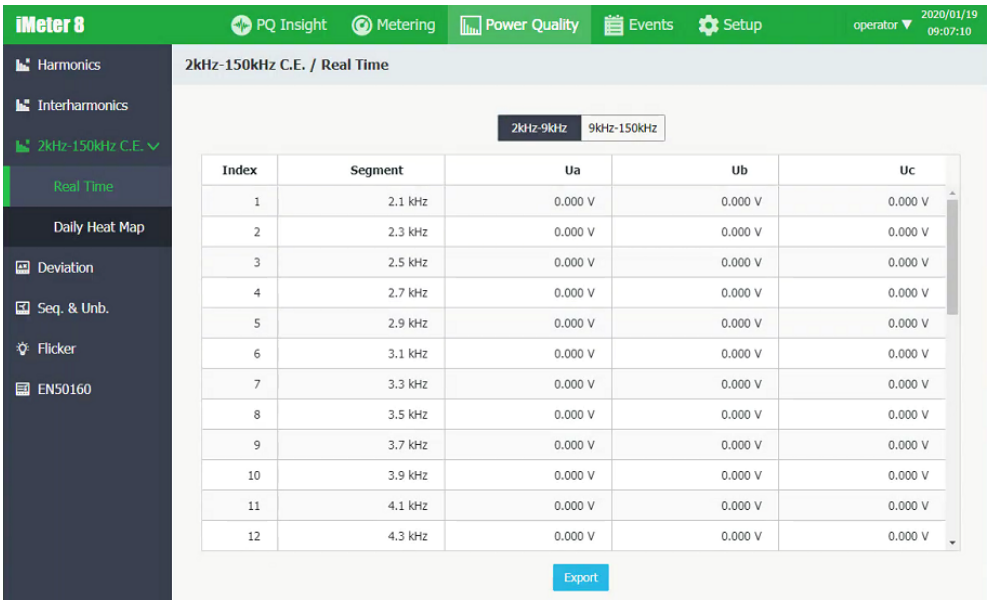


Figure 3-85 2kHz-150kHz Real Time Interface

3.2.4.3.3.2 Daily Heat Map

Click **Daily Heat Map** on the left-hand pane and the following screen appears which displays Max., Min., Avg. and CP95 values for Ua, Ub and Uc.

Click **Max.**, **Min.**, **Avg**. and **CP95** tabs at the top of the page to view respective data.

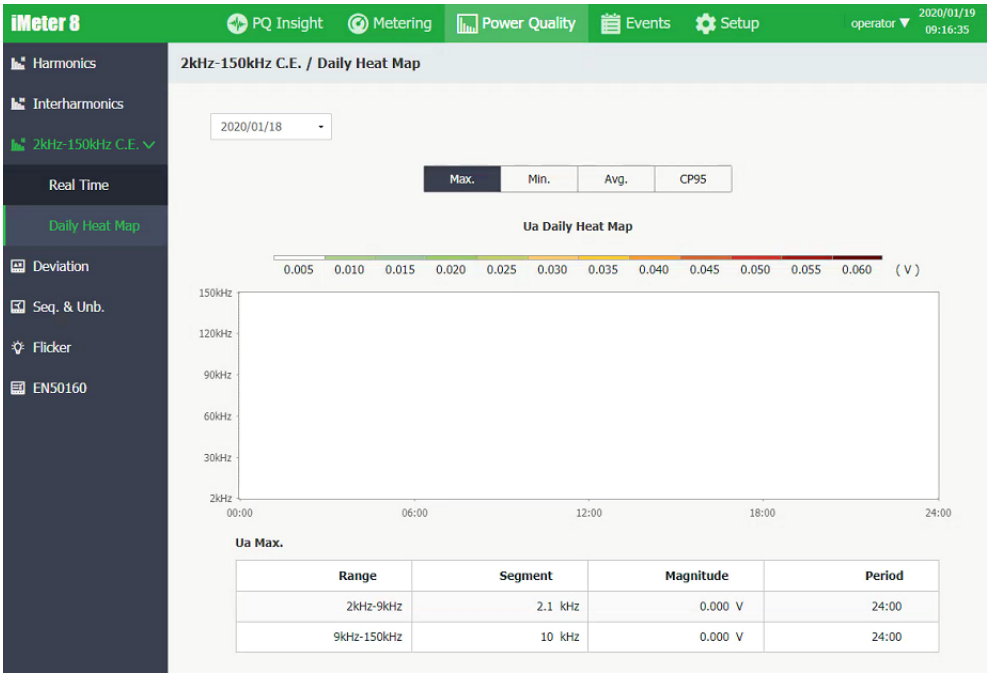


Figure 3-86 Daily Heat Map Interface

3.2.4.3.4 Deviation

Click **Deviation** on the left-hand pane to display **Over/Under Deviation** measurements for 3-phase Ull and Uln as well as **Frequency Deviation**.

Click **Export** to save the data to a .csv file at the default download folder.

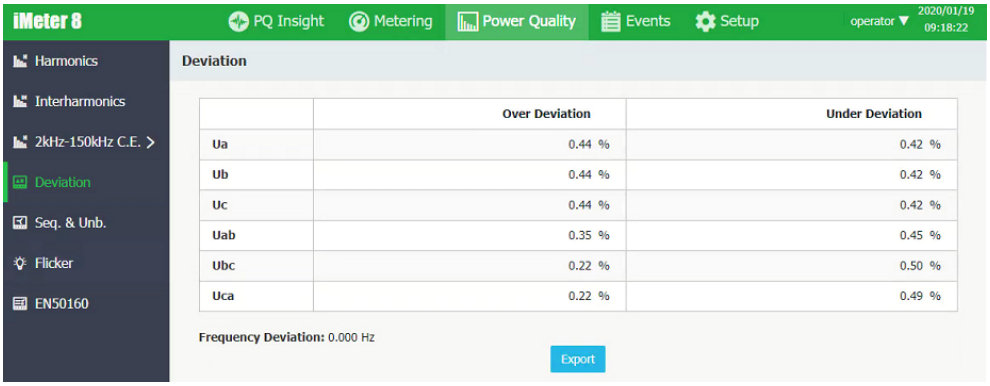


Figure 3-87 Deviation Interface

3.2.4.3.5 Seq. & Unb.

Click **Seq. & Unb.** on the left-hand pane to display Negative and Zero Sequence Unbalance as well as the Positive, Negative and Zero Sequence measurements for Voltage and Current.

Click **Export** to save the data to a .csv file at the default download Folder.

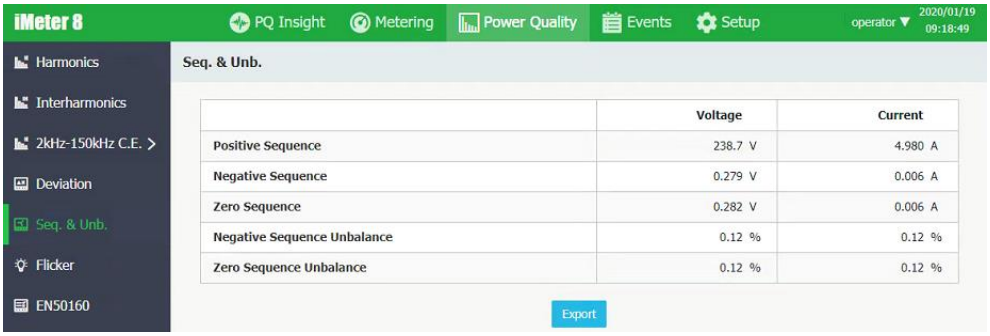


Figure 3-88 Sym. Comp. & Unb. Interface

3.2.4.3.6 Flicker

Click **Flicker** on the left-hand pane to display the **Pst/Plt** measurements for 3-pahse Voltages. Click **Export** to save the data to a .csv file at the default Download Folder.

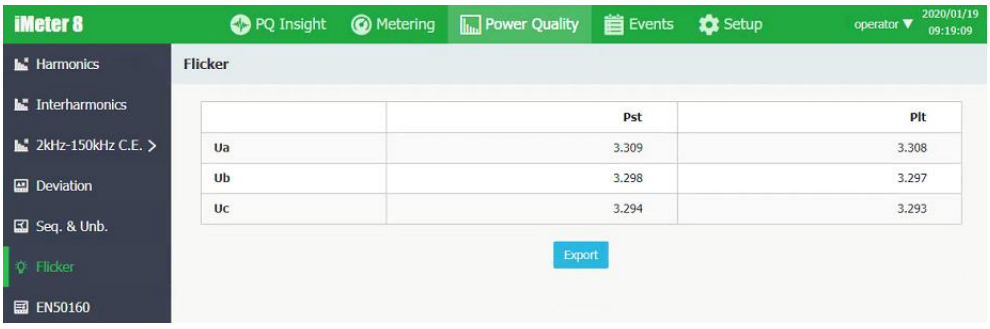


Figure 3-89 Flicker Interfaces

3.2.4.3.7 EN50160

Click **EN50160** on the left-hand pane and the following screen appears. Click on the drop-down list on the top left to select the period for the desired EN50160 Summary Report. As shown in **Figure 3-90**, ✔ denotes the positive evaluation while ✘ denotes the negative evaluation for the parameter. Click on a particular parameter to view the report details. Click **Export** to download the EN50160 Report file for the currently selected period.

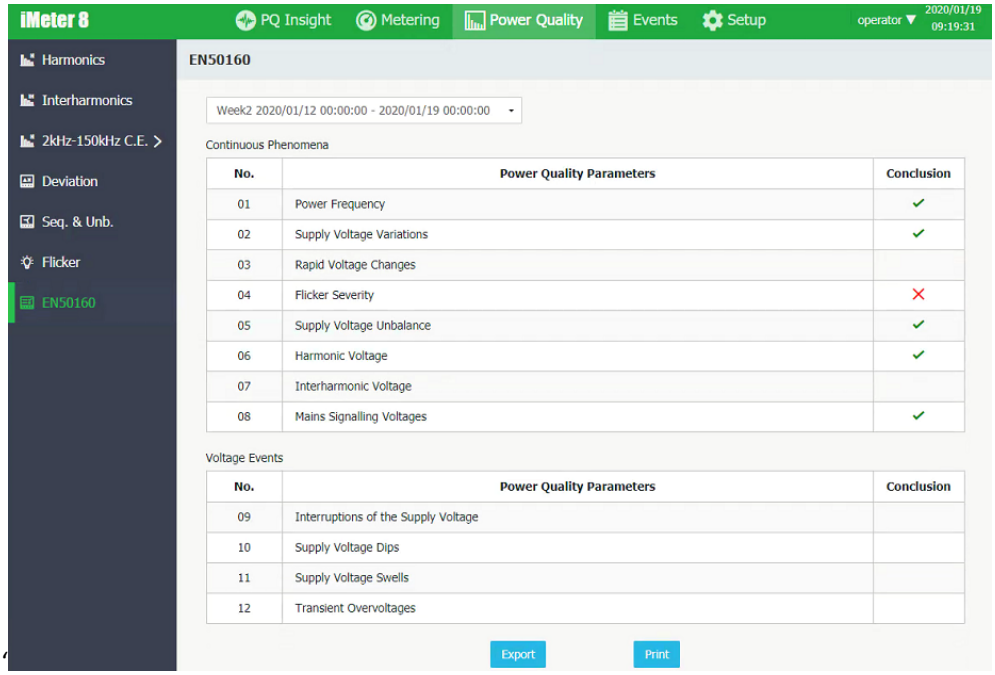


Figure 3-90 EN50160 Interfaces and Parameters' Details

The following screenshots provide a quick overview of the summary details for each parameter.

- **Power Frequency**

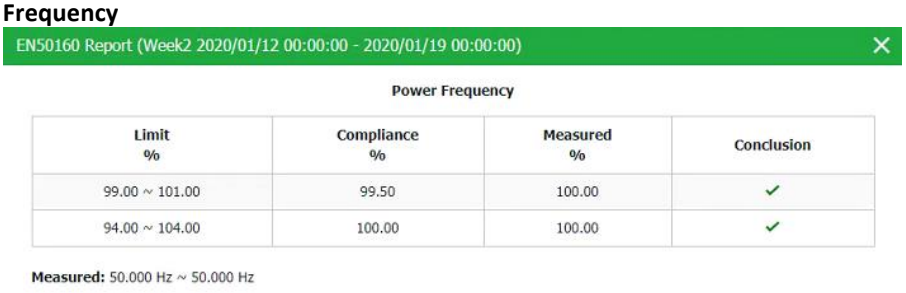


Figure 3-91 Power Frequency

- **Supply Voltage Variations**

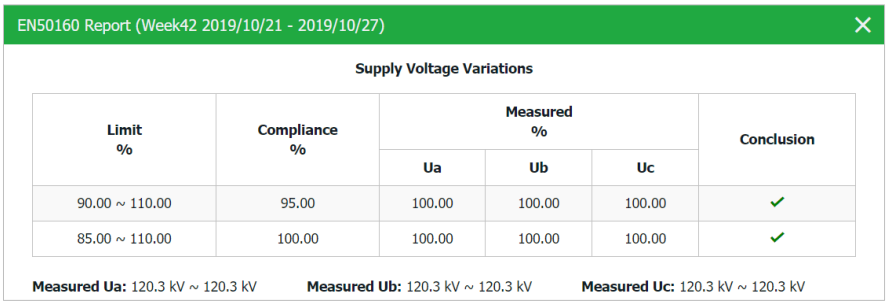


Figure 3-92 Supply Voltage Variations

- **Rapid Voltage Changes**

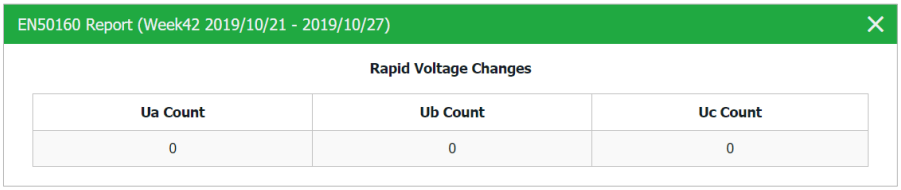


Figure 3-93 Rapid Voltage Changes

- **Flicker Severity**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Flicker Severity

Limit	Compliance %	Measured %			Conclusion
		Ua	Ub	Uc	
Plt ≤ 1.000	95.00	0.00	0.00	0.00	✗

Measured Ua Plt: 3.308 ~ 3.310 **Measured Ub Plt:** 3.298 ~ 3.300 **Measured Uc Plt:** 3.293 ~ 3.296

Figure 3-94 Flicker Severity

- **Supply Voltage Unbalance**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Supply Voltage Unbalance

Limit %	Compliance %	Measured %	Conclusion
2.00	95.00	100.00	✓

Measured U2 Unbalance: 0.12 % ~ 0.12 %

Figure 3-95 Supply Voltage Unbalance

- **Harmonic Voltages**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Harmonic Voltage

Order h	Limit %	CP95 %			Compliance %	Measured %			Conclusion
		Ua	Ub	Uc		Ua	Ub	Uc	
THD	8.00	9.13	9.13	9.13	95.00	0.00	0.00	0.00	✗
Odd Harmonics (Not Multiples of 3)									
H05	6.00	4.00	4.00	4.00	95.00	100.00	100.00	100.00	✓
H07	5.00	2.80	2.80	2.80	95.00	100.00	100.00	100.00	✓
H11	3.50	1.80	1.80	1.80	95.00	100.00	100.00	100.00	✓
H13	3.00	1.40	1.40	1.40	95.00	100.00	100.00	100.00	✓
H17	2.00	1.00	1.00	1.00	95.00	100.00	100.00	100.00	✓
H19	1.50	1.00	1.00	1.00	95.00	100.00	100.00	100.00	✓
H23	1.50	0.80	0.80	0.80	95.00	100.00	100.00	100.00	✓
H25	1.50	0.80	0.80	0.80	95.00	100.00	100.00	100.00	✓
Odd Harmonics (Multiples of 3)									
H03	5.00	6.40	6.40	6.40	95.00	0.00	0.00	0.00	✗
H09	1.50	2.20	2.20	2.20	95.00	0.00	0.00	0.00	✗
H15	0.50	1.20	1.20	1.20	95.00	0.00	0.00	0.00	✗
H21	0.50	0.80	0.80	0.80	95.00	0.00	0.00	0.00	✗
Even Harmonic									
H02	2.00	1.00	1.00	1.00	95.00	100.00	100.00	100.00	✓
H04	1.00	0.50	0.50	0.50	95.00	100.00	100.00	100.00	✓
H06	0.50	0.26	0.26	0.26	95.00	100.00	100.00	100.00	✓
H08	0.50	0.26	0.26	0.26	95.00	100.00	100.00	100.00	✓
H10	0.50	0.26	0.26	0.26	95.00	100.00	100.00	100.00	✓
H12	0.50	0.10	0.10	0.10	95.00	100.00	100.00	100.00	✓
H14	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H16	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H18	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H20	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H22	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓
H24	0.50	0.00	0.00	0.00	95.00	100.00	100.00	100.00	✓

Figure 3-96 Harmonic Voltages

- **Interharmonic Voltages**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Interharmonic Voltage

Order h	Avg. %			CP95 %			Max. %		
	Ua	Ub	Uc	Ua	Ub	Uc	Ua	Ub	Uc
TIHD	0.07	0.07	0.07	0.09	0.09	0.09	0.09	0.09	0.09
IH01	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06
IH02	0.01	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02
IH03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
IH04	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
IH05	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
IH06	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
IH07	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
IH08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
IH09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
IH10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IH25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 3-97 Interharmonic Voltage

- **Mains Signalling Voltages**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Mains Signalling Voltages

Signalling Frequency Hz	Limit %	Compliance %	Measured %			Conclusion
			Ua	Ub	Uc	
1,000.0	5.00	99.00	100.00	100.00	100.00	✓
2,000.0	5.00	99.00	100.00	100.00	100.00	✓
3,000.0	5.00	99.00	100.00	100.00	100.00	✓

Figure 3-98 Mains Signalling Voltages

- **Interruptions of the Supply Voltage**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Interruptions of the Supply Voltage

Duration	t ≤ 1s	1s < t ≤ 3min	3min < t
Count	0	0	0

Figure 3-99 Interruptions of the Supply Voltage

- **Supply Voltage Dips**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Supply Voltage Dips

Residual Voltage u %	Duration t ms				
	10 ≤ t ≤200	200 < t ≤ 500	500 < t ≤ 1000	1000 < t ≤ 5000	5000 < t ≤ 60000
90 > u ≥80	0	0	0	0	0
80 > u ≥ 70	0	0	0	0	0
70 > u ≥ 40	0	0	0	0	0
40 > u ≥ 5	0	0	0	0	0
5 > u	0	0	0	0	0

Figure 3-100 Supply Voltage Dips

- **Supply Voltage Swells**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Supply Voltage Swells

Swell Voltage u %	Duration t ms		
	10 ≤ t ≤500	500 < t ≤ 5000	5000 < t ≤ 60000
u ≥200	0	0	0
200 > u ≥ 160	0	0	0
160 > u ≥ 140	0	0	0
140 > u ≥ 120	0	0	0
120 > u > 110	0	0	0

Figure 3-101 Supply Voltage Swells

- **Transient Overvoltage**

EN50160 Report (Week42 2019/10/21 - 2019/10/27)

Transient Overvoltages

Ua Count	Ub Count	Uc Count
0	0	0

Figure 3-102 Transient Overvoltage

Click **Print** to open the preview window. Then click **Print** at the top of the window to confirm the printing of the report, which includes the conclusion page and the details page for each item.

EN50160 Report (Week2 2020/01/12 00:00:00 - 2020/01/19 00:00:00)

Print

iMeter 8 EN50160 Report

Conlusion

Continuous Phenomena Period: 2020/01/12 00:00:00 - 2020/01/19 00:00:00

No.	Power Quality Parameters	Conclusion
01	Power Frequency	✓
02	Supply Voltage Variations	✓
03	Rapid Voltage Changes	
04	Flicker Severity	✗
05	Supply Voltage Unbalance	✓
06	Harmonic Voltage	✓
07	Interharmonic Voltage	
08	Mains Signalling Voltages	✓

Voltage Events

No.	Power Quality Parameters	Conclusion

Figure 3-103 Preview for Printing EN50160 Report

3.2.4.4 Events

Click **Events** at the **Title Bar** and its sub-menu appear on the left-hand pane which includes **SOE Log, Device Log** and **PQ Counters**. The following sections provide a quick overview of these web pages.

3.2.4.4.1 SOE Log

Click **SOE Log** on the left-hand pane to display the SOE Log on the right-hand pane starting with the most recent events.

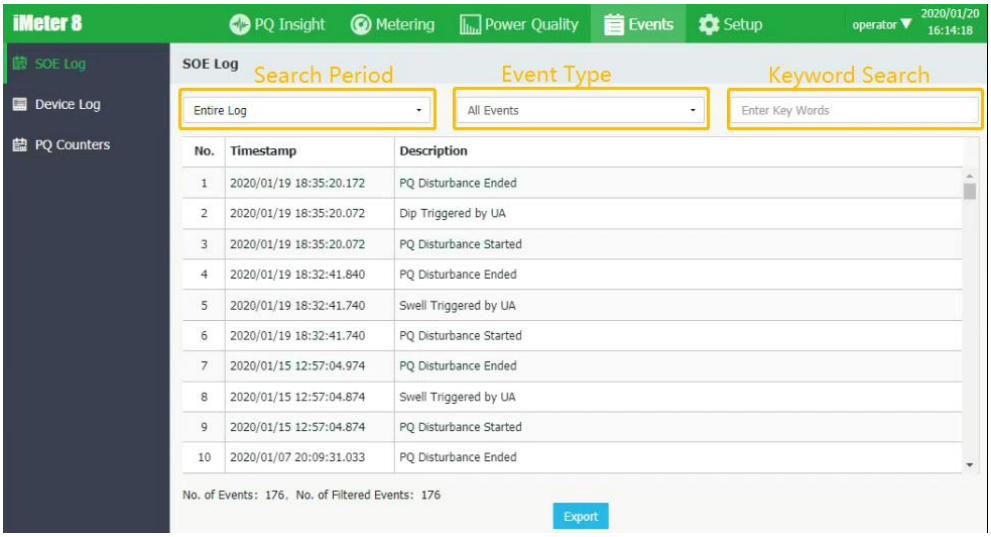


Figure 3-104 SOE Log Interfaces

The interface supports the following filtering mechanism.

Search Period: Use the drop-down box on the left to select a specific period.
Event Type: User the drop-down box in the middle to select a particular event type such as Dip/Swell, Transient, RVC, MSV, Inrush Current, Setpoint, etc.
Keyword Search: Enter a keyword in the text box on the right to search for events that contain the keyword.
Click on a specific event to display the event details. Click **Export** to save all SOE events to a .csv file at the default download folder.

Here are several examples for SOE Log details:

1) DO1 Closed:

Figure 3-105 DO1 Operated by an Interruption Event

2) Under PF Setpoint:

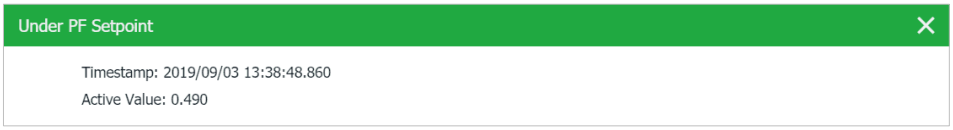


Figure 3-106 Under PF Setpoint

3) Over Ull Setpoint:

Figure 3-107 Over Ull Setpoint

Inside the waveform display, there are four control icons: .

These two icons are used to zoom in and out of the waveforms based on the time scale.

This icon is used to reset the waveform display back to its default resolution.

This icon is used to export the waveform CFG (Configuration) and DAT (Data) file in COMTRADE format to a compressed folder.

There is also a scroll bar at the bottom that allows the waveform to be scrolled forward and backward.

4) When a PQ Setpoint is configured to trigger WFR or DWR, the recorded Swell events will have the option of showing the ITIC plot while the Dips/Swells/Interruptions events will have the option of showing both the ITIC and SEMI F47 plots, along with the WFR/DWR waveform.

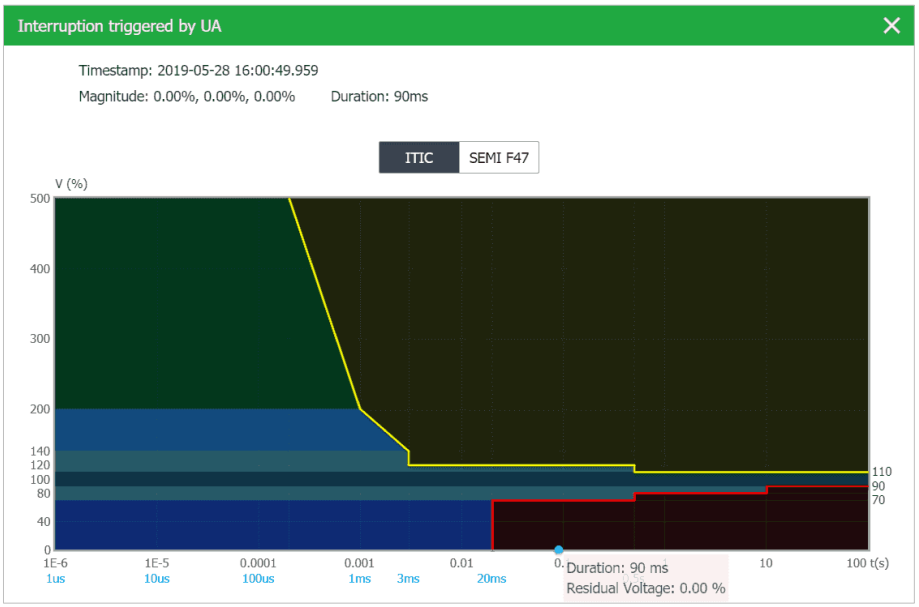


Figure 3-108 Interruption on ITIC Interface

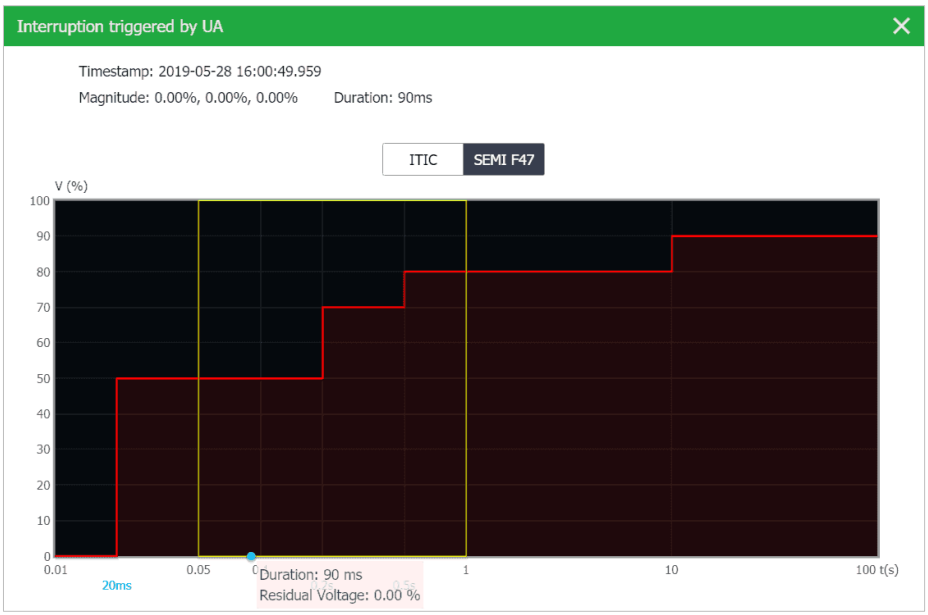


Figure 3-109 Interruption on SEMI F47 Interface

3.2.4.4.2 Device Log

Click **Device Log** on the left-hand pane to display the Device Log on the right-hand pane starting with the most recent events. Also, the interface supports the following filtering mechanism.

Search Period: Use the drop-down box on the left to select a specific period.
Keyword Search: Enter a keyword in the text box on the right to search for events that contain the keyword.

Click **Export** to save all device events to a .csv file at the default download folder.

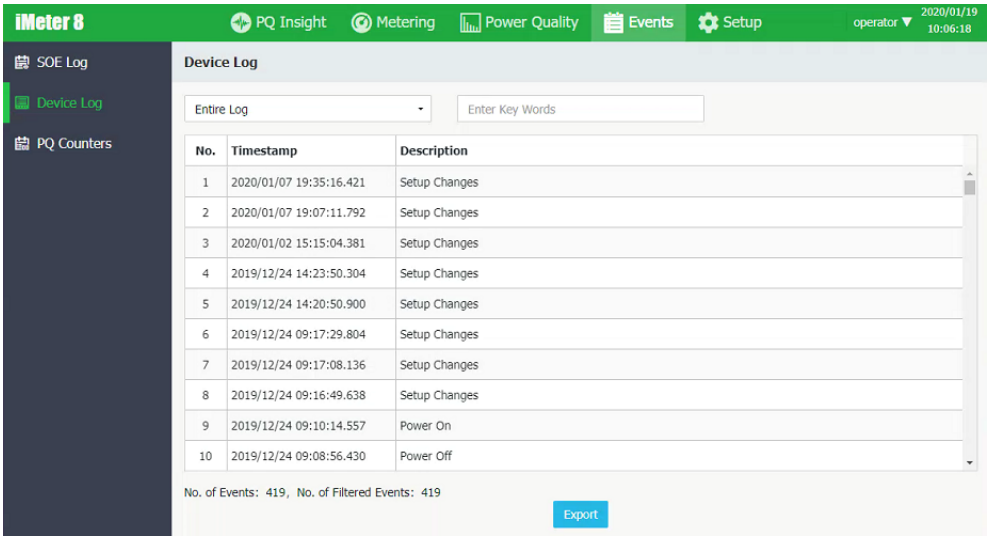


Figure 3-110 Device Log Interface

3.2.4.4.3 PQ Counters

Click **PQ Counters** on the left-hand pane to display different PQ Counters including **Dips, Swells, Interruptions, Transients, RVC, Inrush Current** and 3-levels' **MSV** on the right-hand pane.

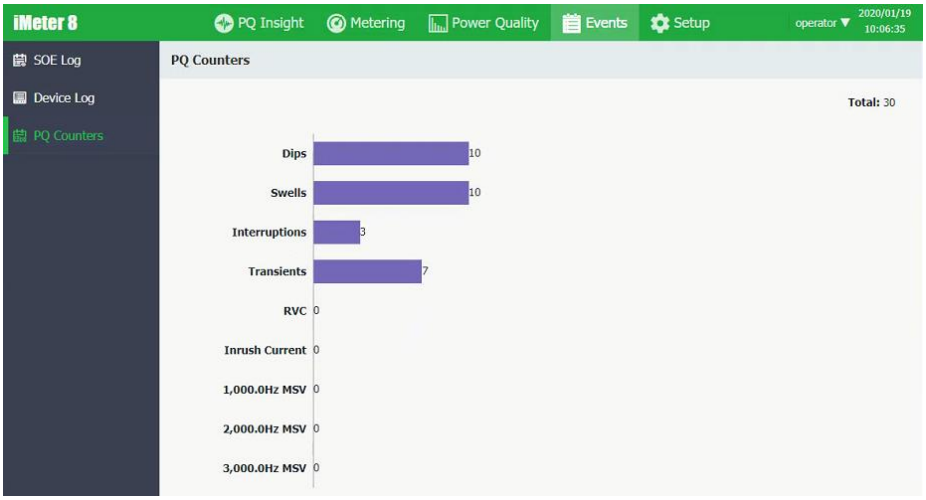


Figure 3-111 PQ Counter Interface

3.2.4.5 Setup

Click **Setup** at the **Title Bar** and the web server displays the **Setup Wizard** to guide users to setup the meter quickly.

- **Start**. The user may select **Manual** to setup the meter step-by-step and then click **Next** or choose **Import Template** to restore a previously saved configuration.

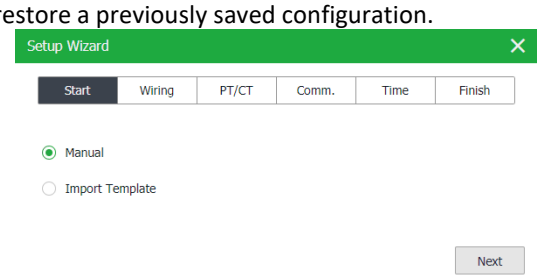


Figure 3-112 Wizard-Start

- **Wiring**. Please refer to 3.2.4.5.1.1 to set the wiring mode.

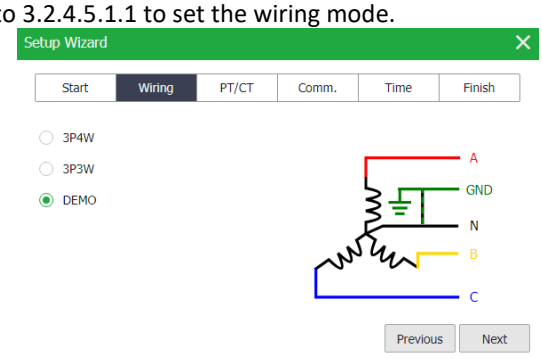


Figure 3-113 Wizard-Wiring

- **PT/CT**. Please refer to 3.2.4.5.1.1 for more information.

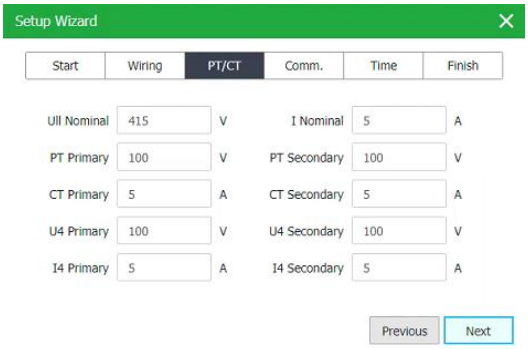


Figure 3-114 Wizard PC-CT

- **Comm.** Please refer to 3.2.4.5.1.2 for more information.

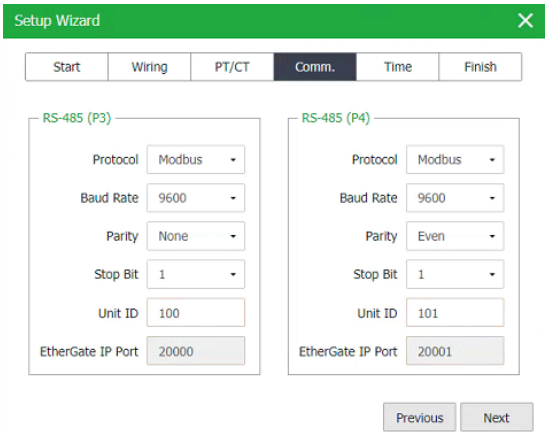


Figure 3-115 Wizard-Comm.

- **Time**. This step provides two methods to set time: manual configuration or synchronization with PC.

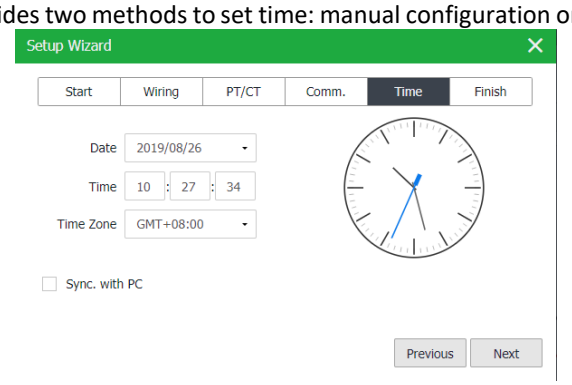


Figure 3-116 Wizard-Time

- **Finish**. Click **Previous** to return to the previous pages or **Finish** to apply the changes and exit the Setup Wizard.

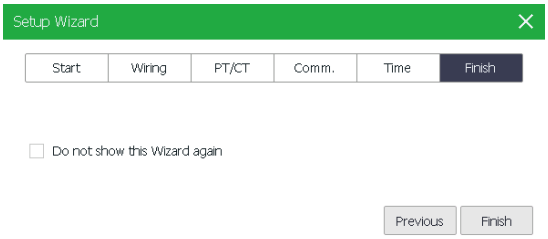


Figure 3-117 Wizard-Finish

The following sections describe the **Setup** sub-menus which include **Basic**, **PQ**, **Dmd. & Energy**, **Record**, **Setpoint**, **I/O**, **HMI**, **Others** and **Diagnostics**.

3.2.4.5.1 Basic

Click **Basic** on the left-hand pane and the following screen appears which has the four tabs: **Basic, Comm., Time** and **Others**.

3.2.4.5.1.1 Basic

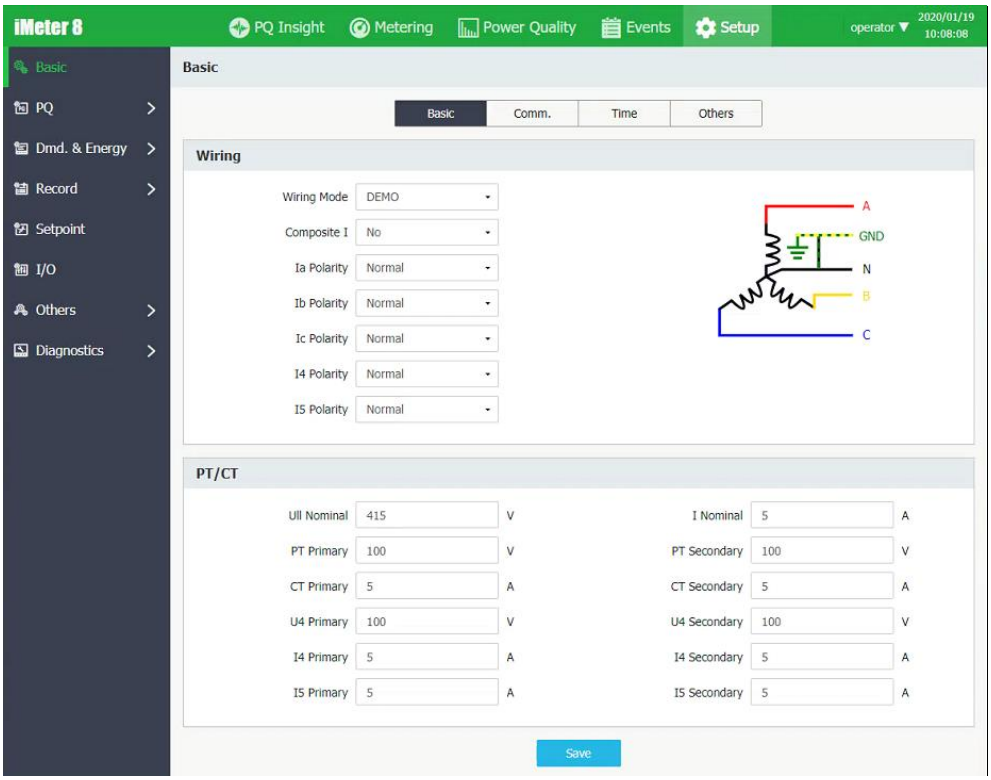


Figure 3-118 Basic Setup Interface

The following table illustrates the ranges and default values for each basic setup parameters:

Parameter	Range, Default*	Parameter	Range, Default*
Wiring			
Wring Mode	4W-WYE*, DEMO, DELTA	Composite I	No*, Phase A, Phase B, Phase C
Ia Polarity	Normal*, Reverse	Ib Polarity	Normal*, Reverse
Ic Polarity	Normal*, Reverse	I4 Polarity	Normal*, Reverse
I5 Polarity	Normal*, Reverse		
PT/CT			
Ull Nominal	1 to 1500V, 100*	I Nominal	1 to 10,000A, 5*
PT Primary	1 to 1,000,000V, 100*	PT Secondary	1 to 1500V, 100*
CT Primary	1 to 30,000A, 5*	CT Secondary	1 to 50A, 5*
U4 Primary	1 to 1,000,000V, 100*	U4 Secondary	1 to 1500V, 100*
I4 Primary	1 to 30,000A, 5*	I4 Secondary	1 to 50A, 5*
I5 Primary	1 to 30,000A, 5*	I5 Secondary	1 to 50A, 5*

Table 3-6 Basic Parameters Description

Click on the wiring graphics on the right-hand side to set the **Channels Color**:

Figure 3-119 Channels Color Settings

3.2.4.5.1.2 Comm.

The iMeter 8 comes standard with two Ethernet ports (P1&P2) and two RS-485 ports (P3&P4).

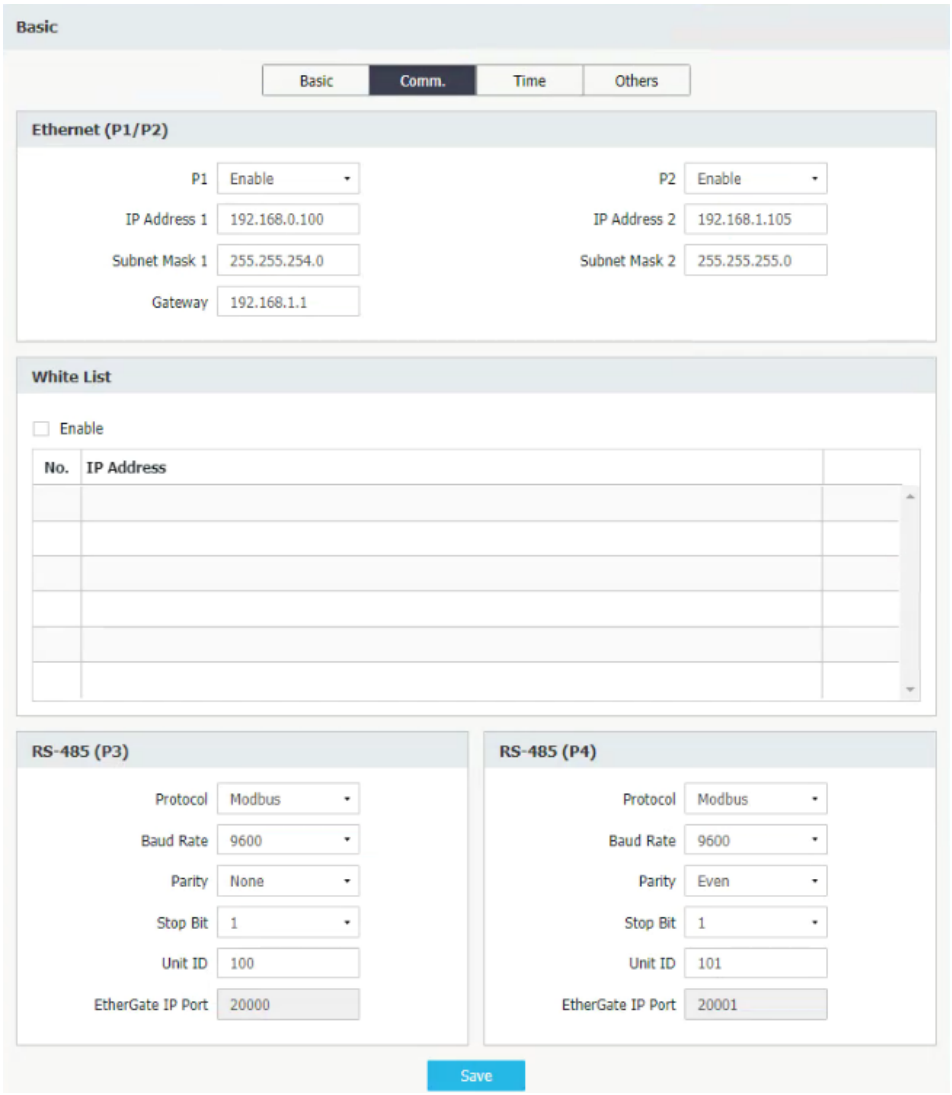


Figure 3-120 Comm. Setup Interface

The following table illustrates the ranges and default values for the Comm. parameter:

Parameter	Range, Default*	Parameter	Range, Default*
Ethernet (P1/P2) Please note that P1 and P2 should not on the same network segment.			
P1	Enable*, Disable	P2	Enable*, Disable
IP Address 1	192.168.0.100*	IP Address 2	192.168.1.100*
Subnet Mask 1	255.255.255.0*	Subnet Mask 2	255.255.255.0*
Gateway	192.168.0.1*		
White List			
Enable	Enable access white list, click ⊕ to add an IP Address to the white list and click 🗑 to delete an IP address from the white list.		
IP Address	The IP Address has been added to the white list.		
RS-485 (P3)			
Protocol	Modbus*, EtherGate, Disable	Baud Rate	1200, 2400, 4800, 9600*, 19200, 38400
Parity	None, Odd, Even*	Stop Bit	1*, 2
Unit ID	1 to 247, 100*	EtherGate IP Port	20000*~60000
RS-485 (P4)			
Protocol	Modbus*, EtherGate, Disable	Baud Rate	1200, 2400, 4800, 9600*, 19200, 38400
Parity	None, Odd, Even*	Stop Bit	1*, 2
Unit ID	1 to 247, 101*	EtherGate IP Port	20000~60000, 20001*

Table 3-7 Comm. Setup Parameters

3.2.4.5.1.3 Time

The **Time** web page shows two areas: **Date** and **Time Sync**. The date and time can be updated manually or synchronized with a local PC by simply checking the **Sync. With PC** box.

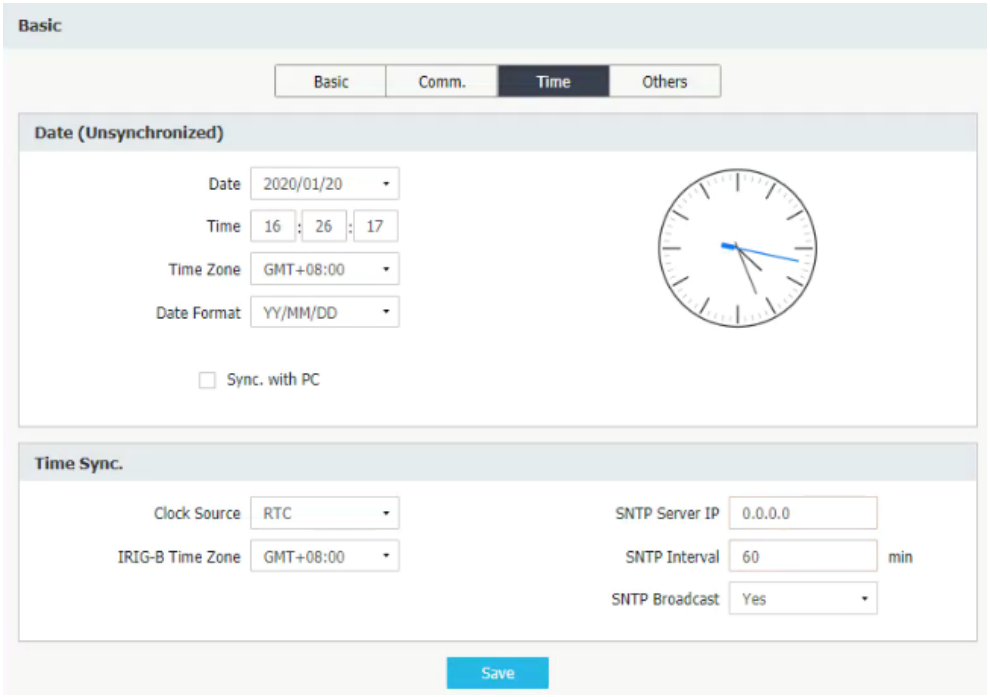


Figure 3-121 Time Setup Interface

The following table illustrates the range for Time parameters where * indicates the default value.

Parameter	Range, Default*	Parameter	Range, Default*
Date		**Time Sync.**	
Date	2000-01-01* to 2037-12-31	Clock Source	RTC*, SNTP, GPS, IRIG-B~,
Time Zone	GMT-12:00 to GMT+13:00; GMT+8:00*	SNTP Server IP	192.168.101.2*
Time	00:00:00* to 23:59:59	IRIG-B Time Zone~	GMT-12 to GMT+13; GMT+8*
Date Format	YY/MM/DD, MM/DD/YY, DD/MM/YY, YY-MM-DD*, MM-DD-YY, DD-MM-YY	SNTP Interval	1 to 1440 min, 60 min*

~ To set the IRIG-B as the Time Source and its time zone, the meter should be equipped with the corresponding module.

Table 3-8 Date and Time Parameters

3.2.4.5.1.4 Others Setup

This web page allows the users to setup Language, Delimiter and the different parameters under **Algorithm**.

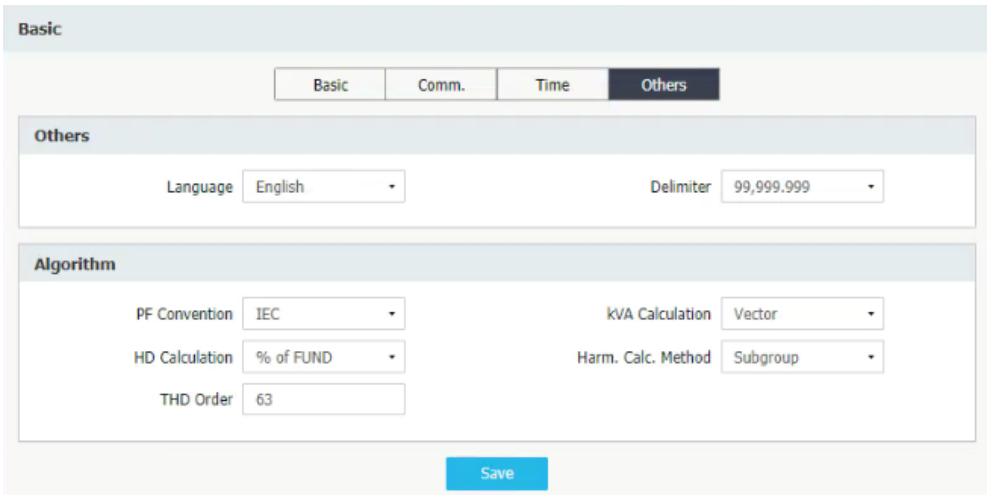


Figure 3-122 Other Parameters Setup Interface

The following table illustrates the setup range for different parameters.

Parameter	Range, Default*
Others	
Language	• English* • Simplified Chinese • Traditional Chinese
Delimiter	• 99,999.999: "," is used as the x1000 delimiter and "." as the decimal point. • 99 999,999: " " is used as the x1000 delimiter and "," as the decimal point.
Algorithm	
PF Convention	IEC*, IEEE, -IEEE
kVA Calculation	Vector*, Scalar
HD Calculation	% of FUND*, % of RMS, % of UN
Harm. Calc. Method	Subgroup*, Group
THD Order	2~63*

Table 3-9 Other Parameters Setup Range

3.2.4.5.2 PQ Setup

Click **PQ** on the left-hand pane to expand its sub-menus to show **Settings** and **EN50160**.

3.2.4.5.2.1 Settings

The **Settings** web pages has six tabs: **PQ Disturbance**, **Transient**, **RVC**, **MSV**, **Inrush Current** and **Flicker**.

- **PQ Disturbance** For more information, please refer to **4.4.5** and **4.4.6**.

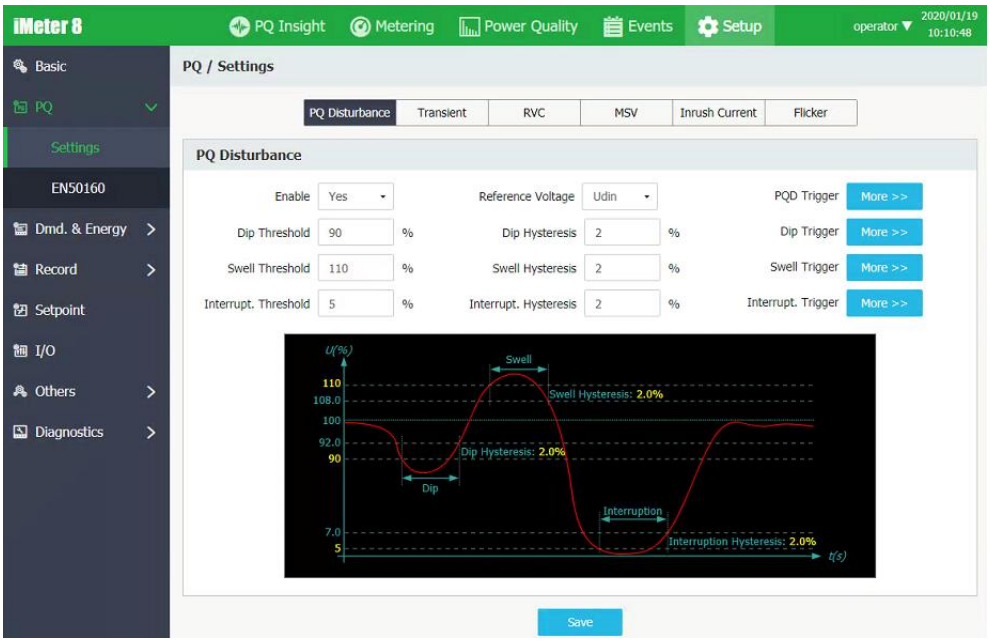


Figure 3-123 Dip/Swell Setup Interface

- **Transient** For more information, please refer to **4.4.7.**

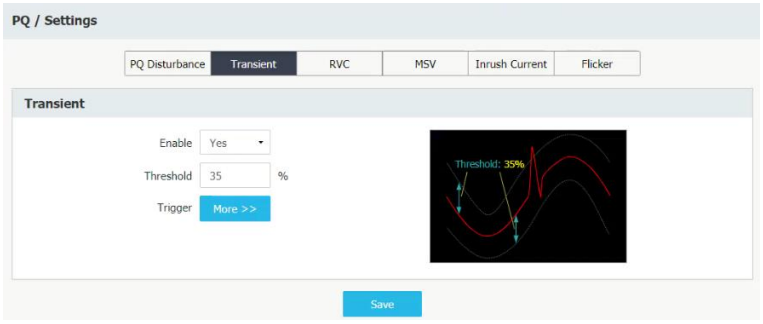


Figure 3-124 Transient Setup Interface

- **RVC** For more information, please refer to **4.4.11.**

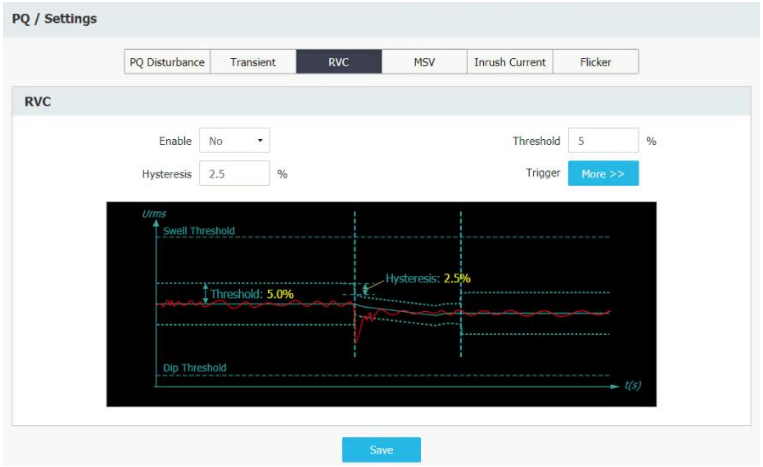


Figure 3-125 RVC Setup Interface

- **MSV** For more information, please refer to **4.4.10.**

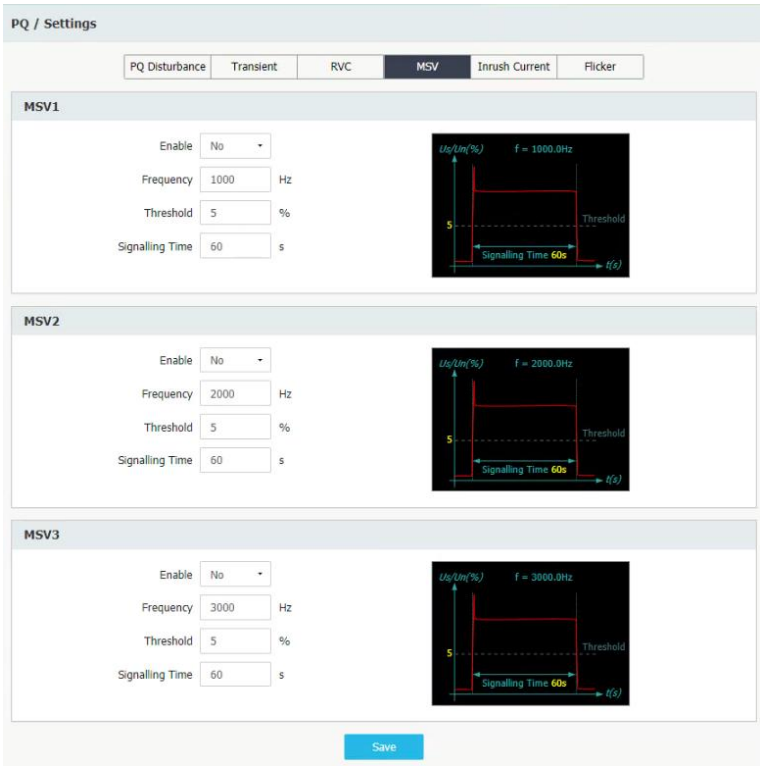


Figure 3-126 MSV Setup Interface

- **Inrush Current** For more information, please refer to **4.4.14.**

Figure 3-127 Inrush Current Setup Interface

- **Flicker** The options for **Flicker Curve** are 120V and 230V (default). For more information, please refer to **4.4.4.**

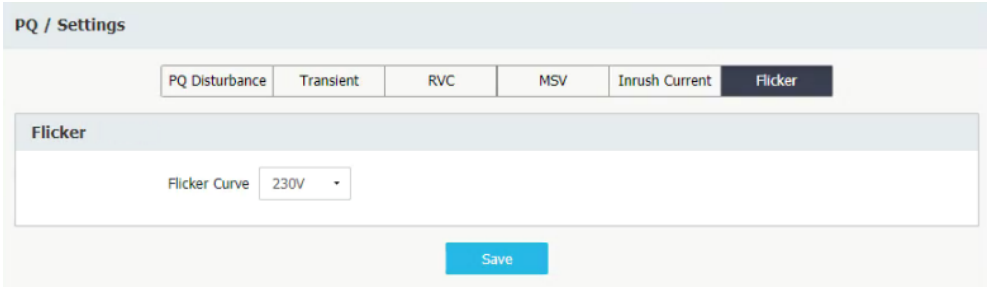


Figure 3-128 Flicker Setup Interface

3.2.4.5.2.2 EN50160

This page allows the users to setup the **Voltage Level** and **First Day of Week** for the EN50160 reporting.

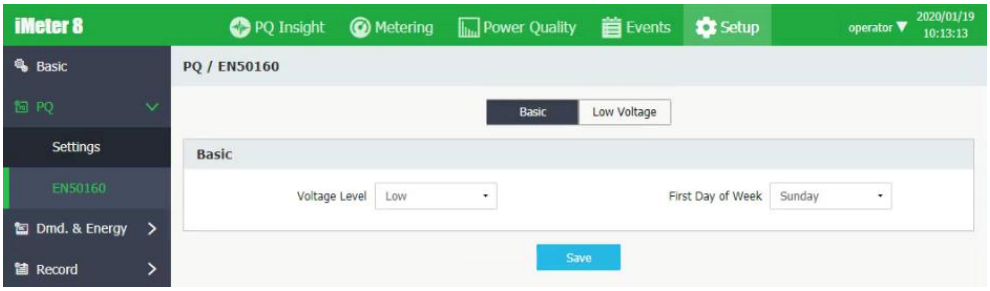
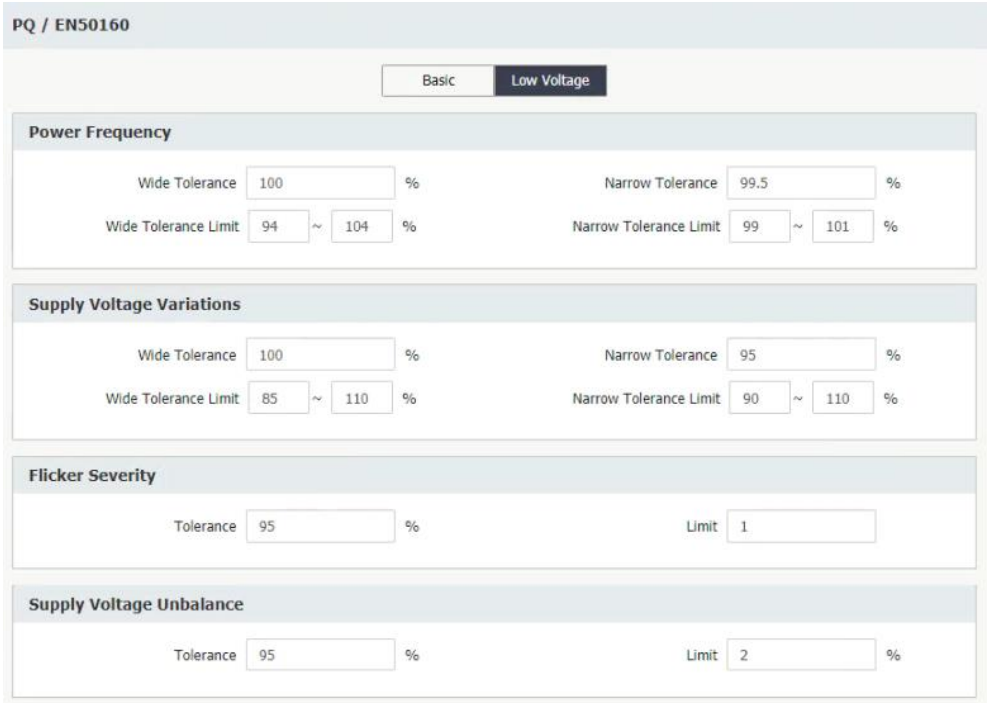


Figure 3-129 Basic EN50160 Setup Interface

The figure below illustrates the default limits of the EN50160 parameters according to the Voltage Level setting, which is Low in this instance. For more information, please refer to **4.4.15.**



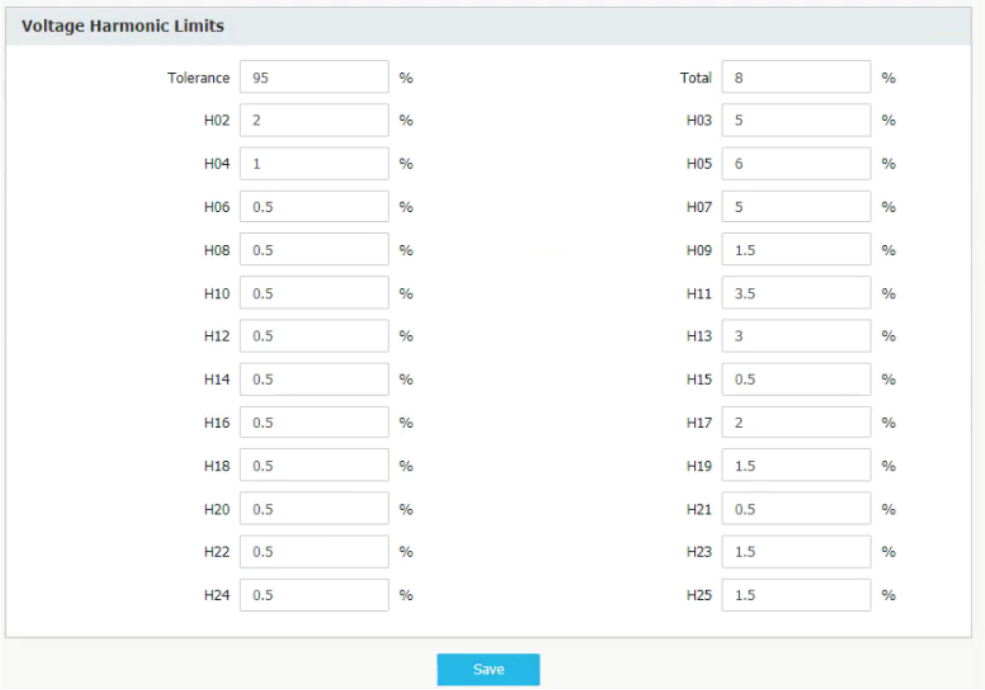


Figure 3-130 Detailed EN50160 Setup Interface

3.2.4.5.3 Demand & Energy

Click **Dmd. & Energy** on the left-hand pane to expand its sub-menu to show **Demand, Energy, Counter** and **TOU**.

3.2.4.5.3.1 Demand

Please refer to **4.2.4** for more information.

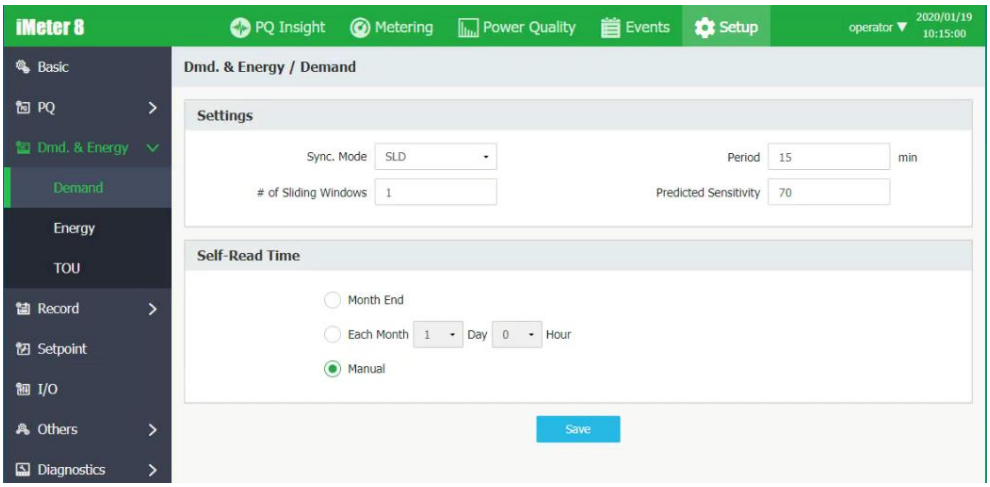


Figure 3-131 Demand Setup Interface

3.2.4.5.3.2 Energy

Click **Energy** on the left-pane of the page to access **Energy Preset**, **Energy Pulse** and **Energy Log** configuration.

- **Energy Preset** Supports the presetting of kWh Import/Export, kvarh Import/Export and kVAh Total. The valid range for the pre-defined energy should be between 0 and 99,999,999,999.999.

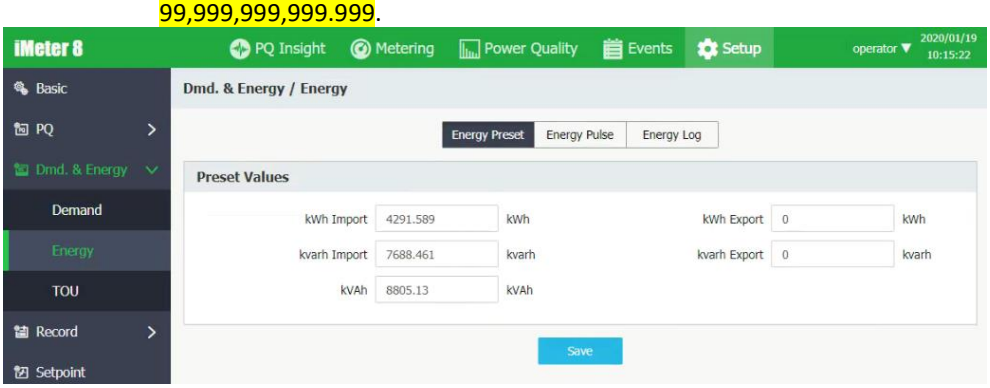


Figure 3-132 Energy Preset Interface

- **Energy Pulse** Supports the configuration of the Pulse Constant, kWh/kvarh LED Pulse and DO Energy Pulse setup parameters. For more information, please refer to **4.1.3.**

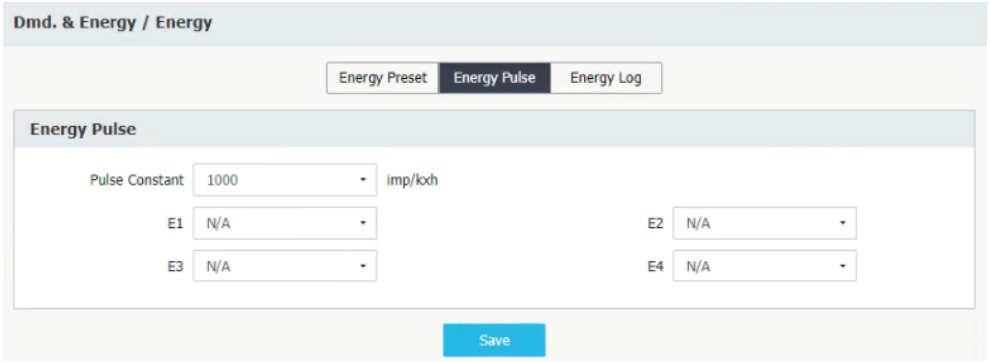


Figure 3-133 Energy Pulse Setup Interface

- **Energy Log** Please refer to **4.5.1** for a detailed description of the parameters below

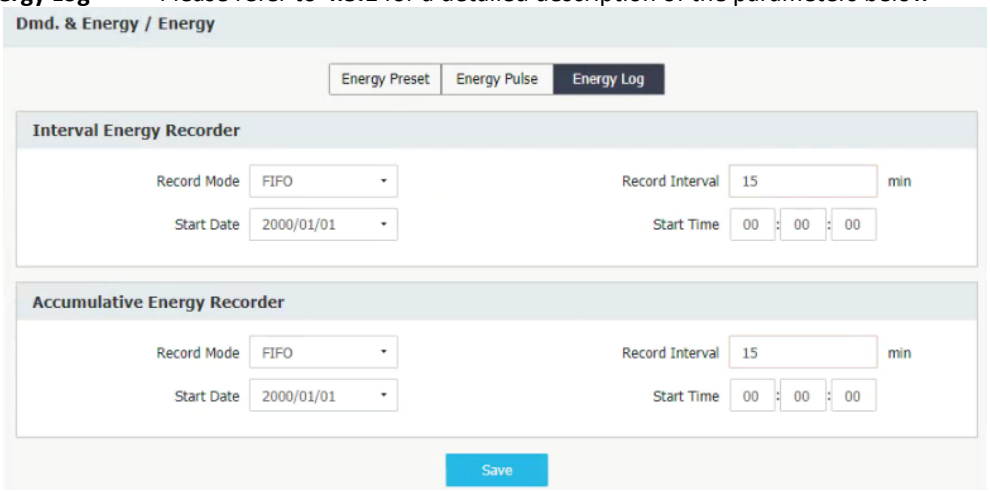


Figure 3-134 Energy Log Setup Interface

3.2.4.5.3.3 TOU

Click **TOU** to access **Labels**, **Basic**, **Daily Profiles**, **Seasons** and **Alternate Days** configurations.

- **Labels**

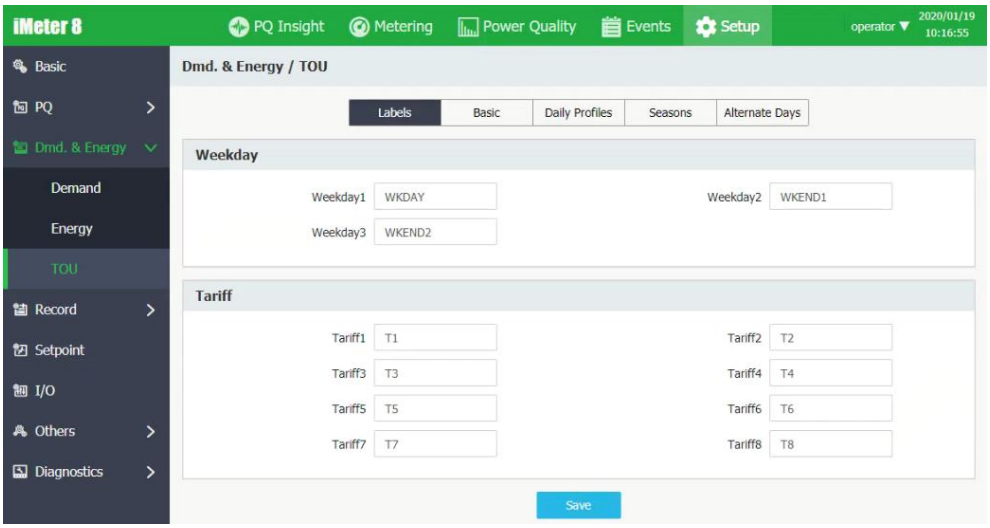


Figure 3-135 Labels Setup Interface

- **Basic**

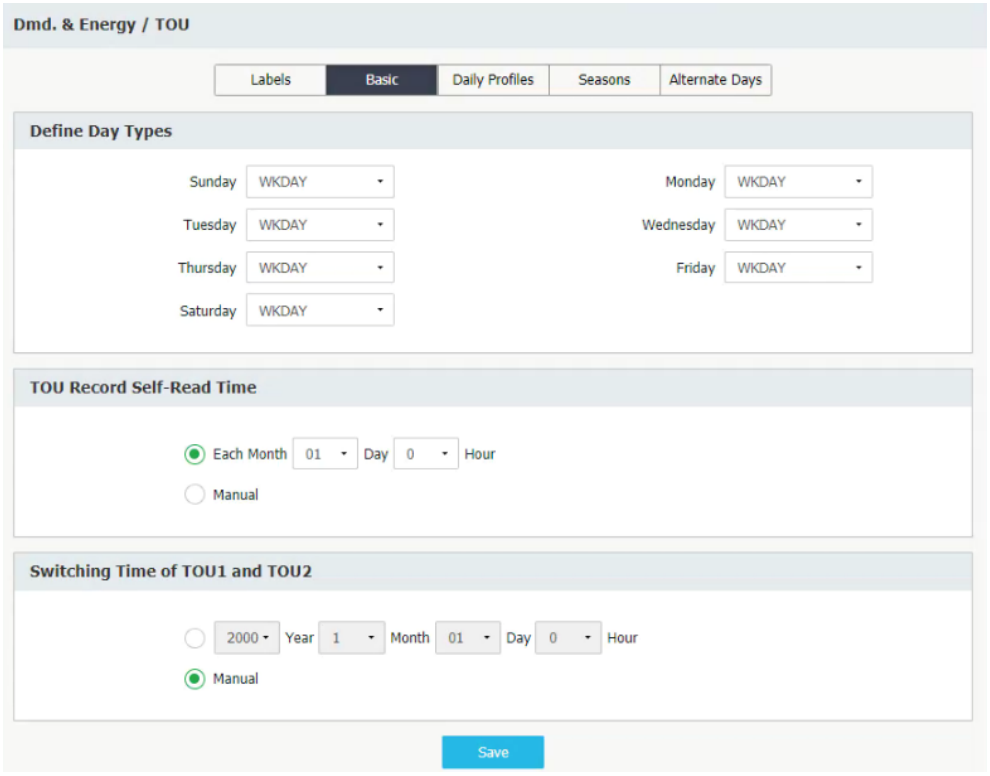


Figure 3-136 Basic Setup Interface

- **Daily Profiles**

Click on a particular **Daily Profile** and the **Profile x** dialog box appears which allows the **Daily Profile Name**, **Start Time** and **Tariff** for each **Period** to be defined until the entire day has been filled. As figure below shown, the **Start Time** for the first **Period** is fixed at 00:00 and cannot be modified. Each **Daily Profile** supports a maximum of 20 **Periods** in 15-minute resolution. The **Start Time** of the next **Period** defines the end time of the previous **Period**. Click ⊕ to add a new **Period** or 🗑 to clear the current **Period's** settings. The last defined **Period** will end at 24:00.

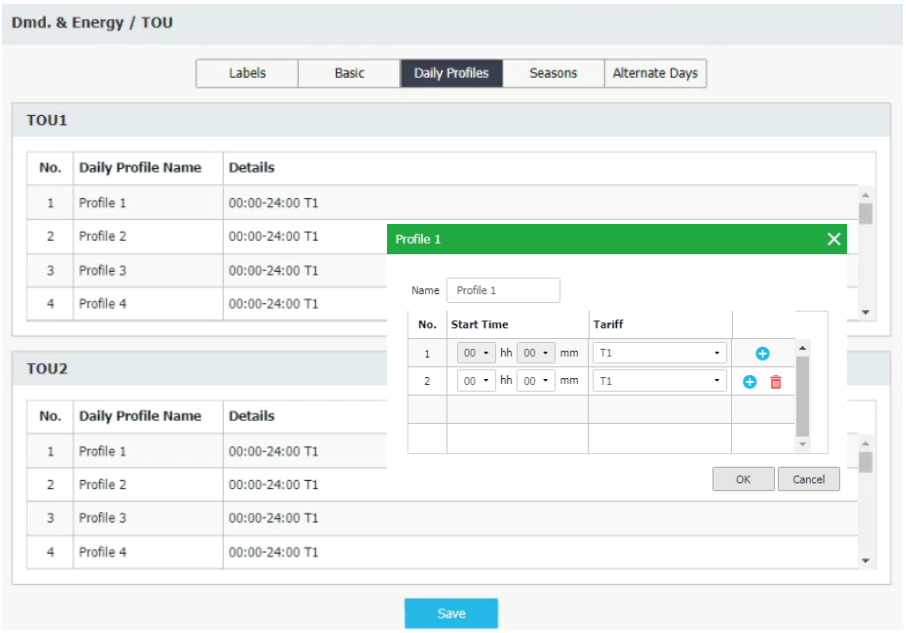


Figure 3-137 Daily Profiles Setup Interface

- **Seasons**

Click **Seasons** and the below screen appears which allows the **Start Date, WKDAY Daily Profile, WKEND1 Daily Profile** and **WKEND2 Daily Profile** each **Season** to be defined until the entire year has been filled. Up to 12 seasons can be defined for each TOU. The **Start Date** for the first **Season** is fixed at 01/01 and cannot be modified. The **Start Date** of the next **Season** defines the end date of the previous **Season**. Click ⊕ to add a new **Season** or 🗑 to clear the current **Season's** settings. The last defined **Season** will end at 12/31.

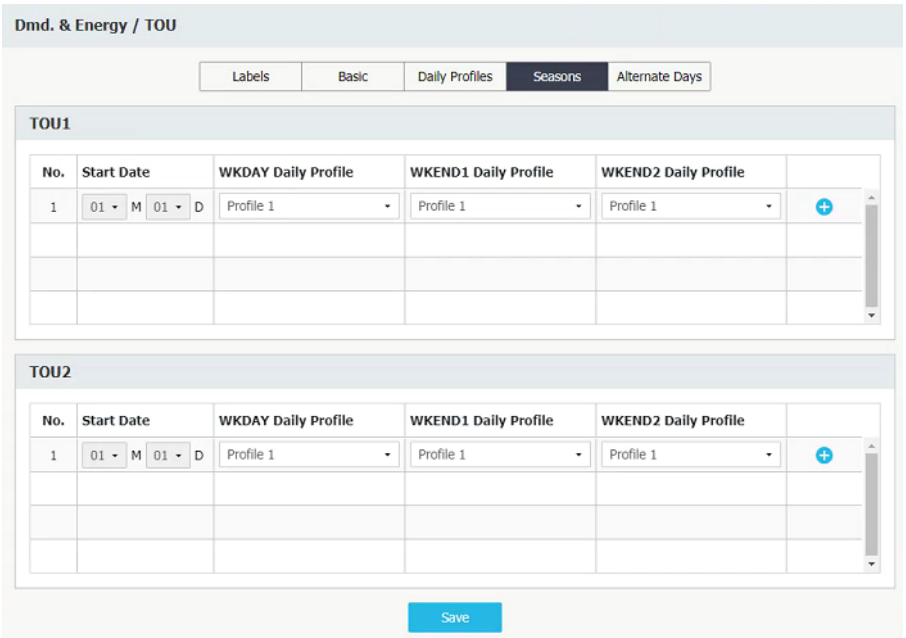


Figure 3-138 Seasons Setup Interface

- **Alternate Days**

Click on **Alternate Days** and the following screen appears which allows up to 90 Alternate Days to be defined for each TOU. Click the **Add** button to start the configuration.

Click ⊕ to add a new Alternate Day or 🗑 to clear the setting for the current Alternate Day.

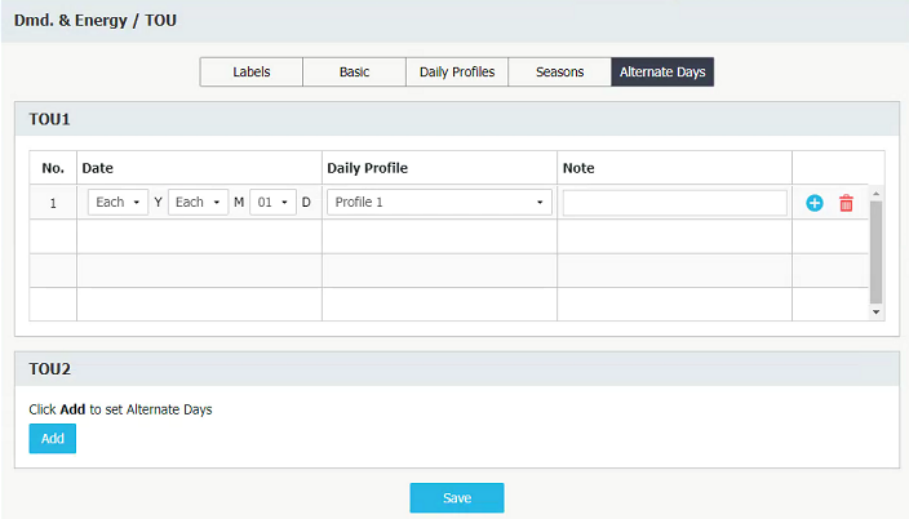


Figure 3-139 Alternate Days Setup Interface

3.2.4.5.4 Record

Click **Record** on the left-hand pane to expand its sub-menus which includes **Waveform, SDR** and **Max./Min.**

3.2.4.5.4.1 Waveform

Click **Waveform** on the left-hand pane and the following page appears which has four tabs: **WFR, DWR, RMSR** and **Sche. WFR.**

- **WFR** For more information, please refer to **4.5.2.**

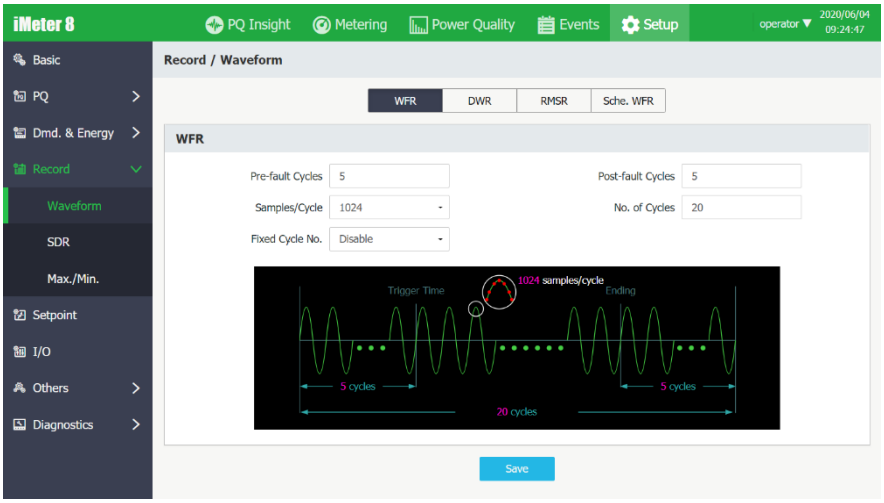


Figure 3-140 WFR Setup Interface

- **DWR** Click **DWR** near the top of the page and the following page appears which provides the **Pre-fault Cycles** settings. The range of **Pre-fault Cycles** is 5 to 10 with 5 being the default, for more information, please refer to **4.5.3.**

Figure 3-141 DWR Setup Interface

- **RMSR** Click "Add" to add a batch of parameters by selecting one or more desired parameters from the **RMSR Source Parameters Dialog Box** or "De-select All" to remove all existing parameters. Click on the right-hand column to edit an existing parameter or to remove a particular parameter. For more information, please refer to **4.5.4.**

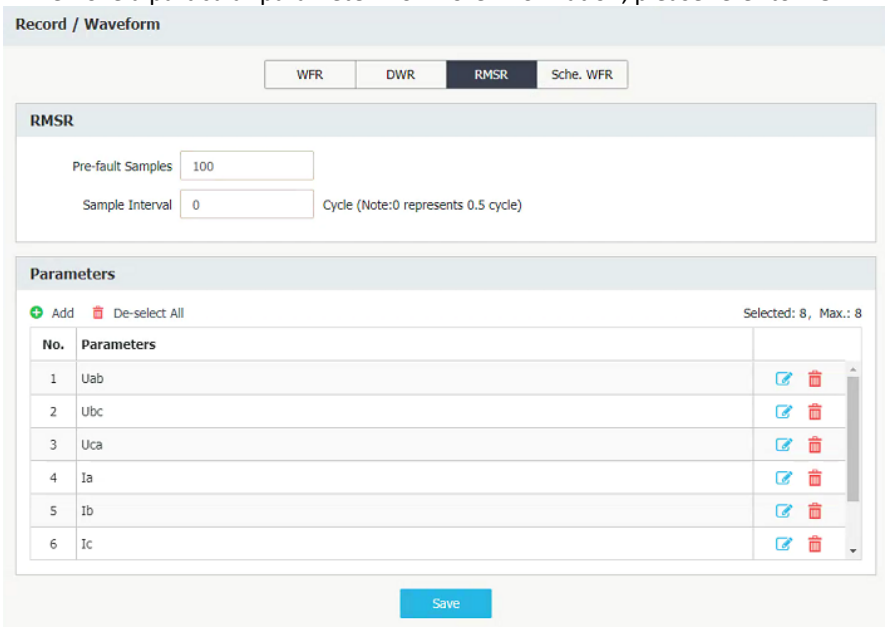


Figure 3-142 RMSR Setup Interface

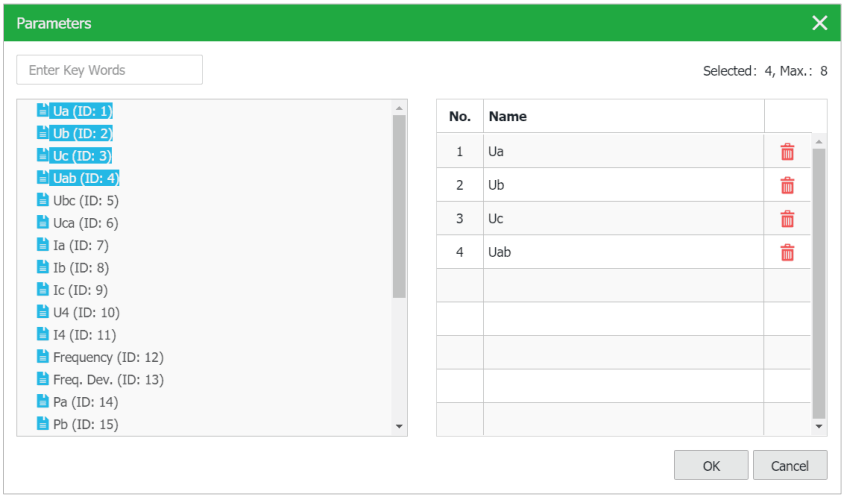


Figure 3-143 RMSR Source Parameters Dialog Box

- **Sche. WFR (Scheduled WFR)** For more information, please refer to **4.5.2.**

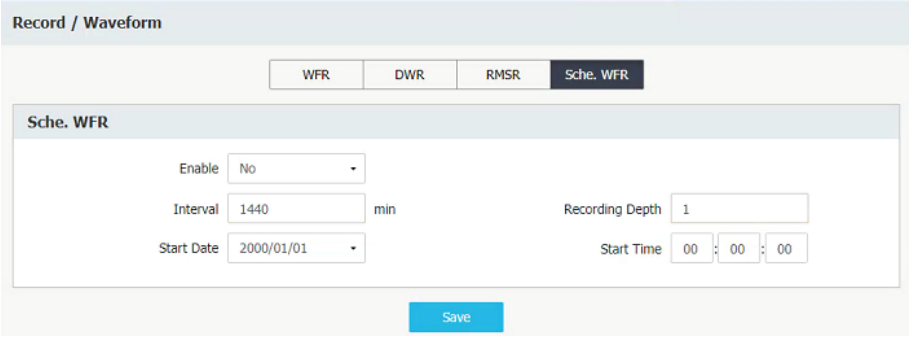


Figure 3-144 Sche. WFR Setup Interface

3.2.4.5.4.2 SDR

The iMeter 8 comes standard with 16 Statistical Data Recorders of 64 parameters each. Please refer to **4.5.8** for more information.

Click "Add" to add a batch of parameters or "De-select All" to remove all existing parameters.

Click on the right-hand column to edit an existing parameter or to remove a particular parameter.

Please refer to **Appendix A** for the available parameters for SDR.

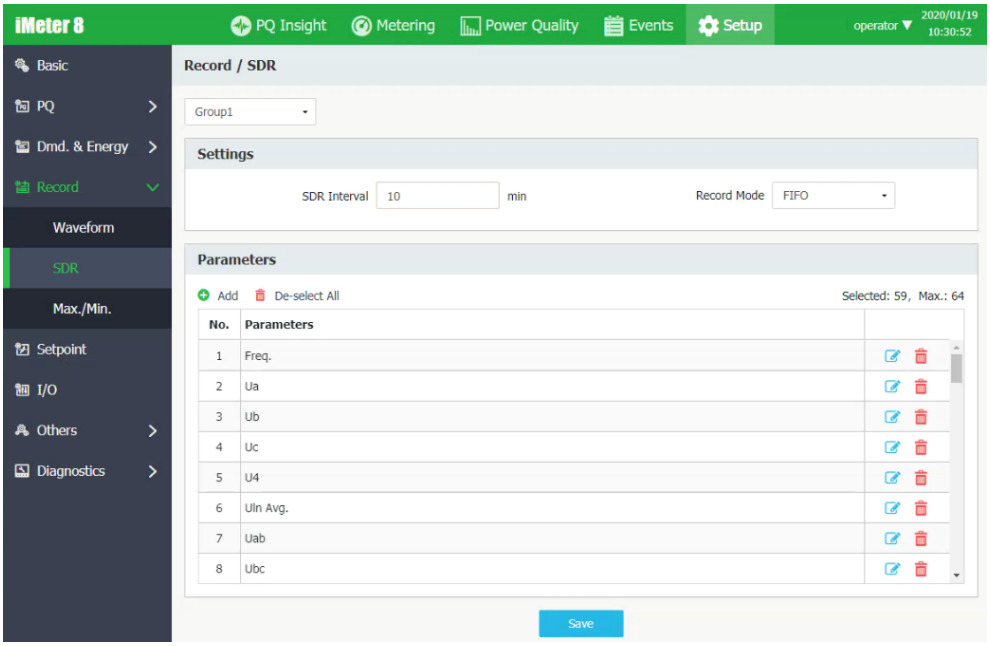


Figure 3-145 SDR Setup Interface

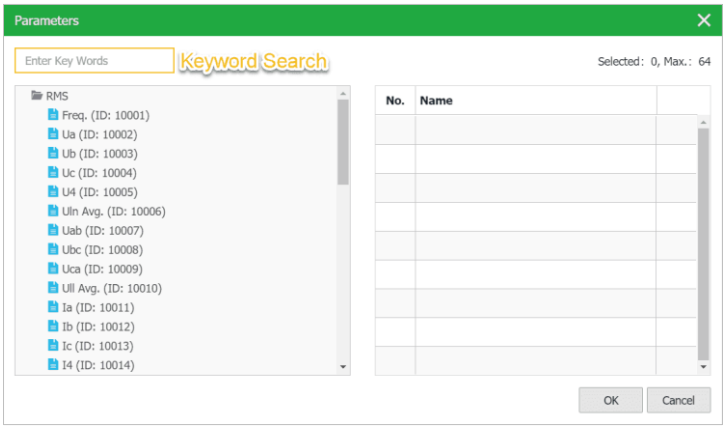


Figure 3-146 SDR Source Parameters Dialog Box

3.2.4.5.4.3 Max./Min.

The iMeter 8 supports 4 Max./Min. Recorders of 20 parameters each. Please refer to **4.5.9** for more information.

Click "Add" to add a batch of parameters or "De-select All" to remove all existing parameters.

Click on the right-hand column to edit an existing parameter or to remove a particular parameter.

Please refer to **Appendix A** for the available parameters for Max./Min. Recorders.

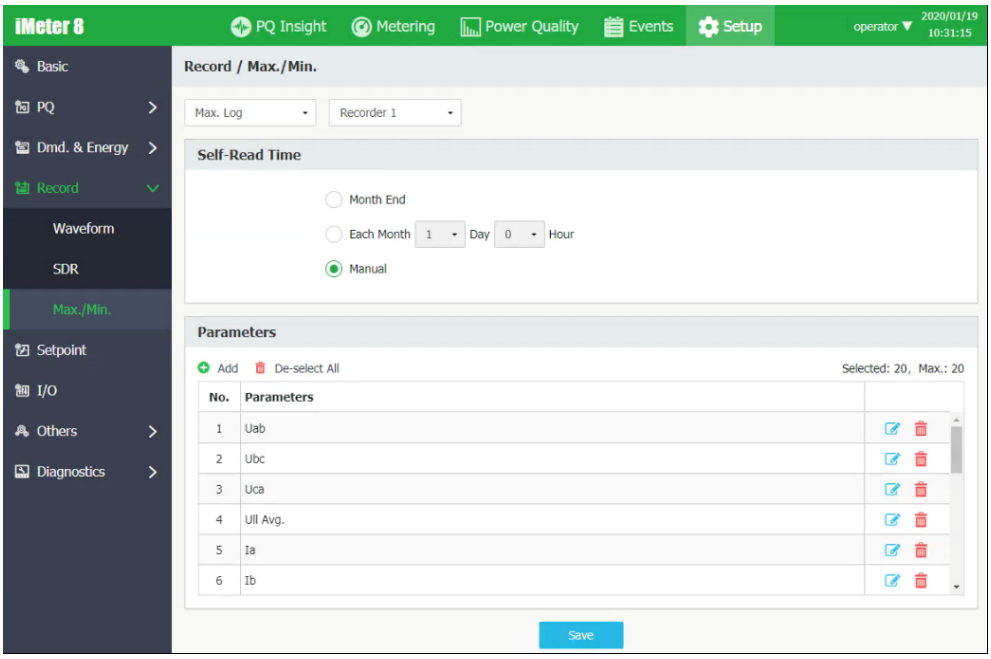


Figure 3-147 Setup Max./Min. Interface

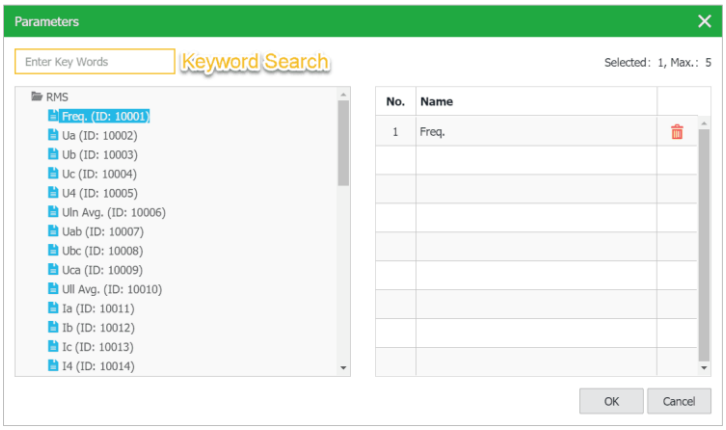


Figure 3-148 Max./Min. Source Parameters Dialog Box

3.2.4.5.5 Setpoint

Click **Setpoint** on the left-hand pane to configure the setup parameters for **Setpoint** (Standard Setpoint) and **HSSP** (High-speed Setpoint).

- **Standard Setpoint:** Click a particular Setpoint and the **Setpoint Settings** dialog box appears, please refer to **5.10.14** for detailed description.

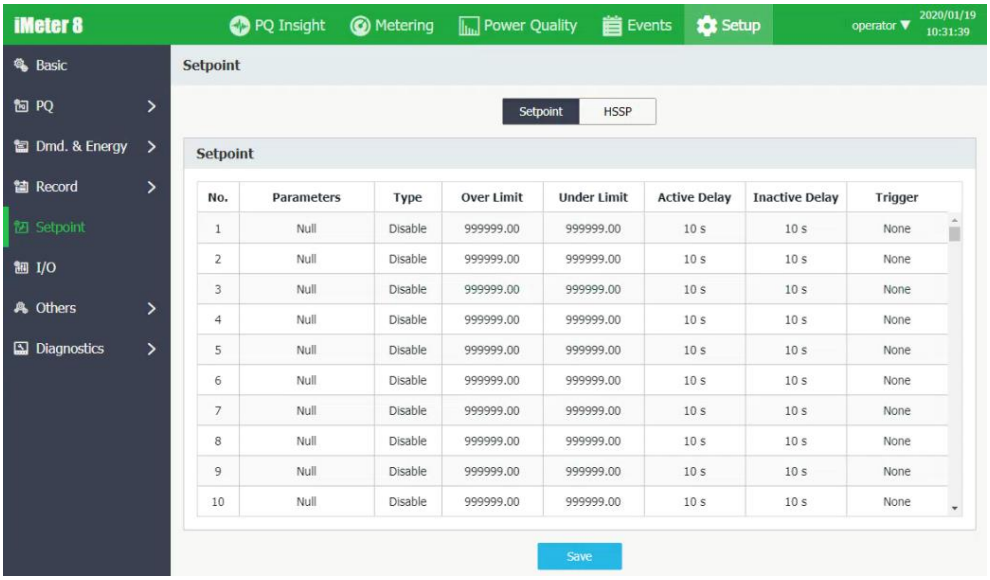


Figure 3-149 Standard Setpoint Setup Interface

- **HS Setpoint Setup**

  1) Click **HSSP** tab on the top pane and the following screen appears.

  2) Click a particular HS Setpoint and the **HSSP Settings** dialog box appears, please refer to **5.10.15** for detailed description.

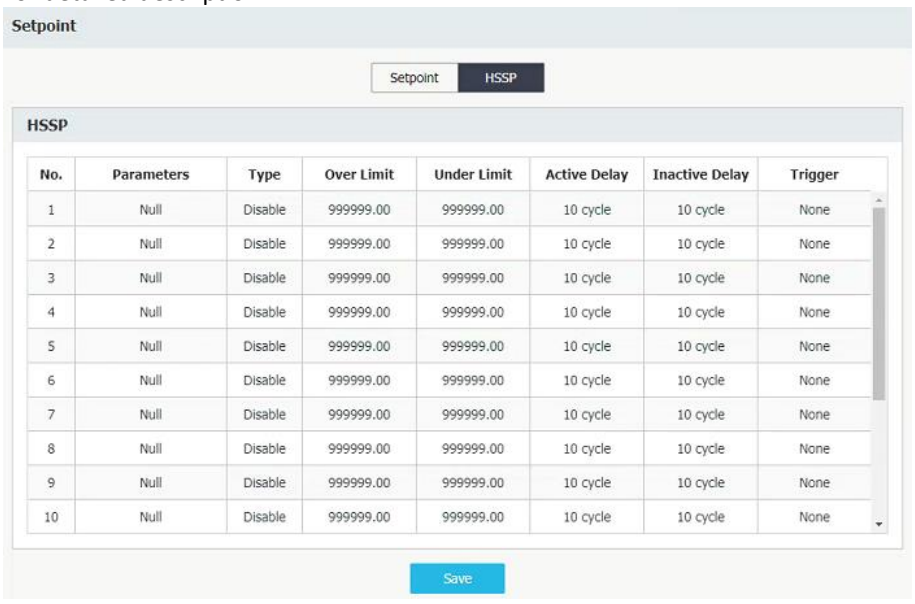


Figure 3-150 HS Setpoint Setup Interface

3.2.4.5.6 I/O Setup

Click **I/O** on the left-hand pane to configure I/O parameters.

- **DI Setup**

  Click on a particular DI and the **DI Settings** dialog box appears. Please refer to **4.1.1** for more information.

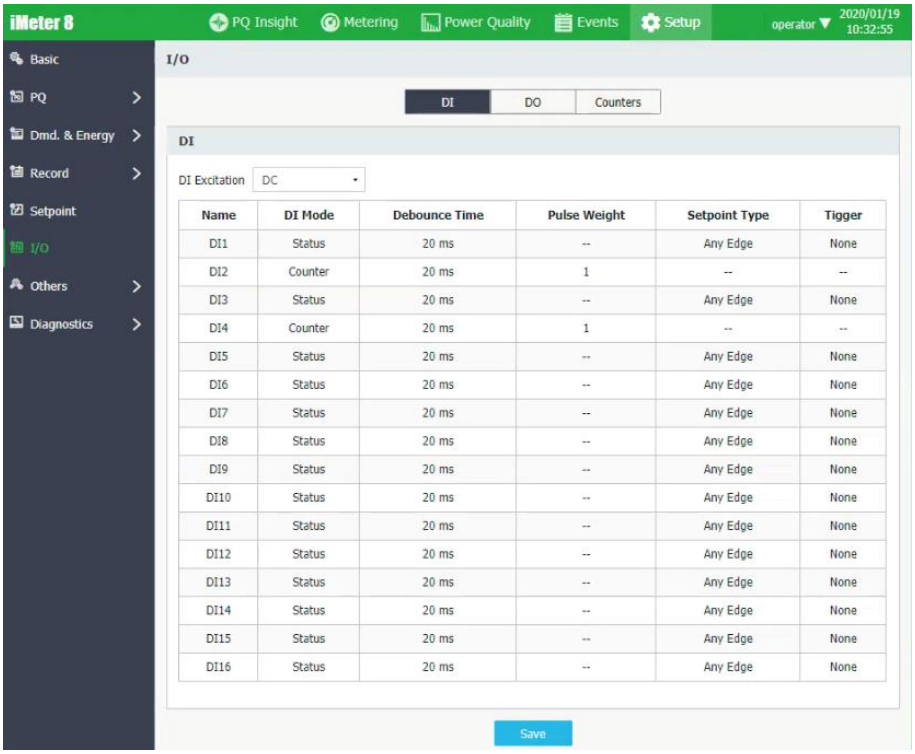


Figure 3-151 DI Setup Interface

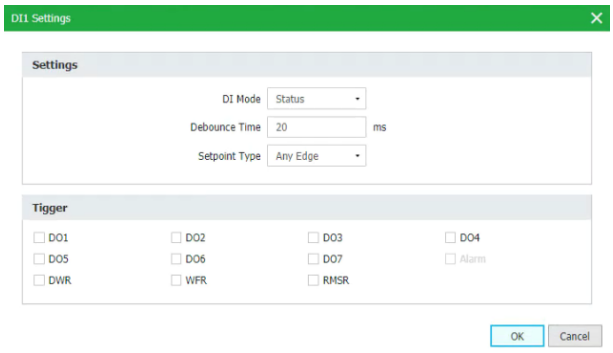


Figure 3-152 DI Setup Interface

- **DO Setup**

Click the **DO** tab at the top of the page and the following screen appears, please refer to **4.1.2** to for more information.

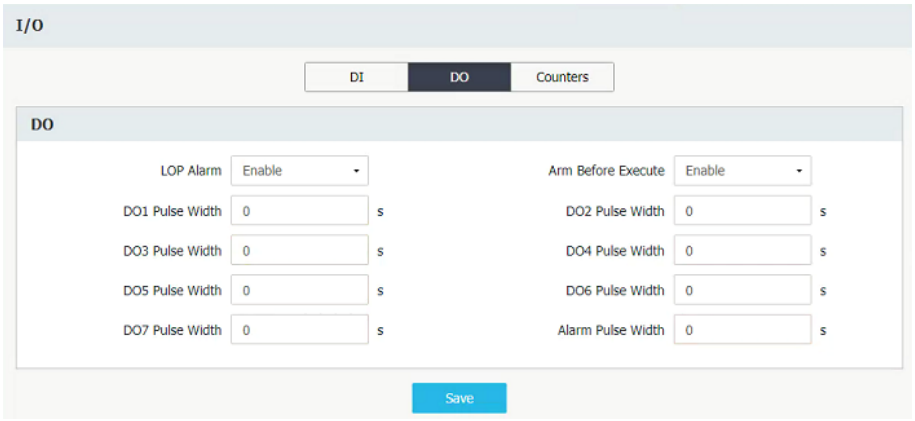


Figure 3-153 DO Setup Interface

- **Counters**

Click the **Counters** tab at the top of the page and the following screen appears, please refer to **5.3** for more information.

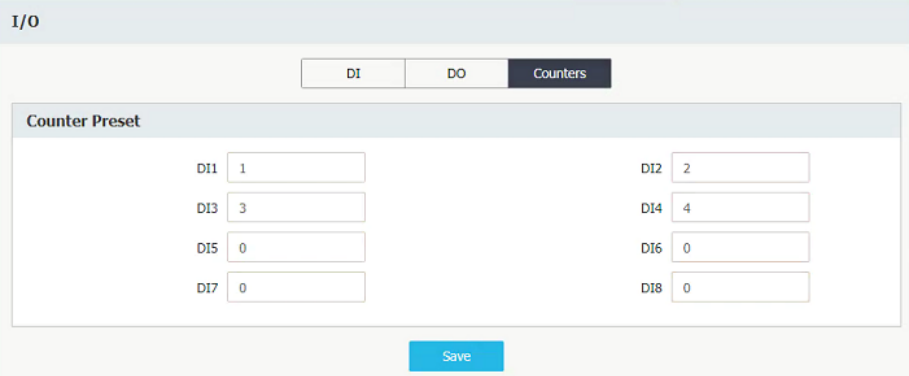


Figure 3-154 Counters Setup Interface

- **AI Setup**

Click the **AI** tab at the top of the page and the following screen appears, please refer to **4.1.4** for more information. Please note that the AI tab only appear when the iMeter 8 is equipped with the corresponding option.

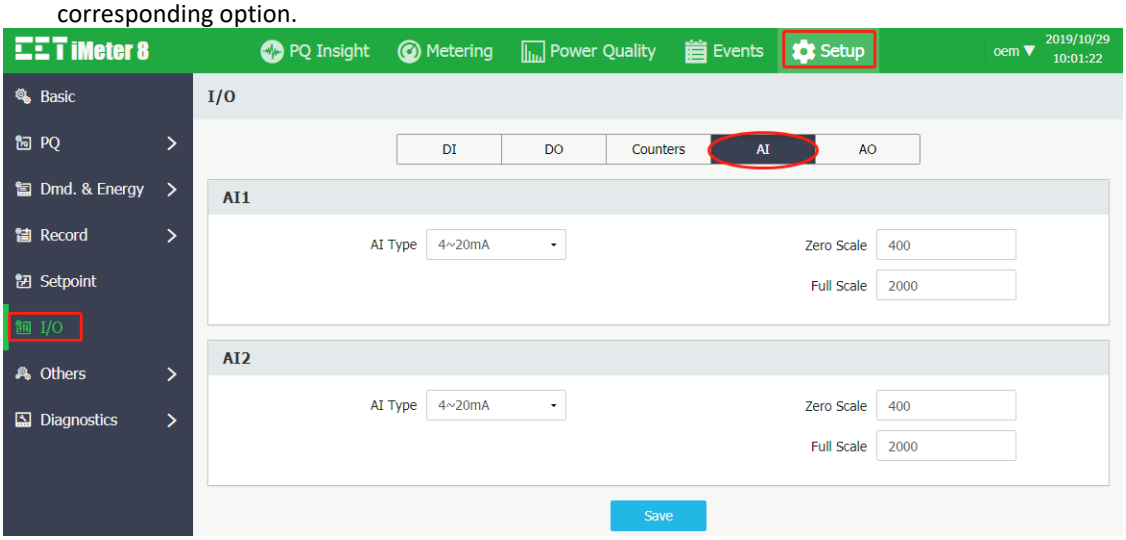


Figure 3-155 AI Setup Interface

- **AO Setup**

Click the **AO** tab at the top of the page and the following screen appears, please refer to **4.1.5** for more information. Please note that the AO tab only appear when the iMeter 8 is equipped with the corresponding option.

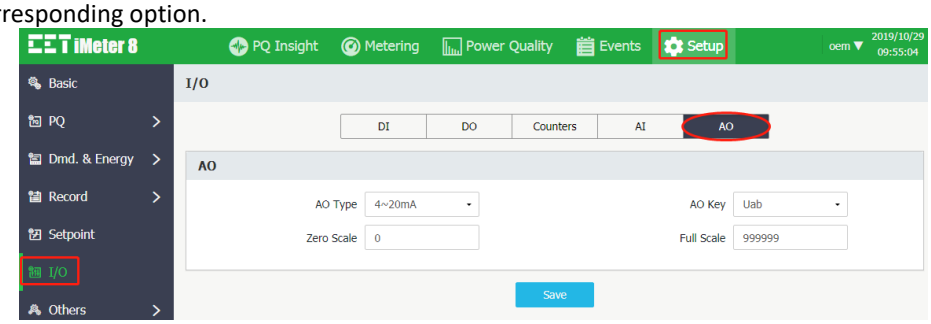


Figure 3-156 AO Setup Interface

3.2.4.5.7 Others

Click **Others** on the left-hand pane to expand its sub-menus which includes **Alarm Email, Alarm LED** and **Advanced.**

3.2.4.5.7.1 Alarm Email

- **Settings** Please refer to **4.7** for more information.

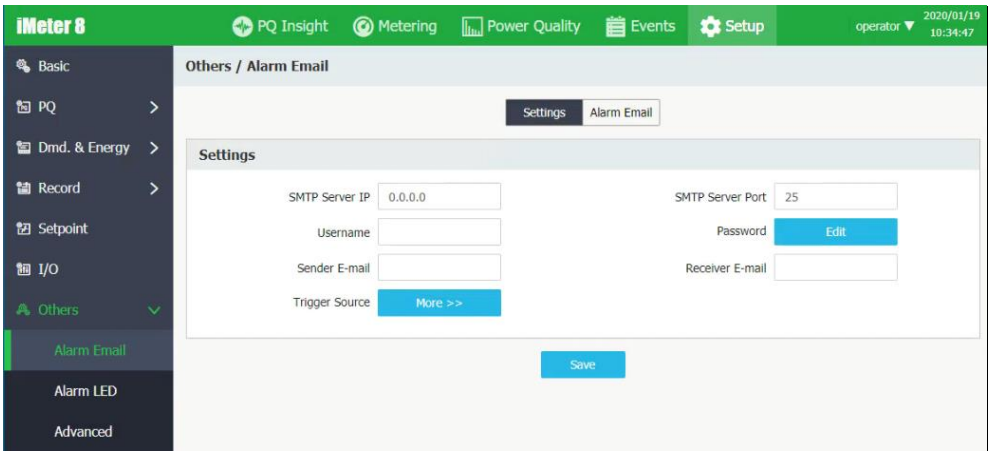


Figure 3-157 Alarm Email Setting Interface

Click **More >>** to open the Trigger Source dialog box and then select the event type that would trigger an alarm email.

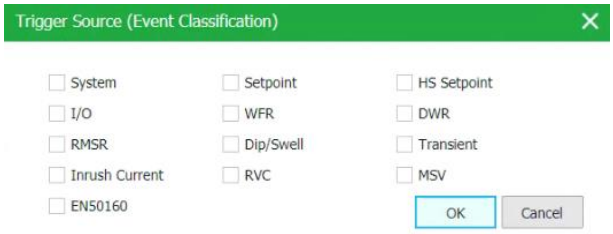


Figure3-158 Trigger Source Dialog Box

- **Alarm Email** Click **Test** to send a test email to check the correctness of the **Alarm Email** configuration

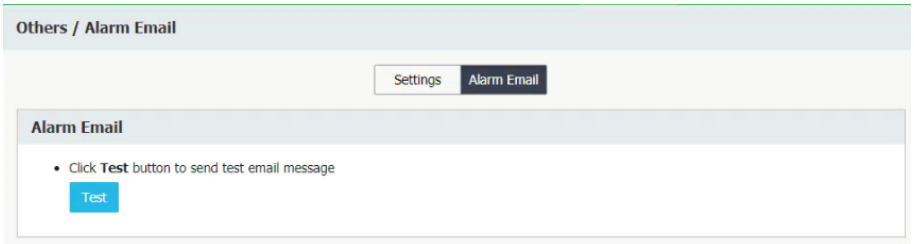


Figure 3-159 Test Alarm Email Interface

3.2.4.5.7.2 Alarm LED

Click on **Alarm LED** on the left-hand pane and the following page appears on the right-hand pane. This menu allows users to set parameters for following LED indicators in the Front Panel: **Harmonics**, **Flicker**, **Voltage Deviation**, **Frequency Deviation** and **Unbalance**. Please refer to **5.10.5** for more information.

Others/Reset Mode is used for setting LED Indicator reset mode which can be set as **Auto** or **Manual**.

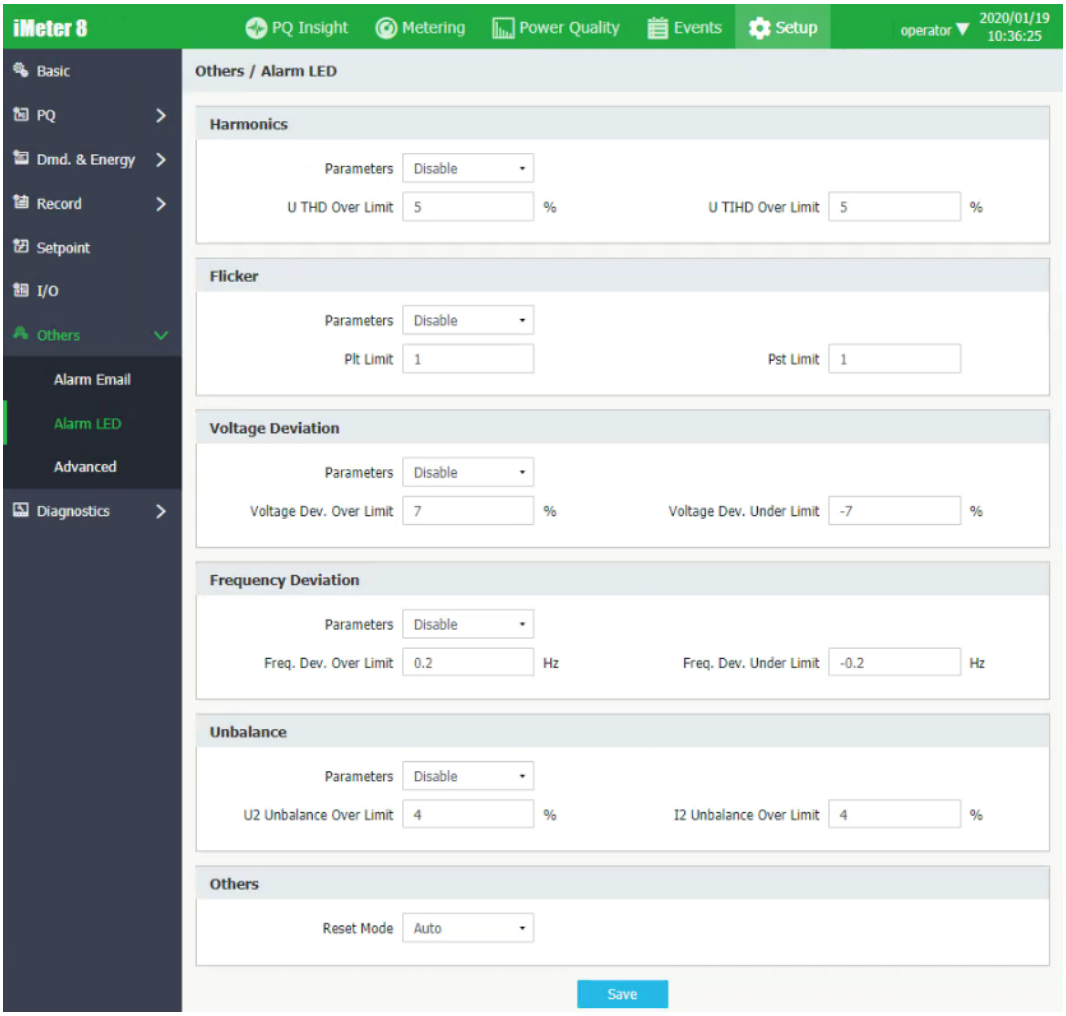
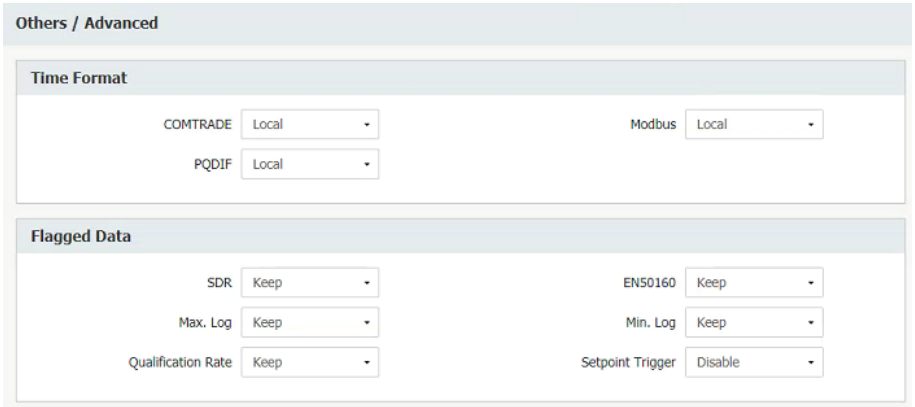


Figure 3-160 Alarm LED Interface

3.2.4.5.7.3 Advanced

Click **Advanced** on the left-hand pane and the following page appears which allows the **Advanced** parameters to be configured. Please consult with the qualified personnel before configuring these advanced parameters.



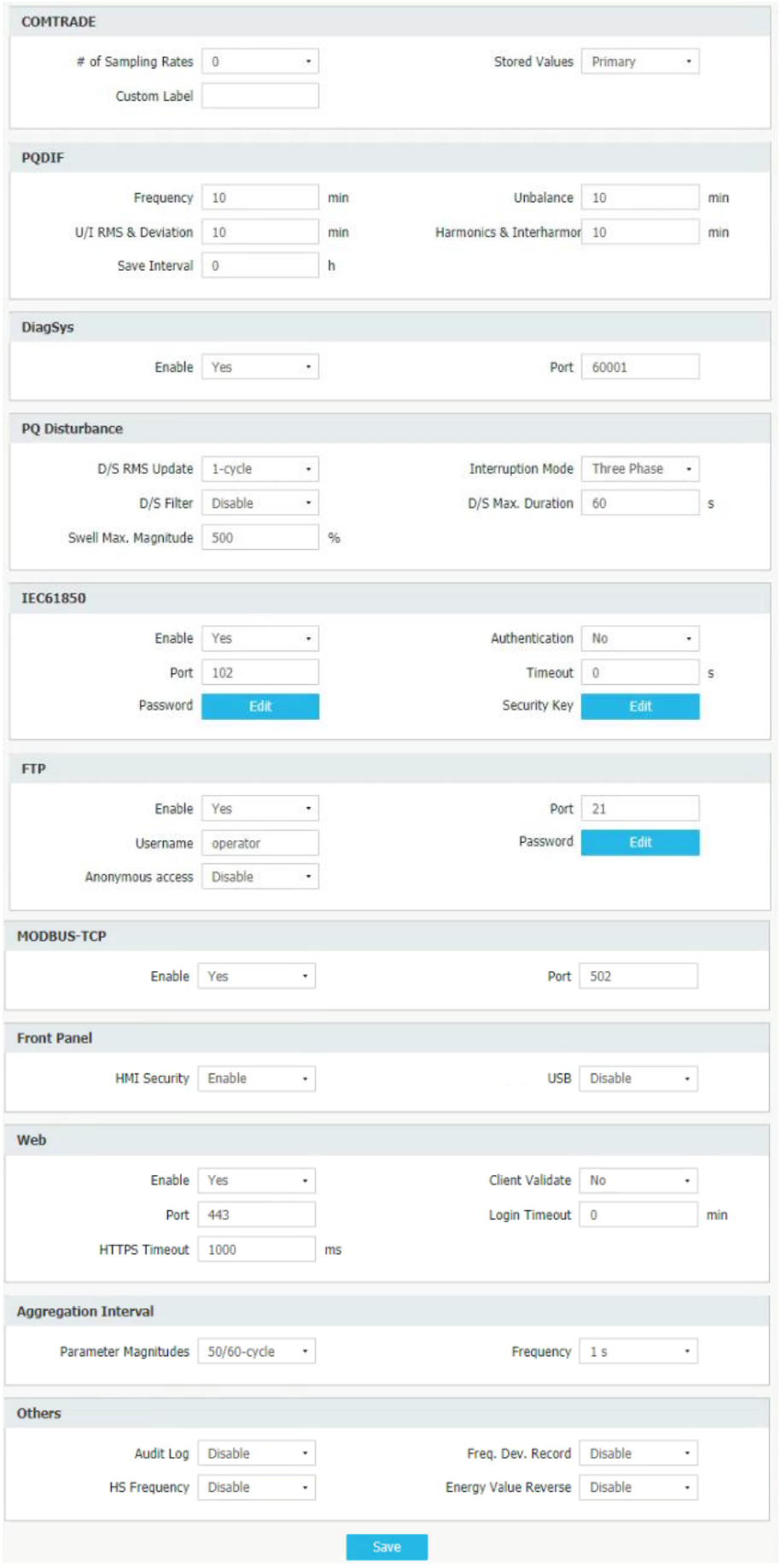


Figure 3-161 Advanced Interface

The following table illustrated the range and default values of the **Advanced** parameters. Please refer to **5.10.6** for more information.

Parameter	Description	Range/Default*
Time Format		
COMTRADE Modbus PQDIF	Specifies time format of the COMTRADE, PQDIF and Modbus.	• Local* • UTC
Flagged Data		
SDR EN50160 Max. Log Min. Log	Specifies keep or remove the flagged data, including SDR, EN50160, Max./Min log and Qualification Rate will trigger Setpoint and Alarm	• Keep* • Remove
Setpoint Trigger		• Disable* • Enable
COMTRADE: Specifies format for WF Comtrade file		
# of Sampling Rates	Specifies the number of Sampling Rates	• 0 • No. of Sampling Rates
Stored Values	Specifies the stored COMTRAD is primary value or secondary value.	• Primary • Secondary
Custom labels	Specifies the custom label of the COMTRADE file.	
PQDIF		
Frequency Unbalance U/I RMS & Deviation Harmonics & Interharmonics	Specifies intervals for the following parameters: • Frequency • Sequence Component and Unbalance • U and I RMS/Deviation • Harmonics and Interharmonics.	1 to 60min, 3*
Save Interval	Specifies storing interval of PQDIF file.	0* to 24Hour 0 means disabled PQDIF function.
DiagSys		
Enable	Enable the DiagSys	• No* • Yes
Port	Specifies the port of the DiagSys	60001
PQ Disturbance		
D/S RMS Update	Magnitude RMS for Dips/Swells/Interruptions. • Every 1 cycle and shifted by 1/2 cycle • Every 1/2 cycle and shifted by 1/2 cycle	1-cycle*
Interruption Mode	Specifies the trigger mode of the interruption. • The voltage of any phase is lower than the Interruption Threshold, the Interruptions will be triggered. • All 3-phase voltages are lower than the Interruption Threshold, the Interruptions will be triggered.	Three Phase*
D/S Filter	Enable Dips/Swells Filter.	• Disable* • Enable
D/S Max. Duration	Specifies the Maximum duration of Dips/Swells.	1-600s, 60*
Swell Max. Magnitude	Specifies the Maximum magnitude of Swells.	101-500 (%), 500*
IEC61850		
Enable	Enable IEC61850 or not.	• No* • Yes
Authentication	Specifies enable Client Authentication or not	
Port	Specifies the port of the IEC61850 Server	1 to 65535, 102*
Timeout	Specifies deviation range of the timestamp.	0s*
Password	Specifies password of the Client Authentication.	
Security Key	Specifies security key of the Client Authentication.	
FTP		
Enable	Enable FTP or not.	• No* • Yes
Port	Specifies the port of the FTP Server	1 to 65535, 21*
Username	Specifies the login user name of the FTP Server	
Password	Specifies the login user password of the FTP Server	
Anonymous access	Enable anonymous login the FTP Server.	• Disable* • Enable
MODBUS-TCP		
Enable	Enable Modbus or not.	• Disable* • Enable
Port	Specifies the port of the Modbus	1 to 65535, 502*

Front Panel		
HMI Security	Enable Front Panel's security protection or not.	• Disable* • Enable
USB	Enable USB Function or not	
Web		
Enable	Enable Web or not.	• Disable* • Enable
Client Validate	Enable Web Client validation or not.	
Port	Specifies Web server port.	1 to 65535, 443*
Login Timeout	Specifies timeout of login web server.	• 0 to 1440min, 5
HTTPS Timeout	Specifies timeout of login https.	100 to 5000ms, 1000*
Aggregation Interval		
Parameter Magnitudes	Specifies what kind of displayed data	• 50/60-cycle • 150/180-cycle* • 10-min • 2-hour
Frequency	Specifies what kind of displayed frequency data.	• 1s* • 3s • 10s
Others		
Audit Log	Enable Audit log alarm.	• Disable* • Enable
Freq. Dev. Record	Enable Frequency deviation recorder or not	
HS Frequency	Enable High-speed real-time Frequency measurement.	• Disable* • Enable

Table 3-10 Advanced Setup Interface

3.2.4.5.8 Diagnostics

Click **Diagnostics** on the left-hand pane to expand its sub-menus which consist of **Device & Site Info., User Management** and **Maintenance.**

3.2.4.5.8.1 Device & Site Info.

- **Device**

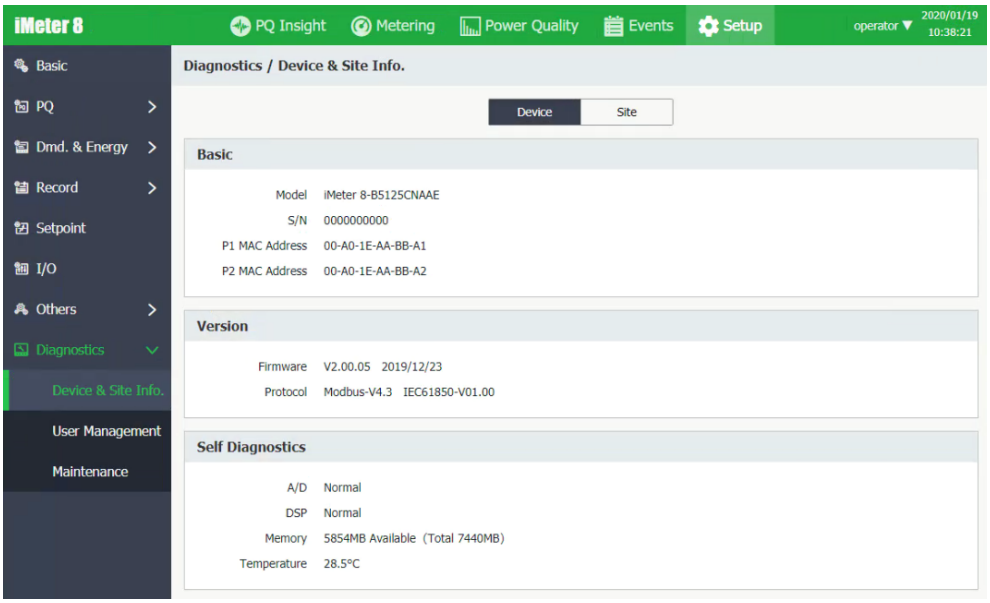


Figure 3-162 Device Interface

- **Site**

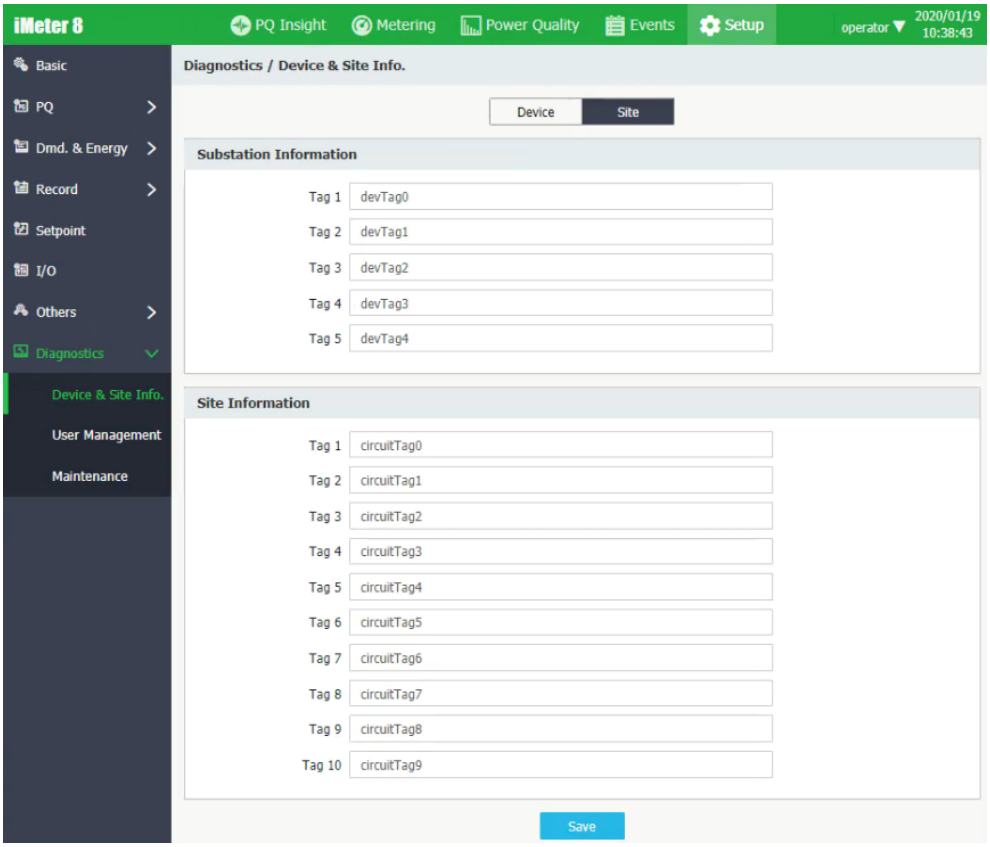


Figure 3-163 Site Interface

3.2.4.5.8.2 User Management

Click **User Management** on the left-hand pane and the following screen appears on the right-hand pane.

The user with Operator authority can click ⊕ to add a new user account or click 🗑 to remove an existing user account.

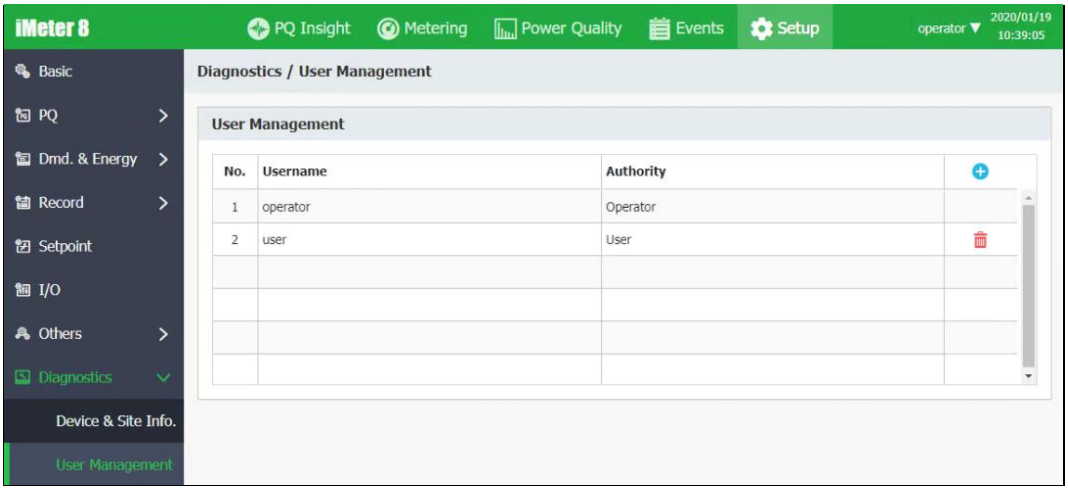


Figure 3-164 User Management Interface

3.2.4.5.8.3 Maintenance

Click **Maintenance** on the left-hand pane and the following screen appears which provides the options for **DO Control, Clear**, **Imp. /Exp.**, **Upgrade** and **Restart**.

- **DO Control** Perform manual **DO Control** or **Reset all DOs to Normal**.

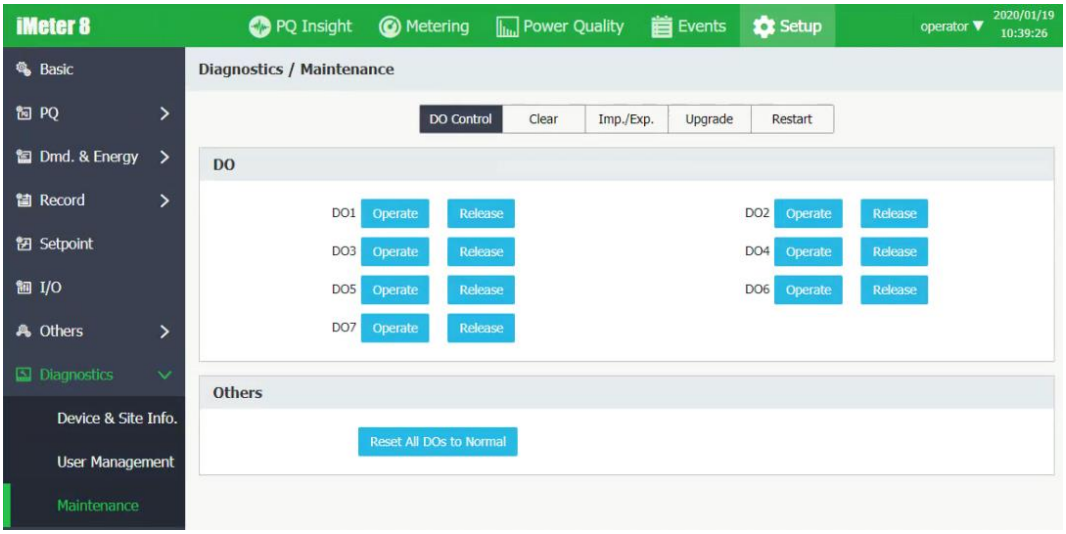


Figure 3-165 DO Control Interface

Depending on the **DO Pulse Width** setting, the DO may behave differently when it is operated manually via the Web Interface. A zero **Pulse Width** means **Latched** operation while non-zero means **Pulsed** operation. For **Latched** operation, the DO will remain in the **Active** state when it's manually operated and will only return to the **Inactive** state when it's manually released. For **Pulsed** operation, the DO will return automatically from the **Active** state to the **Inactive** state after a duration that is equal to the non-zero **Pulse Width** setting, without requiring a manual **Release** operation. In addition, if a DO is already in a **Released** state, the manual **DO Release** command would fail and generate an error message *DOx Released Failed* would be appeared.

- **Clear** Perform the various **Clear** operations by groups or individually
  - **Clear Groups**

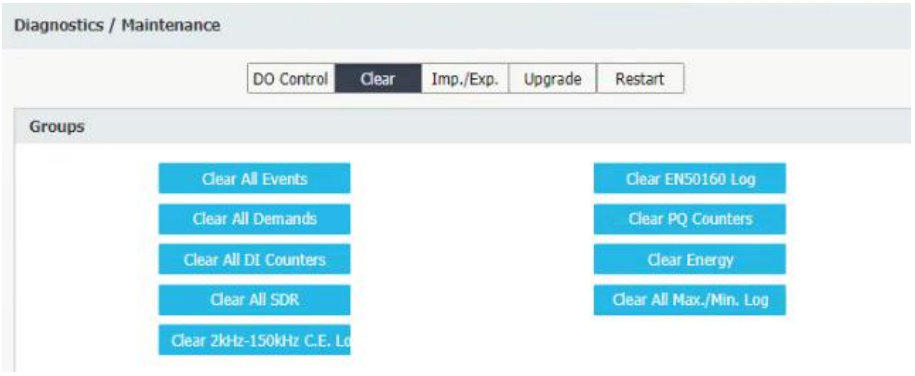


Figure 3-166 Clear Groups

- **Clear Individuals**

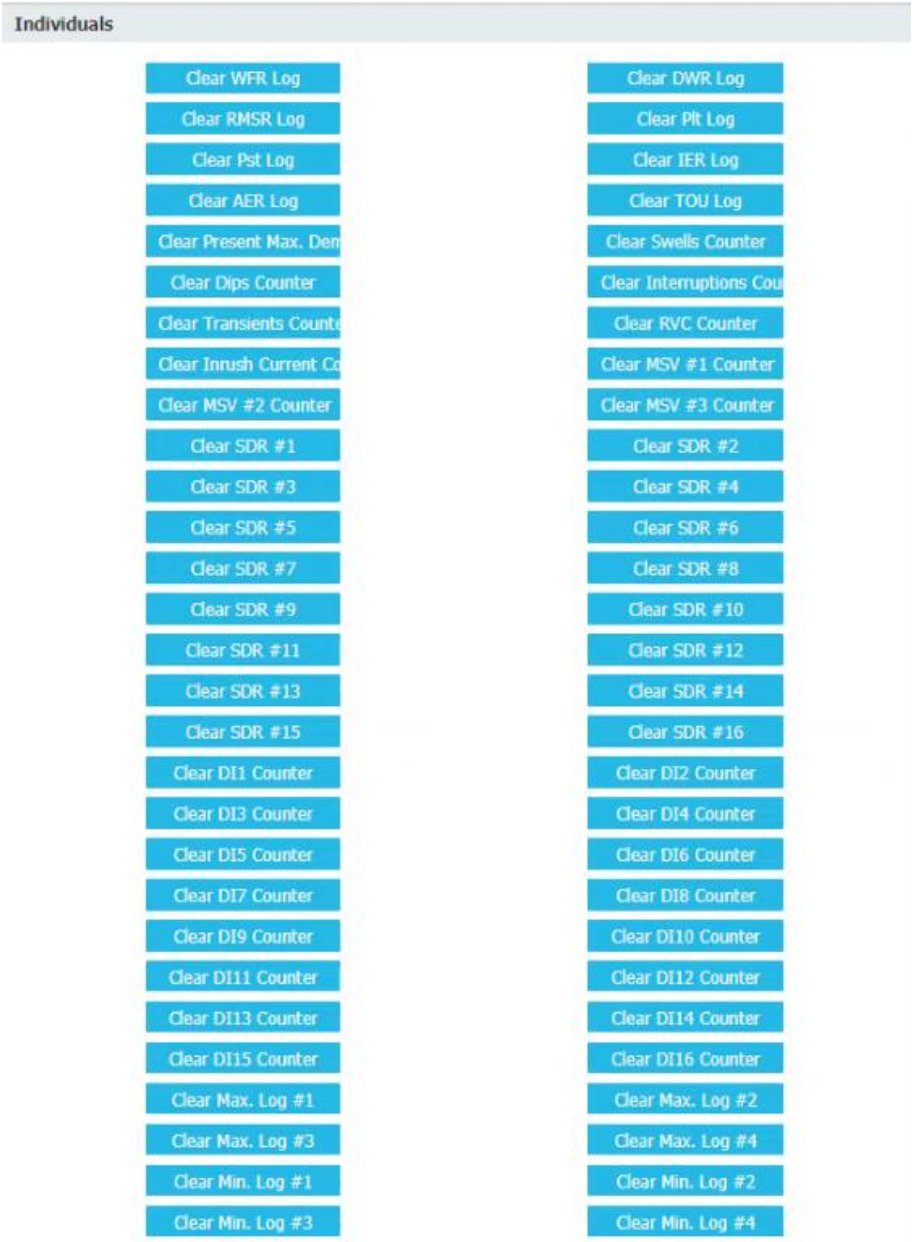


Figure 3-167 Clear Individuals Interface

- **Imp./Exp.** Export or Import Setup parameters, Comm. Parameters, Users Configuration and Calibration Parameters.

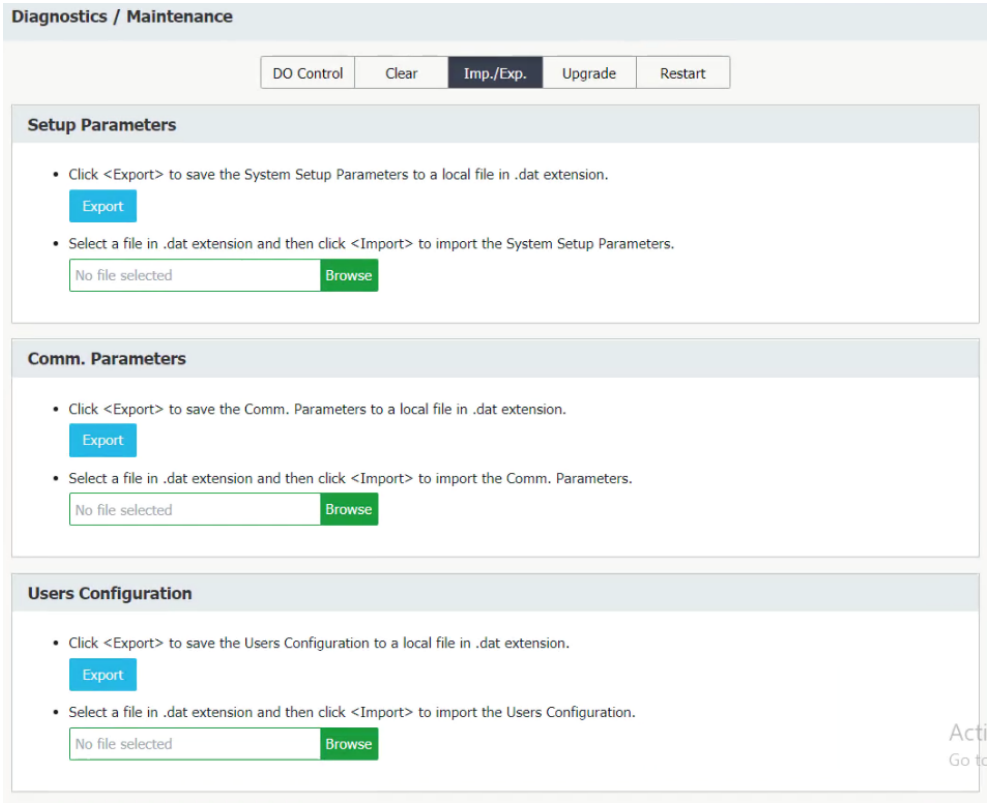


Figure 3-168 Imp./Exp. Interface

- **Upgrade** Only a user with **Operator** authority can import an IEC61850 SCL file or perform the Firmware Upgrade for iMeter 8.

  Please be noted that you may have to clear the browser cache after upgrading the device to ensure the screen can be displayed normally. In most browsers, you can clear the cache in either the settings or options menu. The keyboard combinations **Ctrl+Shift+Del** (Windows) or **Command+Shift+Delete** (Mac) bring up the necessary deletion screen in most browsers as well.

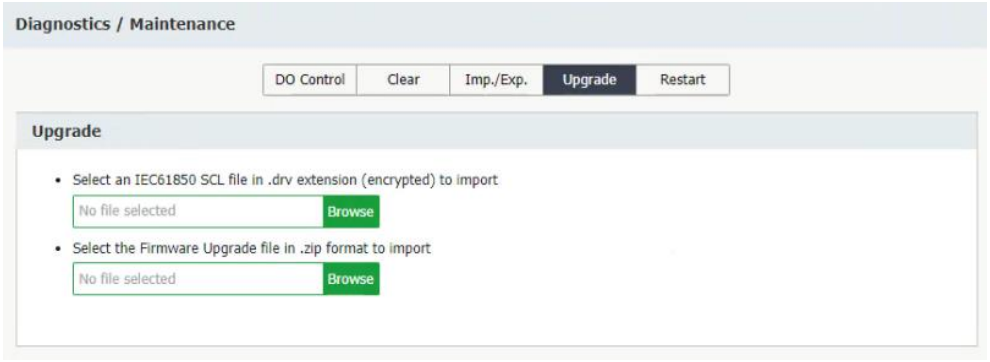


Figure 3-169 Upgrade Interface

- **Restart** Click the **Restart** tab at the top of the page and the following screen appears which allows the meter to be restarted via the Web Interface.

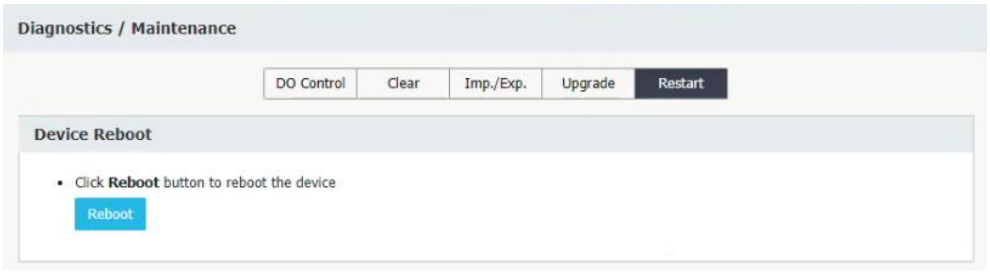


Figure 3-170 Restart Interface

Chapter 4 Applications

4.1 Inputs and Outputs

4.1.1 Digital Inputs

The iMeter 8 comes standard with 8 or optionally with 16 Digital Inputs (DIs) with a sampling frequency of 1000Hz, programmable Excitation Mode and Debounce. The iMeter 8 provides the following programmable functions for its Digital Inputs:

1) Status Input Status Input are typically used for status monitoring which can help prevent equipment damage, improve maintenance, and track security breaches. The real-time statuses of the Digital Inputs are available on the Front Panel Display, Web Interface as well as through communications. Changes in Digital **Input** status are stored as events in the SOE Log in 1 ms resolution.

2) Pulse Counting Pulse counting is supported with programmable Pulse Weight and facilitates WAGES (Water, Air, Gas, Electricity and Steam) information collection with a fixed incremental value of 1 for each pulse received.

3) Demand Sync Pulse One of the Digital Inputs can be programmed to receive the Demand Sync Pulse. Only one DI can be programmed as **DMD Sync**. For example, to set if DI7 as Demand Sync Input, DI1 to DI6 must not be programmed as **DMD Sync** input.

4) Tariff Switching Up to 3 Digital Inputs may be used to select to which of the 8 Tariffs the energy consumption should be accumulated. The 3 Digital Inputs (DI1 to DI3) represent 3 binary digits where Tariff 1=000, Tariff 2=001, …, Tariff 8=111 where DI1 represents the least significant digit and DI3 represents the most significant digit. The **DI1 Function** setup register must first be programmed as a **Tariff Switch** before configuring DI2 with the same function. In other words, if DI1 is configured as a **Status Input** or **Pulse Counter** and DI2 is configured as a **Tariff Switch**, the TOU will continue to function based on the TOU Schedule.

The table below describes the DI's setup parameters:

Setup Parameter	Definition	Options, Default*
DIx Function	Each **DI** can be configured as a Status Input, Pulse Counter or DMD Sync. Only one **DI** should be programmed as a DMD Sync. Only DI1 to DI3 can be configured as **Tariff Switch**.	0=Status Input* 1=Pulse Counter 2=DMD Sync 3=Tariff Switch
DIx Debounce	Specifies the minimum duration the **DI** must remain in the Active or Inactive state before a state change is considered to be valid.	1 to 9999 (ms) (Default=20ms)
DIx Setpoint Type	Specifies the valid transition type, whether it's positive, negative or any, for a DI Setpoint to become active. The DI Setpoint is only used when a DI is configured as a Status Input.	Any Edge* Positive, Negative
DIx Trigger[1]	Specifies what output action a DI Setpoint will take when it becomes active. DI Setpoint is only valid when a DI is configured as a Status Input.	See **Table 4-2**
DIx Pulse Weight	Specifies the incremental value for each received pulse. This is only used when a DI is configured as a Pulse Counter.	1* to 1,000,000
DI Excitation Mode	Specifies the excited mode for each DI.	0=DC*, 1=AC

Table 4-1 DI Setup Parameters

Note:

1. The DIx Setpoint Type only affects which edge would trigger the Waveform Recorder if configured.
2. The WFR/DWR Waveforms linked to the DI Changes are not visible via Front Panel or Web Interface, but downloadable via FTP Server.

The table below provides a list of DIx's Setpoint Trigger.

Key	Action	Key	Action	Key	Action	Key	Action
0	Alarm	**6**	DO6	**22**	DR #4	**28**	WFR
1	DO1	**7**	DO7	**23**	DR #5	**29**	RMSR
2	DO2	**8~18**	Reserved	**24**	DR #6	**30~31**	Reserved
3	DO3	**19**	DR #1	**25**	DR #7		
4	DO4	**20**	DR #2	**26**	DR #8		
5	DO5	**21**	DR #3	**27**	DWR		

Table 4-2 DI Setpoint Trigger

4.1.2 Digital Outputs and Alarm

The iMeter 8 comes standard with 4 or optionally with 8 Form A Electrometrical Digital Outputs (DO), and one of DOs can be used for Power Failure Alarm Output by Enabling **LOP Alarm**.

The Digital Outputs on the iMeter 8 can be used in the following applications:

1) Front Panel Control Manually operated from the Front Panel, mainly used for relay testing. Please refer to **Section 3.1.3.5.10** for a detailed description.

2) Remote Control Remotely operated over communications via the on-board Web Server or the PecStar® iEMS Integrated Energy Management System.

3) Control Setpoint Control setpoints can be programmed to trigger DO, DR, WFR, DWF, RMSR or Alarm Email upon becoming active. Please refer to **Section 4.3** for a detailed description.

4) PQ Disturbance Setpoint PQ Disturbance setpoint can be programmed to trigger DO, DR, WFR, DWF, RMSR or Alarm Email upon becoming active. Dips/Swells/Interruption setpoints can be programmed to trigger DO. Please refer to **Section 4.4.5** for a detailed description.

5) Transient Setpoint: Transient setpoint can be programmed to trigger DO, DR, WFR, DWF, RMSR or Alarm Email upon becoming active. Please refer to **Section 4.4.7** for a detailed description.

6) Inrush Setpoint Inrush Setpoint can be programmed to trigger DO, DR, WFR, DWF, RMSR or Alarm Email, etc. upon becoming active. Please refer to **Section 4.4.14** for a detailed description.

7) RVC Setpoint RVC setpoint can be programmed to trigger DO, DR, WFR, DWF, RMSR or Alarm Email upon becoming active. Please refer to **Section 4.4.11** for a detailed description.

DOs on the iMeter 8 has the following setup parameters:

Setup Parameter	Definition	Options, Default*
DO Alarm Enable Flag	Specifies if DO Alarm function is enabled.	0=Disabled, 1=Enabled*
Arm before Execute	Enable or disable the **Arm Before Execute** feature for the DO.	0=Disabled*, 1=Enabled
Alarm / DOx Pulse Width (x=1 to 7)	Specifies if the duration for which the relay output will be active when a Remote Operate or Setpoint Trigger command is received to operate it.	0* to 6000 (x 0.1s) 0 (Latch Mode)

Table 4-3 DO Setup Parameters

Since there are multiple ways to trigger the relay output on the iMeter 8, a prioritized scheme has been developed to avoid conflicts between different applications. In general, Front Panel Control has the highest priority and can override the other applications. Remote Control, Control, Dip/Swell/Interruption Setpoint, Transient Setpoint, Inrush Current Setpoint and RVC Setpoint share the same priority, meaning that they can all be programmed to control the same relay output. This scheme is equivalent to having an implicit Logical OR operation for the control of a Digital Output and may be useful in providing a generic alarm output signal. However, the sharing of a Digital Output is not recommended if the user intends to generate a control signal in response to a specific setpoint condition.

4.1.3 Energy Pulse Outputs

The iMeter 8 comes standard with 4 Solid State Relay Outputs for energy pulsing as well as kWh and kvarh pulsing. Energy Pulse Outputs are typically used for accuracy testing. Energy pulsing can be configured from the Front Panel (Please refer to **Section 3.1.3.5.3**) or via the Web Interface (Please refer to **Section 3.2.4.5.3.2**).

The table below illustrates the ranges and default values for the Energy Pulse Outputs parameters:

Setup Parameters	Definition	Options, *Default
Ex Source (x=1 to 4)	Specify the source to which the energy pulse output is proportional.	See **Table 4-5 Ex Source**
Pulse Constant	Specify the rate of the energy pulse output. For example, 1000 means 1000 Impulses per kWh or 1 Impulse per 1Wh.	1000, 3200,5000*, 6400, 12800 (imp/kWh)

Table 4-4 Setup Parameters for Energy Pulse Output

Source	Description	Source	Description	Source	Description
1	kWh Total	7	kWh Total TH	13	kvarh Total Fund.
2	kWh Imp.	8	kWh Imp. TH	14	kvarh Imp. Fund.
3	kWh Exp.	9	kWh Exp. TH	15	kvarh Exp. Fund.
4	kWh Total Fund.	10	kvarh Total	16	kvarh Total TH
5	kWh Imp. Fund	11	kvarh Imp.	17	kvarh Imp. TH
6	kWh Exp. Fund	12	kvarh Exp.	18	kvarh Exp. TH

Table 4-5 Ex Source

The **Pulse Constant** can be configured as 1000/3200/5000/6400/12800 impulses per kWh. It's important to understand that Energy Pulsing is always based on the secondary ratings as it would be impossible to generate the required number or pulses based on the primary ratings. The following table illustrates the recommended settings for the **Pulse Constant** based on **Z** = 2 x $V_{nominal}$ x $I_{nominal}$, where $V_{nominal}$ and $I_{nominal}$ are the secondary nominal Voltage and Current ratings. In general, one would use a higher **Pulse Constant** for a smaller **Z** value **(i.e.** a smaller $V_{nominal}$ and $I_{nominal}$**)** in an accuracy testing situation to reduce the test time.

Z	Energy Pulse Constant	Default	Min. Interval
≤1000	1000/3200/5000/6400/12800	1000	160ms
≤2000	1000/3200/5000/6400	1000	
≤2600	1000/3200/5000	1000	
≤4000	1000/3200	1000	
≤13000	1000	1000	

Table 4-6 Recommended Settings for Energy Pulse Constant

4.1.4 Analog Input

The iMeter 8 comes optionally with two Analog Inputs which can be programmed as 0mA to 20mA or 4mA to 20mA input. There are 3 setup parameters:

Type: Select between 0-20mA or 4-20mA input.

AI Zero: This value corresponds to the minimum Analog Input of 4 mA (for 4-20mA input) and has a range of -999,999 to +999,999.

AI Full: This value corresponds to the maximum Analog Input of 20 mA and has a range of -999,999 to +999,999.

For example, to measure the oil temperature of a transformer, connect the outputs of the temperature sensor to the AI terminals of the iMeter 8. The temperature sensor outputs 4mA when the temperature is -25°C and 20mA when the temperature is 100°C. As such, the **Type** parameter should be programmed as **4-20mA**. The **AI FULL** parameter should be programmed with the value 100, and the **AI ZERO** parameter should be programmed with the value -25. Therefore, when the output of the sensor is 20mA, the reading will be 100.00°C. When the output is 4mA, the reading will be -25.00°C. When the output is 12mA, the reading will be (100°C - (-25°C)) x (12mA-4mA) / (20mA-4mA) + (-25°C) = 37.50°C.

4.1.5 Analog Output

The iMeter 8 comes optionally with one Analog Output which can be programmed as 0mA to 20mA or 4mA to 20mA output. There are 4 setup parameters:

Type: Select between 0-20mA or 4-20mA output.

AO Zero: Defines the zero scale value of the parameter when the Analog Output is 0 or 4 mA according to the **AO Type**. The value ranges between -999,999 to +999,999.

AO Full: Defines the full scale value of the parameter when the Analog Output is 20 mA. The value ranges between -999,999 and +999,999.

Key: Defines the parameter to which the Analog Output is proportional. Please refer to **Section 5.10.4** for the detailed Analog Output Parameters.

For example, an AO of 4-20mA is required to be proportional to Phase A current. The maximum value of phase A current is 2000A, and the minimum value is 500A. As such, the **Type** parameter should be programmed as **4-20mA**. The **Key** parameter should be programmed with Ia (Phase A Current). The **AO FULL** parameter should be programmed with the value 2000. The **AO ZERO** parameter should be programmed with the value 500. Therefore, when Phase A Current is 500A or below. The AO output is 4mA. When Phase A Current is 2000A, the AO output is 20mA. When Phase A Current is 1250A, the AO is (1250A-500A) x (20mA-4mA) / (2000A-500A) + 4mA = 12.00 (mA).

4.2 Power, Energy and Demand

4.2.1 Basic Measurements

The iMeter 8 provides the following basic measurements (@ 1-second update rate) which are available through the Front Panel, Web Interface or communications.

- 3-phase U, I, P, Q, S and PF as well as Frequency, U4, I4 and I5
- kWh, kvarh Import/Export/Net/Total and kVAh Total

4.2.2 High-speed Measurements

The iMeter 8 provides the following high-speed measurements which are available through the Front Panel, Web Interface or communications.

- 3-phase U, I, P, Q, S and PF as well as U4, I4 and I5 @ ½ cycle
- Frequency @ 1 cycle

4.2.3 Energy Measurements

The iMeter 8 provides Energy parameters for active energy (kWh), reactive energy (kvarh) and apparent energy (kVAh), as well as harmonic energy with a maximum value of 100,000,000,000.000 or 1,000,000,000.000 (if **Energy Short Rollover** is **Enabled**). When the maximum value is reached, the energy registers will automatically roll over to zero. The energy can be reset manually through the Front Panel, on-board Web or via communications. Besides, the energy can be preset to user-defined values through the Web Interface (see **Section 3.2.4.5.3.2**) or via communications (see **Section 5.2**).

The iMeter 8 provides the following energy measurements:

kWh	kvarh	kVAh
Imp. (Total RMS)	Imp. (Total RMS)	kVAh Total
Exp. (Total RMS)	Exp. (Total RMS)	
Net (Total RMS)	Net (Total RMS)	
Total (Total RMS)	Total (Total RMS)	
Imp. / Exp. / Net / Total Fundamental	Imp. / Exp. / Net / Total Fundamental	
Imp./Exp./Net/Total TH	Imp./Exp./Net/Total TH	
Imp./Exp. H02 to H63	Imp./Exp. H02 to H63	

Table 4-7 Energy Measurements

4.2.4 Demand Measurements

Demand is defined as the average power consumption over a fixed interval (usually 15 minutes). Predicted demand is typically used for pre-alarming and to help users reduce power consumption using a Setpoint to warn that the Demand limit may be exceeded.

The iMeter 8 provides the following Present Demand and Predicted Demand parameters:

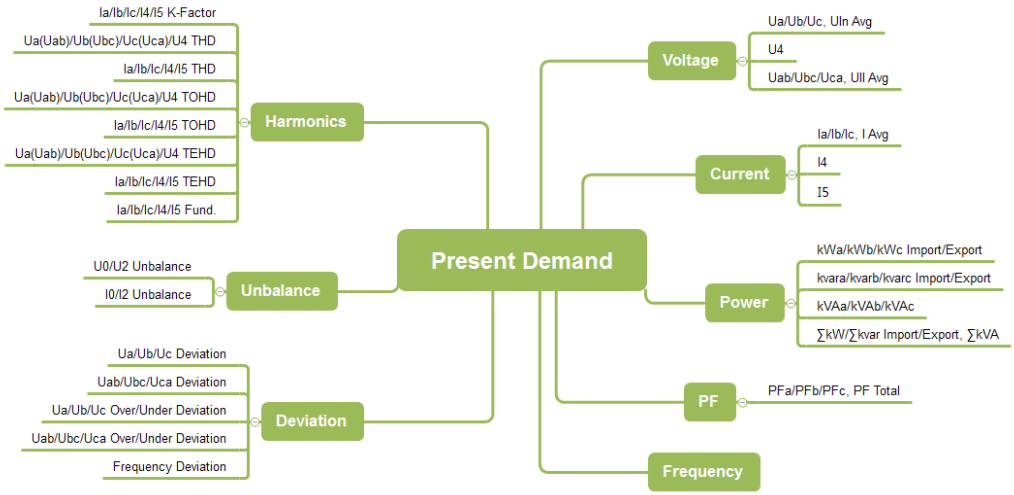


Figure 4-1 Present Demand Parameters

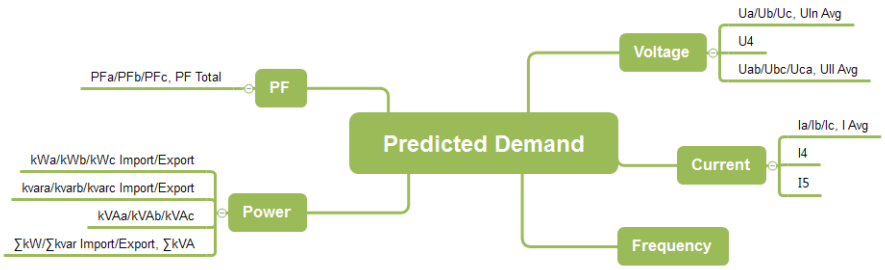


Figure 4-2 Predicted Demand Parameters

The iMeter 8 also provides the Max. Demand of This/Last Month or Since/Before Last Reset according to the **Self-Read Time** setup parameter. The Max. Demand of This Month (or Since Last Reset) is transferred to the Max. Demand of Last Month (or Before Last Reset) and then reset each month at the **Self-Read Time** or after a manual reset.

This Max. Demand can be reset manually through the Front Panel (See **Section 3.1.3.5.10**), Web Interface (See **Section 3.2.4.5.8.2** or through Communications (Register 9294).

The iMeter 8 provides the following Demand setup parameters which can set through Front Panel, Web Interface or via communication:

Setup Parameter	Definition	Options, Default*
Demand Sync. Mode	**SLD** - Internally synchronized to the meter clock **DI Sync** - Externally synchronized to a DI that has been programmed as a Demand Sync Input by setting the **DI Mode** setup parameter as "**DMD Sync**".	0=SLD* 1=DI Sync
Demand Period	1 to 60 minutes. For example, if the **# of Sliding Windows** is set as 1 and the **Demand Period** is 15, the demand cycle will be 1×15=15min.	1 to 60 minutes Default=15
# of Sliding Windows	Number of Sliding Windows.	1* to 15
Self-Read Time	The **Self-Read Time** allows the user to specify the time and day of the month for the Peak Demand Self-Read operation. The **Self-Read Time** supports three options: • A zero value means that the Self-Read will take place at 00:00 of the first day of each month. • A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = Day * 100 + Hour where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month. • A 0xFFFF value will disable the Self-Read operation and replace it with manual operation. A manual reset will cause the Peak Demand of **This Month** to be transferred to the Peak Demand of **Last Month** and then reset. The terms **This Month** and **Last Month** will become **Since Last Reset** and **Before Last Reset**.	Default=0xFFFF
Predicted Response	The Predicated Response shows the speed of the predicted demand output. A value between 70 and 99 is recommended for a reasonably fast response. Specify a higher value for higher sensitivity.	70* to 99

Table 4-8 Demand Setup Parameters

In addition, the iMeter 8 provides the Max./Min. value per Demand Period of the following measurements:

- Ua/Ub/Uc/Uln avg, Uab/Ubc/Uca/Ull avg and U4
- Ia/Ib/Ic/I avg, I4 and I5
- Frequency
- 3-Phase Power and Power Factor
- Voltage Deviation
- U0, U2, I0 and I2 Unbalance
- Current K-Factor
- Voltage and Current THD/TOHD/TEHD
- Current H01

All Max./Min. per Demand Period data can be retrieved through communication.

4.3 Setpoints

The iMeter 8 comes standard with 256 Standard Setpoints and 15 High-speed Setpoints which provide extensive control by allowing users to initiate an action in response to a specific condition. Typical setpoint applications include alarming, control and power quality monitoring.

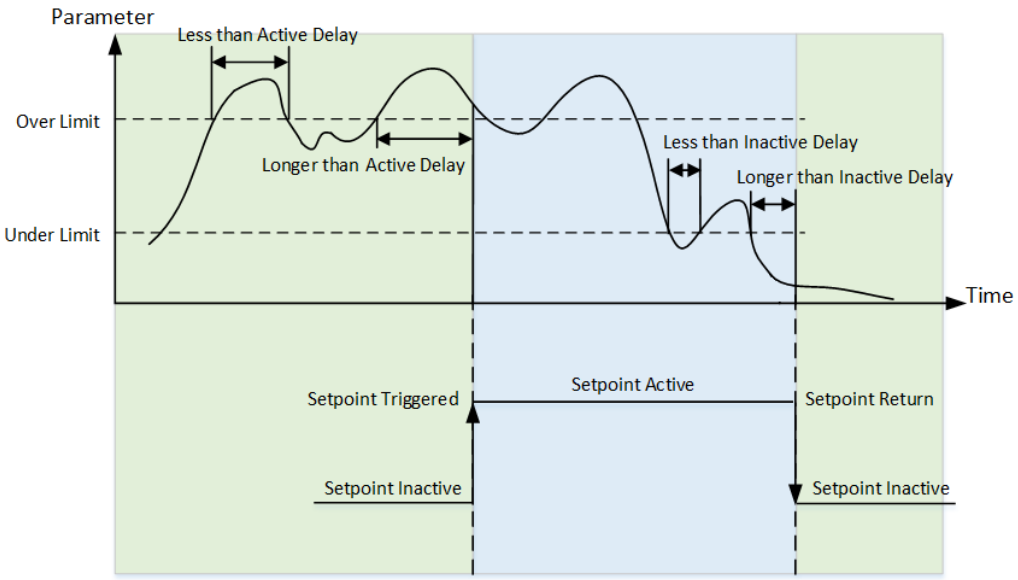


Figure 4-3 Over Setpoints

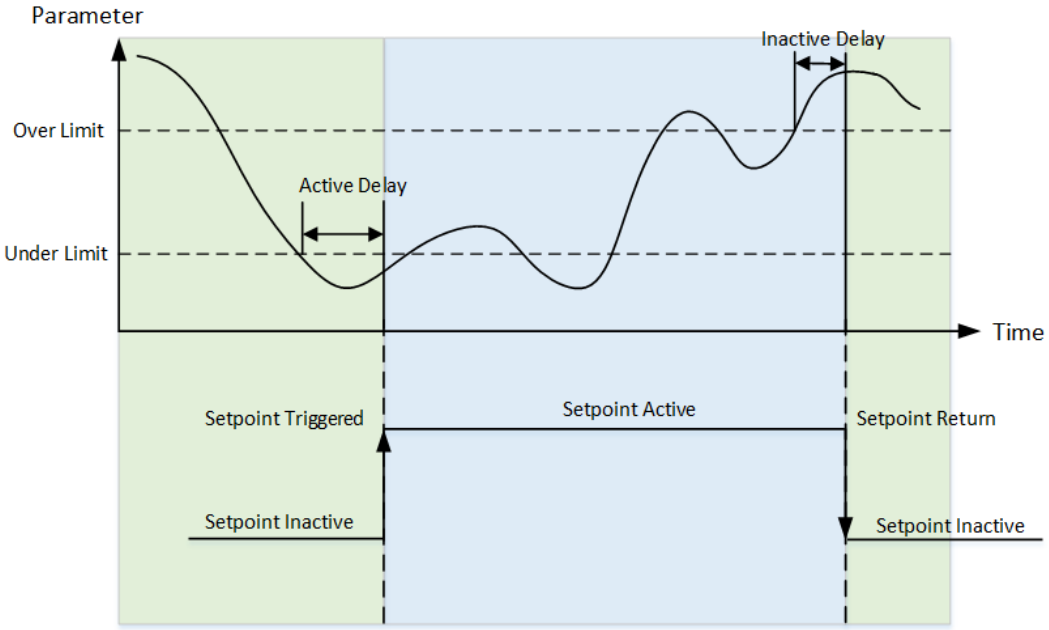


Figure 4-4 Under Setpoints

The Setpoints can be programmed via the Web Interface or communications and have the following setup parameters:

Setup Parameter	Definition	Options/Default*
Type	Disabled, Over or Under Setpoint.	0=Disabled* 1=Over SP, 2=Under SP
Parameter	Specify the parameter to be monitored.	See **Table 4-10**
Over Limit	Specify the value that the setpoint parameter must exceed for Over Setpoint to become active or for Under Setpoint to become inactive.	999,999*
Under Limit	Specify the value that the setpoint parameter must go below for Over Setpoint to become inactive or for Under Setpoint to become active.	999,999*
Active Delay	Specify the minimum duration that the setpoint condition must be met before the setpoint becomes active. An event will be generated and stored in the SOE Log. The range of the **Active Delay** is between 0 and 9999 seconds.	0 to 9999s, 10*
Inactive Delay	Specify the minimum duration that the setpoint return condition must be met before the setpoint becomes inactive. An event will be generated and stored in the SOE Log. The range of the **Inactive Delay** is between 0 and 9999 seconds.	0 to 9999s, 10*
Setpoint Trigger	Specify what action a setpoint would take when it becomes active.	See **Table 4-11 Setpoint Triggers**,

		0*

Table 4-9 Description for Setpoint Parameters

The iMeter 8 provides the following Setpoint parameters, Standard Setpoint can monitor all parameters while the HS Setpoint only can monitor parameters 1 to 10.

Key	Parameter	Key	Parameter	Key	Parameter
1	ULN*	26	I THD	51	kVA Total DMD
2	ULL*	27	I TOHD	52	P.F. Total DMD
3	U4*	28	I TEHD	38	I TH RMS
4	Ia/Ib/Ic*	29	U TIHD	53	kW Imp. Total Pred. DMD
5	I4*	30	U TOIHD	54	kW Exp. Total Pred. DMD
6	I5*	31	U TEIHD	55	kvar Imp. Total Pred. DMD
7	kW Total*	32	I TIHD	56	kvar Exp. Total Pred. DMD
8	kvar Total*	33	I TOIHD	57	kVA Pred. Total DMD
9	kVA Total*	34	I TEIHD	58	P.F. Pred. Total DMD
10	P.F. Total*	35	U TH RMS	59	Pst
11	U0 Unbalance	36	U TOH RMS	60	Plt
12	U2 Unbalance	37	U TEH RMS	61	Voltage Fluct.
13	I0 Unbalance	38	I TH RMS	62	Phase Loss
14	I2 Unbalance	39	I TOH RMS	0x0002xxxx	U HD02
15	U Fundamental	40	I TEH RMS	…	U HD03~HD62
16	I Fundamental	41	U TIH RMS	0x003fxxxx	U HD63
17	U Deviation	42	U TOIH RMS	0x0081xxxx	U IHD01
18	U Over Deviation	43	U TEIH RMS	…	U IHD02~IHD62
19	U Under Deviation	44	I TIH RMS	0x00bfxxxx	U IHD063
20	Frequency	45	I TOIH RMS	0x02xxxxxx	I HD02
21	Frequency Deviation	46	I TEIH RMS	…	I HD03~HD62
22	Phase Reversal	47	kW Imp. Total DMD	0x3fxxxxxx	I HD63
23	U THD	48	kW Exp. Total DMD	0x81xxxxxx	I IHD01
24	U TOHD	49	kvar Imp. Total DMD	…	I IHD02~IHD62
25	U TEHD	50	kvar Exp. Total DMD	0xbfxxxxxx	I IHD063

Table 4-10 Setpoint Parameters

Key	Action	Key	Action	Key	Action	Key	Action
0	Alarm	**6**	DO6	**22**	DR #4	**28**	WFR
1	DO1	**7**	DO7	**23**	DR #5	**29**	RMSR
2	DO2	**8~18**	Reserved	**24**	DR #6	**30~31**	Reserved
3	DO3	**19**	DR #1	**25**	DR #7		
4	DO4	**20**	DR #2	**26**	DR #8		
5	DO5	**21**	DR #3	**27**	DWR		

Table 4-11 Setpoint Triggers

4.4 Power Quality Parameters

4.4.1 Phase Angles

Phase analysis is used to identify the angle relationship between 3-phase Voltages and Currents.

For WYE connected systems, the per phase difference of the Current and Voltage angles should correspond to the per phase PF. For example, if the PF is 0.5 Lag and the Voltage phase angles are 0.0°, 240.0° and 120.0°, the Current phase angles should have the values of -60.0°, 180.0° and 60.0°, respectively.

4.4.2 Power Frequency and Freq. Deviation

The iMeter 8 is capable of measuring **Frequency** accurate to ±0.003Hz. The measurement range is ±10% of $f_{nominal}$, which is 40Hz to 60Hz for 48Hz system and 48Hz to 72Hz for 60Hz system.

The measurement method of **Frequency** is in accordance with **Section 5.1 of IEC 61000-4-30 Standard** for Class A performance. The iMeter 8 also computes **Freq. Deviation** as per below:

$$\textbf{Freq. Deviation} = ((f - f_{nominal})/f_{nominal}) \times 100\%$$

where $f_{nominal}$ is the Nominal Frequency

The **Freq. Deviation** measurement can be accessed through Front Panel (See **Section 3.1.3.2.4**), On-board Web Server (See **Section 3.2.4.3.4**) or through Communications (**Register 0736**).

4.4.3 Magnitude of the Supply Voltage

The measurement method of the **Magnitude of the Supply Voltage** parameters is in accordance with **Section 5.2 of IEC 61000-4-30 Standard** for Class A performance. The measurement method is not intended for the detection and measurement of disturbances such as **Dips**, **Swells**, **Voltage Interruptions** and **Transients**. The RMS value includes voltage related measurements such as **Harmonics**, **Interharmonics**, **Mains Signaling**, etc.

4.4.4 Flicker

The iMeter 8 provides the Flicker measurements in accordance with **Section 5.3 of IEC 61000-4-30 Ed.2 Standard Ed.2 Standard** for Class A performance (where **IEC 61000-4-15 Standard** applies). The Nominal Frequency (50Hz or 60Hz) and the Flicker Curve (120V or 230V) setup parameters, programmable via the Web Server or Communications, determine which model would be used for the following Flicker measurements.

- *Short-term flicker severity (Pst) measured over a 10-minute interval*
- *Long-term flicker severity (Plt) calculated from a sequence of 12 Pst according to the following formula:*

$$Plt = \sqrt[3]{\sum_{i=1}^{12} \frac{Pst_i^3}{12}}$$

The Pst and Plt measurement can be accessed through Front Panel (refer to **Section 3.1.3.2.6**), On-board Web Server (refer to **Section 3.2.4.3.6**) or through Communications. In addition, the iMeter 8 is capable of storing Flicker measurements for 1 year.

4.4.5 Supply Voltage Dips/Swells

The iMeter 8 supports the detection of the **Supply Voltage Dips and Swells** using a method that is in accordance with **Section 5.4 of IEC 61000-4-30 Ed. 3 Standard** for Class A performance.

The iMeter 8 provides Dips/Swells detection for Voltage quality monitoring on a per phase basis, which support multiple triggers at the same time, including **DR/WFR/DWR/RMSR, DO, SOE** and **Alarm Email.** The timestamp, duration and Magnitudes of per phase voltage of each Dip/Swell would be recorded by the iMeter 8.

4.4.5.1 Dips/Swells Detection

As per IEC 61000-4-30 Ed.3:

- ***Voltage Swells Detection***

  On polyphase systems a Swell begins when the $U_{rms(1/2)}$ voltage of one or more channels rises above the Swell Threshold and ends when the $U_{rms(1/2)}$ voltage on all measured channels is equal to or below the Swell Threshold minus the Hysteresis voltage.

- ***Voltage Dips Detection***

  On polyphase systems a Dip begins when the $U_{rms(1/2)}$ voltage of one or more channels is below the Dip Threshold and ends when the $U_{rms(1/2)}$ voltage on all measured channels is equal to or above the Dip Threshold plus the Hysteresis voltage.

PQ Disturbance Settings

The **PQ Disturbance** setup parameters can be programmed over the Web Interface or via Communications. The **Dip Threshold**, **Swell Threshold**, **Voltage Interruption Threshold** and **Dip/Swell Hysteresis** should be configured to meet the following criteria:

a) The **Voltage Interruption Threshold** shall be set below the **Dip Threshold**.

b) The **Dip/Swell Hysteresis** must be less than the **Dip/Swell Thresholds**.

c) The **Rapid Voltage Changes (RVC) Threshold** must be less than the **Dip and Swell Thresholds**.

d) Regardless of whether **Dip/Swell** is enabled, the conditions for a), b) and c) must always be met.

The following table illustrates the ranges and default values for the PQ Disturbance parameters on the iMeter 8.

Parameter	Options/Range, Default*	Parameter	Options/Range, Default*
PQD Enable	Yes*, No	**Dip Threshold**	1% to 99% (x Udin/Usr), 90%*
Reference Voltage	Udin*, Usr	**Dip Hysteresis**	1% to 100% (x Udin/Usr), 2%*
PQD Trigger	WFR, DWR*, RMSR	**Dip Trigger**	DO1 to DO7, Alarm
Swell Threshold	101% to 200% (x Udin/Usr), 110%*	**Interruption Threshold**	0% to 50% (x Udin/Usr), 5%*
Swell Hysteresis	1% to 100% (x Udin/Usr), 2%*	**Interruption Hysteresis**	1% to 100% (x Udin/Usr), 2%*
Swell Trigger	DO1 to DO7, Alarm	**Interruption Trigger**	DO1 to DO7, Alarm

Table 4-12 PQ Disturbance Parameters

4.4.5.2 Voltage Dip Evaluation

A **Voltage Dip** is characterized by a pair of data, the **Residual Voltage** (U_{res}) or **Depth** and **Duration**:

Setup Parameter	Definition
Residual Voltage	The lowest $U_{rms\ (1/2)}$ value measured on any channel during the **Dip.**
Depth	The difference between the **Reference Voltage** and the **Residual Voltage**. It's generally expressed in percentage of the **Reference Voltage**.
Duration	The time span from the start time to the end time of the **Voltage Dip**.

Table 4-13 Dip Evaluation Parameter

As per the **Figure 4-6 Characteristics of Voltage Dip Event**:

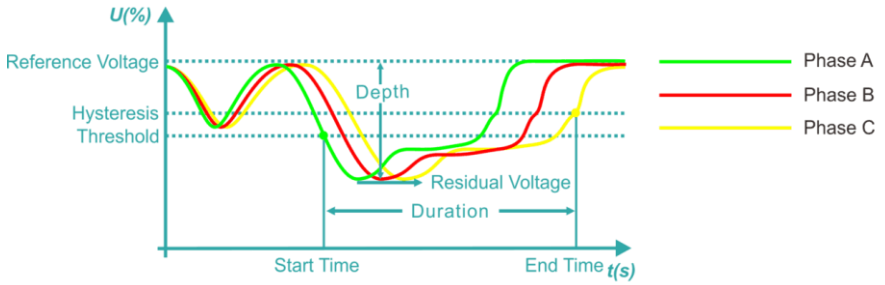


Figure 4-5 Characteristics of Voltage Dip Event

4.4.5.3 Voltage Swell Evaluation

A **Voltage Swell** is characterized by a pair of data, the **Maximum Swell Voltage Magnitude** and **Duration**:

Setup Parameter	Definition
Max. Voltage Swell Magnitude	The largest $U_{rms\ (1/2)}$ value measured on any channel during the **Swell**.
Duration	The time span from the start time to the end time of the **Voltage Swell**.

Table 4-14 Swell Evaluation Parameter

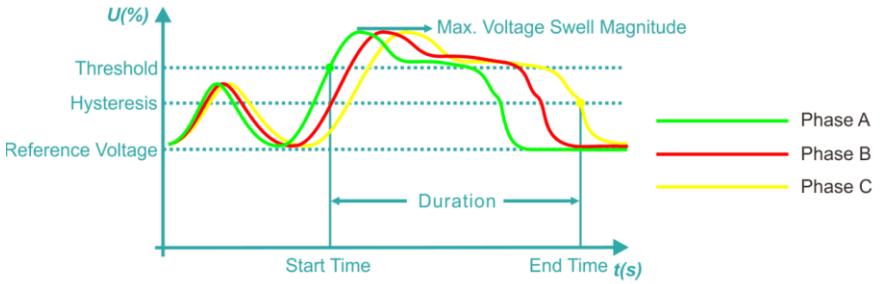


Figure 4-6 Characteristics of Voltage Swell Event

4.4.5.4 Sliding Reference Voltage (U_{sr})

If a Sliding Reference Voltage uses measured values filtered with a 1-minute time constant. This filter is given by

$$U_{sr(n)} = 0.9967 \times U_{sr(n-1)} + 0.0033 \times U_{(10/12)rms}$$

where

$U_{sr(n)}$ is the present value of the **Sliding Reference Voltage**

$U_{sr(n-1)}$ is the previous value of the **Sliding Reference Voltage**

$U_{(10/12)rms}$ is the most recent 10/12-cycle r.m.s. value

Generally, the Sliding Reference Voltage Usr is not used in LV systems.

4.4.5.5 WFR for Dips/Swells

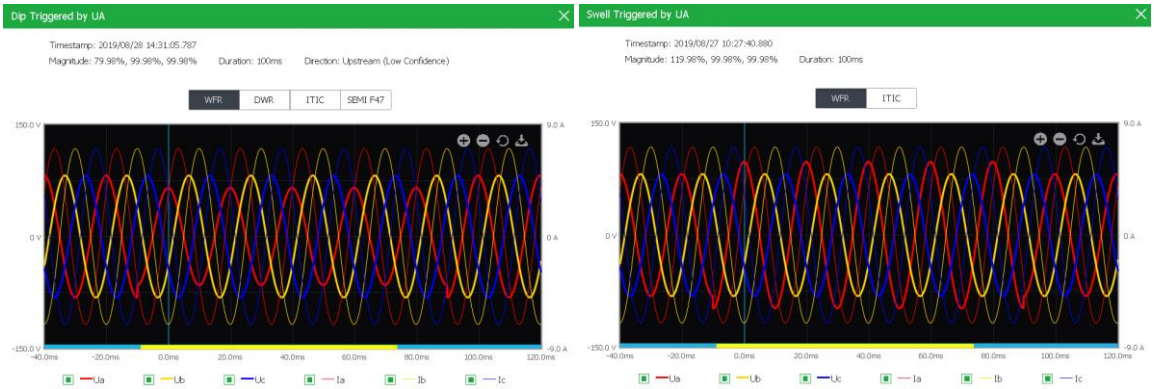


Figure 4-7 Dips and Swells Event WFR

4.4.6 Voltage Interruption

The iMeter 8 supports the detection of **Voltage Interruptions** using a method that is in accordance with **Section 5.5 of IEC 61000-4-30 Ed.3 Standard** for Class A performance.

4.4.6.1 Voltage Interruptions Evaluation

As per IEC 61000-4-30 Ed.2

☞ ***Voltage Interruption Detection***

On polyphase systems, a Voltage Interruption begins when the $U_{rms(1/2)}$ voltages of all channels fall below the Interruption Threshold and ends when the $U_{rms(1/2)}$ voltage on any one channel is equal to, or greater than, the Interruption Threshold plus the Hysteresis.

*The **Interruption Threshold** shall not be set below the uncertainty of **Residual Voltage** measurement plus the value of **Hysteresis**. Typically, the **Hysteresis** and **Interruption Threshold** are 2% of U_{din} and 5% of U_{din}, respectively.*

*The **Duration** of a voltage interruption is the time difference between the beginning and the end of the **Voltage Interruption**.*

Please refer to **Table 4-12** for the ranges and default values of the Interruption Detection parameters.

4.4.6.2 WFR for Voltage Interruption

Figure 4-8 Interruption Event

4.4.7 Voltage Transients

The iMeter 8 provides the capability for detecting Transient Voltages using the sliding-window method which compares the instantaneous value with the corresponding value on the previous cycle at a maximum resolution of 40μs (@50Hz) and in accordance with **Section 5.6** of **IEC 61000-4-30 Ed.3 Standard**.

The iMeter 8 provides the following setup parameters for Voltages Transient which can be programmed via the Front

Panel, Web Interface or communications:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	**Threshold**	5% to 500% of Udin, 35%*
Trigger	WFR*, DWR, RMSR, DO1 to DO7, Alarm		

Table 4-15 Transient Setup Parameters

The figure below shows a WFR of Voltage Transient.

Figure 4-9 Transient Event WFR

4.4.8 Supply Voltage and Current Unbalance

The iMeter 8 provides both the Zero-Sequence and Negative-Sequence Unbalance measurements for Voltage and Current, using Symmetrical Components and in accordance with **Section 5.7**, **Section 5.13.6 of IEC 61000-4-30 Ed.3 Standard** for Class A performance, respectively.

$$V2\ \text{Unbalance} = \frac{V2}{V1} x100\% \ ,\ I2\ \text{Unbalance} = \frac{I2}{I1} x100\% \quad \text{(Negative Sequence Unbalance)}$$

$$V0\ \text{Unbalance} = \frac{V0}{V1} x100\% \ ,\ I0\ \text{Unbalance} = \frac{I0}{I1} x100\% \quad \text{(Zero Sequence Unbalance)}$$

where

V0, V1, V2 are the Zero, Positive and Negative Sequence Components for Voltage, respectively.

and

I0, I1, I2 are the Zero, Positive and Negative Sequence Components for Current, respectively.

4.4.9 Harmonics and Interharmonics

The iMeter 8 provides the Harmonics and Interharmonics measurements in accordance with **Sections 5.8** and **5.9** of **IEC 61000-4-30 Ed.3 Standard** for Class A performance using a 10/12 cycle gapless centered harmonic sub-group measurement, denoted C_{ng} for Harmonics and $C_{n\text{-}200\text{-}ms}$ for Interhamonics, as per **IEC 61000-4-7:2002**.

There are three methods to calculate the Harmonic Distortion (HD):

a) Fundamental Method:

Voltage Kth Harmonic/Interharmonic Distortion= $\frac{U_k}{U_1} X100\%$ where U_1 is the Fundamental Voltage

Current Kth Harmonic/Interharmonic Distortion= $\frac{I_k}{I_1} X100\%$ where I_1 is the Fundamental Current

b) RMS Method:

Voltage Kth Harmonic /Interharmonic Distortion= $\frac{U_k}{\sqrt{\sum_{K=1}^{\infty} U_K^{\,2}}} X100\%$ where the denominator is the RMS

Current Kth Harmonic/Interharmonic Distortion= $\frac{I_k}{\sqrt{\sum_{K=1}^{\infty} I_K^{\,2}}} X100\%$ where the denominator is the RMS

c) Nominal Method:

Voltage K[th] Harmonic /Interharmonic Distortion= $\frac{U_k}{U_{nom}} X100\%$ where U_{nom} is the Nominal Voltage

Current K[th] Harmonic /Interharmonic Distortion= $\frac{I_k}{I_{nom}} X100\%$ where I_{nom} is the Nominal Current

The iMeter 8 also provides measurements for Voltage Harmonics, Current Harmonics, K-Factor, Crest Factor (for Current only), Power Harmonics and Energy Harmonics.

K-Factor is defined as the weighted sum of the harmonic load currents according to their effects on transformer heating, as derived from **ANSI/IEEE C57.110**. A **K-Factor** of 1.0 indicates a linear load (no harmonics). The higher the **K-Factor**, the greater the harmonic heating effects.

$$K-Factor = \frac{\sum_{h=1}^{h=h_{max}} (I_h h)^2}{\sum_{h=1}^{h=h_{max}} (I_h)^2}$$

I_h = h_{th} Harmonic Current in RMS
h_{max} = Highest harmonic order

Crest Factor is defined as the **Peak to Average Ratio (PAR)**, and its calculation is listed below:

$$C = \frac{|X|_{peak}}{X_{rms}}$$

$|X|_{peak}$ = Peak amplitude of the waveform
X_{rms} = RMS value

The iMeter 8 provides following Harmonic setup parameters which can be programmed via Front Panel, Web Interface or through communications.

Setup Parameter	Definition	Options, Default*
Harmonics Calculation	Specifies the Harmonics calculation methods.	0=% of Fundamental* 1=% of RMS, 2=% of Nominal
Statistical Harmonic Calculation	Specifies the mode of calculating harmonic.	0=Subgroup*, 1=Group
Order of Harmonic Calculation	Specifies the order of harmonic statistic.	2 to 63, 40*

Table 4-16 Setup parameters for Harmonic

4.4.9.1 Harmonics/Interharmonics Voltage and Current

The iMeter 8 provides the following Harmonic/Interharmonic Voltage and Current measurements:

Measurements	Ua	Ub	Uc	U4	Ia	Ib	Ic	I4	I5
THD, TOHD, TEHD (%)	▪	▪	▪	▪	▪	▪	▪	▪	▪
HD01 to HD63 (%)	▪	▪	▪	▪	▪	▪	▪	▪	▪
TH, H01 to H63 (RMS)	▪	▪	▪	▪	▪	▪	▪	▪	▪
TOH/TEH/DC RMS	▪	▪	▪	▪	▪	▪	▪	▪	▪
Current K-Factor	-	-	-	-	▪	▪	▪	▪	▪
Crest Factor	▪	▪	▪	▪	▪	▪	▪	▪	▪
IHD01 to IHD63 (%)	▪	▪	▪	▪	▪	▪	▪	▪	▪
IH01 to IH63 (RMS)	▪	▪	▪	▪	▪	▪	▪	▪	▪
TIHD, TOIHD, TEIHD (%)	▪	▪	▪	▪	▪	▪	▪	▪	▪
Phase Angle H01 to H63	▪	▪	▪	▪	▪	▪	▪	▪	▪

Table 4-17 Voltage and Current Harmonics and Interharmonics Measurements

4.4.9.2 Harmonics Power

The iMeter 8 provides Individual Harmonic to the 63[rd] order and the TH (Total Harmonic) P, Q, S and PF for 3-Ø and Total. The Total 3-Ø Harmonic Powers are only available via communications while the Individual Harmonic and TH (Total Harmonic) Powers for Phase A/B/C are available via both the Web Interface and communications.

4.4.9.3 Harmonic Energy

The iMeter 8 provides the Total Harmonic Energy Measurements for kWh, kvarh Import/Export/Net/Total and kVAh

as well as the Individual Harmonic Energy Measurements to the 63rd order for kWh, kvarh Import/Export. The Harmonic Energy can be retrieved via the Front Panel, Web Interface and Communications.

4.4.10 MSV (Mains Signalling Voltage)

The iMeter 8 provides the Mains Signalling Voltage measurements in accordance with **Section 5.10** of **IEC 61000-4-30 Ed.3 Standard** for Class A performance.

- ☞ *Mains Signalling Voltage is RMS voltage of mains signal.*
- ☞ *Mains signalling voltage measurement shall be based on*
  - *Either the corresponding 10/12-cycle r.m.s. value interharmonic bin*
  - *Or the r.m.s. of the four nearest 10/12-cycle r.m.s. value interharmonic bins*
- ☞ *The beginning of a signalling emission shall be detected when the measured value of the concerned interharmonic exceeds a threshold. The measured values are recorded during a period of time specified by the user, in order to give the level and the sequence of the signal voltage.*
- ☞ *The user must select a detection threshold above 0.3% U_{din} as well as the length of the recording period up to 120s.*

The iMeter 8 can simultaneously detect three different frequencies for Mains Signalling Voltage. The emission signalling will trigger an event in SOE, recording the Trigger Channel and Max. Volt. of the three-phase voltages.

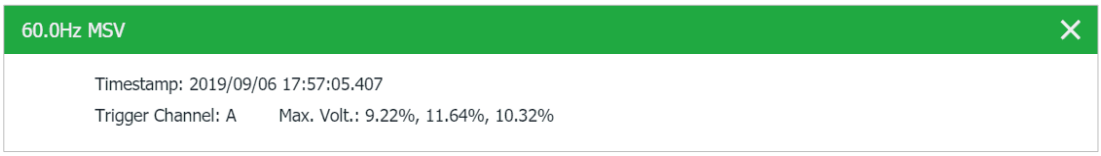


Figure 4-10 Event for 60.0Hz MSV in SOE

The iMeter 8 provides following MSV setup parameters which can be programmed through Front Panel, Web Interface or communications:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	**Frequency**	60 to 3k Hz, 1k(MSV1)*, 2k(MSV2)*, 3k(MSV3)*
Threshold	0.3% to 100% of Udin, 5%*	**Signalling Time**	1 to 120s, 60s*

Table 4-18 Mains Signal Voltage Setup Parameters

4.4.11 RVC (Rapid Voltage Change)

The iMeter 8 provides the ability to capture RVC in accordance with **Section 5.11** & **A.5** the **IEC 61000-4-30 Ed.2 Standard** for Class A performance.

As per 5.11 of IEC 61000-4-30 Ed.3:

- ☞ *A rapid voltage change is a quick transition in RMS voltage occurring between two steady-state conditions and during which the RMS voltage does not exceed the dip/swell thresholds*
- ☞ *An RMS voltage is in a steady-state condition if all the immediately preceding 100/120 $U_{rms\ (1/2)}$ values remain within an RVC threshold from the arithmetic mean of those 100/120 $U_{rms\ (1/2)}$ values.*
- ☞ *The RVC threshold and hysteresis are set by the user according to the application, as percentage of Udin and the hysteresis should be less than the threshold.*

4.4.11.1 Rapid Voltage Change Evaluation

A Rapid Voltage Change event is characterized by 4 parameters: **Start time**, **Duration**, ***ΔU_{max}*** and ***ΔU_{ss}***.

- Start Time — When the "Voltage-is-Steady-State" logic signal becomes False and initiates the RVC event.
- Duration — 100/120 half-cycle prior to the "Voltage-is-Steady-State" logic signal returns to True from False.
- ΔU_{max} — The absolute maximum difference between any of the $U_{rms\ (1/2)}$ values during the RVC event and the final arithmetic mean 100/120 $U_{rms\ (1/2)}$ value just prior to the RVC event.
- ΔU_{ss} — The absolute difference between the final arithmetic mean 100/120 $U_{rms\ (1/2)}$) value just prior to the RVC event and the first arithmetic mean 100/120 $U_{rms\ (1/2)}$ value after the RVC event.

The iMeter 8 provides the following RVC setup parameters which can be programmed via the Front Panel, Web Interface or communications:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	**Threshold**	0.2% to 10% of Udin, 5%*

Hysteresis	0.1 to 5 (%) of Udin, 2.5%*	Trigger	N/A*, WFR, DWR, RMSR, DO1 to DO7

Table 4-19 RVC Setup Parameters

4.4.11.2 RMSR for an RVC Event

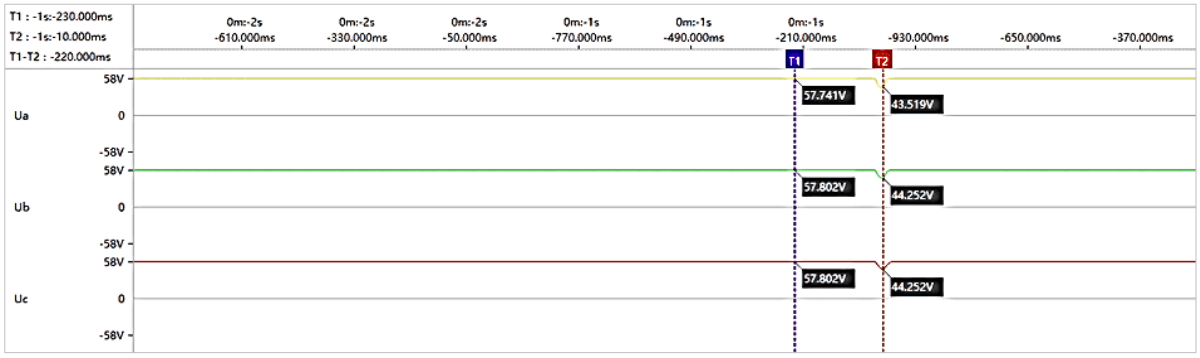


Figure 4-11 RMSR for an RVC Event

4.4.12 Underdeviation and Overdeviation

The iMeter 8 provides the ability to capture **Voltage Deviation** in accordance with the **IEC 61000-4-30 Ed.3 Standard**.

As per Section 5.12 or Annex D (Informative) of IEC 61000-4-30 Ed.3

☞ *The 10/12-cycle r.m.s value, $U_{rms\ (10/12),\ i}$, should be used to assess the underdeviation and overdeviation parameters in percent of Udin. The underdeviation $U_{rms\text{-}under}$ and overdeviation $U_{rms\text{-}over}$ parameters are determined by the following equations:*

Calculation of $U_{rms\text{-}under,\ i}$:

If $U_{rms\ (10/12),\ i} > U_{din}$ then $U_{rms\text{-}under,\ i} = U_{din}$

If $U_{rms\ (10/12),\ i} \leq U_{din}$ then $U_{rms\text{-}under,\ i} = U_{rms\ (10/12),\ i}$

Calculation of $U_{rms\text{-}over,\ i}$:

If $U_{rms\ (10/12),\ i} > U_{din}$ then $U_{rms\text{-}over,\ i} = U_{din}$

If $U_{rms\ (10/12),\ i} \leq U_{din}$ then $U_{rms\text{-}over,\ i} = U_{rms\ (10/12),\ i}$

And the Underdeviation/Overdeviation should be calculated based on the following:

Underdeviation:

$$U_{under} = \frac{U_{din} - \sqrt{\frac{\sum_{i=1}^{n} U_{rms-under,i}^2}{n}}}{U_{din}}$$

Overdeviation:

$$U_{over} = \frac{\sqrt{\frac{\sum_{i=1}^{n} u_{rms-over,i}^2}{n}} - U_{din}}{U_{din}}$$

Where

n = the number of 10/12 cycle RMS values for under or overdeviation

and

$U_{rms\text{-}under,\ i}$ /$U_{rms\text{-}over,\ i}$ is the i^{th} 10/12-cycle RMS value.

The iMeter 8 is capable of measuring Voltage with an accuracy of 0.1% and monitoring Voltage Deviation on line. In addition, the Voltage Deviation is supported by the Setpoint function. Please refer to **Chapter 3 User Interface** for the Deviation parameters on the Front Panel and Web Interface.

4.4.13 Flagging Concept

The iMeter 8 supports the Flagging Concept as per ***Section 4.7 of IEC 61000-4-30 Ed.2 Standard:***

☞ *During a dip, swell, or interruption, the measurement algorithm for other parameters (for example, frequency measurement) might produce an unreliable value. The flagging concept therefore avoids counting single event more than once in different parameters (for example, counting a single dip as both a dip and a frequency variation) and indicates that an aggregated value might be unreliable.*

☞ *Flagging is only triggered by dips, swells and interruptions*. The detection of dips and swells is dependent on the threshold selected by the user and this selection will influence which data are "flagged".*

☞ *The flagging concept is applicable for Class A measurement performance during measurement of power frequency,*

voltage magnitude, flicker, supply voltage unbalance, voltage harmonics, voltage interharmonics, mains signalling and measurement of underdeviation and overdeviation parameters.

☞ *If during a given time interval any value is flagged, the aggregate value indicating that value shall also be flagged. The flagged value shall be stored and also included in the aggregation process, for example, if during a given time interval any value is flagged the aggregated value that includes this value shall also be flagged and stored.*

Besides, flagging will be triggered by the detection of I > 2In on iMeter 8.

The **Flagging Status** register (0080) indicates if a certain group of data has been ***flagged*** because of Dip / Swell / Interruption or Over Current Limit detected, with a bit value of 1 meaning ***flagged*** and 0 meaning ***not flagged***. The following table illustrates the details of the **Flagging Status** register for real-time data.

Bit	Description		Bit	Description	
B0	Basic Measurements	Dip	**B8**	Pst.	Dip
B1		Swell	**B9**		Swell
B2		Interruption	**B10**		Interruption
B3		Over Current Limit	**B11**		Reserved
B4	Freq.	Dip	**B12**	Plt.	Dip
B5		Swell	**B13**		Swell
B6		Interruption	**B14**		Interruption
B7		Reserved	**B15**		Reserved

Table 4-20 Flagging Status Register (0080)

Basic Measurements include Voltage, Current, Frequency, Unbalance, Harmonics and Interharmonics measurements.

The **Flagging Setup** register (40825) defines if the flagging data should be kept or removed in a particular type of statistical log as illustrated in the following table, with a bit value of o meaning **Kept** and 1 meaning that **Removed**.

Bit 15~Bit 4	Bit 3	Bit 2	Bit1	Bit 0
Reserved	EN50160	Min. Log	Max. Log	SDR Log

Table 4-21 Flagging Setup Register (40825)

For any Statistical Log (such as SDR Log, Max. Log, Min. Log and/or EN50160 Log), its log entry will be discarded and will not be included in the statistical evaluation if any data within the log entry has been ***Flagged*** while the bit representing the particular Log type in the **Flagging Setup** register is enabled (set to 1).

4.4.14 Inrush Current

Inrush current refers to the maximum instantaneous current drawn by a power supply or electrical device at turn-on, often several times their normal full-load current, when first energized such as the turning on of an AC electric motor or the energization of a transformer or a capacitor bank. The higher than normal inrush current typically only lasts for a few cycles before returning to their steady-state condition.

As per **Section A6.4** of **IEC61000-4-30 Ed.2 Standard**, the iMeter 8 supports the detection of Inrush Current as a supplement to voltage measurements, especially when trying to determine the causes of events such as voltage dip.

☞ *The inrush current begins when the* $I_{half\_cyc\_rms}$ *current rises above the* ***Inrush Threshold*** *and ends when the* $I_{half\_cycle\text{-}rms}$ *current is equal to or below the* ***Inrush Threshold*** *minus a user-selected* ***Inrush Hysteresis*** *value.*

☞ *The inrush current can be further characterized by*

- *the time duration between the beginning and the end of the inrush current*
- *the maximum value of the measurement inrush current* $I_{half\_cyc\_rms}$
- *the square root of the mean of the squared* $I_{half\ cyc\ rms}$ *values measured during the inrush duration*

The $I_{half\_cyc\_rms}$ is calculated by the following equation: $$I_{half\_cyc\_rms} = \sqrt{\frac{1}{T/2}\int_0^{T/2} i^2(t)dt}$$

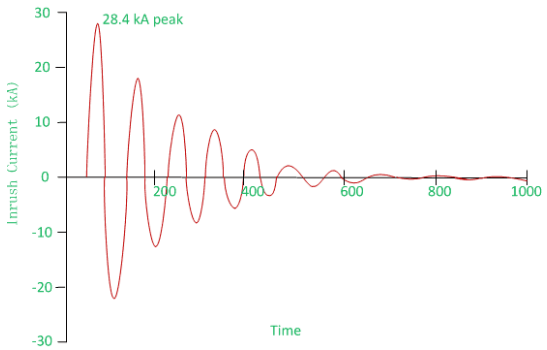


Figure 4-12 Inrush Current

The following table illustrates the ranges and default values for the Inrush Current parameters:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	**Threshold**	100% to 500% of In, 120%*
Hysteresis	0.1% to 100% of In, 1%*	**Trigger**	WFR*, DWR, RMSR, DO1 to DO7

Table 4-22 Inrush Current Parameters

4.4.15 EN50160 Compliance Report

The EN50160 Standard defines the ***Voltage Characteristics of Electricity Supplied by Public Distribution Systems***. It provides the limits within which any customer can expect voltage characteristics to remain. For a complete definition of the non-conformity level for each of the following EN50160 parameters, please consult the EN50160 Standard document. The iMeter 8 can measure, summarize data and statistical relevant data in accordance with the EN50160 standard. Further, the device will create a report per week for the following PQ parameters and store the report for one year.

- Power Frequency, including Maximum and Minimum
- Supply Voltage Variations, including Maximum and Minimum
- Flickers, including Max./Min. and CP95
- Voltage Unbalance, including Max./Min. and CP95
- Harmonic and Interharmonic Voltage, including Max./Min., average and CP95
- Mains Signalling Voltage, including Max./Min. and CP95
- Rapid Voltage Changes
- Dips and Swells with statistical parameters classified according to characteristic Voltage and duration
- Interruptions with statistical parameters classified according to the duration
- Transient

The following table illustrates the default limits for the EN50160 parameters. The users can modify the default values via the Web Server or Communications.

EN50160 Parameter	Setting / Voltage Level	Low	Medium	High
Power Frequency	Wide Tolerance (%)	100	100	100
	Wide Tolerance Limit (%)	94 ~ 104	94 ~ 104	94 ~ 104
	Narrow Tolerance (%)	99.5	99.5	99.5
	Narrow Tolerance Limit (%)	99 ~101	99 ~101	99 ~101
Supply Voltage Variations	Wide Tolerance (%)	100	100	100
	Wide Tolerance Limit (%)	85 ~ 110	85 ~ 115	85 ~ 115
	Narrow Tolerance (%)	95	99	99
	Narrow Tolerance Limit (%)	90 ~ 110	90 ~ 110	90 ~ 110
Flicker Severity	Tolerance (%)	95	95	95
	Limit	1	1	1
Supply Voltage Unbalance	Tolerance (%)	95	95	95
	Limit (%)	2	2	2
Voltage Harmonic Limits	Tolerance (%)	95	95	95
	Total (%)	8	8	8
	H02 (%)	2	2	1.9
	H03 (%)	5	5	3
	H04 (%)	1	1	1
	H05 (%)	6	6	5
	H07 (%)	5	5	4

	H09 (%)	1.5	1.5	1.3
	H11 (%)	3.5	3.5	3
	H13 (%)	3	3	2.5
	H17 (%)	2	2	2
	H19/H23/H25 (%)	1.5	1.5	1.5
	H06/H08/H10/H12/H14/H15/ H16/H18/H20/H21/H22/H24 (%)	0.5	0.5	0.5

Table 4-23 Default Values for EN50160 Settings

The programming of the EN50160 reporting is supported via the Web interface and communications. The EN50160 Report can be accessed through the Front Panel, Web Interface or via communications. The iMeter 8 can store up to 52 weekly reports. If there are more than 52 reports, the newest report will replace the oldest on a FIFO basis. Please refer to **Section 3.1.3.2.7** and **Section 3.2.4.3.7** for an EN50160 sample report from the Front Panel and the Web Interface, respectively.

4.4.16 ITIC/SEMI F47 Curve

The iMeter 8's Front Panel and Web Interface can display the ITIC plot for Dip, Swell and Interruption events but only SEMI F47 plot for Dip and Interruption events as illustrated in **Section 3.1.3.4.3** or **Section 3.2.4.4.1.**

4.4.17 Disturbance Direction Indicator

The iMeter 8 provides the Disturbance Direction Indicator as an educated guess with confidence level for the disturbance direction of a Dip event, whether Upstream or Downstream, and records the information in the SOE Log.

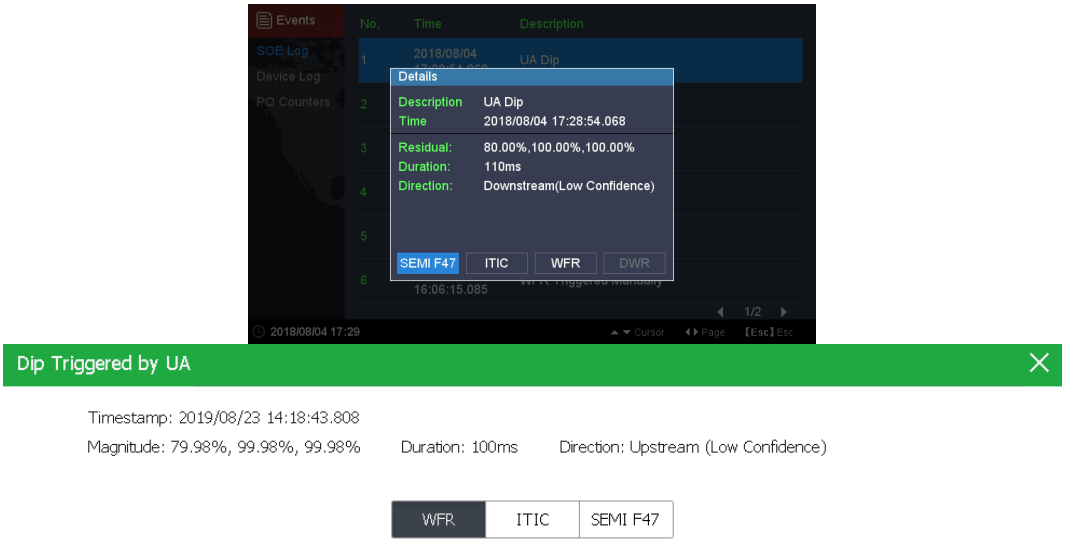


Figure 4-13 Disturbance Direction Location via Front Panel and Web Interface

4.4.18 Conducted Emissions In the 2kHz to 150kHz Range

The iMeter 8 is capable of providing an overview of conducted voltage emissions in the supraharmoics 2-150kHz range in a power quality context, as per **Annex C (Informative)** of **IEC 61000-4-30 Ed.3 Standard.**

- ☞ *These emissions are presumed to be quasi-steady-state levels, although they may have amplitude modulation.*
- ☞ *Useful Information about measuremtn in the 2 kHz to 150 kHz range can be found in IEC 61000-4-7: 2002, Annex B (2 kHz to 9 kHz), and CISPR 16 (9 kHz to 150 kHz).*

The Frequency band 2 – 9 kHz and 9 – 150 kHz are divided into 35 and 71 segments with 200 Hz and 2000 Hz resolution, respectively. The iMeter 8 provides the 3Φ average U_{rms} for each segment every 3s. All the real time measurements are retrievable via the Front Panel, Web Interface or Communications.

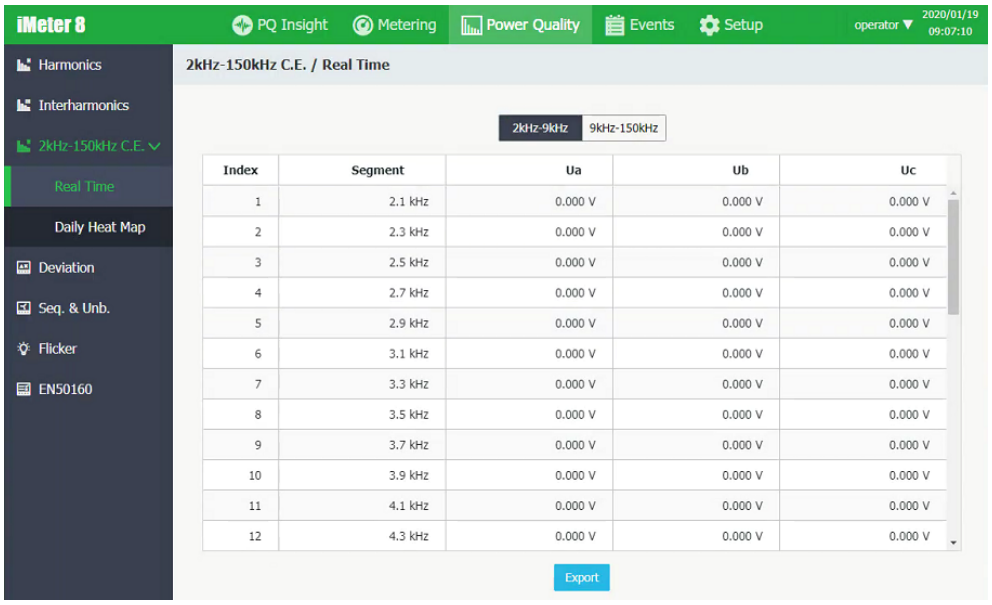
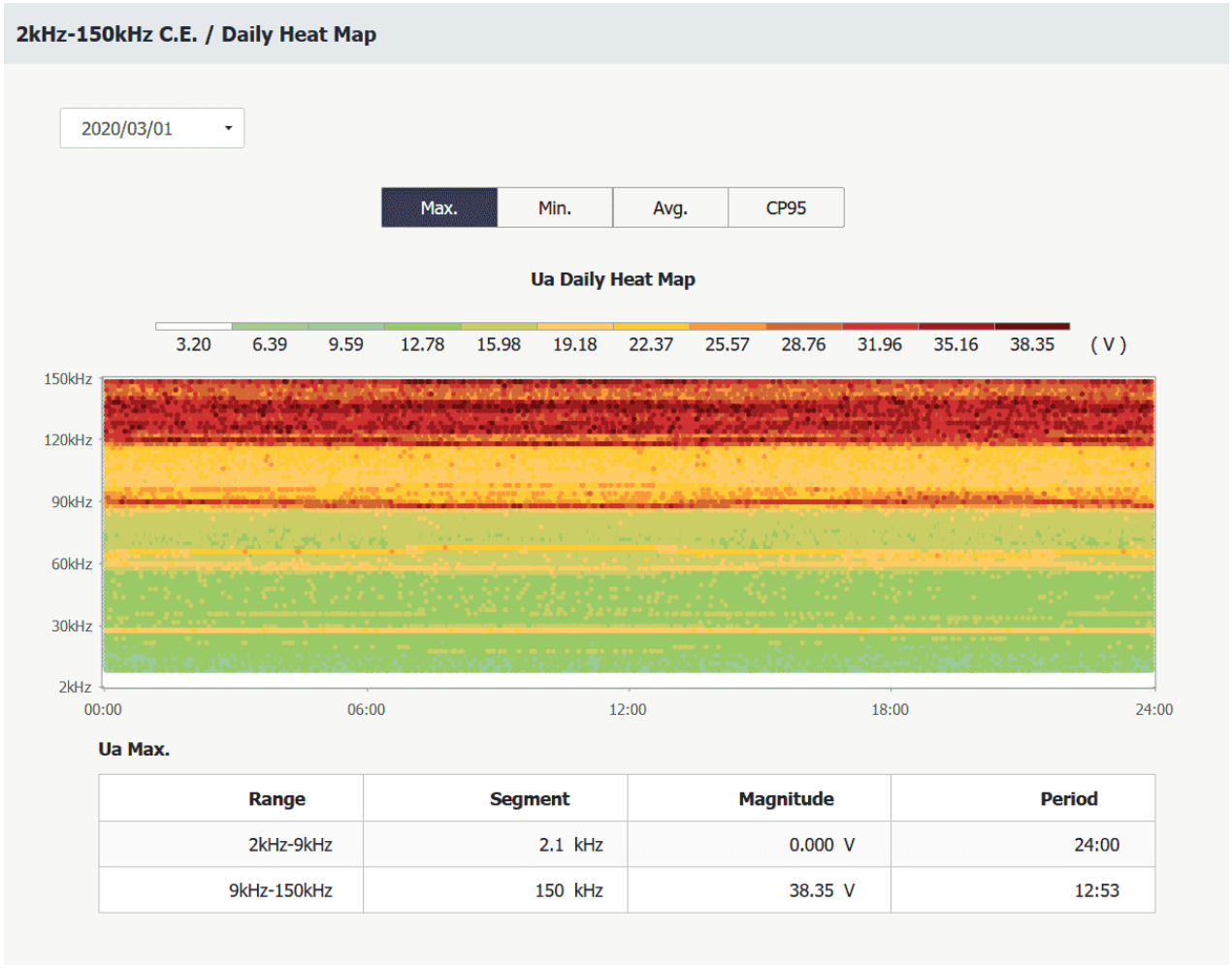
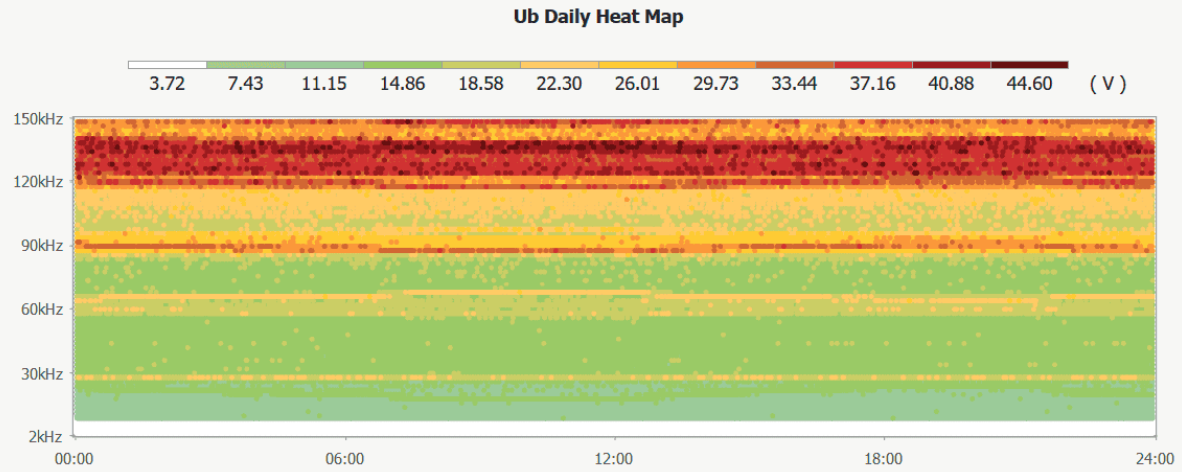


Figure 4-13 2-9kHz Real Time C.E. on Web Interface

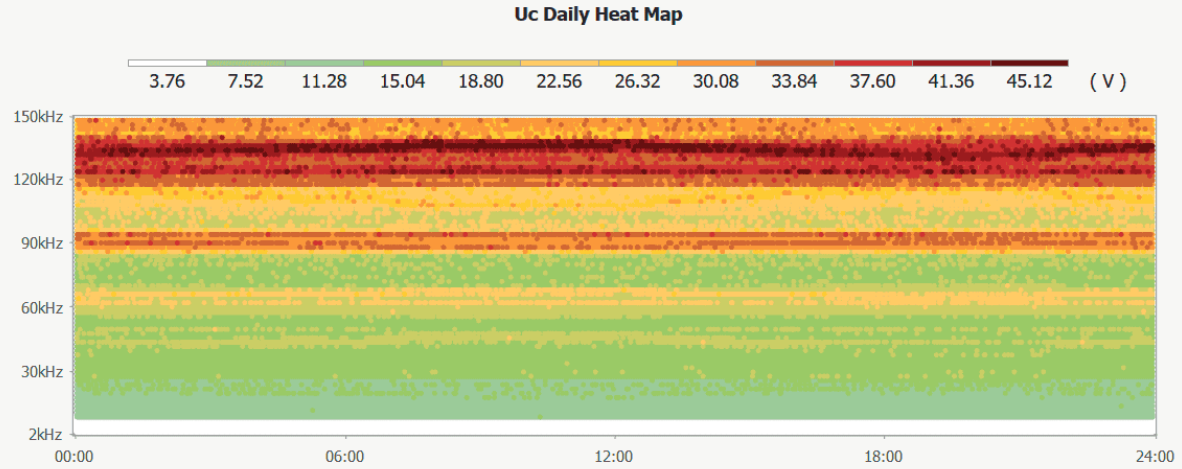
The iMeter 8 also records the Frequency, Timestamp and Daily Amplitudes for Max./Min./Average/Cp95 values of 3Φ U_{rms} in Frequency band 2 – 9 kHz and 9 – 150 kHz, with heat map as shown in Figure 4-15. The iMeter D7 can store up to 30 daily records based on a First-in-First-out principle. All the records can be downloaded from the Web Server or FTP Server. The historical daily records can be reset via Web Server or Communications.





Ub Max.

Range	Segment	Magnitude	Period
2kHz-9kHz	2.1 kHz	0.000 V	24:00
9kHz-150kHz	136 kHz	44.60 V	23:41



Uc Max.

Range	Segment	Magnitude	Period
2kHz-9kHz	2.1 kHz	0.000 V	24:00
9kHz-150kHz	126 kHz	45.12 V	17:32

Export

Figure 4-13 Daily Heat Map

4.5 Data Logging

4.5.1 IER/AER

The iMeter 8 provides a fixed capacity of 65535 entries for both IER (Interval Energy Recorder) and AER (Accumulative Energy Recorder) Logs for the parameter specified in table below. The IER records the amount of energy consumed during the last completed interval while the AER records a snapshot of the accumulated energy at the time of recording. The IER/AER Logs can only be retrieved through communications.

kWh		kvarh		kVAh
Imp. (Total RMS)	Imp. Fundamental	Imp. (Total RMS)	Imp. Fundamental	kVAh Total
Exp. (Total RMS)	Exp. Fundamental	Exp. (Total RMS)	Exp. Fundamental	
Net (Total RMS)	Imp. Harmonics	Net (Total RMS)	Imp. Harmonics	
Total (Total RMS)	Exp. Harmonics	Total (Total RMS)	Exp. Harmonics	

Table 4-24 IER/AER Parameters

The IER/AER setup parameters, which include **Recording Mode, Recording Interval** and **Start Time**, can be programmed from the Front Panel, Web Interface or communications. Please note that changing any of the setup parameters would reset the IER/AER Logs. The following table illustrate the range of the Energy Log parameter.

Parameter	Range, Default*	Parameter	Range, Default*
Record Mode	Disable, Stop When Full, FIFO*	Interval	1 to 65535 min, 15 min*
Start Date	2000-01-01*	Start Time	00:00:00*

Table 4-25 IER/AER Setup Parameters

4.5.2 WFR (Waveform Recorder)

The iMeter 8 supports the waveform recording of 4-phase Voltages and Currents at a maximum resolution of 1024 samples/cycle. WFR on the iMeter 8 can be triggered by PQ Disturbance (Dips/Swells/Interruptions), Transients, Rapid Voltage Changes, Inrush Current, Setpoints, DI Status Changes or even manually triggered through the Front Panel, Web Interface and communications. The manual trigger command has a higher priority. When a WFR is already in progress, other WFR commands will be ignored until the present recording has completed. The WFR has a capacity of 128 entries organized in a FIFO basis, with the newest WFR log replacing the oldest one. The WFR log is stored in the device's non-volatile memory in COMTRADE file format and will not suffer any loss in the event of power failure.

The WFR log can be viewed directly on the Front Panel and Web Interface as well as downloaded from the on-board FTP/Web Server or via communications. The programming of the WFR is supported via the Front Panel (Please refer to **Section 3.1.3.5.6**), Web Interface (Please refer to **Section 3.2.4.5.4.1**) or communications.

The following table illustrates the ranges and default values of the WFR parameters.

Parameter	Range, Default*	Parameter	Range, Default*
Pre-Fault Cycles	2~6 Cycles, 5*	Max. No. of Cycles	No. of Cycles @ Samples/Cycle • (20-3000) @128 • (20-750) @ 512 • (20-1500) @ 256 • (20-375) @ 1024
Post-Fault Cycles			
Adaptive WFR	0=Disabled*, 1=Enabled		

Table 4-26 WFR Setup Parameters

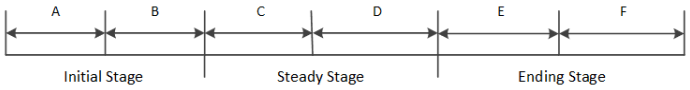
The iMeter 8 also provides the following settings for Schedule WFR to trigger the WFR on the hour as pre-configured. The programming of the Scheduled WFR is supported via the Web Interface or Communications.

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Enable	Yes, No*	Interval	1 to 960 h, 24 h*
Recording Depth	0 to 1000, 1*	Start Date	2000-01-01*
		Start Time	00:00:00*

Table 4-27 Scheduled WFR Setup Parameters

4.5.3 Disturbance Waveform Recorder (DWR)

The iMeter 8 supports the Disturbance Waveform Recording of 4-phase Voltage and 5-phase Current at a maximum resolution of 512 samples/cycle. The DWR can be triggered by Dips, Swells, Interruptions, Transients, RVC, Inrush Current, Setpoint, DI Status Changes or even manually triggered via the Web Interface and communications. The DWR log is stored in the device's non-volatile memory in COMTRADE file format and will not suffer any loss in the event of power failure. The DWR has a capacity of 128 entries organized in a FIFO basis, with the newest DWR log replacing the oldest one. Each DWR log consists of the following stages.



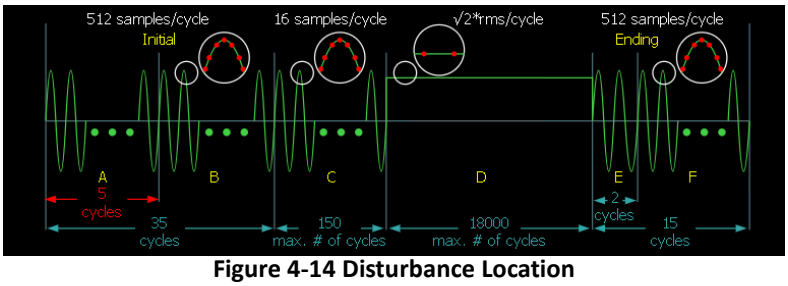


Figure 4-14 Disturbance Location

Stage	Description	Recording Length	Recording Frequency
A	Pre-Fault cycles for the Initial Stage	5 to 10 cycles	512 Samples/Cycle
B	Waveform Recording of the Initial Stage	25 to 35 cycles	512 Samples/Cycle
C	Waveform Recording during the Steady Stage	0 to 150 cycles	16 Samples/Cycle
D	RMS Recording during the Steady Stage	0 to 18,000 cycles	1 Sample/Cycle
E	Pre-Fault cycles of the Ending Stage	2 cycles	512 Samples/Cycle
F	Waveform Recording of the Ending Stage	13 cycles	512 Samples/Cycle

Table 4-28 Time frames of waveform

Notes:
1) The data for Stages A, B, D and E are always recorded.
2) For stages C and D:
If **C** < 150 cycles, the **D** would be 0.
If **C** = 150 cycles, the **D** stage data will be recorded.
If **D** = 18,000 cycles, the recording of **D** stage data end even if disturbance does not finish.

The following figure shows an example of Disturbance Waveform Recording.

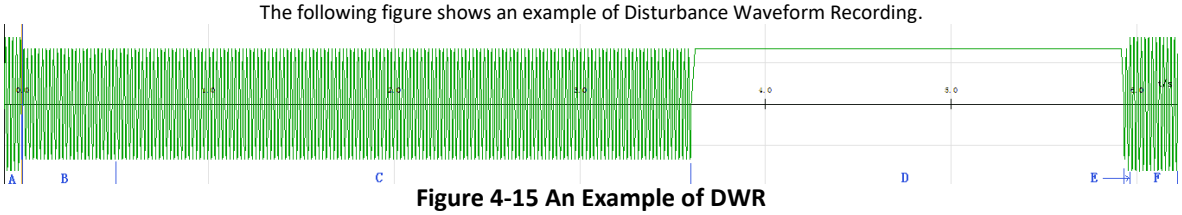


Figure 4-15 An Example of DWR

4.5.4 RMS Recorder (RMSR)

The iMeter 8 provides high-speed RMS Recording which can be triggered by Dips, Swells, Interruption, Transients, RVC, Inrush Current, Setpoints, DI Status Changes, or manually via communications. The RMSR Logs are stored in the device' non-volatile memory in COMTRADE file format and will not suffer any loss in the event of power failure. The RMSR has a capacity of 128 entries organized in a FIFO basis, with the newest RMSR log replacing the oldest one.

All RMSR can be accessible via the on-board FTP Server or communications by our PecStar® iEMS. The programming of the RMSR is supported over the Front Panel (See **Section 3.1.3.5.6**), Web Server (See **Section 3.2.4.5.1)** or via communications. The **Recording Depth** for RMSR is fixed at 7200 samples per parameter. The following table illustrates the ranges and default values for the RMSR parameters.

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Pre-fault Samples	100 to 500, 100*	Sample Interval	0.5 to 60, 0*

Table 4-29 RMSR Setup Parameters

Error! Reference source not found. **4-31** below illustrates the available source parameters for RMSR recording.

Key	Parameter	Key	Parameter	Key	Parameter	Key	Parameter
0	Null	7	Ia	14	kWa	21	kVAb
1	Ua	8	Ib	15	kWb	22	kVAc
2	Ub	9	Ic	16	kWc	23	PFa
3	Uc	10	U4	17	kvara	24	PFb
4	Uab	11	I4	18	kvarb	25	PFc
5	Ubc	12	Frequency	19	kvarc		
6	Uca	13	Freq. Deviation	20	kVAa		

Table 4-30 Available Parameters for RMSR

4.5.5 Pst Log

The iMeter 8's Pst Log can store up to 52560 entries (i.e. 1-year: 365x24x6) about Voltage Pst in its non-volatile memory. Each event record includes the timestamp in 1ms resolution, flagging status and 3-phase Voltage Pst measurements.

The Pst Log can be retrieved via communications for display. If there are more than 52560 events, the newest event will replace the oldest event on a FIFO basis. The Pst Log can be reset from Web Server or via communications.

4.5.6 Plt Log

The iMeter 8's Plt Log can store up to 4380 entries (i.e. 1-year: 365x12) about Voltage Pst in its non-volatile memory. Each event record includes the timestamp in 1ms resolution, flagging status and 3-phase Voltage Plt measurements.

The Plt Log can be retrieved via communications for display. If there are more than 4380 events, the newest event will replace the oldest event on a FIFO basis. The Plt Log can be reset from the Web Server via communications.

4.5.7 DR (Data Recorder)

The iMeter 8 provides 8 DRs with recording interval from 1s to 40 days. Each recorder capable of recording 16 parameters. **DR Log** can be used to Trend or power supply unbalance analysis. The recorded data is stored in non-volatile memory and will not suffer any loss in the event of a power failure.

The programming of the Data Recorder is only supported over communications. Each Data Recorder provides the following setup parameters:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Triggered Mode	Disabled, Triggered by Timer* Triggered by Setpoint	Recording Mode	Stop-When-Full First-In-First-Out*
Recording Interval	1 second to 40 days, 300s*	Offset Time	0* (no offset) to 43200
Number of Parameters	0 to 32*	Parameter 1 to 16	See **Appendix C**

Table 4-31 Setup Parameters for DR

The DR Log is only operational when the values of **Triggered Mode**, **Recording Mode**, **Recording Interval**, and **Number of Parameters** are all non-zero.

Data Recorder #X can be triggered by clearing the Data Recorder #X when it is full in Stop-When-Full mode.

The **Recording Offset** parameter can be used to delay the recording by a fixed time from the **Recording Interval**. For example, if the **Recording Interval** parameter is set to 3600 (hourly) and the **Recording Offset** parameter is set to 300 (5 minutes), the recording will take place at 5 minutes after the hour every hour, i.e. 00:05, 01:05, 02:05…etc. The programmed value of the **Recording Offset** parameter should be less than that of the **Recording Interval** parameter.

4.5.8 SDR (Statistical Data Recorder)

The iMeter 8 provides 16 groups of SDRs of 64 parameters each to record Max., Min., Average, and CP95 measurements with a recording depth of 43200 and configurable recording interval from 0 (disabled) to 60 mins. The SDR Logs are stored in non-volatile memory and will not suffer any loss in the event of a power failure.

The programming of the **SDR** is supported via Web interface or through communications. Each **SDR** provides the following setup parameters:

Parameter	Options/Value, Default*	Parameter	Options/Value, Default*
Recording Interval	0 to 60 minutes, 15 min*	Number of Parameters	0 (invalid) to 64*
Recording Mode	Stop-When-Full, First-In-First-Out	Parameters 1 to 64	See **Appendix B**

Table 4-32 Setup Parameters for SDR

The **SDR** is only operational when the values of **Recording Interval** and **Number of Parameters** are all non-zero.

4.5.9 Max./Min. Log

The iMeter 8 provides 4 **Max./Min. Logs** of 20 parameters each for **This Month (Since Last Reset)** and **Last Month (Before Last Reset).** Each log includes the relevant max./min. values and timestamp. The recorded data is stored in non-volatile memory and will not suffer any loss in the event of a power failure.

The programming of the **Max./Min.** recorders is supported via Web Interface or through communications. Each **Max./Min. Log** recorder provides the following setup parameters:

Setup Parameters	Value
Self-Read time	The same **Self-Read Time** for the **Max. Demand Log** is used to specify the time and day of the month for the **Max./Min.** Self-Read operation. Please refer to **Section 4.2.5** for a complete description of the **Self-Read Time** and its operation.
Number of Parameters	0 to 20

Parameter 1 to 20	See **Appendix A**

Table 4-33 Max./Min. Log Setup Parameters

The Front Panel supports the display for This Max./Min. logs Since the Last Reset.

Both This Max/Min logs and the Last Max/Min logs can be accessed via Web Server or through communications.

The Max./Min. Log can be reset manually from the Front Panel, Web Server or via communication.

4.5.10 Max. Demand Recorder (Peak Demand)

The iMeter 8 records the **Max. Demand** for **This Month (Since Last Reset)** and **Last Month (Before Last Reset)** with timestamp for the parameters listed in **Table 4-35.** The Max. Demand can be accessed from the Front Panel, Web Interface as well as communications. Please refer to **Section 4.2.5** for a complete description of the **Self-Read Time** and its operation.

The Max. Demand of This Month can be reset manually through Web Interface or via communications. The iMeter 8 provides the following Max. Demand parameters:

This Month (Since Last Reset) and Last Month (Before Last Reset)		
kW Imp. Total	Ia	Ia FUND.
kW Exp. Total	Ib	Ib FUND.
kvar Imp. Total	Ic	IC FUND.
kvar Exp. Total		I4 FUND.
kVA Total		I5 FUND.

Table 4-34 Max. Demand Parameters

4.5.11 SOE Log & Device Log

The SOE and Device Logs can be retrieved via the Front Panel (See **Section 3.1.3.4.1** and **Section 3.1.3.4.2**), Web Interface (See **Section 3.2.4.4.1** and **Section 3.2.4.4.2**) or communications.

The SOE Log and Device Log can be reset via the Front Panel (See **Section 3.1.3.5.10**) and Web Interface (See **Section 3.2.4.5.8.2**) with the **Clear All Events** option.

The following sections address the basic properties for the SOE Log and Device Log.

4.5.11.1 SOE Log

The SOE Log can store up to 1024 events such as Setpoint, Digital Input status changes, Relay actions, Dips, Swells, Interruptions, Transient, Inrush Current and Rapid Voltage Changes based on a FIFO principle. Each event record includes the event classification, its relevant parameter values and a timestamp in 1ms resolution.

4.5.11.2 Device Log

The Device Log can store up to 1024 events such as Power-on, Power-off, Setup changes, Clear actions and TOU Schedule Switch in its non-volatile memory on a FIFO basis. Each event record includes the event classification, its relevant parameter values and a timestamp in 1ms resolution.

4.5.12 PQ Counters

The iMeter 8 supports the counting of the different PQ Events as illustrated in **Table 4-36** below. When a particular event is detected, the corresponding counter will increment. The maximum value of the PQ Counter is 2^{32} (4,294,967,296), and it will automatically roll over to 0 when the maximum value has been reached. The counter can be reset from the Front Panel (See **Section 3.1.3.5.10**), Web Interface (See **Section 3.2.4.5.8.2**) or via communications.

No	Event	No	Event	No	Event
1	Dips	5	Rapid Voltage Changes	9	Mains Signal Voltage#3
2	Swells	6	Inrush Current	10	Total
3	Interruption	7	Mains Signal Voltage#1		
4	Transient	8	Mains Signal Voltage#2		

Table 4-35 PQ Event Counter

4.5.13 PQDIF Storage

The iMeter 8 comes equipped with 8G of memory and can store standard data with PQDIF format, WFR data with COMTRADE format in its non-volatile memory. All record can be stored for about half a year without communication

and will not suffer any loss in the event of a power failure. The iMeter 8 can store following standard data with PQDIF format.

Parameter	Description	Cycles
Freq.	Freq.	3s
Voltage RMS	Ua, Ub, Uc	150/180 cycles
	Uab, Ubc, Uca	
Current RMS	Ia, Ib, Ic	
Voltage Deviation	Ua/Ub/Uc Deviation	
	Uab/Ubc/Uca Deviation	
Fundamental RMS	Ua/Ub/Uc H01 RMS	
	Ia/Ib/Ic H01 RMS	
Unbalance	U2/U0 Unbalance	
	I2/I0 Unbalance	
Sequence Components	U1, U2, U0	
	I1, I2, I0	
Harmonic Voltage	Ua/Ub/Uc THD	
	Ua/Ub/Uc TOHD	
	Ua/Ub/Uc TEHD	
	Ua/Ub/Uc HD01	
	...	
	Ua/Ub/Uc HD63	
Harmonic Current	Ia/Ib/Ic THD	
	Ia/Ib/Ic TOHD	
	Ia/Ib/Ic TEHD	
	Ia/Ib/Ic H01 RMS	
	...	
	Ia/Ib/Ic H63 RMS	
Inter-Harmonic Voltage	Ua/Ub/Uc THD	
	Ua/Ub/Uc TOHD	
	Ua/Ub/Uc TEHD	
	Ua/Ub/Uc HD01	
	...	
	Ua/Ub/Uc HD63	
Inter-Harmonic Current	Ia/Ib/Ic THD	
	Ia/Ib/Ic TOHD	
	Ia/Ib/Ic TEHD	
	Ia/Ib/Ic H01 RMS	
	...	
	Ia/Ib/Ic H63 RMS	
Flicker	Pst	10 mines
	Plt	2 hours
Fundamental Power	kWa/kWb/kWc, kvara/kvarb/kvarc, kVAa/kVAb/kVAc, PFa/PFb/PFc, kW Total, kvar Total, kVA Total	150/180 cycles
Total Power	kWa/kWb/kWc, kvara/kvarb/kvarc, kVAa/kVAb/kVAc, PFa/PFb/PFc, kW Total, kvar Total, kVA Total	150/180 cycles
Total Harmonic Power	kWa/kWb/kWc TH, kvara/kvarb/kvarc TH kVAa/kVAb/kVAc TH, kW/kvar/kVA TH	150/180 cycles
Energy	kWh Imp., kWh Exp., kvarh Imp., kvarh Exp., kWh Imp. H01, kWh Exp. H01, kvarh Imp. H01, kvarh Exp. H01	150/180 cycles
Event	SOE Event, DWR, WFR	-

Table 4-36 PQDIF Data

The PQDIF and COMTRADE file are stored in the FTP server. The users can retrieve the files from the FTP server and open it with other tools. The PQDIF provides following setup parameters which can be programmed through Web Server or via communications.

Setup Parameters	Value/Option	Default
Freq. Statistics Interval	1 to 60 mins	10
Symmetrical Components and Unb. Record Interval		
U & I RMS and Deviation Record Interval		
Harmonic & Inter-Harmonic Record Interval		
PQDIF Save Interval	0 to 24 Hour, 0 Indicates PQDIF is disabled	0

Table 4-37 PQDIF Setup Parameters

4.6 Time of Use (TOU)

TOU is used for electricity pricing that varies depending on the time of day, day of week, and season. The TOU system allows the user to configure an electricity price schedule with accumulated energy consumption into different TOU tariffs based on the time of consumption.

The TOU feature on the iMeter 8 supports two TOU schedules, which can be switched at a pre-defined time. Each TOU schedule supports:

- Up to 12 seasons
- 90 Holidays or Alternate Days
- 20 Daily Profiles, each with 12 Periods in 15-minute interval
- 8 Tariffs

Instead of using the TOU schedule to switch between Tariffs, the iMeter 8 supports Tariff switching based on the status of DI1 to DI3.

The 3 Digital Inputs (DI1, DI2 and DI3) represent 3 binary digits where Tariff 1=000, Tariff 2=001, Tariff 3= 010, …Tariff 7=110 and Tariff 8=111 where DI1 represents the least significant digit and DI3 represents the most significant digit. As soon as DI1, DI2 and/or DI3 are configured as **Tariff Switches**, the current **TOU Tariff** will be determined by the status of the DIs, and the TOU Schedule will be ignored. The **DI1 Function** setup register must first be programmed as a **Tariff Switch** before configuring DI2 and DI3 with the same function. In other words, if DI1 is configured as a **Digital Input** or **Pulse Counter**, and DI2 is configured as a **Tariff Switch**, the TOU will continue to function based on the TOU Schedule. The number of Tariffs supported depends on how many DIs are programmed as a Tariff Switch as indicated in the following table.

Tariff	DI Function		
	DI1 = Tariff Switch	**DI2 & DI1 = Tariff Switch**	**DI3, DI2 & DI1 = Tariff Switch**
T1	DI1 (0=T1)	DI2 + DI1 (00=T1)	DI3 + DI2 + DI1 (000=T1)
T2	DI1 (1=T2)	DI2 + DI1 (01=T2)	DI3 + DI2 + DI1 (001=T2)
T3	Not Available	DI2 + DI1 (10=T3)	DI3 + DI2 + DI1 (010=T3)
T4	Not Available	DI2 + DI1 (11=T4)	DI3 + DI2 + DI1 (011=T4)
T5	Not Available	Not Available	DI3 + DI2 + DI1 (100=T5)
T6	Not Available	Not Available	DI3 + DI2 + DI1 (101=T6)
T7	Not Available	Not Available	DI3 + DI2 + DI1 (110=T7)
T8	Not Available	Not Available	DI3 + DI2 + DI1 (111=T8)

Table 4-38 DIs and the Number of Tariffs Setup

Each TOU schedule has the following setup parameters and can only be programmed via the Web Interface (See **Section 3.2.4.5.3.3**) or through communications:

Setup Parameters	Definition	Options
Daily Profile #	Specify a daily rate schedule which can be divided into a maximum of 12 periods in 15-min intervals. Up to 20 Daily Profiles can be programmed for each TOU schedule.	1 to 20, the first period starts at 00:00 and the last period ends at 24:00.
Season #	A year can be divided into a maximum of 12 seasons. Each season is specified with a Start Date and ends with the next season's Start Date.	1 to 12, starts from January 1st
Alternate Days #	A day can be defined as an Alternate Day, such as May 1st. Each Alternate Day is assigned a Daily Profile.	1 to 90.
Day Types	Specify the day type of the week. Each day of a week can be assigned a day type such as Weekday1, Weekday2, Weekday3 and Alternate Days. The Alternate Day has the highest priority.	Weekday1, Weekday2, Weekday3 and Alternate Days
Switching Time	Specify when to switch from one TOU schedule to another. Writing 0xFFFFFFFF to this parameter disables switching between TOU schedules.	Format: YYYYMMDDHH Default=0xFFFFFFFF

Table 4-39 TOU Setup Parameters

For each of the 8 Tariff Rates, the iMeter 8 provides the following information:

- Energy: kWh Import/Export, kvarh Import/Export, kVAh – Per Phase and Total
- Max. Demand: kW/kvar/kVA of This Month (Since Last Reset) and Last Month (Before Last Reset).

All these data above are available via the Front Panel, Web Interface and communications.

In addition, the iMeter 8 provides 12 Historical TOU Logs for Energy and Max. Demand. All TOU log can be reset via the Front Panel, Web Server or communications.

4.7 Alarm Email

The iMeter 8 can be configured to send Alarm Emails based on the Simple Mail Transfer Protocol (SMTP), which may triggered by Setpoint, Dips, Swells, Interruptions, Transients, etc. The Alarm Email provides the following information in a text format:

1) iMeter 8's serial number
2) Event description
3) Event timestamp

The programming of the Alarm Email is supported through Web interface or via the communications.

Parameters	Definition	Options, Default*
Server IP	The IP Address of the SMTP Server	0.0.0.0*
Port	The IP Port No. for the SMTP Server	0 to 65535, 25*
Username	SMTP Server's logon username for Sender's email address	See Note 1), N/A*
Password	SMTP Server's logon password for Sender's email address	See Note 2), N/A*
Sender E-mail	Sender's email address	See Note 3), N/A*
Receiver E-mail	Receiver's email address	See Note 3), N/A*
Trigger Source	Specify When the alarm email will send out	System, Setpoint, HS Setpoint, I/O, DR, WFR, DWR, Dip/Swell, Transient, Inrush Current, RVC, MSV, EN 50160, N/A*

Table 4-40 SMTP Setup Parameters

Notes:
1) The **Username** should not exceed 40 ASCII Characters.
2) The **Password** should not exceed 20 ASCII Characters.
3) Both the **Sender** and **Receiver** setup parameters should not exceed 40 ASCII characters.

Here is an example of how to configure a Setpoint to trigger an Alarm Email.

Click **Setup > Setpoint > Setpoint (Standard Setpoint)** as shown below. Select a particular Setpoint (e.g. No.1) under Standard Setpoint to open the Setpoint 1 Settings dialog box and configure the parameters as required.

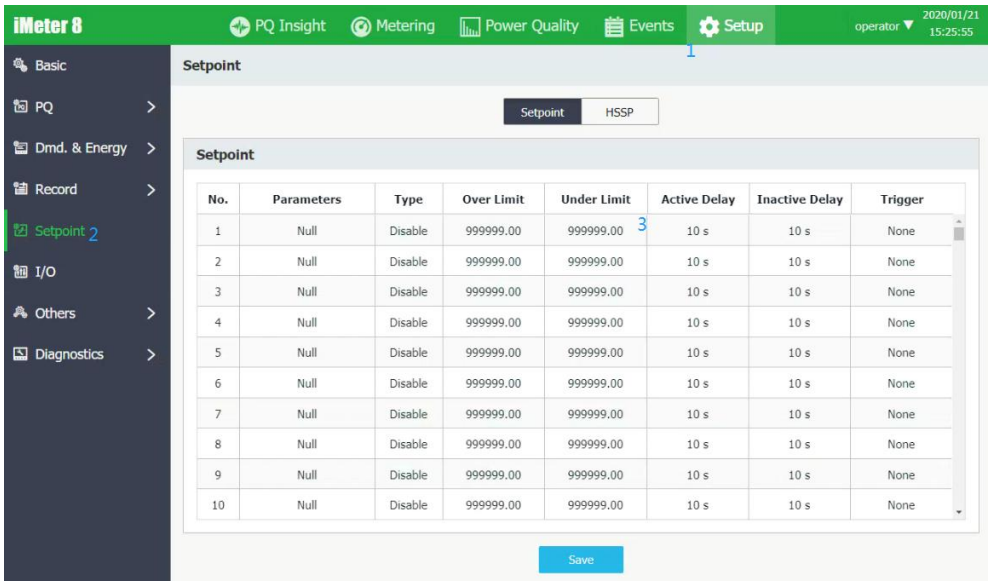


Figure 4-16 Setpoint Settings

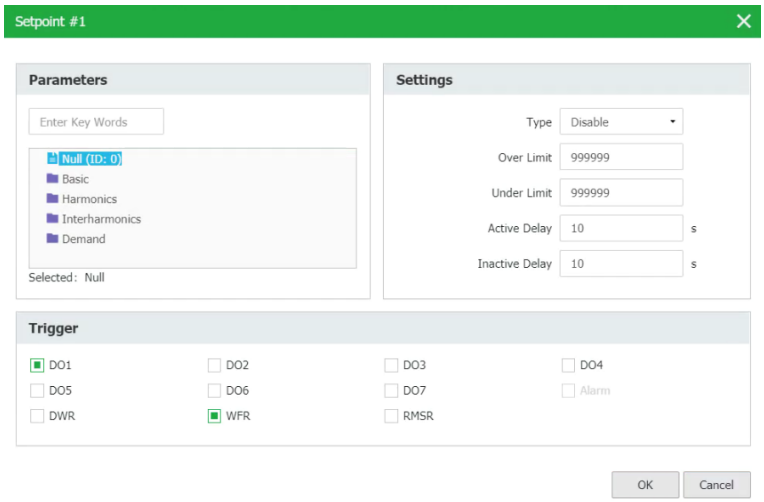


Figure 4-17 Sepoint1 Settings Dialog

1) Click **Setup -> Others -> Alarm Email -> Settings** as shown below. Please note that all the SMTP information should be entered correctly (please log into the Sender Email account to confirm the SMTP settings). Click **Save** to store the configuration in the iMeter 8. The message "**Saved Succeeded**" will appear if the configuration is accepted by the meter.

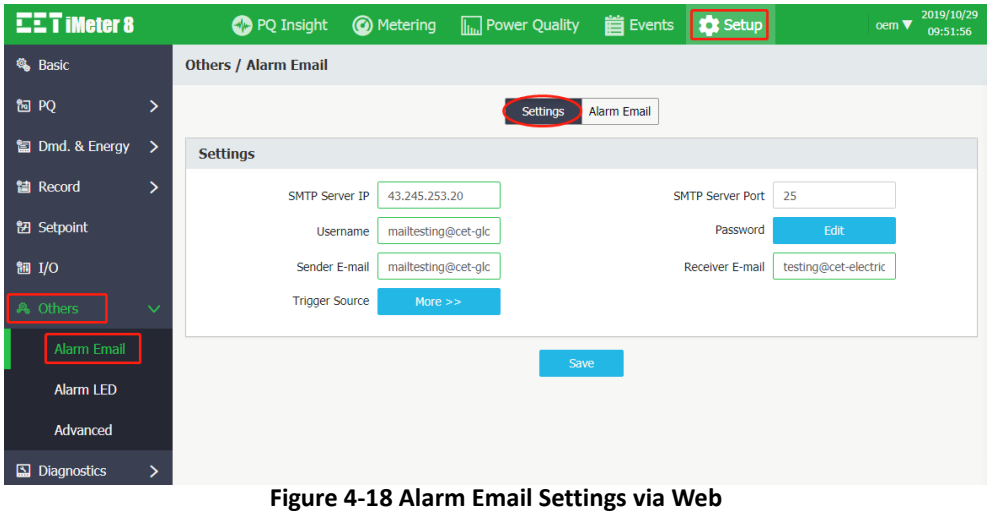


Figure 4-18 Alarm Email Settings via Web

2) Click **Alarm Email** tab to send a Test Email by clicking on **Test**. The message "**E-mail has been sent to the specified address**" will appear if a test email has been successfully sent to the Receiver. However, if the receiver didn't receive the test email, the Alarm Email settings should be verified to make sure that they are correct and the iMeter 8 should be checked that it is connected to the Internet.

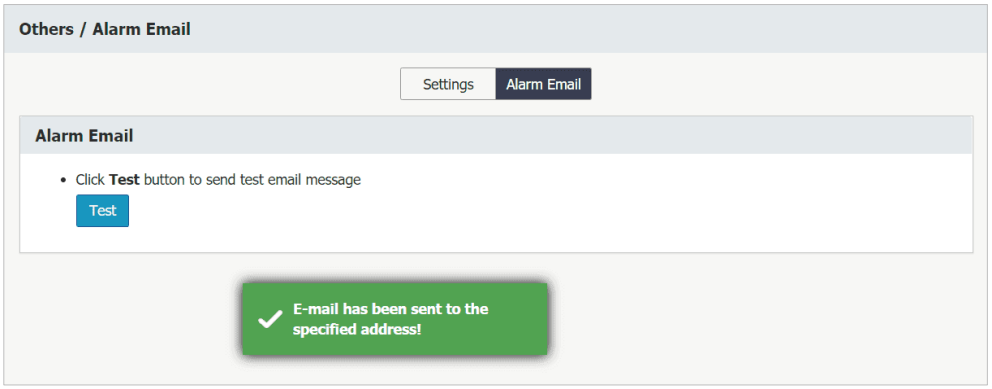


Figure 4-19 Send Test Email

Figure 4-20 An Example of Test Email

3) If the Receiver receives the test email successfully, please return to **Alarm Email Settings** and click on "**More >>**" to open the **Trigger Source** dialog box. Check the Setpoint selection box and click **OK** to confirm the changes. Click **Save** to keep the changes.

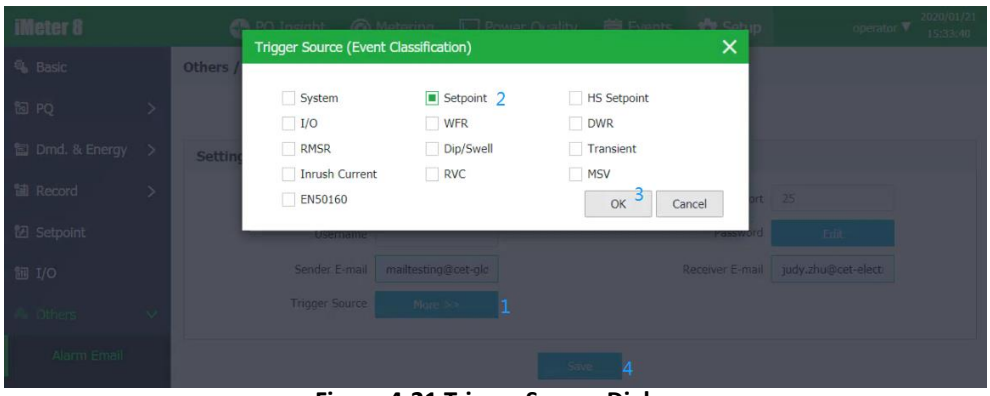
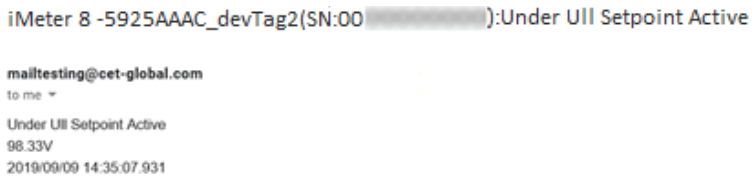


Figure 4-21 Trigger Source Dialog

4) When the Setpoint is activated, an Alarm Email will be sent to the Receiver by the iMeter 8, providing the SMTP configuration is correct.



4.8 Time Synchronization

The iMeter 8 provides timestamps for all recorded data so it's extremely important for the clock to be properly configured to achieve precise time-stamping for Energy, Power Quality and Event analysis. The different time sync. methods are discussed in the following sections.

4.8.1 RTC

The iMeter 8 is equipped with a 6ppm, battery-backed real-time clock that has a maximum error of 0.5s per day. If the supply power is lost or removed, the internal back-up battery keeps the real-time clock running until power is restored. The **Clock Source Register (40800)** is set to **RTC** by default. This can be changed via the Front Panel, Web Server or communications.

The iMeter 8's clock can be synchronized through communications using the Modbus RTU protocol. Please refer to **Section 5.14** for a detailed description**.**

4.8.2 Web Server

The Web Interface can be used to set the clock of an individual iMeter 8 manually or through the **Sync. with PC** function using the computer's clock as the time source

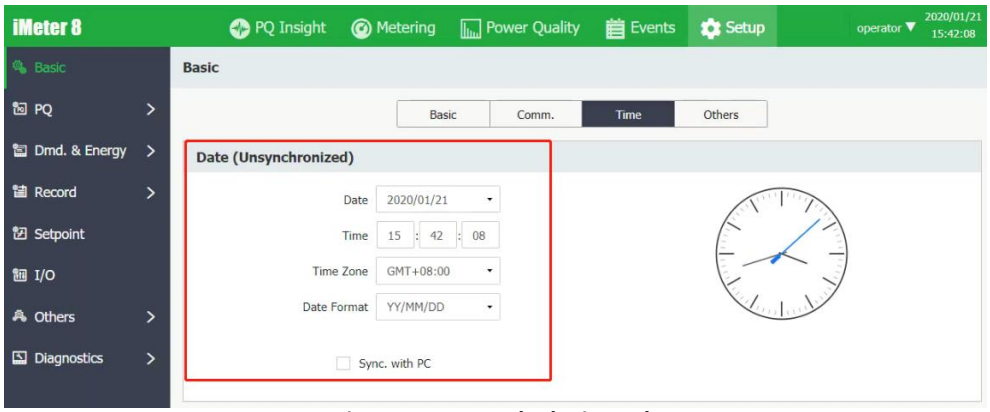


Figure 4-22 Set Clock via Web

4.8.3 SNTP

SNTP (Simple Network Time Protocol) can be used to synchronize the iMeter 8's clock with an external **SNTP Server** through its Ethernet port providing that the network has been properly configured. The programming of the **SNTP** setup parameters are supported via the Front Panel, Web Interface or communications.

Setup Parameters	Option	Setting
Clock Source	0=RTC, 1=SNTP, 2=GPS, 3=IRIGB, 4=Reserved, 5=1588-P1, 6=1588-P2	1
Time Zone	GMT-12:00 / GMT-11:00 / GMT-10:00 / GMT-9:00 / GMT-8:00 / GMT-7:00 / GMT-6:00 / GMT-5:00 / GMT-4:00 / GMT-3:30 / GMT-3:00 / GMT-2:00 / GMT-1:00 / GMT-0:00 / GMT+1:00 / GMT+2:00 / GMT+3:00 / GMT+3:30 / GMT+4:00 / GMT+4:30/ GMT+5:00 / GMT+5:30 / GMT+5:45 / GMT+6:00 / GMT+6:30 / GMT+7:00 / GMT+8:00 (default)/ GMT+9:00 / GMT+9:30 / GMT+10:00 / GMT+11:00 / GMT+12:00 / GMT+13:00	26
SNTP Sync. Interval	10 to 1440 minutes	60
IP Address of SNTP Server	Set the IP address of the **SNTP Server**	192.168.101.2
Broadcast Synchronization		
SNTP Broadcast Flag	Enable or disable SNTP broadcast time sync. 0 = Disabled, 1 = Enabled	1

Table 4-41 SNTP Setup Parameters

4.8.4 GPS with Time Sync Pulse or IRIG-B

The iMeter 8 comes standard with a **GPS** port which can be used as GPS or IRIG-B time synchronization and the following table lists the terminal relations for two Time Sync ways. Please also refer to **Section 2.12 GPS Wiring** for the time synchronization wiring diagram.

GPS Port	GPS+	GPS-
GPS with Sync Pulse	PPS+	PPS+
IRIG-B	P+	P-

Table 4-42 Relation with Terminal

- **GPS**

GPS receivers often provide 1PPS (1 Pulse per Second) timing output. The iMeter 8 can be configured to synchronize its millisecond clock with a GPS's time sync pulse through the **GPS** port. Set **Clock Source** (Register #40800) to **GPS** through the Front Panel, Web Server or via communications.

- **IRIG-B**

IRIG-B, which stands for Inter-Range Instrumentation Group- Time Code Format B, is a standard format for transferring timing information once a second.

The iMeter 8 can be configured to synchronize its clock with the IRIG-B input via its GPS port by having the **Clock Source Register (40800)** set to **IRIG-B**.

Setup Parameters	Option	Setting
Clock Source	0=RTC, 1=SNTP, 2=GPS, 3=IRIGB, 4=Reserved, 5=1588-P1, 6=1588-P2	3
IRIG-B Time Zone	See **Section 5.11.6 System Setup**, register 40802	26

Table 4-43 Setup Parameters for IRIG-B

4.8.5 PecStar iEMS

PecStar® iEMS can be configured to provide regular time synchronization by broadcasting time-sync packets over the connected medium, whether it is RS-485 or Ethernet. The default time synchronization interval of is 60 minutes. Please consult the PecStar iEMS's user manual for a complete description.

4.9 Ethernet Gateway

The iMeter 8's **Ethernet Gateway** feature supports the gateway function for Modbus communications between the Master Software (e.g. PecStar iEMS) on a Local Area Network and other RS-485-enabled devices (e.g. PMC-53A) via the iMeter 8's Ethernet ports (P1/P2) and RS-485 ports (P3/P4). This eliminates the need for an additional, external Ethernet-to-RS-485 Gateway, simplifies the overall network design and save cost. The Master Software sends a "Modbus RTU over TCP/IP" packet (Modbus RTU packet, i.e. the payload, encapsulated in a TCP/IP frame) to the iMeter 8's Ethernet port at its IP Address and the default IP Port No. 20000. The iMeter 8 receives this "Modbus RTU over TCP/IP" packet at its Ethernet port, extracts the "encapsulated" Modbus RTU packet, i.e. the payload, from the TCP/IP frame and then in turn forwards it to its RS-485 port (such as P3). The RS-485-enabled device receives the Modbus RTU packet and sends its response back to the iMeter 8, which in turn encapsulates the Modbus RTU response packet in a TCP/IP frame and then sends it back to the Master Software over Ethernet to complete the transaction.

The following illustrates the steps of configuration the iMeter 8's Ethernet Gateway via P3:

1) Go to **Setup -> Basic -> Comm. -> RS-485 (P3)** to change the **Protocol** setup parameter from the default setting of **Modbus** to **Gateway,** either via the Web Interface or Front Panel.

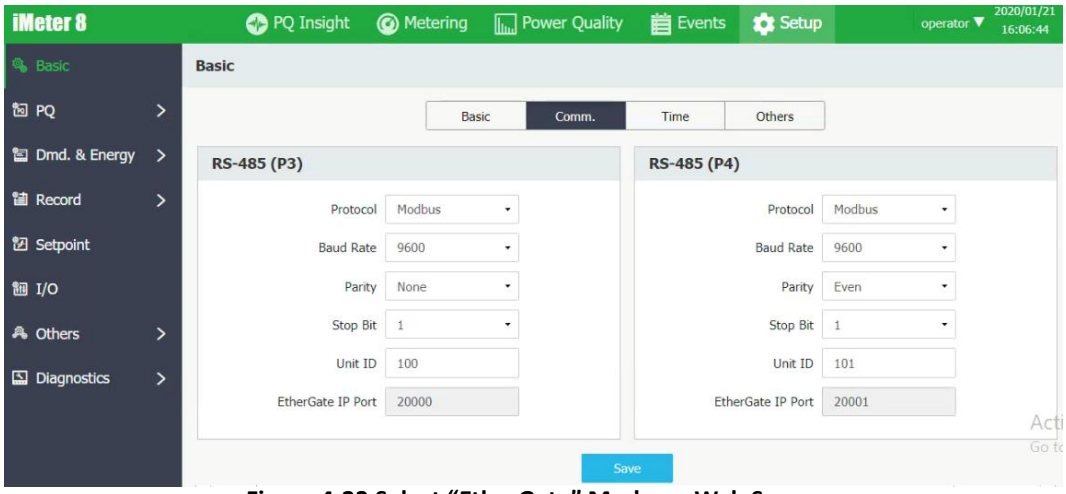


Figure 4-23 Select "EtherGate" Mode on Web Server

2) Connect the RS-485-enabled devices (i.e. PMC-53A) to the RS-485 port (P3) of the iMeter 8.

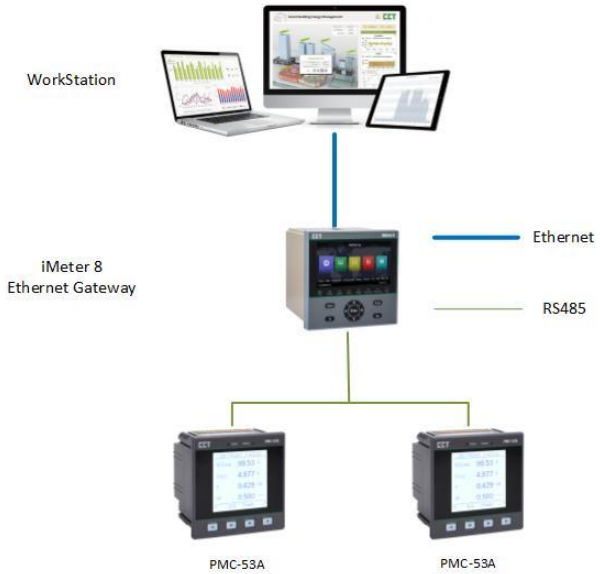


Figure 4-24 Typical Application for Ethernet Gateway

3) Configure the Master Software (e.g. PecStart iEMS) on the WorkStation to communicate with the RS-485-enabled devices via iMeter 8's Ethernet port at IP port No. 20000. It should be noted that the Master Software must support the **Modbus RTU over TCP/IP** protocol for this to work.

4) Make sure the serial port settings such as Baud Rate and Data Format are identical between iMeter 8's RS-485 port and the RS-485-enabled devices.

5) The Master Software should be able to communicate with the RS-485-enabled devices via the iMeter 8's Ethernet Gateway, providing that all the necessary configuration is correct.

Chapter 5 Modbus Register Map

This chapter provides a complete description of the Modbus register map (**Protocol Version 4.3**) for the iMeter 8 Advanced Utility Power Quality Analyzer to facilitate the development of 3rd party Modbus RTU communications driver for accessing information on the iMeter 8. For a complete Modbus Protocol Specification, please visit http://www.modbus.org.

The iMeter 8 supports the following Modbus functions:

1) Read Holding Registers (Function Code 0x03)
2) Force Single Coil (Function Code 0x05)
3) Preset Multiple Registers (Function Code 0x10)

5.1 Basic Measurements

Register	Property	Description	Format	Unit
0000	RO	Ua[1]	Float	V
0002	RO	Ub[1]	Float	V
0004	RO	Uc[1]	Float	V
0006	RO	ULN Avg.[1]	Float	V
0008	RO	Uab	Float	V
0010	RO	Ubc	Float	V
0012	RO	Uca	Float	V
0014	RO	ULL Avg.	Float	V
0016	RO	Ia	Float	A
0018	RO	Ib	Float	A
0020	RO	Ic	Float	A
0022	RO	I Avg.	Float	A
0024	RO	Pa (kWa)[1]	Float	W
0026	RO	Pb (kWb)[1]	Float	W
0028	RO	Pc (kWc)[1]	Float	W
0030	RO	P (kW) Total	Float	W
0032	RO	Qa (kvara)[1]	Float	var
0034	RO	Qb (kvarb)[1]	Float	var
0036	RO	Qc (kvarc)[1]	Float	var
0038	RO	Q (kvar) Total	Float	var
0040	RO	Sa (kVAa)[1]	Float	VA
0042	RO	Sb (kVAb)[1]	Float	VA
0044	RO	Sc (kVAc)[1]	Float	VA
0046	RO	S (kVA) Total	Float	VA
0048	RO	PFa[1]	Float	--
0050	RO	PFb[1]	Float	--
0052	RO	PFc[1]	Float	--
0054	RO	PF Total	Float	--
0056	RO	Frequency	Float	Hz
0058	RO	U4	Float	V
0060	RO	I4	Float	A
0062	RO	I5	Float	A
0064	RO	Real-time Data Timestamp - Second (UNIX Time)	UINT32	s
0066	RO	Real-time Data Timestamp - Millisecond (UNIX Time)	UINT32	ms
0068	RO	Frequency Timestamp - Second (UNIX Time)	UINT32	s
0070	RO	Frequency Timestamp - Millisecond (UNIX Time)	UINT32	ms
0072	RO	Pst. Timestamp - Second (UNIX Time)	UINT32	s
0074	RO	Pst. Timestamp - Millisecond (UNIX Time)	UINT32	ms
0076	RO	Plt. Timestamp - Second (UNIX Time)	UINT32	s
0078	RO	Plt. Timestamp - Millisecond (UNIX Time)	UINT32	ms
0080	RO	Flagging Status of Real-time Data[2]	UINT16	
0081~0092		Reserved	Float	
0093	RO	Standard Setpoint Status #1[3]	UINT32	
0095	RO	Standard Setpoint Status #2[3]	UINT32	
0097	RO	Standard Setpoint Status #3[3]	UINT32	
0099	RO	Standard Setpoint Status #4[3]	UINT32	
0101	RO	Standard Setpoint Status #5[3]	UINT32	
0103	RO	Standard Setpoint Status #6[3]	UINT32	
0105	RO	Standard Setpoint Status #7[3]	UINT32	
0107	RO	Standard Setpoint Status #8[3]	UINT32	
0109	RO	Standard Setpoint Status #9[3]	UINT32	

0111	RO	HS Setpoint Status[3]	UINT32	
0113	RO	Reserved	UINT32	
0115	RO	Dips Counter	UINT32	
0117	RO	Swells Counter	UINT32	
0119	RO	Interruption Counter	UINT32	
0121	RO	Transient Counter	UINT32	
0123	RO	RVC Counter	UINT32	
0125	RO	Inrush Current Counter	UINT32	
0127	RO	Relative RMS Counter	UINT32	
0129	RO	Mains Signalling Voltage #1 Event Counter	UINT32	
0131	RO	Mains Signalling Voltage #2 Event Counter	UINT32	
0133	RO	Mains Signalling Voltage #3 Event Counter	UINT32	
0135	RO	Total PQ Event	UINT32	
0137	RO	SOE Log Pointer[4]	UINT32	
0139	RO	PQ Log Pointer[4]	UINT32	
0141	RO	WFR Log Pointer[4]	UINT32	
0143	RO	RMSR Log Pointer	UINT32	
0145	RO	DWR Log Pointer	UINT32	
0147~0157	RO	Reserved	UINT32	
0159	RO	SDR Log #1 Pointer[4]	UINT32	
0161	RO	SDR Log #2 Pointer[4]	UINT32	
0163	RO	SDR Log #3 Pointer[4]	UINT32	
0165	RO	SDR Log #4 Pointer[4]	UINT32	
0167	RO	SDR Log #5 Pointer[4]	UINT32	
0169	RO	SDR Log #6 Pointer[4]	UINT32	
0171	RO	SDR Log #7 Pointer[4]	UINT32	
0173	RO	SDR Log #8 Pointer[4]	UINT32	
0175	RO	SDR Log #9 Pointer[4]	UINT32	
0177	RO	SDR Log #10 Pointer[4]	UINT32	
0179	RO	SDR Log #11 Pointer[4]	UINT32	
0181	RO	SDR Log #12 Pointer[4]	UINT32	
0183	RO	SDR Log #13 Pointer[4]	UINT32	
0185	RO	SDR Log #14 Pointer[4]	UINT32	
0187	RO	SDR Log #15 Pointer[4]	UINT32	
0189	RO	SDR Log #16 Pointer[4]	UINT32	
0191~0205	RO	Reserved	UINT32	
0207	RO	DR Log #1 Pointer[4]	UINT32	
0209	RO	DR Log #2 Pointer[4]	UINT32	
0211	RO	DR Log #3 Pointer[4]	UINT32	
0213	RO	DR Log #4 Pointer[4]	UINT32	
0215	RO	DR Log #5 Pointer[4]	UINT32	
0217	RO	DR Log #6 Pointer[4]	UINT32	
0219	RO	DR Log #7 Pointer[4]	UINT32	
0221	RO	DR Log #8 Pointer[4]	UINT32	
0223~0237	RO	Reserved	UINT32	
0239	RO	Pst Log Pointer	UINT32	
0241	RO	Plt Log Pointer	UINT32	
0243	RO	Reserved	UINT32	
0245	RO	IER Log Pointer[4]	UINT32	
0247	RO	EN50160 Report Pointer	UINT32	
0249	RO	Reserved	UINT32	
0251	RO	Historical TOU Log Pointer	UINT32	
0253	RO	Reserved	UINT32	
0255		Frequency Deviation Log Pointer	UINT32	
0257	RO	AER Log Pointer[4]	UINT32	
0259	RO	Reserved	UINT32	
0261	RO	Conduct Emissions in the 2-150kHz Range Recorder Pointer	UINT32	
0263~0293	RO	Reserved		
0294	RO	HS Frequency	Float	
0300	RO	AI1	Float	
0302	RO	AI2	Float	
0304~0307		Reserved		
0308	RO	DI Status[5]	Bitmap	
0309		Reserved	UINT16	
0310	RO	DO Status[6]	Bitmap	
0311~0312		Reserved	UINT32	
0314	RO	Audit Log Pointer	UINT32	

Table 5-1 Basic Measurements

Notes:

1) When the **Wiring Mode** is **3P3W**, the per phase Uln, P (kW), Q (kvar), S (kVA) and PF have no meaning, and their registers are reserved.
2) Please refer to **Section 4.4.13 Flagging Concept** for a detailed description of the **Flagging Status** register.

Bit	Description		Bit	Description	
B0	Basic Measurement	Dip	**B8**	Pst.	Dip
B1		Swell	**B9**		Swell
B2		Interruption	**B10**		Interruption
B3		Over Current Limit*	**B11**		Reserved
B4	Frequency	Dip	**B12**	Plt.	Dip
B5		Swell	**B13**		Swell
B6		Interruption	**B14**		Interruption
B7		Reserved	**B15**		Reserved

* 2xIn

Table 5-2 Flagging Status

3) The **Standard Setpoint Status #1 to #8** registers represent the states of Standard Setpoints #1 to #256 while the **HS Setpoint Status** register represents the states of HS Setpoints #1 to #16, with a bit value of 1 meaning active and 0 meaning inactive. The **Standard Setpoint Status #9** register is reserved.

Bit	B0	B1	B2	…	B31
Standard Setpoint	Setpoint #1	Setpoint #2	Setpoint #3	…	Setpoint #32

Table 5-3 Standard Setpoint Status #1 (0093)

Bit	B0	B1	B2	…	B31
Standard Setpoint	Setpoint #33	Setpoint #34	Setpoint #35	…	Setpoint #64

Table 5-4 Standard Setpoint Status #2 (0095)

Bit	B0	B1	B2	…	B31
Standard Setpoint	Setpoint #65	Setpoint #66	Setpoint #67	…	Setpoint #96

Table 5-5 Standard Setpoint Status #3 (0097)

Bit	B0	B1	B2	…	B31
Standard Setpoint	Setpoint #97	Setpoint #98	Setpoint #99	…	Setpoint #128

Table 5-6 Standard Setpoint Status #4 (0099)

Bit	B0	B1	B2	…	B31
Standard Setpoint	Setpoint #129	Setpoint #130	Setpoint #131	…	Setpoint #160

Table 5-7 Standard Setpoint Status #5 (0101)

Bit	B0	B1	B2	…	B31
Standard Setpoint	Setpoint #161	Setpoint #162	Setpoint #163	…	Setpoint #192

Table 5-8 Standard Setpoint Status #6 (0103)

Bit	B0	B1	B2	…	B31
Standard Setpoint	Setpoint #193	Setpoint #194	Setpoint #195	…	Setpoint #224

Table 5-9 Standard Setpoint Status #7 (0105)

Bit	B0	B1	B2	…	B31
Standard Setpoint	Setpoint #225	Setpoint #226	Setpoint #227	…	Setpoint #256

Table 5-10 Standard Setpoint Status #8 (0107)

Bit	B0~B31
Standard Setpoint	Reserved

Table 5-11 Standard Setpoint Status #9 (0109)

Bit	Alarm Event	Bit	Alarm Event	Bit	Alarm Event	Bit	Alarm Event
B0	HS Setpoint #1	**B4**	HS Setpoint #5	**B8**	HS Setpoint #9	**B12**	HS Setpoint #13
B1	HS Setpoint #2	**B5**	HS Setpoint #6	**B9**	HS Setpoint #10	**B13**	HS Setpoint #14
B2	HS Setpoint #3	**B6**	HS Setpoint #7	**B10**	HS Setpoint #11	**B14**	HS Setpoint #15
B3	HS Setpoint #4	**B7**	HS Setpoint #8	**B11**	HS Setpoint #12	**B15**	HS Setpoint #16

Table 5-12 High-speed Setpoint Status (0111)

4) The **Log Pointer** indicates its current logging position with a range of 0 and 0xFFFFFFFF, and it is incremented by one for every new log generated and will roll over to 0 if its current value is 0xFFFFFFFF. A value of 0 indicates that the recorder doesn't contain any log. If a **Clear xxx Log** is performed from the Front Panel, Web Interface or via communications, its corresponding **Log Pointer** will be reset to zero, which will be recorded into SOE Log. When the number of log is larger than the Log Depth, only the latest **N** x logs (N represents the value of **Log Depth**) will be stored (when Record Mode = FIFO).

The latest log location is determined by the following equation:

Latest Log Location = Modulo [**Log Pointer / Log Depth**]

The following table lists the Log Depth for each Log Recorder:

Recorder	Depth	Recorder	Depth	Recorder	Depth	Recorder	Depth	Recorder	Depth
SOE	1024	DWR	128	Plt.	4380	DR(1-8)	65535	SDR (1-16)	43200
PQ	1024	RMSR	128	IER	65535	EN 50160	52		
WFR	128	Pst.	56520	AER	65535	Historical TOU	12		

Table 5-13 Log Depth

5) For the **DI Status** register, the bit values of B0 to B15 represent the states of DI1 to DI16, respectively, with "1" meaning Active (Closed) and "0" meaning Inactive (Open).
6) For the **DO Status** register, the bit value of B0 represents the Alarm state while the bit values of B1 to B7 represent the states of DO1 to DO7, respectively, with "1" meaning Active (Closed) and "0" meaning Inactive (Open).

5.2 Energy Measurements

5.2.1 Energy Measurement (INT64)

If the **Roll-over Energy Value** (Register 40758) is **Enabled**, the Energy registers have a maximum value of 1,000,000,000,000, otherwise the Energy registers have a maximum value of 100,000,000,000,000.

The Energy registers will roll over to zero automatically when it is reached to the maximum value.

Register	Property	Description	Format	Scale	Unit
0500	RW	∑kWh Imp.	INT64	1	wh
0504	RW	∑kWh Exp.	INT64	1	wh
0508	RW	∑kvarh Imp.	INT64	1	varh
0512	RW	∑kvarh Exp.	INT64	1	varh
0516	RW	∑kVAh	INT64	1	VAh
0520	RO	∑kWh Net	INT64	1	wh
0524	RO	∑kWh Total	INT64	1	wh
0528	RO	∑kvarh Net	INT64	1	varh
0532	RO	∑kvarh Total	INT64	1	varh

Table 5-1 Energy Measurements (INT64)

5.2.2 Energy Registers (INT32)

The Energy measurement should be calculated based on E1 & E2:

∑kxh (Import/Export/Net/Total)
= E1x100 GWh + E2x0.1 kWh
= E1×10^8 kWh + E2×0.1 kWh

The E1 and E2 registers have a maximum value of 100,000,000 and 1000, respectively, and will roll over to zero automatically when it is reached. The E1 register will be incremented by 1 when the E2 register rolls over. The calculated Total kxh (Import/Export/Net/Total) has a maximum value of 1x10^{11}kxh.

Register	Property	Description	Format	Scale	Unit
0550	RW	∑kWh Import E1	INT32	1	100 GWh
0552	RW	∑kWh Import E2	INT32	0.1	kWh
0554	RW	∑kWh Export E1	INT32	1	100 GWh
0556	RW	∑kWh Export E2	INT32	0.1	kWh
0558	RW	∑kvarh Import E1	INT32	1	100 Gvarh
0560	RW	∑kvarh Import E2	INT32	0.1	kvarh
0562	RW	∑kvarh Export E1	INT32	1	100 Gvarh
0564	RW	∑kvarh Export E2	INT32	0.1	kvarh
0566	RW	∑kVAh E1	INT32	1	100 GVAh
0568	RW	∑kVAh E2	INT32	0.1	kVAh
0570	RO	∑kWh Net E1	INT32	1	100 GWh
0572	RO	∑kWh Net E2	INT32	0.1	kWh
0574	RO	∑kWh E1	INT32	1	100 GWh
0576	RO	∑kWh E2	INT32	0.1	kWh
0578	RO	∑kvarh Net E1	INT32	1	100 Gvarh
0580	RO	∑kvarh Net E2	INT32	0.1	kvarh
0582	RO	∑kvarh E1	INT32	1	100 Gvarh
0584	RO	∑kvarh E2	INT32	0.1	kvarh

Table 5-1 32-bits Energy Measurements

5.3 DI Pulse Counter

The DI Counters have a maximum value of 999,999,999 and will roll over to zero automatically when it is reached.

Register	Property	Description	Format	Range
0650	RW	DI1 Counter	INT32	0 to 999,999,999
0652	RW	DI2 Counter	INT32	
0654	RW	DI3 Counter	INT32	
0656	RW	DI4 Counter	INT32	
0658	RW	DI5 Counter	INT32	
0660	RW	DI6 Counter	INT32	
0662	RW	DI7 Counter	INT32	
0664	RW	DI8 Counter	INT32	
0666	RW	DI9 Counter[1]	INT32	
0668	RW	DI10 Counter[1]	INT32	
0670	RW	DI11 Counter[1]	INT32	
0672	RW	DI12 Counter[1]	INT32	
0674	RW	DI13 Counter[1]	INT32	
0676	RW	DI14 Counter[1]	INT32	
0678	RW	DI15 Counter[1]	INT32	
0680	RW	DI16 Counter[1]	INT32	

Table 5-1 Pulse Counter

Notes:

1) DI9 Counter to DI16 Counter are only valid when the iMeter 8 is equipped with corresponding options.

5.4 PQ Measurements

Register	Property	Description	Format	Unit
0700	RO	Ua Deviation[1]	Float	
0702	RO	Ub Deviation[1]	Float	
0704	RO	Uc Deviation[1]	Float	
0706	RO	Uab Deviation	Float	
0708	RO	Ubc Deviation	Float	
0710	RO	Uca Deviation	Float	
0712	RO	Ua Over Deviation[1)]	Float	
0714	RO	Ub Over Deviation[1)]	Float	
0716	RO	Uc Over Deviation[1)]	Float	
0718	RO	Uab Over Deviation	Float	
0720	RO	Ubc Over Deviation	Float	
0722	RO	Uca Over Deviation	Float	
0724	RO	Ua Under Deviation[1)]	Float	
0726	RO	Ub Under Deviation[1)]	Float	
0728	RO	Uc Under Deviation[1)]	Float	
0730	RO	Uab Under Deviation	Float	
0732	RO	Ubc Under Deviation	Float	
0734	RO	Uca Under Deviation	Float	
0736	RO	Freq. Deviation	Float	Hz
0738	RO	Ua / Uab[2] Fluctuation	Float	
0740	RO	Ub / Ubc[2] Fluctuation	Float	
0742	RO	Uc / Uca[2] Fluctuation	Float	
0744	RO	Ua / Uab[2] Fluctuation Freq.	Float	
0746	RO	Ub / Ubc[2] Fluctuation Freq.	Float	
0748	RO	Uc / Uca[2] Fluctuation Freq.	Float	
0750	RO	U0 Unbal.	Float	
0752	RO	U2 Unbal.	Float	
0754	RO	I0 Unbal.	Float	
0756	RO	I2 Unbal.	Float	
0758	RO	U0	Float	V
0760	RO	U1	Float	V
0762	RO	U2	Float	V

0764	RO	I0	Float	A
0766	RO	I1	Float	A
0768	RO	I2	Float	A
0770	RO	Ua / Uab Pst.[2]	Float	
0772	RO	Ub / Ubc Pst.[2]	Float	
0774	RO	Uc / Uca Pst.[2]	Float	
0776	RO	Ua / Uab Plt.[2]	Float	
0778	RO	Ub / Ubc Plt.[2]	Float	
0780	RO	Uc / Uca Plt. [2]	Float	
0782	RO	Reserved	Float	
0784	RO	Ia TDD	Float	
0786	RO	Ib TDD	Float	
0788	RO	Ic TDD	Float	
0790	RO	I4 TDD	Float	
0792	RO	I5 TDD	Float	
0794	RO	Ia TDD Odd	Float	
0796	RO	Ib TDD Odd	Float	
0798	RO	Ic TDD Odd	Float	
0800	RO	I4 TDD Odd	Float	
0802	RO	I5 TDD Odd	Float	
0804	RO	Ia TDD Even	Float	
0806	RO	Ib TDD Even	Float	
0808	RO	Ic TDD Even	Float	
0810	RO	I4 TDD Even	Float	
0812	RO	I5 TDD Even	Float	
0814	RO	Ia K-Factor	Float	
0816	RO	Ib K-Factor	Float	
0818	RO	Ic K-Factor	Float	
0820	RO	I4 K-Factor	Float	
0822	RO	I5 K-Factor	Float	
0824	RO	Ia Crest Factor	Float	
0826	RO	Ib Crest Factor	Float	
0828	RO	Ic Crest Factor	Float	
0830	RO	I4 Crest Factor	Float	
0832	RO	I5 Crest Factor	Float	
0834	RO	Ua Crest Factor	Float	
0836	RO	Ub Crest Factor	Float	
0838	RO	Uc Crest Factor	Float	
0840	RO	U4 Crest Factor	Float	
0842	RO	Ua / Uab MSV #1[2]	Float	V
0844	RO	Ub / Ubc MSV #1[2]	Float	V
0846	RO	Uc / Uca MSV #1[2]	Float	V
0848	RO	Ua / Uab MSV #2[2]	Float	V
0850	RO	Ub / Ubc MSV #2[2]	Float	V
0852	RO	Uc / Uca MSV #2[2]	Float	V
0854	RO	Ua / Uab MSV #3[2]	Float	V
0856	RO	Ub / Ubc MSV #3[2]	Float	V
0858	RO	Uc / Uca MSV #3[2]	Float	V

Table 5-1 PQ Measurements

Notes:

1) When the **Wiring Mode** is **3P3W**, the 3Ø Uln Deviations have no meaning and their registers are reserved.
2) When the **Wiring Mode** is **3P3W**, the phase A/B/C Voltage Fluction/Fluction Freq./Pst./Plt./MSV. mean phase AB/BC/CA Voltage Fluction/Fluction Freq./Pst./Plt/MSV.

5.5 Harmonics & Interharmonic Measurements

5.5.1 Harmonic Distortion

Register	Property	Description	Format	Unit/Scale
1000	RO	Ua / Uab THD[1]	Float	% / x100
1002	RO	Ub / Ubc THD[1]	Float	% / x100
1004	RO	Uc / Uca THD[1]	Float	% / x100
1006	RO	U4 THD	Float	% / x100
1008	RO	Ia THD	Float	% / x100
1010	RO	Ib THD	Float	% / x100
1012	RO	Ic THD	Float	% / x100
1014	RO	I4 THD	Float	% / x100
1016	RO	I5 THD	Float	% / x100
1018	RO	Ua / Uab TOHD[1]	Float	% / x100
1020	RO	Ub / Ubc TOHD[1]	Float	% / x100
1022	RO	Uc / Uca TOHD[1]	Float	% / x100
1024	RO	U4 TOHD	Float	% / x100
1026	RO	Ia TOHD	Float	% / x100
1028	RO	Ib TOHD	Float	% / x100
1030	RO	Ic TOHD	Float	% / x100
1032	RO	I4 TOHD	Float	% / x100
1034	RO	I5 TOHD	Float	% / x100
1036	RO	Ua / Uab TEHD[1]	Float	% / x100
1038	RO	Ub / Ubc TEHD[1]	Float	% / x100
1040	RO	Uc / Uca TEHD[1]	Float	% / x100
1042	RO	U4 TEHD	Float	% / x100
1044	RO	Ia TEHD	Float	% / x100
1046	RO	Ib TEHD	Float	% / x100
1048	RO	Ic TEHD	Float	% / x100
1050	RO	I4 TEHD	Float	% / x100
1052	RO	I5 TEHD	Float	% / x100
1054	RO	Ua / Uab DC Component[1]	Float	% / x100
1056	RO	Ub / Ubc DC Component[1]	Float	% / x100
1058	RO	Uc / Uca DC Component[1]	Float	% / x100
1060	RO	U4 DC Component	Float	% / x100
1062	RO	Ia DC Component	Float	% / x100
1064	RO	Ib DC Component	Float	% / x100
1066	RO	Ic DC Component	Float	% / x100
1068	RO	I4 DC Component	Float	% / x100
1070	RO	I5 DC Component	Float	% / x100
1072	RO	Ua / Uab HD01[1]	Float	% / x100
1074	RO	Ub / Ubc HD01[1]	Float	% / x100
1076	RO	Uc / Uca HD01[1]	Float	% / x100
1078	RO	U4 HD01	Float	% / x100
1080	RO	Ia HD01	Float	% / x100
1082	RO	Ib HD01	Float	% / x100
1084	RO	Ic HD01	Float	% / x100
1086	RO	I4 HD01	Float	% / x100
1088	RO	I5 HD01	Float	% / x100
	…	…	…	% / x100
2188	RO	Ua / Uab HD63[1]	Float	% / x100
2190	RO	Ub / Ubc HD63[1]	Float	% / x100
2192	RO	Uc / Uca HD63[1]	Float	% / x100
2194	RO	U4 HD63	Float	% / x100
2196	RO	Ia HD63	Float	% / x100
2198	RO	Ib HD63	Float	% / x100
2200	RO	Ic HD63	Float	% / x100

2202	RO	I4 HD63	Float	% / x100
2204	RO	I5 HD63	Float	% / x100

Table 5-1 Harmonics Distortion Measurements

Note:

1. When the **Wiring Mode** is **3P3W**, the Ua/Ub/Uc THD, TOHD, TEHD and Individual Harmonics mean Uab/Ubc/Uca THD, TOHD, TEHD and Individual Harmonics.

5.5.2 Harmonic RMS Measurements

Register	Property	Description	Format	Unit
2300	RO	Ua / Uab TH RMS[1]	Float	V
2302	RO	Ub / Ubc TH RMS[1]	Float	V
2304	RO	Uc / Uca TH RMS[1]	Float	V
2306	RO	U4 TH RMS	Float	V
2308	RO	Ia TH RMS	Float	A
2310	RO	Ib TH RMS	Float	A
2312	RO	Ic TH RMS	Float	A
2314	RO	I4 TH RMS	Float	A
2316	RO	I5 TH RMS	Float	A
2318	RO	Ua / Uab TOH RMS[1]	Float	V
2320	RO	Ub / Ubc TOH RMS[1]	Float	V
2322	RO	Uc / Uca TOH RMS[1]	Float	V
2324	RO	U4 TOH RMS	Float	V
2326	RO	Ia TOH RMS	Float	A
2328	RO	Ib TOH RMS	Float	A
2330	RO	Ic TOH RMS	Float	A
2332	RO	I4 TOH RMS	Float	A
2334	RO	I5 TOH RMS	Float	A
2336	RO	Ua / Uab TEH RMS[1]	Float	V
2338	RO	Ub / Ubc TEH RMS[1]	Float	V
2340	RO	Uc / Uca TEH RMS[1]	Float	V
2342	RO	U4 TEH RMS	Float	V
2344	RO	Ia TEH RMS	Float	A
2346	RO	Ib TEH RMS	Float	A
2348	RO	Ic TEH RMS	Float	A
2350	RO	I4 TEH RMS	Float	A
2352	RO	I5 TEH RMS	Float	A
2354	RO	Ua / Uab DC Component RMS[1]	Float	V
2356	RO	Ub / Ubc DC Component RMS[1]	Float	V
2358	RO	Uc / Uca DC Component RMS[1]	Float	V
2360	RO	U4 DC RMS	Float	V
2362	RO	Ia DC RMS	Float	A
2364	RO	Ib DC RMS	Float	A
2366	RO	Ic DC RMS	Float	A
2368	RO	I4 DC RMS	Float	A
2370	RO	I5 DC RMS	Float	A
2372	RO	Ua / Uab H01 RMS[1]	Float	V
2374	RO	Ub / Ubc H01 RMS[1]	Float	V
2376	RO	Uc / Uca H01 RMS[1]	Float	V
2378	RO	U4 H01 RMS	Float	V
2380	RO	Ia H01 RMS	Float	A
2382	RO	Ib H01 RMS	Float	A
2384	RO	Ic H01 RMS	Float	A
2386	RO	I4 H01 RMS	Float	A
2388	RO	I5 H01 RMS	Float	A
…	RO	…	…	…
3488	RO	Ua / Uab H63 RMS[1]	Float	V
3490	RO	Ub / Ubc H63 RMS[1]	Float	V
3492	RO	Uc / Uca H63 RMS[1]	Float	V

3494	RO	U4 H63 RMS	Float	V
3496	RO	Ia H63 RMS	Float	A
3498	RO	Ib H63 RMS	Float	A
3500	RO	Ic H63 RMS	Float	A
3502	RO	I4 H63 RMS	Float	A
3504	RO	I5 H63 RMS	Float	A

Table 5-1 Harmonics RMS Measurements

Note:

1. When the **Wiring Mode** is **3P3W**, the TH/TOH/TEH RMS and Individual Harmonic RMS for Ua/Ub/Uc mean the TH/TOH/TEH RMS and Individual Harmonic RMS for Uab/Ubc/Uca.

5.5.3 Individual Total Harmonic Power

Register	Property	Description	Format	Unit
27000	RO	∑kW H01	Float	W
27002	RO	∑kvar H01	Float	var
27004	RO	∑kVA H01	Float	VA
27006	RO	PF H01	Float	
27008	RO	∑kW H02	Float	W
27010	RO	∑kvar H02	Float	var
27012	RO	∑kVA H02	Float	VA
27014	RO	PF H02	Float	
…		…		
27496	RO	∑kW H63	Float	W
27498	RO	∑kvar H63	Float	var
27500	RO	∑kVA H63	Float	VA
27502	RO	PF H63	Float	

Table 5-1 Individual Total Harmonic Power

5.5.4 Harmonic Power

Register	Property	Description	Format	Unit
28000	RO	kWa TH[1]	Float	W
28002	RO	kWb TH[1]	Float	W
28004	RO	kWc TH[1]	Float	W
28006	RO	kW TH	Float	W
28008	RO	kvara TH[1]	Float	var
28010	RO	kvarb TH[1]	Float	var
28012	RO	kvarc TH[1]	Float	var
28014	RO	kvar TH	Float	var
28016	RO	kVAa TH[1]	Float	VA
28018	RO	kVAb TH[1]	Float	VA
28020	RO	kVAc TH[1]	Float	VA
28022	RO	kVA TH	Float	VA
28024	RO	PFa TH[1]	Float	
28026	RO	PFb TH[1]	Float	
28028	RO	PFc TH[1]	Float	
28030	RO	PF TH	Float	
28032~28038		Reserved	Float	
28040	RO	kWa H01[1]	Float	W
28042	RO	kWb H01[1]	Float	W
28044	RO	kWc H01[1]	Float	W
28046	RO	kvara H01[1]	Float	var
28048	RO	kvarb H01[1]	Float	var
28050	RO	kvarc H01[1]	Float	var
28052	RO	kVAa H01[1]	Float	VA
28054	RO	kVAb H01[1]	Float	VA
28056	RO	kVAc H01[1]	Float	VA
28058	RO	PFa H01[1]	Float	
28060	RO	PFb H01[1]	Float	
28062	RO	PFc H01[1]	Float	
…	RO	…	Float	
29528	RO	kWa H63[1]	Float	W
29530	RO	kWb H63[1]	Float	W
29532	…	kWc H63[1]	Float	W
29534	RO	kvara H63[1]	Float	var
29536	RO	kvarb H63[1]	Float	var
29538	RO	kvarc H63[1]	Float	var

29540	RO	kVAa H63[1]	Float	VA
29542	RO	kVAb H63[1]	Float	VA
29544	RO	kVAc H63[1]	Float	VA
29546	RO	PFa H63[1]	Float	
29548	RO	PFb H63[1]	Float	
29550	RO	PFc H63[1]	Float	

Table 5-1 Harmonic Power

Notes:

1. When the **Wiring Mode** is **3P3W**, the Total Harmonics and Individual Harmonics for Phase A/B/C kW, kvar, kVA and PF have no meaning and their registers are reserved.

5.5.5 Harmonic Angles

Register	Property	Description	Format	Unit
30018	RO	Ua / Uab H01 Angle Error! Reference source not found.	Float	
30020	RO	Ub / Ubc H01 Angle Error! Reference source not found.	Float	
30022	RO	Uc / Uca H01 Angle Error! Reference source not found.	Float	
30024	RO	U4 H01 Angle	Float	
30026	RO	Ia H01 Angle	Float	
30028	RO	Ib H01 Angle	Float	
30030	RO	Ic H01 Angle	Float	
30032	RO	I4 H01 Angle	Float	
30034	RO	I5 H01 Angle	Float	
…	RO	…	Float	
31134	RO	Ua / Uab H63 Angle Error! Reference source not found.	Float	
31136	RO	Ub / Ubc H63 Angle Error! Reference source not found.	Float	
31138	RO	Uc / Uca H63 Angle Error! Reference source not found.	Float	
31140	RO	U4 H63 Angle	Float	
31142	RO	Ia H63 Angle	Float	
31144	RO	Ib H63 Angle	Float	
31146	RO	Ic H63 Angle	Float	
31148	RO	I4 H63 Angle	Float	
31150	RO	I5 H63 Angle	Float	

Table 5-1 Harmonic Angle

5.5.6 Harmonic Energy

Register	Property	Description	Format	Unit
31500	RW	kWh Imp. TH[1]	Int64	wh
31504	RW	kWh Exp. TH[1]	Int64	wh
31508	RW	kvarh Imp. TH[1]	Int64	varh
31512	RW	kvarh Exp. TH[1]	Int64	varh
31516	RO	kWh Net TH	Int64	wh
31520	RO	kWh Total TH	Int64	wh
31524	RO	kvarh Net TH	Int64	varh
31528	RO	kvarh Total TH	Int64	varh
31532~31598		Reserved		
31600	RW	kWh Imp. H01[1]	Int64	wh
31604	RW	kWh Exp. H01[1]	Int64	wh
31608	RW	kvarh Imp. H01[1]	Int64	varh
31612	RW	kvarh Exp. H01[1]	Int64	varh
31616	RW	kWh Imp. H02[1]	Int64	wh
31620	RW	kWh Exp. H02[1]	Int64	wh
31624	RW	kvarh Imp. H02[1]	Int64	varh
31628	RW	kvarh Exp. H02[1]	Int64	varh
…	RW	…	Int64	
32592	RW	kWh Imp. H63[1]	Int64	wh
32596	RW	kWh Exp. H63[1]	Int64	wh
32600	RW	kvarh Imp. H63[1]	Int64	varh
32604	RW	kvarh Exp. H63[1]	Int64	varh
33000	RO	kWh Net TH	Float	Wh
33004	RO	kWh Total TH[1]	Float	Wh
33008	RO	kvarh Net TH	Float	varh
33012	RO	kvarh Total TH[1]	Float	varh

Table 5-1 Harmonic Energy

Notes:

1) The registers have a maximum value of 99,999,999,999,999 and will roll over to zero automatically when it is reached.

5.5.7 Interharmonics Distortion Measurements

Register	Property	Description	Format	Unit/Scale
33100	RO	Ua / Uab TIHD[1)]	Float	%, x100
33102	RO	Ub / Ubc TIHD[1)]	Float	%, x100
33104	RO	Uc / Uca TIHD[1)]	Float	%, x100
33106	RO	U4 TIHD	Float	%, x100
33108	RO	Ia TIHD	Float	%, x100
33110	RO	Ib TIHD	Float	%, x100
33112	RO	Ic TIHD	Float	%, x100
33114	RO	I4 TIHD	Float	%, x100
33116	RO	I5 TIHD	Float	%, x100
33118	RO	Ua / Uab TOIHD[1)]	Float	%, x100
33120	RO	Ub / Ubc TOIHD[1)]	Float	%, x100
33122	RO	Uc / Uca TOIHD[1)]	Float	%, x100
33124	RO	U4 TOIHD	Float	%, x100
33126	RO	Ia TOIHD	Float	%, x100
33128	RO	Ib TOIHD	Float	%, x100
33130	RO	Ic TOIHD	Float	%, x100
33132	RO	I4 TOIHD	Float	%, x100
33134	RO	I5 TOIHD	Float	%, x100
33136	RO	Ua / Uab TEIHD[1)]	Float	%, x100
33138	RO	Ub / Ubc TEIHD[1)]	Float	%, x100
33140	RO	Uc / Uca TEIHD[1)]	Float	%, x100
33142	RO	U4 TEIHD	Float	%, x100
33144	RO	Ia TEIHD	Float	%, x100
33146	RO	Ib TEIHD	Float	%, x100
33148	RO	Ic TEIHD	Float	%, x100
33150	RO	I4 TEIHD	Float	%, x100
33152	RO	I5 TEIHD	Float	%, x100
33154	RO	Ua / Uab IHD00[1)]	Float	%, x100
33156	RO	Ub / Ubc IHD00[1)]	Float	%, x100
33158	RO	Uc / Uca IHD00[1)]	Float	%, x100
33160	RO	U4 IHD00	Float	%, x100
33162	RO	Ia IHD00	Float	%, x100
33164	RO	Ib IHD00	Float	%, x100
33166	RO	Ic IHD00	Float	%, x100
33168	RO	I4 IHD00	Float	%, x100
33170	RO	I5 IHD00	Float	%, x100
33172	RO	Ua / Uab IHD01[1)]	Float	%, x100
33174	RO	Ub / Ubc IHD01[1)]	Float	%, x100
33176	RO	Uc / Uca IHD01[1)]	Float	%, x100
33178	RO	U4 IHD01	Float	%, x100
33180	RO	Ia IHD01	Float	%, x100
33182	RO	Ib IHD01	Float	%, x100
33184	RO	Ic IHD01	Float	%, x100
33186	RO	I4 IHD01	Float	%, x100
33188	RO	I5 IHD01	Float	%, x100
…	…	….	…	
34288	RO	Ua / Uab IHD63[1)]	Float	%, x100
34290	RO	Ub / Ubc IHD63[1)]	Float	%, x100
34292	RO	Uc / Uca IHD63[1)]	Float	%, x100
34294	RO	U4 IHD63	Float	%, x100
34296	RO	Ia IHD63	Float	%, x100
34298	RO	Ib IHD63	Float	%, x100
34300	RO	Ic IHD63	Float	%, x100
34302	RO	I4 IHD63	Float	%, x100
34304	RO	I5 IHD63	Float	%, x100

Table 5-1 Interharmonics Measurements

Note:

1) When the **Wiring Mode** is **3P3W**, the Ua/Ub/Uc TIHD, TOIHD, TEIHD and Individual IHDs mean Uab/Ubc/Uca TIHD, TOIHD, TEIHD and Individual IHDs.

5.5.8 Interharmonic RMS Measurements

Register	Property	Description	Format	Unit
34500	RO	Ua / Uab TIH RMS[1]	Float	V
34502	RO	Ub / Ubc TIH RMS[1]	Float	V
34504	RO	Uc / Uca TIH RMS[1]	Float	V
34506	RO	U4 TIH RMS	Float	V
34508	RO	Ia TIH RMS	Float	A
34510	RO	Ib TIH RMS	Float	A
34512	RO	Ic TIH RMS	Float	A
34514	RO	I4 TIH RMS	Float	A
34516	RO	I5 TIH RMS	Float	A
34518	RO	Ua / Uab TOIH RMS[1]	Float	V
34520	RO	Ub / Ubc TOIH RMS[1]	Float	V
34522	RO	Uc / Uca TOIH RMS[1]	Float	V
34524	RO	U4 TOIH RMS	Float	V
34526	RO	Ia TOIH RMS	Float	A
34528	RO	Ib TOIH RMS	Float	A
34530	RO	Ic TOIH RMS	Float	A
34532	RO	I4 TOIH RMS	Float	A
34534	RO	I5 TOIH RMS	Float	A
35436	RO	Ua / Uab TEIH RMS[1]	Float	V
34538	RO	Ub / Ubc TEIH RMS[1]	Float	V
34540	RO	Uc / Uca TEIH RMS[1]	Float	V
34542	RO	U4 TEIH RMS	Float	V
34544	RO	Ia TEIH RMS	Float	A
34546	RO	Ib TEIH RMS	Float	A
34548	RO	Ic TEIH RMS	Float	A
34550	RO	I4 TEIH RMS	Float	A
34552	RO	I5 TEIH RMS	Float	A
34554	RO	Ua / Uab IH00 RMS[1]	Float	V
34556	RO	Ub / Ubc IH00 RMS[1]	Float	V
34558	RO	Uc / Uca IH00 RMS[1]	Float	V
34560	RO	U4 IH00 RMS	Float	V
34562	RO	Ia IH00 RMS	Float	A
34564	RO	Ib IH00 RMS	Float	A
34566	RO	Ic IH00 RMS	Float	A
34568	RO	I4 IH00 RMS	Float	A
34570	RO	I5 IH00 RMS	Float	A
34572	RO	Ua / Uab IH01 RMS[1]	Float	V
34574	RO	Ub / Ubc IH01 RMS[1]	Float	V
34576	RO	Uc / Uca IH01 RMS[1]	Float	V
34578	RO	U4 IH01 RMS	Float	V
34580	RO	Ia IH01 RMS	Float	A
34582	RO	Ib IH01 RMS	Float	A
34584	RO	Ic IH01 RMS	Float	A
34586	RO	I4 IH01 RMS	Float	A
34588	RO	I5 IH01 RMS	Float	A
...	RO	...	Float	
35688	RO	Ua / Uab IH63 RMS[1]	Float	V
35690	RO	Ub / Ubc IH63 RMS[1]	Float	V
35692	RO	Uc / Uca IH63 RMS[1]	Float	V
35694	RO	U4 IH63 RMS	Float	V
35696	RO	Ia IH63 RMS	Float	A
35698	RO	Ib IH63 RMS	Float	A
35700	RO	Ic IH63 RMS	Float	A
35702	RO	I4 IH63 RMS	Float	A
35704	RO	I5 IH63 RMS	Float	A

Table 5-1 Interharmonics Voltage & Current RMS

Note:

1. When the **Wiring Mode** is **3P3W**, the TIH/TOIH/TEIH RMS and Individual IH RMSs for Ua/Ub/Uc mean TIH/TOIH/TEIH RMS and Individual IH RMSs for Uab/Ubc/Uca.

5.6 Conducted Emissions in the 2-150kHz Range

Register	Property	Description	Format	Unit
6200	RO	Timestamp-sec	Float	
6202	RO	Timestamp-ms	Float	
6204	RO	Ua 2.1kHz Aptitude	Float	

6206	RO	Ub 2.1kHz Aptitude	Float	
6208	RO	Uc 2.1kHz Aptitude	Float	
6210	RO	Ua 2.3kHz Aptitude	Float	
6212	RO	Ub 2.3kHz Aptitude	Float	
6214	RO	Uc 2.3kHz Aptitude	Float	
6216	RO	Ua 2.5kHz Aptitude	Float	
6218	RO	Ub 2.5kHz Aptitude	Float	
6220	RO	Uc 2.5kHz Aptitude	Float	
…	RO	…	Float	
6408	RO	Ua 8.9kHz Aptitude	Float	
6410	RO	Ub 8.9kHz Aptitude	Float	
6412	RO	Uc 8.9kHz Aptitude	Float	
6414	RO	Ua 10kHz Aptitude	Float	
6416	RO	Ub 10kHz Aptitude	Float	
6418	RO	Uc 10kHz Aptitude	Float	
6420	RO	Ua 12kHz Aptitude	Float	
6422	RO	Ub 12kHz Aptitude	Float	
6424	RO	Uc 12kHz Aptitude	Float	
6426	RO	Ua 14kHz Aptitude	Float	
6428	RO	Ub 14kHz Aptitude	Float	
6430	RO	Uc 14kHz Aptitude	Float	
…	RO	…	Float	
6834	RO	Ua 150kHz Aptitude	Float	
6836	RO	Ub 150kHz Aptitude	Float	
6838	RO	Uc 150kHz Aptitude	Float	

Table 5-1 Conducted Emissions in the 2-150kHz Range

5.7 Demand

5.7.1 Present Demand

Register	Property	Description	Format	Unit
3600	RO	Ua[1]	Float	V
3602	RO	Ub[1]	Float	V
3604	RO	Uc[1]	Float	V
3606	RO	ULN Avg	Float	V
3608	RO	U4	Float	V
3610	RO	Uab	Float	V
3612	RO	Ubc	Float	V
3614	RO	Uca	Float	V
3616	RO	ULL Avg.	Float	V
3618	RO	Ia	Float	A
3620	RO	Ib	Float	A
3622	RO	Ic	Float	A
3624	RO	I Avg.	Float	A
3626	RO	I4	Float	A
3628	RO	I5	Float	A
3630	RO	kWa Imp.[1]	Float	W
3632	RO	kWb Imp.[1]	Float	W
3634	RO	kWc Imp.[1]	Float	W
3636	RO	kW Total Imp.	Float	W
3638	RO	kWa Exp.[1]	Float	
3640	RO	kWb Exp.[1]	Float	
3642	RO	kWc Exp.[1]	Float	
3644	RO	kW Total Exp.	Float	
3646	RO	kvara Imp.[1]	Float	var
3648	RO	kvarb Imp.[1]	Float	var
3640	RO	kvarc Imp.[1]	Float	var
3652	RO	kvar Total Imp.	Float	var
3654	RO	kvara Exp.[1]	Float	var
3656	RO	kvarb Exp.[1]	Float	var
3658	RO	kvarc Exp.[1]	Float	var
3660	RO	kvar Total Exp.	Float	var
3662	RO	kVAa[1]	Float	VA
3664	RO	kVAb[1]	Float	VA
3666	RO	kVAc[1]	Float	VA
3668	RO	kVA Total	Float	VA
3670	RO	PFa[1]	Float	--

3672	RO	PFb[1]	Float	--
3674	RO	PFc[1]	Float	--
3676	RO	PF Total	Float	--
3678	RO	Frequency	Float	Hz
3680	RO	Ua Deviation[1]	Float	100%
3682	RO	Ub Deviation[1]	Float	100%
3684	RO	Uc Deviation[1]	Float	100%
3686	RO	Uab Deviation	Float	100%
3688	RO	Ubc Deviation	Float	100%
3690	RO	Uca Deviation	Float	100%
3692	RO	Ua Over Deviation[1]	Float	100%
3694	RO	Ub Over Deviation[1]	Float	100%
3696	RO	Uc Over Deviation[1]	Float	100%
3698	RO	Uab Over Deviation	Float	100%
3700	RO	Ubc Over Deviation	Float	100%
3702	RO	Uca Over Deviation	Float	100%
3704	RO	Ua Under Deviation[1]	Float	100%
3706	RO	Ub Under Deviation[1]	Float	100%
3708	RO	Uc Under Deviation[1]	Float	100%
3710	RO	Uab Under Deviation	Float	100%
3712	RO	Ubc Under Deviation	Float	100%
3714	RO	Uca Under Deviation	Float	100%
3716	RO	Frequency Deviation	Float	100%
3718	RO	U0 Unbal.	Float	
3720	RO	U2 Unbal.	Float	
3722	RO	I0 Unbal.	Float	
3724	RO	I2 Unbal.	Float	
3726	RO	Ia K-Factor	Float	
3728	RO	Ib K-Factor	Float	
3730	RO	Ic K-Factor	Float	
3732	RO	I4 K-Factor	Float	
3734	RO	I5 K-Factor	Float	
3736	RO	Ua / Uab THD[2)]	Float	
3738	RO	Ub / Ubc THD[2)]	Float	
3740	RO	Uc / Uca THD[2)]	Float	
3742	RO	U4 THD	Float	
3744	RO	Ia THD	Float	
3746	RO	Ib THD	Float	
3748	RO	Ic THD	Float	
3750	RO	I4 THD	Float	
3752	RO	I5 THD	Float	
3754	RO	Ua / Uab TOHD[2)]	Float	
3756	RO	Ub / Ubc TOHD[2)]	Float	
3758	RO	Uc / Uca TOHD[2)]	Float	
3760	RO	U4 TOHD	Float	
3762	RO	Ia TOHD	Float	
3764	RO	Ib TOHD	Float	
3766	RO	Ic TOHD	Float	
3768	RO	I4 TOHD	Float	
3770	RO	I5 TOHD	Float	
3772	RO	Ua / Uab TEHD[2)]	Float	
3774	RO	Ub / Ubc TEHD[2)]	Float	
3776	RO	Uc / Uca TEHD[2)]	Float	
3778	RO	U4 TEHD	Float	
3780	RO	Ia TEHD	Float	
3782	RO	Ib TEHD	Float	
3784	RO	Ic TEHD	Float	
3786	RO	I4 TEHD	Float	
3788	RO	I5 TEHD	Float	
3790	RO	Ia H01	Float	A
3792	RO	Ib H01	Float	A
3794	RO	Ic H01	Float	A
3796	RO	I4 H01	Float	A
3798	RO	I5 H01	Float	A
3800~3806		Reserved		

Table 5-1 Present Demand

Notes:

1) When the **Wiring Mode** is **3P3W**, the Present Demands for Ua/Ub/Uc, ULN Average, kW Import/Export, kvar Import/Export, kVA, PF, Voltage Deviation, have no meaning and their registers are reserved.
2) When the **Wiring Mode** is **3P3W**, the Present Demands for Ua/Ub/Uc THD, TOHD and TEHD mean the Demands for Uab/Ubc/Uca THD, TOHD and TEHD.

5.7.2 5.7.2 Predicted Demand

Register	Property	Description	Format	Unit
3900	RO	Ua[1]	Float	V
3902	RO	Ub[1]	Float	V
3904	RO	Uc[1]	Float	V
3906	RO	ULN Avg.	Float	V
3908	RO	U4	Float	V
3910	RO	Uab	Float	V
3912	RO	Ubc	Float	V
3914	RO	Uca	Float	V
3916	RO	ULL Avg.	Float	V
3918	RO	Ia	Float	A
3920	RO	Ib	Float	A
3922	RO	Ic	Float	A
3924	RO	I Avg.	Float	A
3926	RO	I4	Float	A
3928	RO	I5	Float	A
3930	RO	kWa Imp.[1]	Float	W
3932	RO	kWb Imp.[1]	Float	W
3934	RO	kWc Imp.[1]	Float	W
3936	RO	kW Total Imp.	Float	W
3938	RO	kWa Exp.[1]	Float	W
3940	RO	kWb Exp.[1]	Float	W
3942	RO	kWc Exp.[1]	Float	W
3944	RO	kW Total Exp.	Float	W
3946	RO	kvara Imp.[1]	Float	var
3948	RO	kvarb Imp.[1]	Float	var
3940	RO	kvarc Imp.[1]	Float	var
3952	RO	kvar Total Imp.	Float	var
3954	RO	kvara Exp.[1]	Float	var
3956	RO	kvarb Exp.[1]	Float	var
3958	RO	kvarc Exp.[1]	Float	var
3960	RO	kvar Total Exp.	Float	var
3962	RO	kVAa[1]	Float	VA
3964	RO	kVAb[1]	Float	VA
3966	RO	kVAc[1]	Float	VA
3968	RO	kVA Total	Float	VA
3970	RO	PFa[1]	Float	-
3972	RO	PFb[1]	Float	-
3974	RO	PFc[1]	Float	-
3976	RO	PF Total	Float	-
3978	RO	Frequency	Float	Hz

Table 5-1 Predicted Demand

Notes:

1) When the **Wiring Mode** is **3P3W**, the Predicted Demands for Ua/Ub/Uc, ULN Average, kW Import/Export, kvar Import/Export, kVA and PF, have no meaning and their registers are reserved.

5.7.3 Max. Value per Demand Period

Register	Property	Description	Format	Unit
4100	RO	Ua[1]	See Note 3)	V
4106	RO	Ub[1]		
4112	RO	Uc[1]		
4118	RO	ULN avg[1]		
4124	RO	U4		
4130	RO	Uab		
4136	RO	Ubc		
4142	RO	Uca		
4148	RO	ULL avg		
4154	RO	Ia		A
4160	RO	Ib		

4166	RO	Ic		
4172	RO	I avg		
4178	RO	I4		
4184	RO	I5		
4190	RO	kWa Imp.[1]		W
4196	RO	kWb Imp.[1]		
4202	RO	kWc Imp.[1]		
4208	RO	kW Imp. Total		
4214	RO	kWa Exp.[1]		W
4220	RO	kWb Exp.[1]		
4226	RO	kWc Exp.[1]		
4232	RO	kW Exp. Total		
4238	RO	kvara Imp.[1]		var
4244	RO	kvarb Imp.[1]		
4250	RO	kvarc Imp.[1]		
4256	RO	kvar Imp. Total		
4262	RO	kvara Exp.[1]		
4268	RO	kvarb Exp.[1]		
4274	RO	kvarc Exp.[1]		
4280	RO	kvar Exp. Total		
4286	RO	kVAa[1]		VA
4292	RO	kVAb[1]		
4298	RO	kVAc[1]		
4304	RO	kVA Total		
4310	RO	PFa[1]		
4316	RO	PFb[1]		
4322	RO	PFc[1]		
4328	RO	PF Total		
4334	RO	Frequency		Hz
4340	RO	Ua Deviation[1]		100%
4346	RO	Ub Deviation[1]		
4352	RO	Uc Deviation[1]		
4358	RO	Uab Deviation		
4364	RO	Ubc Deviation		
4370	RO	Uca Deviation		
4376	RO	Ua Over Deviation[1]		
4382	RO	Ub Over Deviation[1]		
4388	RO	Uc Over Deviation[1]		
4394	RO	Uab Over Deviation		
4400	RO	Ubc Over Deviation		
4406	RO	Uca Over Deviation		
4412	RO	Ua Under Deviation[1]		
4418	RO	Ub Under Deviation[1]		
4424	RO	Uc Under Deviation[1]		
4430	RO	Uab Under Deviation		
4436	RO	Ubc Under Deviation		
4442	RO	Uca Under Deviation		
4448	RO	Frequency Deviation		
4454	RO	U0 Unbalance		
4460	RO	U2 Unbalance		
4466	RO	I0 Unbalance		
4472	RO	I2 Unbalance		
4478	RO	Ia K Factor		
4484	RO	Ib K Factor		
4490	RO	Ic K Factor		
4496	RO	I4 K Factor		
4502	RO	I5 K Factor		
4508	RO	Ua / Uab THD[2]		
4514	RO	Ub / Ubc THD[2]		
4520	RO	Uc / Uca THD[2]		
4526	RO	U4 THD		
4532	RO	Ia THD		
4538	RO	Ib THD		
4544	RO	Ic THD		
4550	RO	I4 THD		
4556	RO	I5 THD		
4562	RO	Ua /Uab TOHD[2]		

4568	RO	Ub / Ubc TOHD[2]		
4574	RO	Uc / Uca TOHD[2]		
4580	RO	U4 TOHD		
4586	RO	Ia TOHD		
4592	RO	Ib TOHD		
4598	RO	Ic TOHD		
4604	RO	I4 TOHD		
4610	RO	I5 TOHD		
4616	RO	Ua /Uab TEHD[2]		
4622	RO	Ub / Ubc TEHD[2]		
4628	RO	Uc / Uca TEHD[2]		
4634	RO	U4 TEHD		
4640	RO	Ia TEHD		
4646	RO	Ib TEHD		
4652	RO	Ic TEHD		
4658	RO	I4 TEHD		
4664	RO	I5 TEHD		
4670	RO	Ia H01		A
4676	RO	Ib H01		A
4682	RO	Ic H01		A
4688	RO	I4 H01		A
4694	RO	I5 H01		A
4700~4718	RO	Reserved		

Table 5-1 Max. Value per Demand Period

Notes:

1) When the **Wiring Mode** is **3P3W**, the Max. Value per Demands for Ua/Ub/Uc, ULN Average, kW Import/Export, kvar Import/Export, kVA, PF, Voltage Deviation, have no meaning and their registers are reserved.
2) When the **Wiring Mode** is **3P3W**, the Max. Value per Demands for Ua/Ub/Uc THD, TOHD and TEHD mean the Demands for Uab/Ubc/Uca THD, TOHD and TEHD.
3) The following table illustrates Demand Data Structure:

Offset		Description
+0	High	Year (-2000)
	Low	Month
+1	High	Day
	Low	Hour
+2	High	Minute
	Low	Second
+3	-	Reserved
+4 ~ +5	-	Record Value

Table 5-2 Demand Data Structure

5.7.4 Min. Value per Demand Period

Register	Property	Description	Format	Unit
4800	RO	Ua[1]	See Note 3)	V
4806	RO	Ub[1]		
4812	RO	Uc[1]		
4818	RO	ULN avg[1]		
4824	RO	U4		
4830	RO	Uab		
4836	RO	Ubc		
4842	RO	Uca		
4848	RO	ULL avg		
4854	RO	Ia		A
4860	RO	Ib		
4866	RO	Ic		
4872	RO	I avg		
4878	RO	I4		
4884	RO	I5		
4890	RO	kWa Imp.[1]		W
4896	RO	kWb Imp.[1]		
4902	RO	kWc Imp.[1]		
4908	RO	kW Imp. Total		
4914	RO	kWa Exp.[1]		W
4920	RO	kWb Exp.[1]		
4926	RO	kWc Exp.[1]		
4932	RO	kW Exp. Total		

4938	RO	kvara Imp.[1]		var
4944	RO	kvarb Imp.[1]		
4950	RO	kvarc Imp.[1]		
4956	RO	kvar Imp. Total		
4962	RO	kvara Exp.[1]		
4968	RO	kvarb Exp.[1]		
4974	RO	kvarc Exp.[1]		
4980	RO	kvar Exp. Total		
4986	RO	kVAa[1]		VA
4992	RO	kVAb[1]		
4298	RO	kVAc[1]		
5004	RO	kVA Total		
5010	RO	PFa[1]		
5016	RO	PFb[1]		
5022	RO	PFc[1]		
5028	RO	PF Total		
5034	RO	Freq.		Hz
5040	RO	Ua Deviation[1]		100%
5046	RO	Ub Deviation[1]		
5052	RO	Uc Deviation[1]		
5058	RO	Uab Deviation		
5064	RO	Ubc Deviation		
5070	RO	Uca Deviation		
5076	RO	Ua Over Deviation[1]		
5082	RO	Ub Over Deviation[1]		
5088	RO	Uc Over Deviation[1]		
5094	RO	Uab Over Deviation		
5100	RO	Ubc Over Deviation		
5106	RO	Uca Over Deviation		
5112	RO	Ua Under Deviation[1]		
5118	RO	Ub Under Deviation[1]		
5124	RO	Uc Under Deviation[1]		
5130	RO	Uab Under Deviation		
5136	RO	Ubc Under Deviation		
5142	RO	Uca Under Deviation		
5148	RO	Freq. Deviation		
5154	RO	U0 Unbalance		
5160	RO	U2 Unbalance		
5166	RO	I0 Unbalance		
5172	RO	I2 Unbalance		
5178	RO	Ia K-Factor		
5184	RO	Ib K-Factor		
5190	RO	Ic K-Factor		
5196	RO	I4 K-Factor		
5202	RO	I5 K-Factor		
5208	RO	Ua / Uab THD[2]		
5214	RO	Ub / Ubc THD[2]		
5220	RO	Uc / Uca THD[2]		
5226	RO	U4 THD		
5232	RO	Ia THD		
5238	RO	Ib THD		
5244	RO	Ic THD		
5250	RO	I4 THD		
5256	RO	I5 THD		
5262	RO	Ua /Uab TOHD[2]		
5268	RO	Ub / Ubc TOHD[2]		
5274	RO	Uc / Uca TOHD[2]		
5280	RO	U4 TOHD		
5286	RO	Ia TOHD		
5292	RO	Ib TOHD		
5298	RO	Ic TOHD		
5304	RO	I4 TOHD		
5310	RO	I5 TOHD		
5316	RO	Ua / Uab TEHD[2]		
5322	RO	Ub / Ubc TEHD[2]		
5328	RO	Uc / Uca TEHD[2]		
5334	RO	U4 TEHD		

5340	RO	Ia TEHD		
5346	RO	Ib TEHD		
5352	RO	Ic TEHD		
5358	RO	I4 TEHD		
5364	RO	I5 TEHD		
5370	RO	Ia H01		A
5376	RO	Ib H01		A
5382	RO	Ic H01		A
5388	RO	I4 H01		A
5394	RO	I5 H01		A
5400	RO	AI1		
5406	RO	AI2		
5412	RO	AI3 (will confirm with the R&D)		
5418	RO	AI4		

Table 5-1 Min. Value per Demand Period

Notes:

1) When the **Wiring Mode** is **3P3W**, the Min. Value per Demands for Ua/Ub/Uc, ULN Average, kW Import/Export, kvar Import/Export, kVA, PF, Voltage Deviation, have no meaning and their registers are reserved.
2) When the **Wiring Mode** is **3P3W**, the Min. Value per Demands for Ua/Ub/Uc THD, TOHD and TEHD mean the Demands for Uab/Ubc/Uca THD, TOHD and TEHD.
3) The following table illustrates Demand Data Structure:

Offset		Description
+0	High	Year (-2000)
	Low	Month
+1	High	Day
	Low	Hour
+2	High	Minute
	Low	Second
+3	-	Reserved
+4 ~ +5	-	Record Value

Table 5-2 Demand Data Structure

5.7.5 This/Last Max. Demand Log

Register		Property	Description	Format	Unit
This Max.	Last Max.				
5500	5700	RO	kW Imp. Total	**See Table 5-34**	W
5506	5706	RO	kW Exp. Total		W
5512	5712	RO	kvar Imp. Total		var
5518	5718	RO	kvar Exp. Total		var
5524	5724	RO	kVA Total		VA
5530	5730	RO	Ia		A
5536	5736	RO	Ib		A
5542	5742	RO	Ic		A
5548	5748	RO	Ia H01		A
5554	5754	RO	Ib H01		A
5560	5760	RO	Ic H01		A
5566	5766	RO	I4 H01		A
5572	5772	RO	I5 H01		A

Table 5-1 Present Max. Demand

Notes:

1) The following table illustrates Demand Data Structure:

Offset		Description
+0	High	Year (-2000)
	Low	Month
+1	High	Day
	Low	Hour
+2	High	Minute
	Low	Second
+3	-	Reserved
+4~+5	-	Record Value

Table 5-2 Demand Data Structure

5.8 Real-time IER & AER

Register		Property	Description	Format	Unit
IER	AER				
6000	6100	RO	kWh Imp.	INT64	wh
6004	6104	RO	kWh Exp.	INT64	wh
6008	6108	RO	kWh Total	INT64	wh
6012	6112	RO	kvarh Imp.	INT64	varh
6016	6116	RO	kvarh Exp.	INT64	varh
6020	6120	RO	kvarh Total	INT64	varh
6024	6124	RO	kVAh	INT64	VAh
6028	6128	RO	kWh Imp. Fund.	INT64	wh
6032	6132	RO	kWh Exp. Fund.	INT64	wh
6036	6136	RO	kvarh Imp. Fund.	INT64	varh
6040	6140	RO	kvarh Exp. Fund.	INT64	varh
6044	6144	RO	kWh Imp. TH	INT64	wh
6048	6148	RO	kWh Exp. TH	INT64	wh
6052	6152	RO	kvarh Imp. TH	INT64	varh
6056	6156	RO	kvarh Exp. TH	INT64	varh
6060	6160	RO	kWh Net	INT64	wh
6064	6164	RO	kvarh Net	INT64	varh

Table 5-1 Real-time IER & AER Measurements

5.9 Data Logging

5.9.1 SOE Log Buffer

The iMeter 8 can store up to 1024 entries SOE Logs. Writing N to the **SOE Log Index** register will update the #N to #N+9 SOE Log Buffer with SOE Log Events. For example, if the **SOE Log Pointer (Register 0137)** = 2000, writing 1991 to register 10000 will update the log buffer with the latest 9 logs and writing 977 will load the oldest 9 logs.

Register	Property	Description	Format
10000	RW	SOE Log Pointer N*	UINT32
10002~10037	RO	Event #N	See **Table 5-37 SOE Log Data Structure**
10038~10073	RO	Event #N+1	
…		…	
10326~10361	RO	Event #N+9	

Table 5-1 SOE Log Buffer

Offset	Property	Description	Format	Unit
+0	RO	High-order Byte: Event Classification	UINT16	-
	RO	Low-order Byte: Sub-Classification		
+1	RO	Record Time: Year	UINT16	0-99 (Year-2000)
	RO	Record Time: Month		1 to 12
+2	RO	Record Time: Day	]UINT16	1 to 31
	RO	Record Time: Hour		0 to 23
+3	RO	Record Time: Minute	UINT16	0 to 59
	RO	Record Time: Second		0 to 59
+4	RO	Record Time: Millisecond	UINT16	0 to 999
+5	RO	Reserved		
+6 to +35	RO	Event Values	See **Appendix D**	-

Table 5-2 SOE Log Data Structure

5.9.2 PQ Log Buffer

The iMeter 8 can store up to 1024 entries PQ Logs. Writing N to the **PQ Log Index** register will update the #N to #N+9 PQ Log Buffer with PQ Log Events. For example, if the **PQ Log Pointer (Register 0139)** = 2000, writing 1991 to register 10500 will update the log buffer with the latest 9 logs and writing 977 will load the oldest 9 logs.

Register	Property	Description	Format
10500	RW	PQ log Pointer N*	UINT32
10502~10537	RO	Event #N	See **Table 5-39 PQ Log Data Structure**
10538~10573	RO	Event #N+1	
…		…	
10826~10861	RO	Event #N+9	

Table 5-1 PQ Log Buffer

Offset	Property	Description	Format	Unit
+0	RO	High-order Byte: Event Classification	UINT16	-
	RO	Low-order Byte: Sub-Classification		
+1	RO	Record Time: Year	UINT16	0-99 (Year-2000)
	RO	Record Time: Month		1 to 12
+2	RO	Record Time: Day	UINT16	1 to 31
	RO	Record Time: Hour		0 to 23
+3	RO	Record Time: Minute	UINT16	0 to 59
	RO	Record Time: Second		0 to 59
+4	RO	Record Time: Millisecond	UINT16	0 to 999
+5	RO	Reserved		
+6 to +35	RO	Event Values	See **Appendix D**	-

Table 5-2 PQ Log Data Structure

5.9.3 SDR Log

5.9.3.1 SDR Log Buffer

Register	Property	Description	Format
11000~11518	RO	SDR Log #1 Buffer	See **Section 5.9.3.2 SDR Log Buffer Structure**
11600~12118	RO	SDR Log #2 Buffer	
12200~12718	RO	SDR Log #3 Buffer	
12800~13318	RO	SDR Log #4 Buffer	
13400~13918	RO	SDR Log #5 Buffer	
14000~14518	RO	SDR Log #6 Buffer	
14600~15118	RO	SDR Log #7 Buffer	
15200~15718	RO	SDR Log #8 Buffer	
15800~16318	RO	SDR Log # 9 Buffer	
16400~16918	RO	SDR Log #10 Buffer	
17000~17518	RO	SDR Log #11 Buffer	
17600~18118	RO	SDR Log #12 Buffer	
18200~18718	RO	SDR Log #13 Buffer	
18800~19318	RO	SDR Log #14 Buffer	
19400~19918	RO	SDR Log #15 Buffer	
20000~20518	RO	SDR Log #16 Buffer	

Table 5-1 SDR Log Buffer

5.9.3.2 SDR Log Buffer Structure

The iMeter 8 provides 16 groups of SDR with each recording depth of 43200. Writing N to the **SDR Log #X Index** register will update the #N to #N+63 Data Item of SDR #X Log Buffer. For example, if the **SDR Log #1 Pointer (Register 0159)** =50000 (providing the recording mode = First-In-First-Out), writing 49938 to register 11000 will load the latest 63 Data Items and writing 6800 will load the oldest 63 Data Item to the SDR #1 Log Buffer.

Offset	Property	Description	Format	Note
+0	RW	SDR Log # X Index N (1≤X≤16)	UINT32	-
+2~+4	RO	Record Time[2]	Bitmap	-
+5	RO	Flagging Data Status	UINT16	0 = No Flag 1 = Flagged & Removed 2 = Flagged & Kept
+6~+13	RO	Data Item #N	See **Section 5.9.3.3 SDR Data Item Structure**	-
+14~+22	RO	Data Item #N+1		
…		…		
+510~+517	RO	Data Item #N+63		

Table 5-1 SDR Log Buffer Structure

Notes:

1) The data items can be configured as any real-time data. Please see **Appendix A**.
2) Record Time data structure

Offset	Property	Description	Format	Unit
+0	RO	Year	UINT16	0-99 (Year-2000)
	RO	Month		1 to 12
+1	RO	Day	UINT16	1 to 31
	RO	Hour		0 to 23
+2	RO	Minute	UINT16	0 to 59
	RO	Second		0 to 59

Table 5-2 Record Time Data Structure

5.9.3.3 SDR Data Item Structure

Offset	Property	Description	Format
+0	RO	Maximum	Float
+2	RO	Minimum	Float
+4	RO	Average	Float
+6	RO	CP95	Float

Table 5-1 SDR Data Item Structure

5.9.4 DR (Data Recorder) Log

5.9.4.1 Standard DR Log Buffer

The iMeter 8 provides 8 groups of DR with each recording depth of 43200. Writing N to the **DR #X Log Index** register will update the #N to #N+31 Data Item of DR #X Log Buffer. For example, if the **DR #1 Log Pointer (Register 0207)** =50000 (providing the recording mode = First-In-First-Out), writing 49938 to register 11000 will load the latest 63 Data Items and writing 6800 will load the oldest 63 Data Item to the SDR #1 Log Buffer.

Register	Property	Description	Format
20600~20671	RO	DR Log #1 Buffer	See **Section 5.9.4.2 DR Log Buffer Structure**
20700~20771	RO	DR Log #2 Buffer	
20800~20871	RO	DR Log #3 Buffer	
20900~20971	RO	DR Log #4 Buffer	
21000~21071	RO	DR Log #5 Buffer	
21100~21171	RO	DR Log #6 Buffer	
21200~21271	RO	DR Log #7 Buffer	
21300~21371	RO	DR Log #8 Buffer	

Table 5-1 DR Log Buffer

5.9.4.2 DR Log Buffer Structure

Offset	Property	Description	Format
+0	RW	DR Log #X Pointer (N)*	UINT32
+2~+4	RO	Record Time[2]	Bitmap
+5	RO	Millisecond	UINT16
+6	RO	Flagging Status[3]	UINT16
+7	RO	Data Item #N	Float
…		…	
+69	RO	Data Item #N+31	

* Writing N to the DR Log #X Pointer register will update the DR Log # X Buffer with the DR Log #X Record at pointer position N.

Table 5-1 DR Data Buffer Structure

Notes:

1) The data items can be configured as any real-time data. Please see **Appendix A**.

2) Record Time data structure

Offset	Property	Description	Format	Range
+0	RO	Year	UINT16	0-99 (Year-2000)
	RO	Month		1 to 12
+1	RO	Day	UINT16	1 to 31
	RO	Hour		0 to 23
+2	RO	Minute	UINT16	0 to 59
	RO	Second		0 to 59

Table 5-2 Record Time Data Structure

3) The following table illustrates Flagging Status:

Offset	Description		Offset	Description	
Bit0	Basic Realtime Measurement	Dip	Bit8	Pst	Dip
Bit1		Swell	Bit9		Swell
Bit2		Interruption	Bit10		Interruption
Bit3		Current	Bit11		Reserved
Bit4	Freq.	Dip	Bit12	Plt	Dip
Bit5		Swell	Bit13		Swell
Bit6		Interruption	Bit14		Interruption
Bit7		Reserved	Bit15		Reserved

Table 5-3 Flagging Status

5.9.5 MM Log (Max./Min. Log)

5.9.5.1 MM Log Buffer

Register	Description	Format
22200-22306	Max. #1 Log Buffer	See **Section 5.9.5.2 MM Log Buffer Structure**
22350~22456	Max. #2 Log Buffer	
22500~22606	Max. #3 Log Buffer	
22650~22756	Max. #4 Log Buffer	
22800~22906	Min. #1 Log Buffer	
22950~23056	Min. #2 Log Buffer	
23100~23206	Min. #3 Log Buffer	
23250~23356	Min. #4 Log Buffer	

Table 5-1 MM Log Buffer

5.9.5.2 MM Log Buffer Structure

Offset	Property	Description	Format	Range/Options
+0	RW	Max./Min. #X Log Index N	UINT32	0 = Since Last Reset/This Month 1 = Before Last Reset/Last Month
+2	RO	Recording Time[2]	Bitmap	
+5	RO	Flagging Data Status	UINT16	0 = No Flag 1 = Flagged & Removed, 2 = Flagged & Kept
+6~+10	RO	Data Item #1	Bitmap	See **Table 5-51 MM Data Structure**
+11~+15	RO	Data Item #2		
…	RO	…		
+101~+105	RO	Data Item #20		

Table 5-1 Max./Min. Log Data Structure

Notes:

1. The data items can be configured as any real-time data. Please see **Section 5.11.18**.
2. Please refer to Table 5-50 for the Recording Time data structure. Please note that the Recording Time means the Start Time of a Max. Recorder while the End Time of a Min. Recorder.

Offset	Property	Description	Format	Unit
+0	RO	Year	UINT16	0-99 (Year-2000)
	RO	Month		1 to 12
+1	RO	Day	UINT16	1 to 31
	RO	Hour		0 to 23
+2	RO	Minute	UINT16	0 to 59
	RO	Second		0 to 59

Table 5-2 Time Structure

3. The following table illustrates the data structure of the MM Log.

Offset	Property	Description		
+0	RO	Timestamp	Hi	Year (-2000)
			Low	Month
+1	RO		Hi	Day
			Low	Hour
+2	RO		Hi	Minute
			Low	Second
+3~+4	RO	Max. or Min. Value (Float)		

Table 5-3 MM Data Structure

5.9.6 Pst/Plt Log

5.9.6.1 Pst Log Buffer

The iMeter 8 can store up to 56520 Pst Log based on a First-In-First-Out principle. Writing N to **Pst Log Index** register will update the #N to #N+9 log of the Log Buffer. For example, if the **Pst Log Pointer (Register 0239)** = 60000, writing 59990 to register 23400 will load the latest 9 log buffers and writing 3480 will load the oldest 9 log buffers.

Register	Property	Description	Format
23400	RW	Pst Log Index (N)	UINT32
23402~23411	RO	Log N	See **Section 5.9.6.3 Pst / Plt Log Data Structure**
23412~23421	RO	Log N+1	
…		…	
23492~23501	RO	Log N+9	

Table 5-1 Pst Log Buffer

5.9.6.2 Plt Log Buffer

The iMeter 8 can store up to 4380 Plt Log based on a First-In-First-Out principle. Writing N to Plt Log Index register will update the #N to #N+9 log of the Log Buffer. For example, if the Plt Log Pointer (Register 0241) = 5000, writing 4990 to register 23600 will load the latest 9 log buffers and writing 620 will load the oldest 9 log buffers.

Register	Property	Description	Format
23600	RW	Plt Log Index (N)	UINT32
23602~23611	RO	Log N	See **Section 5.9.6.3 Pst / Plt Log Data Structure**
23612~23621	RO	Log N+1	
…		…	
23692~23701	RO	Log N+9	

Table 5-1 Plt Log

5.9.6.3 Pst/Plt Log Data Structure

Offset	Property	Description		Format	Note/Unit
+0	RO	Record Time	High-Year (-2000)	Bitmap	
			Low- Month		
+1	RO		High- Day		
			Low- Hour		
+2	RO		High- Minute		
			Low- Second		
+3	RO	Flagging Status[1]		UINT16	
+4~+5	RO	Ua Pst/Plt		Float	V
+6~+7	RO	Ub Pst/Plt		Float	V
+8~+9	RO	Uc Pst/Plt		Float	V

Table 5-1 Pst/Plt Log Data Structure

Notes:

1) The Flagging Status register indicates if this Pst/Plt log is flagged because of Dip (Bit0), Swell (Bit1) or Interruption (Bit2), with a bit value of "1" meaning Flagged while "0" meaning not flagged.

5.9.7 IER & AER Log

The iMeter 8 can store up to 65535 IER and AER Logs independently. Writing N to the **IER / AER Log Index** will update the #N to #N+1 Log Buffer. For example, if the **IER Log Pointer (Register 0245)** = 65530, writing 65529 to register 23800 to update the log buffer with the latest 2 logs and writing 1 to load the oldest 2 logs.

5.9.7.1 IER / AER Log

Register		Property	Description	Format
IER	AER			
23800	24000	RW	IER / AER Log Index N	UINT32
23802~23875	24002~24075	RO	Log #N	See **Table 5-56**
23876~23949	24076~24149	RO	Log #N+1	
23950	24150	RO	Reserved	

Table 5-1 IER/AER Log Buffer

5.9.7.2 IER & AER Log Data Structure

Offset	Property	Description	Format	Note
+0~+2	RO	Start Time[1]	UINT32	
+3~+5	RO	End Time	UINT32	
+6~+9	RO	kWh Imp.	Int64	
+10~+13	RO	kWh Exp.	Int64	
+14~+17	RO	kWh Total	Int64	
+18~+21	RO	kvarh Imp.	Int64	
+22~+25	RO	kvarh Exp.	Int64	
+26~+29	RO	kvarh Total	Int64	
+30~+33	RO	kVAh Total	Int64	
+34~+37	RO	kWh Imp. Fund.	Int64	
+38~+41	RO	kWh Exp. Fund.	Int64	
+42~+45	RO	kvarh Imp. Fund.	Int64	
+46~+49	RO	kvarh Exp. Fund.	Int64	
+50~+53	RO	kWh Imp. TH	Int64	
+54~+57	RO	kWh Exp. TH	Int64	
+58~+61	RO	kvarh Imp. TH	Int64	

+62~+65	RO	kvarh Exp. TH	Int64	
+66~+69	RO	kWh Net	Int64	
+70~+73	RO	kvarh Net	Int64	

Table 5-1 IER & AER Log Data Structure

Note:

1. The following table illustrates the Data Structure of the Start/End Time.

Offset	Property	Description	Format	Unit
+0	RO	Year	UINT16	0-99 (Year-2000)
	RO	Month		1 to 12
+1	RO	Day	UINT16	1 to 31
	RO	Hour		0 to 23
+2	RO	Minute	UINT16	0 to 59
	RO	Second		0 to 59

Table 5-2 Time Structure

5.9.8 EN50160 Log

The iMeter 8 can store up to 52 entries EN50160 Log for a year. Retrieve the newest 52 entries EN50160 logs through writing entry number which you can get from **EN50160 Report Pointer** (Register 0247) into **EN50160 Log Index X** (Register 24200). For example, if the value for **EN50160 Report Pointer** is 100, then you can write 100 to 49 into **24200** register where 100 means the newest logs, and 49 means the oldest logs.

Register	Property	Description	Format	Note
24200	RW	EN50160 Log Index X	UINT32	
24202	RO	Start Time	Bitmap	
24205	RO	End Time	Bitmap	
24208	RO	Reserved	UINT32	
24210	RO	Freq. Evaluation Result	UINT32	0=Pass, 1=Failed
24212	RO	Freq N Valid	UINT32	Number of valid intervals
24214	RO	Freq N Invalid	UINT32	Number of invalid intervals
24216	RO	Freq Wide Limit Result	UINT32	0=Pass, 1=Failed
24218	RO	Freq N2	UINT32	Number of valid intervals in which the freq deviates from the nominal by more than user defined wide limit
24220	RO	Freq (1 - N2/N)	Float	--
24222	RO	Freq Narrow Limit Result	UINT32	0=Pass, 1=Failed
24224	RO	Freq N1	UINT32	Number of valid intervals in which the freq. deviates from the nominal by more than user defined narrow limit
24226	RO	Freq (1 - N1/N)	Float	--
24228	RO	Freq Max-op	Float	Hz, maximum mean Frequency (Freq mean-ep) over 1week
24230	RO	Freq Min-op	Float	Hz, minimum mean Frequency (Freq mean-ep) over 1week
24232	RO	U Magnitude Conclusion	UINT32	0=Pass, 1=Failed
24234	RO	U Magnitude Valid N	UINT32	Number of valid intervals
24236	RO	U Magnitude Invalid N	UINT32	Number of invalid intervals
24238	RO	U-Mag Wide Conclusion	UINT32	0=Pass, 1=Failed
24240	RO	Ua Mag N2	UINT32	Number of valid intervals in which the voltage on 3-phase deviates from nominal by more than user defined wide limit
24242	RO	Ub Mag N2	UINT32	
24244	RO	Uc Mag N2	UINT32	
24246	RO	Ua Mag (1 - N2/N)	Float	--
24248	RO	Ub Mag (1 - N2/N)	Float	--
24250	RO	Uc Mag (1 - N2/N)	Float	--
24252	RO	U Magnitude Narrow Conclusion	UINT32	0=Pass, 1=Failed
24254	RO	Ua Mag N1	UINT32	Number of valid intervals in which the voltage on 3-phase deviates from nominal by more than user defined narrow limit
24256	RO	Ub Mag N1	UINT32	
24258	RO	Uc Mag N1	UINT32	
24260	RO	Ua Mag (1 - N1/N)	Float	--
24262	RO	Ub Mag (1 - N1/N)	Float	
24264	RO	Uc Mag (1 - N1/N)	Float	--
24266	RO	Ua mean Max.	Float	Max. of average voltage Ua/Ub/Uc over 1 week
24268	RO	Ub mean Max.	Float	
24270	RO	Uc mean Max.	Float	

24272	RO	Ua mean Min.	Float	Min. of average voltage Ua/Ub/Uc over 1 week
24274	RO	Ub mean Min.	Float	
24276	RO	Uc mean Min.	Float	
24278	RO	Flicker Evaluation Conclusion	UINT32	0=Pass, 1=Failed
24280	RO	Plt N Valid	UINT32	Number of valid intervals
24282	RO	Plt N invalid	UINT32	Number of invalid intervals
24284	RO	Ua Plt N1	UINT32	Number of valid intervals in which Plt on 3-phase is greater than 1
24286	RO	Ub Plt N1	UINT32	
24288	RO	Uc Plt N1	UINT32	
24290	RO	Ua (1 - N1/N)	Float	--
24292	RO	Ub (1 - N1/N)	Float	--
24294	RO	Uc (1 - N1/N)	Float	--
24296	RO	Ua Plt Max.	Float	Maximum Plt for 3-phase over 1 week
24298	RO	Ub Plt Max.	Float	
24300	RO	Uc Plt Max.	Float	
24302	RO	Ua Plt Min.	Float	Minimum Plt for 3-phase over 1 week
24304	RO	Ub Plt Min.	Float	
24306	RO	Uc Plt Min.	Float	
24308	RO	Ua Plt CP95	Float	CP95 of Plt for 3-phase over 1 week
24300	RO	Ub Plt CP95	Float	
24312	RO	Uc Plt CP95	Float	
24314	RO	U Unbalance Conclusion	UINT32	0=Pass, 1=Failed
24316	RO	U Unbalance N valid	UINT32	Number of valid intervals
24318	RO	U Unbalance N invalid	UINT32	Number of invalid intervals
24320	RO	U Unbalance N1	UINT32	Number of valid intervals in which the voltage unbalance exceeds user defined unbalance limit value
24322	RO	U Unbalance (1 - N1/N)	Float	
24324	RO	U Unbalance Max.	Float	Maximum/Minimum/CP95 voltage unbalance value over 1 week
24326	RO	U Unbalance Min.	Float	
24328	RO	U Unbalance CP95	Float	
24330	RO	Harmonic Conclusion	UINT32	0=Pass, 1=Failed
24332	RO	Harmonic N Valid	UINT32	Number of valid intervals
24334	RO	Harmonic N Invalid	UINT32	Number of invalid intervals
24336	RO	THD Conclusion	UINT32	0=Pass, 1=Failed
24338	RO	Ua THD N1	UINT32	Number of intervals in which the THD on 3-phase exceed user defined limits
24340	RO	Ub THD N1	UINT32	
24342	RO	Uc THD N1	UINT32	
24344	RO	Ua THD (1 - N1/N)	Float	
24346	RO	Ub THD (1 - N1/N)	Float	
24348	RO	Uc THD (1 - N1/N)	Float	
24350~24376		Reserved		
24378	RO	H02 Harm Conclusion	UINT32	0=Pass, 1=Failed
24380	RO	Ua H02 N1	UINT32	Number of intervals in which the 2nd Harmonics on 3-phase exceed user defined limits
24382	RO	Ub H02 N1	UINT32	
24384	RO	Uc H02 N1	UINT32	
24386	RO	Ua H02 (1 - N1/N)	Float	
24388	RO	Ub H02 (1 - N1/N)	Float	
24400	RO	Uc H02 (1 - N1/N)	Float	
...	RO	...	UINT32	...
24700	RO	H25 Conclusion	UINT32	0=Pass, 1=Failed
24702	RO	Ua H25 N1	UINT32	Number of intervals in which the 25th Harmonics on 3-phase exceed user defined limits
24704	RO	Ub H25 N1	UINT32	
24706	RO	Uc H25 N1	UINT32	
24708	RO	Ua H25 (1 - N1/N)	Float	
24710	RO	Ub H25 (1 - N1/N)	Float	
24712	RO	Uc H25 (1 - N1/N)	Float	
24714	RO	Ua THD Max.	Float	Max. THD on 3-phase over 1 week
24716	RO	Ub THD Max.	Float	
24718	RO	Uc THD Max.	Float	
24720	RO	Ua THD Min.	Float	Min. THD on 3-phase over 1 week
24722	RO	Ub THD Min.	Float	
24724	RO	Uc THD Min.	Float	
24726	RO	Ua THD CP95	Float	CP95 average THD on 3-phase over 1 week
24728	RO	Ub THD CP95	Float	
24730	RO	Uc THD CP95	Float	
24732	RO	Ua THD Avg	Float	Average THD on 3-phase over 1 week

24734	RO	Ub THD Avg	Float	
24736	RO	Uc THD Avg	Float	
24738~24748		Reserved		
24750	RO	Ua H02 Max.	Float	Maximum 2nd harmonics on 3-phase over 1 week
24752	RO	Ub H02 Max.	Float	
24754	RO	Uc H02 Max.	Float	
24756~24886	RO	…	Float	…
24888	RO	Ua H25 Max.	Float	Maximum 25th harmonics on 3-phase over 1 week
24890	RO	Ub H25 Max.	Float	
24892	RO	Uc H25 Max.	Float	
24894~24904	--	Reserved	--	--
24906	RO	Ua H02 Min.	Float	Minimum 2nd harmonics on 3-phase over 1 week
24908	RO	Ub H02 Min.	Float	
24910	RO	Uc H02 Min.	Float	
24912~25042	RO	…	Float	…
25044	RO	Ua H25 Min.	Float	Minimum 25th harmonics on 3-phase over 1 week
25046	RO	Ub H25 Min.	Float	
25048	RO	Uc H25 Min.	Float	
25050~25060		Reserved		
25062	RO	Ua H02 CP95	Float	CP95 2nd harmonics on 3-phase over 1 week
25064	RO	Ub H02 CP95	Float	
25066	RO	Uc H02 CP95	Float	
25068~25198	RO	…	Float	…
25200	RO	Ua H25 CP95	Float	CP95 25th harmonics on 3-phase over 1 week
25202	RO	Ub H25 CP95	Float	
25204	RO	Uc H25 CP95	Float	
25206~25216		Reserved		
25218	RO	Ua H02 Avg	Float	Average 2nd harmonics on 3-phase over 1 week
25220	RO	Uc H02 Avg	Float	
25222	RO	Uc H02 Avg	Float	
25224~25354	RO	…	Float	…
25356	RO	Ua H25 Avg	Float	Average 25th harmonics on 3-phase over 1 week
25358	RO	Uc H25 Avg	Float	
25360	RO	Uc H25 Avg	Float	
25362	RO	Interharmonics N Valid	UINT32	Number of valid intervals
25364	RO	Interharmonics N Invalid	UINT32	Number of invalid intervals
25366	RO	Ua TIHD Max.	Float	Maximum TIHD on 3-phase over 1 week
25368	RO	Ub TIHD Max.	Float	
25370	RO	Uc TIHD Max.	Float	
25372	RO	Ua TIHD Min.	Float	Minimum TIHD on 3-phase over 1 week
25374	RO	Ub TIHD Min.	Float	
25376	RO	Uc TIHD Min.	Float	
25378	RO	Ua TIHD CP95	Float	CP95 of TIHD on 3-phase over 1 week
25380	RO	Ub TIHD CP95	Float	
25382	RO	Uc TIHD CP95	Float	
25384	RO	Ua TIHD Avg	Float	Average TIHD on 3-phase over 1 week
25386	RO	Ub TIHD Avg	Float	
25388	RO	Uc TIHD Avg	Float	
25390~25394		Reserved		
25396	RO	Ua IH01 Max.	Float	Maximum 1st Interharmonics on 3-phase over 1 week
25398	RO	Ub IH01 Max.	Float	
25400	RO	Uc IH01 Max.	Float	
25402~25538	RO	…	Float	…
25540	RO	Ua IH25 Max.	Float	Maximum 25th Interharmonics on 3-phase over 1 week
25542	RO	Ub IH25 Max.	Float	
25544	RO	Uc IH25 Max.	Float	
25546~25550	RO	Reserved	Float	
25552	RO	Ua IH01 Min.	Float	Minimum 1st Interharmonics on 3-phase over 1 week
25554	RO	Ub IH01 Min.	Float	
25556	RO	Uc IH01 Min.	Float	
	RO	…	Float	…
25696	RO	Ua IH25 Min.	Float	Minimum 25th Interharmonics on 3-phase over 1 week
25698	RO	Ub IH25 Min.	Float	
25700	RO	Uc IH25 Min.	Float	
25702~25706	RO	Reserved	Float	
25708	RO	Ua IH01 CP95	Float	CP95 1st Interharmonics on 3-phase over 1 week
25710	RO	Ub IH01 CP95	Float	

25712	RO	Uc IH01 CP95	Float	
	RO	…	Float	…
25852	RO	Ua IH25 CP95	Float	CP95 25th Interharmonics on 3-phase over 1 week
25854	RO	Ub IH25 CP95	Float	
25856	RO	Uc IH25 CP95	Float	
25858~25862	--	Reserved	--	--
25864	RO	Ua IH01 Avg	Float	Average 1st Interharmonics on 3-phase over 1 week
25866	RO	Ub IH01 Avg	Float	
25868	RO	Uc IH01 Avg	Float	
25870~26006	RO	…	Float	…
26008	RO	Ua IH25 Avg	Float	Average 25th Interharmonics on 3-phase over 1 week
26010	RO	Ub IH25 Avg	Float	
26012	RO	Uc IH25 Avg	Float	
26014	RO	MSV Conclusion	UINT32	0=Pass, 1=Failed
26016	RO	MSV N Valid	UINT32	Number of valid intervals
26018	RO	MSV N Invalid	UINT32	Number of invalid intervals
26020	RO	MSV1 Conclusion	UINT32	0=Pass, 1=Failed
26022	RO	Ua MSV1 N1	UINT32	# of valid intervals in which the Signalling voltage of Freq. #1 on 3-phase exceeds user-defined limit
26024	RO	Ub MSV1 N1	UINT32	
26026	RO	Uc MSV1 N1	UINT32	
26028	RO	Ua MSV1 (1 - N1/N)	Float	
26030	RO	Ub MSV1 (1 - N1/N)	Float	
26032	RO	Uc MSV1 (1 - N1/N)	Float	
26034~26046	RO	…		…
26048	RO	MSV3 Conclusion	UINT32	0=Pass, 1=Failed
26050	RO	Ua MSV3 N1	UINT32	# of valid intervals in which the Signalling voltage of Freq. #3 on 3-phase exceeds the user-defined limit
26052	RO	Ub MSV3 N1	UINT32	
26054	RO	Uc MSV3 N1	UINT32	
26056	RO	Ua MSV3 (1 - N1/N)	Float	--
26058	RO	Ub MSV3 (1 - N1/N)	Float	--
26060	RO	Uc MSV3 (1 - N1/N)	Float	--
26062	RO	Ua MSV1 Max.	Float	Maximum Mains Signalling value of Freq. #1 on 3-phase over 1 week
26064	RO	Ub MSV1 Max.	Float	
26066	RO	Uc MSV1 Max.	Float	
26068	RO	Ua MSV2 Max.	Float	Maximum Mains Signalling value of Freq. #2 on 3-phase over 1 week
26070	RO	Ub MSV2 Max.	Float	
26072	RO	Uc MSV2 Max.	Float	
26074	RO	Ua MSV3 Max.	Float	Maximum Mains Signalling value of Freq. #3 on 3-phase over 1 week
26076	RO	Ub MSV3 Max.	Float	
26078	RO	Uc MSV3 Max.	Float	
26080	RO	Ua MSV1 Min.	Float	Minimum Mains Signalling value of Freq. #1 on 3-phase over 1 week
26082	RO	Ub MSV1 Min.	Float	
26084	RO	Uc MSV1 Min.	Float	
26086	RO	Ua MSV2 Min.	Float	Minimum Mains Signalling value of Freq. #2 on 3-phase over 1 week
26088	RO	Ub MSV2 Min.	Float	
26090	RO	Uc MSV2 Min.	Float	
26092	RO	Ua MSV3 Min.	Float	Minimum Mains Signalling value of Freq. #3 on 3-phase over 1 week
26094	RO	Ub MSV3 Min.	Float	
26096	RO	Uc MSV3 Min.	Float	
26098	RO	Ua MSV1 CP95	Float	CP95 Mains Signalling value of Freq. #1 on 3-phase over 1 week
26100	RO	Ub MSV1 CP95	Float	
26102	RO	Uc MSV1 CP95	Float	
26104	RO	Ua MSV2 CP95	Float	CP95 Mains Signalling value of Freq. #2 on 3-phase over 1 week
26106	RO	Ub MSV2 CP95	Float	
26108	RO	Uc MSV2 CP95	Float	
26110	RO	Ua MSV3 CP95	Float	CP95 Mains Signalling value of Freq. #3 on 3-phase over 1 week
26112	RO	Ub MSV3 CP95	Float	
26114	RO	Uc MSV3 CP95	Float	
26116	RO	Ua RVC N1	UINT32	RVC counter occurs on 3-phase within a week
26118	RO	Ub RVC N1	UINT32	
26120	RO	Uc RVC N1	UINT32	
26122		Reserved		
26124		Reserved		
26126	RO	Swell N11	UINT32	See Note **Error! Reference source not found.**
26128	RO	Swell N21	UINT32	
26130	RO	Swell N31	UINT32	
26132	RO	Swell N41	UINT32	

26134	RO	Swell N12	UINT32	
26136	RO	Swell N22	UINT32	
26138	RO	Swell N32	UINT32	
26140	RO	Swell N42	UINT32	
26142	RO	Swell N13	UINT32	
26144	RO	Swell N23	UINT32	
26146	RO	Swell N33	UINT32	
26148	RO	Swell N43	UINT32	
26150	RO	Swell N14	UINT32	
26152	RO	Swell N24	UINT32	
26154	RO	Swell N34	UINT32	
26156	RO	Swell N44	UINT32	
26158	RO	Swell N15	UINT32	
26160	RO	Swell N25	UINT32	
26162	RO	Swell N35	UINT32	
26164	RO	Swell N45	UINT32	
26166	RO	Dip N11	UINT32	
26168	RO	Dip N21	UINT32	
26170	RO	Dip N31	UINT32	
26172	RO	Dip N41	UINT32	
26174	RO	Dip N51	UINT32	
26176	RO	Dip N61	UINT32	
26178	RO	Dip N12	UINT32	
26180	RO	Dip N22	UINT32	
26182	RO	Dip N32	UINT32	
26184	RO	Dip N42	UINT32	
26186	RO	Dip N52	UINT32	
26188	RO	Dip N62	UINT32	
26190	RO	Dip N13	UINT32	
26192	RO	Dip N23	UINT32	
26194	RO	Dip N33	UINT32	
26196	RO	Dip N43	UINT32	
26198	RO	Dip N53	UINT32	
26200	RO	Dip N63	UINT32	
26202	RO	Dip N14	UINT32	
26204	RO	Dip N24	UINT32	
26206	RO	Dip N34	UINT32	
26208	RO	Dip N44	UINT32	
26210	RO	Dip N54	UINT32	
26212	RO	Dip N64	UINT32	
26214	RO	Dip N15	UINT32	
26216	RO	Dip N25	UINT32	
26218	RO	Dip N35	UINT32	
26220	RO	Dip N45	UINT32	
26222	RO	Dip N55	UINT32	
26224	RO	Dip N65	UINT32	
26226	RO	Interruptions N11	UINT32	
26228	RO	Interruption N21	UINT32	
26230	RO	Interruption N31	UINT32	
26232	RO	Ua Transient N1	UINT32	Transients occur on 3-Phase over 1 week
26234	RO	Ub Transient N1	UINT32	
26236	RO	Uc Transient N1	UINT32	

Table 5-1 EN50160 Log

Notes:

1) Nxx have following definitions:

Swell (t indicates Duration, while u indicates Residual Voltage)				
Counter	10ms ≤ t ≤ 500ms	500ms < t ≤ 5000ms	5000ms < t ≤ 60000ms	t > 60000ms
110%<u<120%	N11	N21	N31	N41
120%≤u<140%	N12	N22	N32	N42
140%≤u<160%	N13	N23	N33	N43
160%≤u<200%	N14	N24	N34	N44
u≥200%	N15	N25	N35	N45

Table 5-2 Swell Counter Definition

Dip (t indicates Duration, while u indicates Residual Voltage)

Counter	10ms < t ≤ 200ms	200ms < t ≤ 500ms	500ms < t ≤ 1000ms	1000ms < t ≤ 5000ms	5000ms < t ≤ 60000ms	t > 60000 ms
u < 5%	N11	N21	N31	N41	N51	N61
5%≤u<40%	N12	N22	N32	N42	N52	N62
40%≤u<70%	N13	N23	N33	N43	N53	N63
70%≤u<80%	N14	N24	N34	N44	N54	N64
80%≤u<90%	N15	N25	N35	N45	N55	N65

Table 5-3 Dip Counter Definition

Interruption (t indicates Duration, while u indicates Residual Voltage)			
Counter	t ≤ 1s	t ≤ 180000ms	t > 180000ms
	N11	N21	N31

Table 5-61 Interruption Counter Definition

5.9.9 Frequency Deviation Log

5.9.9.1 Frequency Deviation Log Buffer

The iMeter 8 can store up to 777600 Frequency Deviation Log based on a First-In-First-Out principle. Writing N to **Frequency Deviation Log Index** register will update the #N to #N+9 log of the Log Buffer. For example, if the **Frequency Deviation Log Pointer (Register 0255)** = 60000, writing 59990 to register 26600 will load the latest 9 log buffers and writing 3480 will load the oldest 9 log buffers.

Register	Property	Description	Format
26600	RW	Frequency Deviation Log Index (N)	UINT32
26602~26606	RO	Log N	See **Section 5.9.9.2 Frenquency Deviiation Log Data Structure**
26607~26611	RO	Log N+1	
…		…	
26647~26651	RO	Log N+9	

Table 5-1 Frequency Deviation Log Buffer

5.9.9.2 Frequency Deviation Log Data Structure

Offset	Property	Description		Format
+0	RO	Record Time	High-Year (-2000)	Bitmap
			Low- Month	
+1	RO		High- Day	
			Low- Hour	
+2	RO		High- Minute	
			Low- Second	
+3~+4	RO	Frequency Value		UIN Float T16

Table 5-1 Frequency Deviation Log Data Structure

5.9.10 TOU Log

5.9.10.1 Present TOU Status

Register	Property	Description	Format	Note/Range
36000	RO	Present Tariff Schedule	UINT16	0~7: T1~T8
36001	RO	Present Season Schedule	UINT16	0~11: Season1~12
36002	RO	Present Daily Profile	UINT16	0~11: Daily Profile 1~12
36003	RO	Present Daily Profile Index	UINT16	0~19: Daily Profile Index 1~20
36004	RO	Present Weekday Type	UINT16	0 = Weekday 1, 1 = Weekday 2 2 = Weekday 3, 3 = Special Day
36005	RO	Present TOU Schedule	UINT16	0~1
36006	RO	TOU Log Pointer	UINT32	

Table 5-1 TOU Real-time Status

5.9.10.2 Real-time TOU Log

Register	Description	Format
36100~36139	Tariff #1 Data	See **Section 5.9.9.5 TOU Log Data Structure**
36140~36179	Tariff #2 Data	
36180~36219	Tariff #3 Data	
36220~36259	Tariff #4 Data	
36260~36299	Tariff #5 Data	
36300~36339	Tariff #6 Data	

36340~36379	Tariff #7 Data	
36380~36419	Tariff #8 Data	

Table 5-1 TOU Real-time Log

5.9.10.3 TOU Historical Log

The iMeter 8 can store up to 12 months of TOU Historical Log. Retrieve the newest 12 entries TOU logs through writing entry number which you can get from **Historical TOU Data Record Pointer** (Register 0251) into **Log Index X** (Register 36500). For example, if the value for **Historical TOU Data Record Pointer** is 100, then you can write 100 to 89 into **36500** register where 100 means the newest logs, and 89 means the oldest logs.

Register	Property	Description	Format
36500	RW	Log Index N	UINT32
36502	RO	Record Time	Bitmap
36505	RO	Period PF Avg. (Avg. PF over the Period)	Float
36507~36546	RO	Tariff #1 Data	See **Section 5.9.9.5 TOU Log Data Structure**
36547~36586	RO	Tariff #2 Data	
36587~36626	RO	Tariff #3 Data	
36627~36666	RO	Tariff #4 Data	
36667~36706	RO	Tariff #5 Data	
36707~36746	RO	Tariff #6 Data	
36747~36786	RO	Tariff #7 Data	
36787~36826	RO	Tariff #8 Data	

Table 5-1 TOU Historical Log

5.9.10.4 TOU Transient Log

Register	Property	Description	Format
36900	RO	Record Time	Bitmap
36903~36942	RO	Tariff #1 Data	See **Section 5.9.9.5 TOU Log Data Structure**
36943~36982	RO	Tariff #2 Data	
36983~37022	RO	Tariff #3 Data	
37023~37062	RO	Tariff #4 Data	
37063~37102	RO	Tariff #5 Data	
37103~37142	RO	Tariff #6 Data	
37143~37182	RO	Tariff #7 Data	
37183~37223	RO	Tariff #8 Data	

Table 5-1 TOU Transient Log

5.9.10.5 TOU Log Data Structure

Offset	Property	Description	Format
0	RW	kWh Imp.	INT64
4	RW	kWh Exp.	INT64
8	RW	kvarh Imp.	INT64
12	RW	kvarh Exp.	INT64
16	RW	kVAh	INT64
20	RW	kW Imp. Max. Demand	Float
22	RW	kW Imp. Max. Demand Timestamp[1]	
25	RW	kW Exp. Max. Demand	Float
27	RW	kW Exp. Max. Demand Timestamp[1]	
30	RW	kvar Imp. Max. Demand	Float
32	RO	kvar Imp. Max. Demand Timestamp[1]	
35	RO	kvar Exp. Max. Demand	Float
37	RO	kvar Exp. Max. Demand Timestamp[1]	

Table 5-1 TOU Log Data Structure

Notes:

1) The following table illustrates the register of timestamp:

Offset	Description
+0	High: Year (-2000)
	Low: Month
+1	High: Day
	Low: Hour
+2	High: Minute

	Low: Second

Table 5-2 Timestamp Format

5.9.11 Real-time WFR Register

Register	Property	Description	Format	Note/Range
53000	RO	Start Time	Bitmap	
53004~53005	RO	Reserved	UINT16	
53006	RO	Frequency	Float	
53008	RO	Ia 1st Sample	Float	
…	RO	…	Float	
54030	RO	Ia 512nd Sample	Float	
54032	RO	Ib 1st Sample	Float	
…	RO	…	Float	
55054	RO	Ib 512nd Sample	Float	
55056	RO	Ic 1st Sample	Float	
…	RO	…	Float	
56078	RO	Ic 512nd Sample	Float	
56080	RO	Ua 1st Sample	Float	
…	RO	…	Float	
57102	RO	Ua 512nd Sample	Float	
57104	RO	Ub 1st Sample	Float	
…	RO	…	Float	
58126	RO	Ub 512nd Sample	Float	
58128	RO	Uc 1st Sample	Float	
…	RO	…	Float	
59150	RO	Uc 512nd Sample	Float	

Table 5-1 Real-time WFR Register

Notes:

1) Read real-time WFR by reading 53000, and when the register is read, it will refresh automatically to ensure WFR's integrity.
2) The following table illustrates the register of the recording start time.

Offset	Description
+0	High: Year (-2000)
	Low: Month
+1	High: Day
	Low: Hour
+2	High: Minute
	Low: Second

Table 5-2 Time Structure

5.10 Device Setup Parameters

5.10.1 Communications Setup

Register	Property	Description		Format	Note, Default*
40000	RW	RS-485 Port 1 (P3)	Unit ID	UINT16	1 to 247, 100*
40001	RW		Baud rate[1]	UINT16	0 to 5, 3*
40002	RW		Parity	UINT16	0=None, 1=Odd, 2=Even*
40003	RW		Stop Bit	UINT16	1=1 Bit*, 2=2 Bits
40004	RW		Protocol[2]	UINT16	0=Modbus RTU* 1=EtheGate, 2=Disabled
40005	RW		EtheGate Port	UINT16	20000* to 60000
40006~40007	RW	Reserved		UINT16	
40008	RW	RS-485 Port 2 (P4)[3]	Unit ID	UINT16	1 to 247, 101*
40009	RW		Baud rate[1]	UINT16	0 to 5, 3*
40010	RW		Parity	UINT16	0=None, 1=Odd, 2=Even*
40011	RW		Stop Bit	UINT16	1=1 Bit*, 2=2 Bits
40012	RW		Protocol[2]	UINT16	0=Modbus RTU* 1=EtheGate, 2=Disabled
40013	RW		EtheGate Port	UINT16	20000 to 60000, 20001*
40014~40015	RW	Reserved		UINT16	
40016	RW	Ethernet 1 (P1)	IP Address[4]	UINT32	192.168.0.100*
40018	RW		Subnet Mask[4]	UINT32	255.255.255.0*
40020	RW		Default Gateway[4]	UINT32	192.168.0.1*

40022	RW	Reserved			
40024	RW	Ethernet 2 (P2)	IP Address[4]	UINT32	192.168.1.100*
40026	RW		Subnet Mask[4]	UINT32	255.255.255.0*
40028~40030	RW	Reserved		UINT32	
40032	RW	Access Control		UINT16	0=Disabled*, 1=Enabled
40033	RW	White List IP1		UINT32	0*
40035	RW	White List IP2		UINT32	
…	RW	…		UINT32	
40063	RW	White List IP16		UINT32	
40065	RW	IP Address of SNTP Server		UINT32	192.168.101.2*
40067	RW	SNTP Time Sync. Interval		UINT16	10 to 1440 min, 60*
40068	RW	SNTP Broadcast		UINT16	0=Disabled, 1=Enabled*

Table 5-1 Communication Setup Parameters

Notes:

1) Baudrate options: 0=1200, 1=2400, 2=4800, 3=9600, 4=19200, 5=38400
2) Protocol options: 0=Modbus RTU, 1-1999=Invalid, >=2000=IP Port # when used as an Transparent Ethernet Gateway
3) When the **Clock Source** is **GPS** or **IRIG-B**, P4 (RS-485 Port 2) is used by default for GPS and IRIG-B Time Sync. Please refer to Section **4.8 Time Synchronization** for detailed description.
4) If the IP Address is 192.168.0.100, write "0xC0A00064" to the register. P1 and P2 should not on the same network segment.

5.10.2 DI Setup

Register	Property	Description	Format	Range, Default*
40100	RW	DI1 Mode[1]	UINT16	0=Status Input*, 1=Pulse Counter 2=DMD Sync, 3= Tariff Switch
40101	RW	DI1 Debounce	UINT16	1 to 9999 (ms), 20ms*
40102	RW	DI1 Pulse Weight	UINT32	1*~1,000,000
40104	RW	DI1 Setpoint Type[2]	UINT16	0=Any*, 1=Positive, 2=Negative
40105	RW	DI1 Setpoint Trigger	UINT32	0*
40107~40108	RW	Reserved	UINT16	
…		…	UINT16	…
40163	RW	DI8 Mode[1]	UINT16	0=Status Input*, 1=Pulse Counter 2=DMD Sync, 3= Tariff Switch
40164	RW	DI8 Debounce	UINT16	1 to 9999 (ms), 20ms*
40165	RW	DI8 Pulse Weight	UINT32	1*~1,000,000
40167	RW	DI8 Setpoint Type[2]	UINT16	0=Any *, 1=Positive, 2=Negative
40168	RW	DI8 Setpoint Trigger	UINT32	0*
40170~40171	RW	Reserved	UINT16	
40172	RW	DI9 Mode[1,4]	UINT16	0=Status Input*, 1=Pulse Counter 2=DMD Sync, 3= Tariff Switch
40173	RW	DI9 Debounce[4]	UINT16	1 to 9999 (ms), 20ms*
40174	RW	DI9 Pulse Weight[4]	UINT32	1*~1,000,000
40176	RW	DI9 Setpoint Type[2, 4]	UINT16	0=Any *, 1=Positive, 2=Negative
40177	RW	DI9 Setpoint Trigger[4]	UINT32	0*
40179~40180	RW	Reserved	UINT16	
…		…	UINT16	…
40235	RW	DI16 Mode[1, 4]	UINT16	0=Status Input*, 1=Pulse Counter, 2=DMD Sync
40236	RW	DI16 Debounce[4]	UINT16	1 to 9999 (ms), (Default=20ms)
40237	RW	DI16 Pulse Weight[4]	UINT32	1*~1,000,000
40239	RW	DI16 Setpoint Type[4]	UINT16	0=Any*, 1=Positive, 2=Negative
40240	RW	DI16 Setpoint Trigger[3, 4]	UINT32	0*
40242~40243	RW	Reserved	UINT16	
40244	RW	DI Excitation Type	UINT16	0=DC*, 1=AC

Table 5-1 DI Setup Parameter

Notes:

1) Only one DI should be programmed as the DMD Sync. Input. To use a different DI for DMD Sync., the existing DI must first be reset back to **Normal (Status Input)** before programming the new DI for DMD Sync. Otherwise the configuration will be unsuccessful. Only DI1 to DI3 can be set as **Tariff Switch**.
2) The DIx Setpoint Type only affects which edge would trigger the Waveform Recorder if configured.
3) The table below provides a list of DIx's Setpoint Trigger, with a value of "1" meaning active and "0" meaning inactive.

Key	Action	Key	Action	Key	Action	Key	Action	Key	Action
0	Alarm	**4**	DO4	**8~18**	Reserved	**22**	DR #4	**26**	DR #8
1	DO1	**5**	DO5	**19**	DR #1	**23**	DR #5	**27**	DWR

2	DO2	**6**	DO6	**20**	DR #2	**24**	DR #6	**28**	WFR
3	DO3	**7**	DO7	**21**	DR #3	**25**	DR #7	**29**	RMSR

Table 5-2 DIx's Setpoint Triggers

4) DI9 ~ DI16 setup registers are valid only the device is equipped with corresponding options.

5.10.3 DO Setup

Register	Property	Description	Format	Range, Default*
40300	RW	Power OFF Alarm Enable	UINT16	0=Disabled, 1=Enabled*
40301	RW	Arm Before Execute[1]	UINT16	0=Disabled*, 1=Enabled
40302	RW	Alarm Pulse Width	UINT16	0 to 6000 (x0.1s) 0=Latch Default=10 (x0.1s)
40303	RW	DO1 Pulse Width [2]	UINT16	
40304	RW	DO2 Pulse Width [2]	UINT16	
40305	RW	DO3 Pulse Width [2]	UINT16	
40306	RW	DO4 Pulse Width [2,3]	UINT16	
40307	RW	DO5 Pulse Width [2,3]	UINT16	
40308	RW	DO6 Pulse Width [2,3]	UINT16	
40309	RW	DO7 Pulse Width [2,3]	UINT16	

Table 5-1 DO Setup Parameters

Notes:

1) **Arm Before Execute** setup register is used to specify if the relays needs to be armed before they can be operated on.
2) **DO Pulse Width** specifies the duration for which the relay output will be active when a Remote Operate or Setpoint Trigger command is received to operate it.
3) This is available only when the iMeter 8 is equipped with corresponding options.

5.10.4 AI/AO Setup

Register	Property	Description	Format	Range, Default*
40400	RW	AI1 Type	UINT16	0 = 4~20mA* , 1 = 0~20mA
40401	RW	AI1 Zero Scale	INT32	-999,999 to +999,999, 400*
40403	RW	AI1 Full Scale	INT32	-999,999 to +999,999, 2000*
40405	RW	AI2 Type	UINT16	0 = 4~20mA* , 1 = 0~20mA
40406	RW	AI2 Zero Scale	INT32	-999,999 to +999,999, 400*
40408	RW	AI2 Full Scale	INT32	-999,999 to +999,999, 2000*
40410~40422	RW	Reserved	UINT16	-
40424	RW	AO Type	UINT16	0 = 4~20mA* , 1 = 0~20mA
40425	RW	AO Key[4]	UINT16	0* to 15
40426	RW	AO Zero Scale	INT32	-999,999 to +999,999, 0*
40428	RW	AO Full Scale	INT32	-999,999 to +999,999*

Table 5-1 AI/AO Setup Parameters

Notes:

1) The table below lists the Analog Output Parameters. The Units for Voltage, Current, kW, kvar, kVA and Frequency are V, A, kW, kvar, kVA and Hz, respectively.

Key	Parameter	Scale	Unit	Key	Parameter	Scale	Unit
0	Uab	x1	V	**8**	kW Total	x1	kW
1	Ubc		V	**9**	kvar Total		kvar
2	Uca		V	**10**	kVA Total		kVA
3	Ull Average		V	**11**	PF Total	x1000	-
4	Ia		A	**12**	Frequency	x100	-
5	Ib		A	**13**	kW Total Present Demand	x1	kW
6	Ic		A	**14**	kvar Total Present Demand		kvar
7	I Average		A	**15**	kVA Total Present Demand		kVA

Table 5-2 Analog Output Parameters

5.10.5 LED Setup

Register	Property	Description	Format	Range, Default*
40500	RW	Key of Harmonics LED	UINT16	0=Disabled*, 1=U THD 2=U TIHD, 3=U THD & U TIHD
40501	RW	Key of Unbalance LED	UINT16	0=Disabled* 1=U2 (-ve Seq. U Unbalance) 2=I2 (-ve Seq. I Unbalance) 3=U2 & I2

40502	RW	Key of Flicker LED	UINT16	0=Disabled*, 1=Plt 2=Pst, 3=Plt & Pst
40503	RW	Key of Voltage Deviation LED	UINT16	0=Disabled*, 1=Enabled
40504	RW	Key of Frequency Deviation LED	UINT16	0=Disabled*, 1=Enabled
40505	RW	Over limit of Voltage Deviation	FLOAT	0 to 1 (x100%), 0.07*
40507	RW	Under Limit of Voltage Deviation	FLOAT	-1 to 0 (x100%), -0.07*
40509	RW	Over limit of Frequency Deviation	FLOAT	0 to 7.5Hz, 0.2Hz*
40511	RW	Under Limit of Frequency Deviation	FLOAT	-7.5 to 0Hz, -0.2Hz*
40513	RW	Over Limit of U THD	FLOAT	0 to 1 (x100%), 0.05*
40515	RW	Over Limit of U TIHD	FLOAT	0 to 1 (x100%), 0.05*
40517	RW	Over Limit of Voltage Unbalance	FLOAT	0 to 1 (x100%), 0.04*
40519	RW	Over limit of Current Unbalance	FLOAT	0 to 1 (x100%), 0.04*
40521	RW	Threshold for Pst	FLOAT	0 to 50, 1*
40523	RW	Threshold for Plt	FLOAT	

Table 5-1 LED Setup Parameters

5.10.6 System Setup

Register	Property	Description	Format	Range/Default*
40751	RW	Dips/Swells RMS Update[1]	UINT16	0=1-cycle*, 1= ½ -cycle
40752	RW	Interruption Mode[2]	UINT16	0=Single Phase, 1=Three Phase*
40753	RW	Dips/Swells Filter[3]	UINT16	0=Disabled*, 1=Enabled
40754	RW	Dips/Swells Max. Duration[3]	UINT16	1 to 600s, 60s*
40755	RW	Swell Max. Magnitude[3]	UINT16	101~500* (%)
40756	RW	Enable Audit Log Alarm	UINT16	0=Disabled*, 1=Enabled
40757	RW	Reserved	UINT16	
40758	RW	Energy Short Rollover[4]	UINT16	0=Disabled*, 1=Enabled
40759~40798	RW	Reserved	UINT16	
40799	RW	Delimiter[5]	UINT16	0=Option 1*, 1=Option 2
40800	RW	Clock Source[6]	UINT16	0=RTC*, 1=SNTP, 2=GPS, 3=IRIG-B, 4=Reserved, 5=1588-P1, 6=1588-P2
40801	RW	Time Zone[7]	UINT16	0 to 32, 26*
40802	RW	IRIG-B Time Zone [7]	UINT16	0 to 32, 26*
40803	RW	Language	UINT16	0=English* 1=Simple Chinese 2=Traditional Chinese
40804	RW	Date Format	UINT16	0=YYMMDD*, 1=MMDDYY 2=DDMMYY, 3=YYYY-MM-DD 4=MM-DD-YYYY, 5=DD-MM-YYYY
40805	RW	Reserved		
40806	RW	Backlight Timeout	UINT16	0 to 60 min (0 means disabled), 5*
40807	RW	LCD Contrast (%)	UINT16	50 to 100 (%), 90*
40808	RW	Phase A Color	UINT16	See Note 8), 1*
40809	RW	Phase B Color	UINT16	See Note 8), 4*
40810	RW	Phase C Color	UINT16	See Note 8), 8*
40811	RW	Phase N Color	UINT16	See Note 8), 13*
40812	RW	Earth Wire Color	UINT16	0=Green, 1=Yellow-Green*
40813	RW	Device Password	UINT32	0~999999, 000001*
40815	RW	Reserved	UINT32	
40817	RW	Block Flagged Data for Setpoint Trigger	UINT32	0=Disabled, 1=Enabled*
40819	RW	Time Zone of Data Format[9]	UINT16	0x00
40820	RW	Reserved	UINT16	
40821	RW	Aggregation Interval (Refresh Rate)[10]	UINT16	0=50/60cycles*, 1=150/180cycles 2=10min, 3=2hour
40822	RW	Freq. Interval	UINT16	0=1s*, 1=3s, 2=10s
40823	RW	Reset Mode of LED Indicators	UINT16	0=Auto*, 1=Manual
40824	RW	Sampling Rates in CFG File[12]	UINT16	0*, 1=Actual Sampling
40825	RW	Eliminate Flagged Data[12]	UINT16	0=Keep*, 1=Remove BIT0: SDR Log, BIT1: Max. Log

				BIT2: Min. Log, BIT3: EN50160 BIT4: QR Log, Others: Reserved	
40826~40833	RW	FTP User Name[13]	Char	Operator*	
40834~40841	RW	FTP User Password[13]	Char	abcd1234-*	
40842	RW	Prohibit FTP Anonymous Login	UINT16	0=Enabled, 1=Disabled*	
40843	RW	FTP Enable	UINT16	0=Enabled*, 1=Disabled	
40844	RW	Telnet Enable	UINT16	0=Enabled, 1=Disabled*	
40845~40856	RW	Reserved	UINT32		
40857	RW	Web Enable	UINT16	0=Enable*, 1=Disable	
40858	RW	Web Client Certificate Validated	UINT16	0=Enable, 1=Disable*	
40859	RW	Web Port No.	UINT16	1 to 65535	443*
40860	RW	FTP Port No.	UINT16		21*
40861	RW	Telnet Port No.	UINT16		23*
40862	RW	DiagSys Enable[14]	UINT16	0=Disabled, 1=Enabled*	
40863	RW	DiagSys Port No.	UINT16	1 to 65535, 60001*	
40864	RW	Modbus TCP Enable[15]	UINT16	0=Disabled, 1=Enabled*	
40865	RW	Modbus TCP Port No.	UINT16	1 to 65535, 502*	
40866	RW	HMI Security	UINT16	0=Disabled, 1=Enabled*	
40867	RW	IEC61850 Enable	UINT16	0=Disabled, 1=Enabled*	
40868	RW	Comm. Port 1 Enable	UINT16	0=Disabled, 1=Enabled*	
40869	RW	Comm. Port 2 Enable	UINT16	0=Disabled, 1=Enabled*	
40870~40876	RW	Reserved	UINT16		
40877	RW	USB Enable	UINT16	0=Disabled*, 1=Enabled	
40878	RW	IEC 61850 Client Certificate Validated	UINT16	0=Disabled*, 1=Enabled	
40879~40886	RW	IEC 61850 Client Authentication key	CHAR	ASCII (Must occupy 16 bytes) 6365742D656C6563747269632E636 F6D	
40887~40892	RW	IEC 61850 Authentication Code[16]	UINT16	Null	
40893	RW	IEC 61850 Timestamp Offset	UINT16	0*-65535s, "0" means time difference is not examined.	
40894	RW	Value Type in COMTRADE files	UINT16	0=Primary*, 1=Secondary	
40895	RW	Web Timeout	UINT16	0 to 1440 mins, 5*	
40896	RW	IEC 61850 Port No.	UINT16	1 to 65535, 102*	
40897	RW	Reserved	UINT16		
40898	RW	HTTPS Timeout	UINT16	100 to 5000ms, 1000*	
40899	RW	Freq. Dev. Record Enable	UINT16	0=Disabled*, 1=Enabled	

Table 5-1 System Setup Parameters

Notes:

1) The **Dip/Swell RMS Update** register determines if the U_{rms} is computed every cycle and then shifted by ½ cycle (register value = 0) or if the U_{rms} is computed every ½ cycle and then shifted by ½ cycle (register value = 1).
2) The **Interruption Mode** register determines if an Interruption event should start when the U_{rms} of all 3 phases (register value = 1) or when the U_{rms} of any phase (register value = 0) is lower than the **Interruption Threshold**.
3) The **Dip/Swell Filter** determines if a Dip/Swell event should be recorded when the Dip/Swell duration exceeds the preset value of **Dip/Swell Max. Duration** register or if a Swell event should be recorded if the U_{rms} exceeds the preset value of **Swell Max. Magnitude** register. The **Dip/Swell Max. Duration** and **Swell Max. Magnitude** registers are disregarded if the **Dip/Swell Filter** is disabled.
4) If the **Roll-over Energy Value** is **Enabled,** the maximum value of Energy register is 1,000,000,000.000.
5) The **Delimiter** setup register supports two options, 1 and 2:

Option 1: "," is used as the x1000 delimiter and "." as the decimal point (e.g. 123,456,789.0).
Option 2: " " is used as the x1000 delimiter and "," as the decimal point (e.g. 123 456 789,0).

6) When **Clock Source** is set to GPS or IRIG-B, P4 (RS-485 Port 2) will be automatically used for the respective Time Sync signal. Please refer to Section **4.8 Time Synchronization** for detailed description. When **Clock Source** is set to DI, DI8 will be used by default for the 1PPS GPS Time Sync input. The IRIG-B option only available when the iMeter 8 is equipped with corresponding options.
7) The following table lists the Codes for different Time Zones. The **IRIG-B Time Zone** parameter should be configured when **Clock Source** is set to IRIG-B.

Code	Time Zone	Code	Time Zone	Code	Time Zone
0	GMT-12:00	**11**	GMT-2:00	**22**	GMT+5:45
1	GMT-11:00	**12**	GMT-1:00	**23**	GMT+6:00
2	GMT-10:00	**13**	GMT-0:00	**24**	GMT+6:30
3	GMT-9:00	**14**	GMT+1:00	**25**	GMT+7:00
4	GMT-8:00	**15**	GMT+2:00	**26**	GMT+8:00
5	GMT-7:00	**16**	GMT+3:00	**27**	GMT+9:00
6	GMT-6:00	**17**	GMT+3:30	**28**	GMT+9:30

7	GMT-5:00	**18**	GMT+4:00	**29**	GMT+10:00
8	GMT-4:00	**19**	GMT+4:30	**30**	GMT+11:00
9	GMT-3:30	**20**	GMT+5:00	**31**	GMT+12:00
10	GMT-3:00	**21**	GMT+5:30	**32**	GMT+13:00

Table 5-2 Time Zones

8) The following table lists the Color options for different wires.

No.	Color (R,G,B)	No.	Color (R,G,B)	No.	Color (R,G,B)
0	Brown (153,51,0)	5	Turquoise (0,162,132)	10	Grey (159,159,159)
1	Red (255,0,0)	6	Green (0,255,36)	11	Neutral Grey(193,193,193)
2	Pink (255,173,177)	7	Light blue (79,204,246)	12	White (255,255,255)
3	Orange (255,102,0)	8	Blue (0,0,255)	13	Black (0,0,0)
4	Yellow (255,216,0)	9	Violet (112,48,160)		

Table 5-3 Wire Color Options

9) The timestamp for different data is programmable by writing the "Time Zone of Data Format" register, with the bit value of "0" meaning LOCAL time, while "1" meaning UTC time. The following table illustrates the details of this register.

BIT	Description	Note
BIT0	MODBUS	Timestamp of retrieved Data logs via Modbus: Real-time measurement, SOE, PQ Log, SDR, Max./Min. Log, Plt/Pst, EN50160 Log, TOU Log, IER and AER Log.
BIT1	COMTRADE	Timestamp of COMTRADE file including the first/trigger point in .cfg file
BIT2	PQDIF	Timestamp of PQDIF file, file name and store directory.

Table 5-4 Timestamp of Historical Data

10) The basic measurement interval shall be a 10-cycle period for 50 Hz power system and a 12-cycle period for 60 Hz power system. The 10/12-cycle measurement are then aggregated over 4 additional intervals: 50/60-cycle, 150/180-cycle, 10 min, and 2-hour.
11) "0" means the DWR file in COMTRADE format doesn't include any sampling section information.
12) For **Eliminate Flagged Data** register, the bit value of "0" means Keep Flagged Data in the log while "1" means remove. The following table illustrates the details of this register.

Bit4~Bit15	Bit3	Bit2	Bit1	Bit0
Reserved	EN50160 Log	Min. Log	Max. Log	SDR Log

Table 5-5 Keep/Remove Flagged Data Register

13) The FTP Username and Password should not exceed 16 characters.
14) Modification written to this register requires a Device Reboot to take effect.
15) Modification written to this register will take effect at once.
16) The **IEC 61850 Authentication Code** can be set Up to 12 characters. If the code is less than 12 characters, statement terminator should be used. If the Code is default to be null, the code is 01+SN

5.10.7 SMTP Setup

Register	Property	Description	Format	Range/Options
40900	RW	SMTP Trigger Event Classification	Bitmap	Note 1)
40902	RW	SMTP IP Port	UINT16	1 to 65535 (Default=25)
40903	RW	IP Address of SMTP Server[2]	UINT32	Default=0.0.0.0
40905	RW	Source Email Address[3]	CHAR	40 characters, Null*
40925	RW	Source Username[4]	CHAR	40 characters, Null*
40935	RW	Login Password[5]	CHAR	20 characters, Null*
40945	RW	Destination Email Address[6]	CHAR	90 characters, Null*

Table 5-1 SMTP Setup Parameters

Notes:

1) **SMTP Trigger Event Classification** register determines if a newly generated SOE/PQ Log is sent out by email. The following table illustrates the Bitmap definition of this register. When a particular bit is set to 1, its corresponding events will be sent out by email.

Bit	Classification	Event Type	Bit	Classification	Event Type
0	1=System Events, See Appendix D	SOE	16	0x81=Dip/Swell/Interruption	PQ Log
1	2=Standard Setpoints Events		17	0x82=Transient	
2	3=High-speed Setpoints Events		18	0x83 = Inrush Current	
3	Reserved		19	0x84 = RVC	
4	5 =WFR		20	0x85 = MSV	
5	6 = DWR		21	Reserved	
6	7 = MSV WFR		25	EN50160	EN50160
7	8 = Standard DR		26	Daily Report	
8	Reserved				
9	RMSR				

Table 5-2 SMTP Trigger Source Register (40900)

2) If the SMTP Server IP Address is 192.168.0.100, write "0xC0A00064" to the register.

3) This string parameter may be up to 40 characters long and specifies the source email address that appears in the "**From**" field of the email. For example, if the email address is iMeter 8@ceiec-electric.com, set the parameter as"69 4D 65 74 65 72 20 38 40 63 65 74 2D 65 6C 65 63 74 72 69 63 2E 63 6F 6D 00 00" where the two zero characters "00 00" at the end of the string are the string terminator.
4) This string parameter may be up to 40 characters long and specifies the "**Source Username**" that appears in the email. For example, if the username is "abc", set the parameter as "61 62 63 00 00" where the two zero characters "00 00" at the end of the string are the string terminator.
5) This string parameter may be up to 20 characters long and specifies the Logon Password to login the "**Source Email Address**" account. For example, if the password is "iMeter 8", set the parameter as "69 4D 65 74 65 72 20 38 00 00" where the two zero characters "00 00" at the end of the string are the string terminator.
6) This string parameter may be up to 40 characters long and specifies the destination email address that appears in the "**To**" field of the email. For example, if the email address is iMeter 8@ceiec-electric.com, so set the registers as" 69 4D 65 74 65 72 20 38 40 63 65 74 2D 67 6C 6F 62 61 6C 2E 63 6F 6D 00 00" where the two zero characters "00 00" at the end of the string are the string terminator.

5.10.8 Basic Setup Parameters

Register	Property	Description	Format	Range, Default*
41000	RW	Wiring Mode	UINT16	1= 3P4W, 3=3P3W, 4=Demo
41001	RW	PT Primary (V)	UINT32	1 to 1,000,000, 100*
41003	RW	PT Secondary (V)	UINT32	1 to 1500V, 100*
41005	RW	CT Primary (A)	UINT32	1 to 30000A, 5*
41007	RW	CT Secondary (A)	UINT32	1 to 50A, 5*
41009	RW	U4 Primary (V)	UINT32	1 to 1,000,000V, 100*
41011	RW	U4 Secondary (V)	UINT32	1 to 1500V, 100*
41013	RW	I4 Primary (A)	UINT32	1 to 30000A, 5*
41015	RW	I4 Secondary (A)	UINT32	1 to 50A, 5*
41017	RW	I5 Primary (A)	UINT32	1 to 30000A, 5*
41019	RW	I5 Secondary (A)	UINT32	1 to 50A, 5*
41021	RW	ULL Nominal ($Vll_{nominal}$)	UINT32	1 to 1500V, 415*
41023	RW	Nominal Current ($I_{nominal}$)	UINT32	1 to 10,000A, 5*
41025	RW	CT Polarity[1]	Bitmap	0=Normal*, 1=Reverse
41026	RW	Composite Current	UINT16	0= No Composite*, 1=Phase A 2=Phase B, 3=Phase C
41027	RW	Power Factor Convention[2]	UINT16	0=IEC*, 1=IEEE, 2=-IEEE
41028	RW	kVA Calculation[3]	UINT16	0=Vector*, 1=Standard
41029	RW	Harmonics Calculation	UINT16	0=% of Fund.*, 1=% of RMS 2=% of Nominal
41030	RW	Statistical Harmonic Calculation	UINT16	0=Subgroup*, 1=Group
41031	RW	Order of Harmonic Calculation	UINT16	2 to 63*
41032~41033	RW	Reserved	INT32	
41035	RW	SCCP Model	UINT16	0=5A (50A) @10mV/A* 1=20A@10mV/A, 2=200A@1mV/A 3=500A @1mV/A, 4=500A(550A) @1mV/A 5=5kA @0.1mV/A

Table 5-1 Basic Setup Parameters

Notes:

1) The **CT Polarity** register defines the polarity for the Current Inputs as illustrated in the following table.

Bit 15~Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	I5	I4	Ic	Ib	Ia

Table 5-2 CT Polarity Register

2) P.F. Convention: -IEEE is the same as IEEE but with the opposite sign.

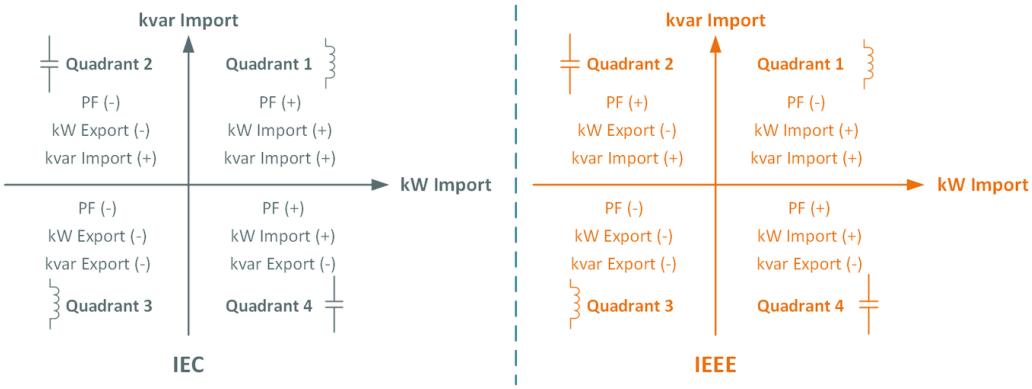


Figure 5-1 Power Factor Definitions

3) There are two ways to calculate kVA:

Mode V (Vector method**):** $kVA^2_{total}=\sqrt{kW^2_{total}+kvar^2_{total}}$

Mode S (Scalar method**):** $kVA_{total}=kVA_a+kVA_b+kVA_c$

5.10.9 PQ Setup

Register	Property	Description	Format	Range, Default*
41100	RW	Dip/Swell Enable	UINT16	0=Disabled, 1=Enabled*
41101	RW	Dip/Swell Voltage Reference	UINT16	0=Udin*, 1=Usr
41102	RW	Swell Limit[1]	UINT16	101 to 200 (x0.01Udin/Usr), 110*
41103	RW	Dip Limit[1]	UINT16	1 to 99 (x0.01 Udin/Usr), 90*
41104	RW	Interruption Limit[1]	UINT16	0 to 50 (x0.01 Udin/Usr), 5*
41105	RW	Swell Hysteresis[1]	UINT16	1 to 1000 (x0.001 Udin/Usr), 20*
41106	RW	Dip Hysteresis[1]	UINT16	
41107	RW	Interruption Hysteresis[1]	UINT16	
41108	RW	Dip/Swell Trigger[2]	UINT32	DWR*
41110	RW	DO/Alarm Trigger by Dip/Swell/Interruption	UINT32	BIT0-7: triggered by Dips BIT8-15: triggered by Swells BIT16-23: triggered by Interruptions
41112	RW	Transient Enable	UINT16	0=Disabled, 1=Enabled*
41113	RW	Transient Limit	UINT16	5 to 500 (%), 35*
41114	RW	Transient Trigger[3]	UINT32	WFR*
41116~41119	RW	Reserved	UINT16	
41120	RW	Inrush Current Enable	UINT16	0=Disabled*, 1=Enabled
41121	RW	Inrush Current Limit	UINT16	100 to 500 (%), 120*
41122	RW	Inrush Current Hysteresis	UINT16	1 to 1000 (0.1% to 100%), 10*
41123	RW	Inrush Current Trigger[3]	UINT32	WFR
41125~41127	RW	Reserved	UINT16	
41128	RW	Rapid Voltage Changes (RVC)	UINT16	0=Disabled*, 1=Enabled
41129	RW	RVC Limit	UINT32	2 to 100 (0.2% to 10%Un), 50*
41131	RW	RVC Hysteresis	UINT32	1 to 50 (0.1% to 5%Un), 25*
41133	RW	RVC Trigger[3]	UINT32	0
41135~41153	RW	Reserved	UINT32	
41154	RW	MSV #1 Enable	UINT16	0=Disabled*, 1=Enabled
41155	RW	MSV #1 Frequency	UINT16	600 to 30000 (x0.1Hz), 10000*
41156	RW	MSV #1 Limit	UINT16	3 to 1000 (x0.001U Udin/Usr), 50*
41157	RW	MSV #1 Emission Time	UINT16	1 to 120s, Default=60s
41158~41159	RW	Reserved		
41160	RW	MSV #2 Enable	UINT16	0=Disabled*, 1=Enabled
41161	RW	MSV #2 Frequency	UINT16	600 to 30000 (x0.1Hz), 20000*
41162	RW	MSV #2 Limit	UINT16	3 to 1000 (x0.001 Udin/Usr) , 50*
41163	RW	MSV #2 Emission Time	UINT16	1 to 120s, Default=60s
41164~41165	RW	Reserved		
41166	RW	MSV #3 Enable	UINT16	0=Disabled*, 1=Enabled
41167	RW	MSV #3 Frequency	UINT16	600 to 30000* (x0.1Hz)
41168	RW	MSV #3 Limit	UINT16	3 to 1000 (x0.001 Udin/Usr), 50*
41169	RW	MSV #3 Emission Time	UINT16	1 to 120s, Default=60s
41170~41171		Reserved		
41172	RW	Flicker Mode	UINT16	0=120V, 1=230V*

Table 5-1 PQ Log Setup

Notes:

1) The values for the **Dip Limit**, **Swell Limit**, **Voltage Interruption Limit** and **Dip/Swell Hysteresis** should be configured to meet the following criteria:
   a) The **Voltage Interruption Limit**shall be set below **Dip Limit**.
   b) The **Dip/Swell Hysteresis** must be less than the **Dip/Swell Limit**.
   c) The **Rapid Voltage Changes (RVC) Limit** must be less than the **Dip and Swell Limits**.
   d) Regardless of whether **Dip/Swell** is enabled, the conditions for a), b) and c) must always be met.
2) The following table illustrates the details of the **Dip/Swell Trigger** register with a bit value of "1" meaning Active while "0" meaning Inactive.

Bit	Trigger	Bit	Trigger	Bit	Trigger	Bit	Trigger
0~18	Reserved	**19**	DR #1	**20**	DR #2	**21**	DR #3
22	DR #4	**23**	DR #5	**24**	DR #6	**25**	DR #7
26	DR #8	**27**	DWR	**28**	WFR	**29**	RMSR

Table 5-2 PQD Trigger Register

3) The table below provides a list of Transient/Rapid Voltage Changes Triggers register with a bit value of "1" meaning Active while "0" meaning Inactive.

Bit	Trigger	Bit	Trigger	Bit	Trigger	Bit	Trigger
0	Alarm	**1**	DO1	**2**	DO2	**3**	DO3
4	DO4	**5**	DO5	**6**	DO6	**7**	DO7
8~26	Reserved	**27**	DWR	**28**	WFR	**29**	RMSR

Table 5-3 Transient/Inrush Current/RVC Triggers

5.10.10 PQDIF Setup

Register	Property	Description	Format	Range, Default*
41200	RW	Freq. Statistics Interval	UINT16	1 to 60 mins, 10*
41201	RW	Symmetrical Components and Unb. Statistics Interval	UINT16	
41202	RW	U & I RMS and Deviation Statistics Interval	UINT16	
41203	RW	Harmonic & Inter-Harmonic Statistics Interval	UINT16	
41204	RW	PQDIF Save Interval	UINT16	0 (Disabled)* to 24 Hour

Table 5-1 PQDIF Setup

5.10.11 Demand Setup

Register	Property	Description	Format	Range, Default*
41250	RW	Demand Sync. Mode	UINT16	0=SLD*, 1=SYNC DI
41251	RW	Demand Period	UINT16	1 to 60minutes, 15*
41252	RW	Number of Sliding Windows	UINT16	1* to 15
41253	RW	Self-Read Time[1]	UINT16	Default = 0Xffff (Manual)
41254	RW	Predicated Response	UINT16	70* to 99

Table 5-1 Demand Setup

Notes:

1) The **Self-Read Time** allows the user to specify the time and day of the month for the Peak Demand Self-Read operation. The **Self-Read Time** supports three options:
   - A zero value means that the Self-Read will take place at 00:00 of the first day of each month.
   - A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = Day * 100 + Hour where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.
   - A 0xFFFF value will disable the Self-Read operation and replace it with manual operation. A manual reset will cause the Max. Demand of **This Month** to be transferred to the Max. Demand of **Last Month** and then reset. The terms **This Month** and **Last Month** will become **Since Last Reset** and **Before Last Reset**.

5.10.12 WFR Setup

Register	Property	Description	Format	Range, Default*
41300	RW	Pre-fault Cycles of WFR	UINT16	2 to 6, 5*
41301	RW	Post-fault Cycles of WFR	UINT16	
41302	RW	Max. No. of Cycles	UINT16	No. of Cycles @ Samples/Cycle • (20-3000) @128 • (20-1500) @ 256 • (20-750) @ 512 • (20-375) @ 1024 20*
41303	RW	Sampling Rates	UINT16	0=128 Samples/Cycles 1=256 Samples/Cycles 2=512 Samples/Cycles 3=1024 Samples/Cycles*
41304	RW	Adaptive WFR[1]	UINT16	0=Disabled*, 1=Enabled
41305	RW	Reserved	UINT16	
41306	RW	Pre-fault Cycles of DWR	UINT16	5* to 10 Cycles
41307	RW	Schedule WFR Enable	UINT16	0=Disabled*, 1=Enabled
41308	RW	Scheduled WFR Start Time	UINT16	See Note 3)
41311	RW	Scheduled WFR Interval	UINT16	1 to 1440* minutes
41312	RW	Repetitions	UINT16	0 to 10000, 1* 0 indicates recording continuously
41313	RW	Pre-fault Samples of RMSR	UINT16	100* to 500 samples
41314	RW	RMSR Sampling Interval	UINT16	0* to 60 cycles, 0: 1/2 cycle
41315	RW	Channel 1	UINT16	See Note 3), 4*

41316	RW	Channel 2	UINT16	See Note 3), 5*
41317	RW	Channel 3	UINT16	See Note 3), 6*
41318	RW	Channel 4	UINT16	See Note 3), 7*
41319	RW	Channel 5	UINT16	See Note 3, 8*
41320	RW	Channel 6	UINT16	See Note 3), 9*
41321	RW	Channel 7	UINT16	See Note 3), 12*
41322	RW	Channel 8	UINT16	See Note 3), 13*

Table 5-1 WFR Log Setup

Notes:

1) If the Adaptive **WFR** is **Enabled**, the **WFR** on the iMeter 8 is always recording the **Max. No. of Cycles.**
2) The following table illustrates the **Scheduled WFR Start Time** structure.

Offset	Description
+0	High – Year (-2000) / Low – Month
+1	High – Day / Low – Hour
+2	High – Minute / Low – Second

Table 5-94 Scheduled WFR Start Time Structure

3) The table below lists the available parameters for each channel, please note that the channel should be configured continually from the Channel 1.

Key	Parameter	Key	Parameter	Key	Parameter	Key	Parameter
0	Disabled	7	Ia	14	kWa	21	kVAb
1	Ua	8	Ib	15	kWb	22	kVAc
2	Ub	9	Ic	16	kWc	23	PFa
3	Uc	10	U4	17	kvara	24	PFb
4	Uab	11	I4	18	kvarb	25	PFc
5	Ubc	12	Frequency	19	kvarc		
6	Uca	13	Freq. Deviation	20	kVAa		

Table 5-2 Available RMSR Channel

5.10.13 Energy Pulse Setup

Register	Property	Description	Format	Range, Default*
41350	RW	Energy Pulse Constant[1]	UINT16	0=1000*, 1=3200, 2=5000 3=6400, 4=12800 (imp/kWh)
41351~41352	RW	Reserved	UINT16	
41353	RW	Energy Pulse Output #1[2]	UINT16	0* to 18
41354	RW	Reserved	UINT16	
41355	RW	Energy Pulse Output #2[2]	UINT16	0* to 18
41356	RW	Reserved	UINT16	
41357	RW	Energy Pulse Output #3[2]	UINT16	0* to 18
41358	RW	Reserved	UINT16	
41359	RW	Energy Pulse Output #4[2]	UINT16	0* to 18
41360	RW	Reserved	UINT16	

Table 5-1 Energy Pulse Setup

Notes:

1) It's important to understand that energy pulsing is always based on the secondary ratings (e.g. 100V and 5A) as it would be impossible to generate the required number or pulses based on the primary ratings. The following table illustrates the recommended settings for the **Energy Pulse Constant** based on **Z** = $V_{nominal}$ x $I_{nominal}$ x 2, where $V_{nominal}$ and $I_{nominal}$ are the secondary voltage and current nominal ratings, respectively. In general, one would use a higher **Pulse Constant** for a smaller **Z** value (**i.e.** a smaller $V_{nominal}$ and $I_{nominal}$) in an accuracy testing situation to reduce the test time.

Z	Energy Pulse Constant	Min. Interval (ms)	Default
≤1000	1000/3200/5000/6400/12800	160	1000
≤2000	1000/3200/5000/6400		
≤2600	1000/3200/5000		
≤4000	1000/3200		
≤13000	1000		

Table 5-2 Energy Pulse Constant Range

2) The following table illustrates the valid options for the Energy Pulse Source setup register:

Value	Source	Value	Source	Value	Source	Value	Source
0	Disabled	5	kWh Imp. H01	10	kvarh Total RMS	15	kvarh Exp. H01
1	kWh Total RMS	6	kWh Exp. H01	11	kvarh Imp.	16	kvarh TH
2	kWh Imp.	7	kWh TH	12	kvarh Exp.	17	kvarh Imp. TH
3	kWh Exp.	8	kWh Imp. TH	13	kvarh Total Fund.	18	kvarh Exp. TH

4	kWh Total Fund.	9	kWh Exp. TH	14	kvarh Imp. H01		

Table 5-3 Energy Pulse Source Setup Register

5.10.14 Standard Setpoints Setup

Register	Property	Description		Format	Range, Default*
41400	RW	Setpoint #1	Parameter [1]	UINT32	0*
41402	RW		Type	UINT16	0=Disabled* 1=Over Setpoint, 2=Under Setpoint
41403	RW		Active Limit	Float	999,999*
41405	RW		Inactive Limit	Float	999,999*
41407	RW		Active Delay	UINT16	0 to 9999 s, 10*
41408	RW		Inactive Delay	UINT16	0 to 9999 s, 10*
41409	RW		Trigger Action[2]	UINT32	0=Disabled*
41411	RW		Reserved	UINT32	
…		…			…
44715	RW	Setpoint #256	Parameter[1]	UINT32	0*
44717	RW		Type	UINT16	0=Disabled* 1=Over Setpoint, 2=Under Setpoint
44718	RW		Active Limit	Float	999,999*
44720	RW		Inactive Limit	Float	999,999*
44722	RW		Active Delay	UINT16	0 to 9999 s, 10*
44723	RW		Inactive Delay	UINT16	0 to 9999 s, 10*
44724	RW		Trigger Action[2]	UINT32	0=Disabled*
44726	RW		Reserved	UINT32	

Table 5-1 Setpoint Setup Parameters

Notes:

1) The iMeter 8 provides the following setpoint parameters:

Key	Parameter	Key	Parameter	Key	Parameter
1	ULN*	26	I THD	51	kVA Total DMD
2	ULL*	27	I TOHD	52	P.F. Total DMD
3	U4*	28	I TEHD	53	kW Total Imp. Pred. DMD
4	Ia/Ib/Ic*	29	U TIHD	54	kW Total Exp. Pred. DMD
5	I4*	30	U TOIHD	55	kvar Total Imp. Pred. DMD
6	I5*	31	U TEIHD	56	kvar Total Exp. Pred. DMD
7	kW Total*	32	I TIHD	57	kVA Total Pred. DMD
8	kvar Total*	33	I TOIHD	58	P.F. Total Pred. DMD
9	kVA Total*	34	I TEIHD	59	Pst
10	P.F. Total*	35	U TH RMS	60	Plt
11	U0 Unbalance	36	U TOH RMS	61	Voltage Fluct.
12	U2 Unbalance	37	U TEH RMS	62	Phase Loss
13	I0 Unbalance	38	I TH RMS	0x0002xxxx	U HD02
14	I2 Unbalance	39	I TOH RMS	…	U HD03~HD62
15	U Fundamental	40	I TEH RMS	0x003fxxxx	U HD63
16	I Fundamental	41	U TIH RMS	0x0081xxxx	U IHD01
17	U Deviation	42	U TOIH RMS	…	U IHD02~IHD62
18	U Over Deviation	43	U TEIH RMS	0x00bfxxxx	U IHD063
19	U Under Deviation	44	I TIH RMS	0x02xxxxxx	I HD02
20	Frequency	45	I TOIH RMS	…	I HD03~HD62
21	Frequency Deviation	46	I TEIH RMS	0x3fxxxxxx	I HD63
22	Phase Reversal	47	kW Total Imp. DMD	0x81xxxxxx	I IHD01
23	U THD	48	kW Total Exp. DMD	…	I IHD02~IHD62
24	U TOHD	49	kvar Total Imp. DMD	0xbfxxxxxx	I IHD063
25	U TEHD	50	kvar Total Exp. DMD		

* High-Speed Setpoint Parameters

Table 5-2 Setpoint Parameters

2) The iMeter 8 provides the following Setpoint Triggers:

Bit	Trigger	Bit	Trigger	Bit	Trigger	Bit	Trigger
0	Alarm	**5**	DO5 Closed	**20**	DR #2	**25**	DR #7
1	DO1 Closed	**6**	DO6 Closed	**21**	DR #3	**26**	DR #8
2	DO2 Closed	**7**	DO7 Closed	**22**	DR #4	**27**	DWR
3	DO3 Closed	**8~18**	Reserved	**23**	DR #5	**28**	WFR

4	DO4 Closed	**19**	DR #1	**24**	DR #6	**29**	RMSR

Table 5-3 Setpoint Triggers

5.10.15 HS (High-speed) Setpoints Setup

Register	Property	Description		Format	Range, Default*
45400	RW	HS Setpoint #1	Parameter	UINT32	See **Table 5-97** above
45402	RW		Type	UINT16	0=Disabled* 1=Over Setpoint, 2=Under Setpoint
45403	RW		Active Limit	Float	999,999*
45405	RW		Inactive Limit	Float	999,999*
45407	RW		Active Delay	UINT16	0 to 9999 cycle, 10*
45408	RW		Inactive Delay	UINT16	0 to 9999 cycle, 10*
45409	RW		Trigger Action	UINT32	See **Table 5-98** (Default=0)
45411	RW		Reserved	UINT32	
…		…			…
45595	RW	HS Setpoint #16	Parameter[1]	UINT32	See **Table 5-97** above
45597	RW		Type	UINT16	0=Disabled* 1=Over Setpoint, 2=Under Setpoint
45598	RW		Active Limit	Float	999,999*
45600	RW		Inactive Limit	Float	999,999*
45602	RW		Active Delay	UINT16	0 to 9999 cycle, 10*
45603	RW		Inactive Delay	UINT16	0 to 9999 cycle, 10*
45604	RW		Trigger Action	UINT32	See **Table 5-98** (Default=0)
45606	RW		Reserved	UINT32	

Table 5-1 Setpoint Setup Parameters

5.10.16 SDR Setup

5.11.16.1 SDR Setup Registers

Register	Property	Description	Format
45700~45766	RW	SDR #1	See **Section 5.11.16.2 SDR Setup Data Structure**
45800~45866	RW	SDR #2	
45900~45966	RW	SDR #3	
46000~46066	RW	SDR #4	
46100~46166	RW	SDR #5	
46200~46266	RW	SDR #6	
46300~46366	RW	SDR #7	
46400~46466	RW	SDR #8	
46500~46566	RW	SDR #9	
46600~46666	RW	SDR #10	
46700~46766	RW	SDR #11	
46800~46866	RW	SDR #12	
46900~46966	RW	SDR #13	
47000~47066	RW	SDR #14	
47100~47166	RW	SDR #15	
47200~47266	RW	SDR #16	

Table 5-1 SDR Setup Registers

5.11.16.2 SDR Setup Data Structure

Offset	Property	Description	Format	Range, Default*
+0	RW	Recording Interval	UINT32	1 to 60 (cycles), 10*
+1	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-First-Out*
+2	RW	Number of Parameters	UINT16	0 to 64*
+3	RW	Parameter 1		
+4	RW	Parameter 2	UINT16	Please refer to **Appendix A** and **B** for a complete list of the SDR Parameters and default configuration for each SDR, respectively.
+5	RW	Parameter 3	UINT16	
+6	RW	Parameter 4	UINT16	
…	RW	…	UINT16	
+65	RW	Parameter 63	UINT16	
+66	RW	Parameter 64	UINT16	

Table 5-2 SDR Setup Data Structure

5.10.17 5.11.17 Data Recorder (DR) Setup

5.10.17.1 Data Recorder Setup Registers

Register	Property	Description	Format
47300~47338	RW	Data Recorder #1	See **Section 5.11.17.2 Data Recorder Setup Data Structure**
47400~47438	RW	Data Recorder #2	
47500~47538	RW	Data Recorder #3	
47600~47638	RW	Data Recorder #4	
47700~47738	RW	Data Recorder #5	
47800~47838	RW	Data Recorder #6	
47900~47938	RW	Data Recorder #7	
48000~48038	RW	Data Recorder #8	

Table 5-1 Data Recorder Setup Registers

5.10.17.2 Data Recorder Setup Data Structure

Offset	Property	Description	Format	Range
+0	RW	Trigged Mode [1]	UINT16	0=Disabled, 1=Triggered by Timer 2=Triggered by Setpoint
+1	RW	Recording Mode	UINT16	0=Stop-When-Full, 1=First-In-Frist-Out
+2	RW	Reserved	UINT16	
+3	RW	Recording Interval	UINT32	1 to 60 (cycles)
+5	RW	Recording Offset[2]	UINT16	0
+6	RW	Number of Parameters[3]	UINT16	0 to 32
+7	RW	Parameter 1	UINT16	Please refer to **Appendices A and C** for a complete list of the Data Recorder Parameters and the default configuration for each DR, respectively.
+8	RW	Parameter 2	UINT16	
+9	RW	Parameter 3	UINT16	
+10	RW	Parameter 4	UINT16	
+11	RW	Parameter 5	UINT16	
+12	RW	Parameter 6	UINT16	
+13	RW	Parameter 7	UINT16	
+14	RW	Parameter 8	UINT16	
+15	RW	Parameter 9	UINT16	
+16	RW	Parameter 10	UINT16	
+17	RW	Parameter 11	UINT16	
+18	RW	Parameter 12	UINT16	
+19	RW	Parameter 13	UINT16	
+20	RW	Parameter 14	UINT16	
+21	RW	Parameter 15	UINT16	
+22	RW	Parameter 16	UINT16	
+23	RW	Parameter 17	UINT16	
+24	RW	Parameter 18	UINT16	
+25	RW	Parameter 19	UINT16	
+26	RW	Parameter 20	UINT16	
+27	RW	Parameter 21	UINT16	
+28	RW	Parameter 22	UINT16	
+29	RW	Parameter 23	UINT16	
+30	RW	Parameter 24	UINT16	
+31	RW	Parameter 25	UINT16	
+32	RW	Parameter 26	UINT16	
+33	RW	Parameter 27	UINT16	
+34	RW	Parameter 28	UINT16	
+35	RW	Parameter 29	UINT16	
+36	RW	Parameter 30	UINT16	
+37	RW	Parameter 31	UINT16	
+38	RW	Parameter 32	UINT16	

Table 5-1 HS DR Setup Data Structure

Notes:

1) The Standard Data Recorder can be triggered by Setpoint (**Triggered by Setpoint**) or on a time basis using the meter clock (**Triggered by Timer**). For **Triggered by Setpoint**, when the Setpoint goes active, the Data Recorder starts to record, and when the Setpoint becomes inactive, the Data Recorder stops.
2) **Recording Offset** can be used to delay the recording by a fixed time from the **Recording Interval**. For example, if **Recording Interval** is set to 3600 (hourly) and **Recording Offset** is set to 300 (5 minutes), the recording will take place at 5 minutes after the hour every hour, i.e. 00:05, 01:05, 02:05…etc. The programmed value of **Recording Offset** should be less than that of **Recording Interval**.
3) **Appendix A** provides a list of available parameters for data recording. All parameters are available for standard data recording. If **Number of parameters** is set to **0**, the Data Recorder is disabled.

5.10.18 Max./Min. Recorder (MMR) Setup

The **Self-Read Time** allows the user to specify the time and day of the month for the Max./Min. Log Self-Read operation. The **Self-Read Time** supports three options:

- A zero value means that the Self-Read will take place at 00:00 of the first day of each month.
- A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = Day * 100 + Hour where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.
- A 0xFFFF value will disable the Self-Read operation and replace it with manual operation. A manual reset will cause the Max. Demand of **This Month** to be transferred to the Max. Demand of **Last Month** and then reset. The terms **This Month** and **Last Month** will become **Since Last Reset** and **Before Last Reset**.

5.10.18.1 Max./Min. Recorder #1 Setup

Register		Property	Description	Format	Range/Options, Default*
Max.	Min.				
48900	49301	RW	Self-read Time[1]	UINT16	Manual/Auto, 0xFFFF*
48901	49302	RW	Number of Parameters	UINT16	0 to 20*
48902	49303	RW	Parameter #1	UINT16	Uab*
48903	49304	RW	Parameter #2	UINT16	Ubc*
48904	49305	RW	Parameter #3	UINT16	Uca*
48905	49306	RW	Parameter #4	UINT16	Ull avg*
48906	49307	RW	Parameter #5	UINT16	Ia*
48907	49308	RW	Parameter #6	UINT16	Ib*
48908	49309	RW	Parameter #7	UINT16	Ic*
48909	49310	RW	Parameter #8	UINT16	I avg*
48910	49311	RW	Parameter #9	UINT16	P Total*
48911	49312	RW	Parameter #10	UINT16	Q Total*
48912	49313	RW	Parameter #11	UINT16	S Total*
48913	49314	RW	Parameter #12	UINT16	P.F. Total*
48914	49315	RW	Parameter #13	UINT16	Freq*
48915	49316	RW	Parameter #14	UINT16	Ua*
48916	49317	RW	Parameter #15	UINT16	Ub*
48917	49318	RW	Parameter #16	UINT16	Uc*
48918	49319	RW	Parameter #17	UINT16	Uln avg*
48919	49320	RW	Parameter #18	UINT16	U4*
48920	49321	RW	Parameter #19	UINT16	I4*
48921	49301	RW	Parameter #20	UINT16	I5*

Table 5-1 Max./Min. Recorder #1 Setup

5.10.18.2 Max./Min. Recorder #2 Setup

Register		Property	Description	Format	Range/Options, Default*
Max.	Min.				
49000	49400	RW	Self-read Time[1]	UINT16	Manual/Auto, 0xFFFF*
49001	49401	RW	Number of Parameters	UINT16	0 to 20, 16*
49002	49402	RW	Parameter #1	UINT16	Pa*
49003	49403	RW	Parameter #2	UINT16	Pb*
49004	49404	RW	Parameter #3	UINT16	Pc*
49005	49405	RW	Parameter #4	UINT16	Qa*
49006	49406	RW	Parameter #5	UINT16	Qb*
49007	49407	RW	Parameter #6	UINT16	Qc*
49008	49408	RW	Parameter #7	UINT16	Sa*
49009	49409	RW	Parameter #8	UINT16	Sb*
49010	49410	RW	Parameter #9	UINT16	Sc*
49011	49411	RW	Parameter #10	UINT16	P.F.a*
49012	49412	RW	Parameter #11	UINT16	P.F.b*
49013	49413	RW	Parameter #12	UINT16	P.F.c*
49014	49414	RW	Parameter #13	UINT16	U0 Unb.*.
49015	49415	RW	Parameter #14	UINT16	I0 Unb.*
49016	49416	RW	Parameter #15	UINT16	U2 Unb.*
49017	49417	RW	Parameter #16	UINT16	I2 Unb.*
49018	49418	RW	Parameter #17	UINT16	
49019	49419	RW	Parameter #18	UINT16	
49020	49420	RW	Parameter #19	UINT16	

49021	49421	RW	Parameter #20	UINT16	

Table 5-1 Max. Recorder #2 Setup

5.10.18.3 Max./Min. Recorder #3 Setup

Register		Property	Description	Format	Range/Options, Default*
Max.	Min.				
49100	49500	RW	Self-read Time[1]	UINT16	Manual/Auto, 0xFFFF*
49101	49501	RW	Number of Parameters	UINT16	0 to 20, 18*
49102	49502	RW	Parameter #1	UINT16	Ua THD*
49103	49503	RW	Parameter #2	UINT16	Ub THD*
49104	49504	RW	Parameter #3	UINT16	Uc THD*
49105	49505	RW	Parameter #4	UINT16	Ia THD*
49106	49506	RW	Parameter #5	UINT16	Ib THD*
49107	49507	RW	Parameter #6	UINT16	Ic THD*
49108	49508	RW	Parameter #7	UINT16	Ia TDD*
49109	49509	RW	Parameter #8	UINT16	Ib TDD*
49110	49510	RW	Parameter #9	UINT16	Ic TDD*
49111	49511	RW	Parameter #10	UINT16	Ia K-Factor*
49112	49512	RW	Parameter #11	UINT16	Ib K-Factor*
49113	49513	RW	Parameter #12	UINT16	Ic K-Factor*
49114	49514	RW	Parameter #13	UINT16	Ua Crest Factor*
49115	49515	RW	Parameter #14	UINT16	Ub Crest Factor*
49116	49516	RW	Parameter #15	UINT16	Uc Crest Factor*
49117	49517	RW	Parameter #16	UINT16	Ia Crest Factor*
49118	49518	RW	Parameter #17	UINT16	Ib Crest Factor*
49119	49519	RW	Parameter #18	UINT16	Ic Crest Factor*
49120	49520	RW	Parameter #19	UINT16	
49121	49521	RW	Parameter #20	UINT16	

Table 5-1 Max./Min. Recorder #3 Setup

5.10.18.4 Max./Min. Recorder #4 Setup

Register		Property	Description	Format	Range/Options, Default*
Max.	Min.				
49200	49600	RW	Self-read Time[1]	UINT16	Manual/Auto, 0xFFFF*
49201	49601	RW	Number of Parameters	UINT16	0 to 20, 19*
49202	49602	RW	Parameter #1	UINT16	U0 (Zero Sequence)
49203	49603	RW	Parameter #2	UINT16	U1 (+ve Sequence)
49204	49604	RW	Parameter #3	UINT16	U2 (-ve Sequence)
49205	49605	RW	Parameter #4	UINT16	I0 (Zero Sequence)
49206	49606	RW	Parameter #5	UINT16	I1 (+ve Sequence)
49207	49607	RW	Parameter #6	UINT16	I2 (-ve Sequence)
49208	49608	RW	Parameter #7	UINT16	Ua Pst
49209	49609	RW	Parameter #8	UINT16	Ub Pst
49210	49610	RW	Parameter #9	UINT16	Uc Pst
49211	49611	RW	Parameter #10	UINT16	Ua Plt
49212	49612	RW	Parameter #11	UINT16	Ub Plt
49213	49613	RW	Parameter #12	UINT16	Uc Plt
49214	49614	RW	Parameter #13	UINT16	Uab Deviation
49215	49615	RW	Parameter #14	UINT16	Ubc Deviation
49216	49616	RW	Parameter #15	UINT16	Uca Deviation
49217	49617	RW	Parameter #16	UINT16	Ua Deviation
49218	49618	RW	Parameter #17	UINT16	Ub Deviation
49219	49619	RW	Parameter #18	UINT16	Uc Deviation
49220	49620	RW	Parameter #19	UINT16	Freq. Dev.
49221	49621	RW	Parameter #20	UINT16	

Table 5-1 Max./Min. Recorder #4 Setup

5.10.19 IER & AER Setup

Register		Property	Description	Format	Range, Default*
IER	AER				
49700	49730	RW	Recording Mode	UINT16	0=Disabled 1=Stop-When-Full 2=First-In-First-Out*
49701	49731	RW	Reserved	UINT16	
49702	49732	RW	Reserved	UINT16	

49703	49733	RW	Recording Interval		UINT16	1 to 65535min, 15*
49704 ~ 49706	49734 ~ 49736	RW	Start Time[2]	High-order Byte: Year	UINT16	0-99 (Year-2000)
				Low-order Byte: Month		1 to 12
				High-order Byte: Day	UINT16	1 to 31
				Low-order Byte: Hour		0 to 23
				High-order Byte: Minute	UINT16	0 to 59
				Low-order Byte: Second		0 to 59

Table 5-1 IER &AER Setup

5.10.20 EN50160 Setup

The default values in **Section 5.11.20.2** may be different for LV, MV and HV levels such that it's required to set **Register 49790 Voltage Level** first.

5.10.20.1 Basic

Register	Property	Description	Format	Range, Default*
49790	RW	Voltage Level	UINT16	0=LV*, 1=MV, 2=HV
49791	RW	Start Week	UINT16	0=Sunday* 1~6=Monday to Saturday

Table 5-1 EN50160 Basic Setup

5.10.20.2 EN50160 Parameters

Register	Property	Description	Format	Range, Default*
49792~49799	RW	Reserved		
49800	RW	Freq Wide Tolerance	Float	1.0
49802	RW	Freq positive deviation wide limit	Float	1.04
49804	RW	Freq negative deviation wide limit	Float	0.94
49806	RW	Freq narrow tolerance	Float	0.995
49808	RW	Freq positive deviation narrow limit	Float	1.01
49810	RW	Freq negative deviation narrow limit	Float	0.99
49812	RW	Voltage wide tolerance	Float	1.0
49814	RW	Voltage positive deviation wide limit	Float	LV: 1.1, MV/LV: 1.15
49816	RW	Voltage negative deviation wide limit	Float	0.85
49818	RW	Voltage narrow tolerance	Float	LV: 0.95, MV/HV: 0.99
49820	RW	Voltage positive deviation narrow limit	Float	1.1
49822	RW	Voltage negative deviation narrow limit	Float	0.9
49824	RW	Flicker tolerance	Float	0.95
49826	RW	Flicker limit	Float	1
49828	RW	Voltage Unbalance tolerance	Float	0.95
49830	RW	Voltage Unbalance limit	Float	0.02
49832	RW	Harmonic Voltage tolerance	Float	0.95
49834	RW	THD limit	Float	0.08
49836	RW	Reserved	Float	
49838	RW	Reserved	Float	
49840	RW	H02 Voltage limit	Float	LV/MV: 0.02, HV: 0.019
49842	RW	H03 Voltage limit	Float	LV/MV: 0.05, HV: 0.03
49844	RW	H04 Voltage limit		0.01
49846	RW	H05 Voltage limit	Float	LV/MV: 0.06, HV: 0.05
49848	RW	H06 Voltage limit	Float	0.005
49850	RW	H07 Voltage limit	Float	LV/MV: 0.05, HV: 0.04
49852	RW	H08 Voltage limit	Float	0.005
49854	RW	H09 Voltage limit	Float	LV/MV:0.015, HV: 0.013
49856	RW	H10 Voltage limit	Float	0.005
49858	RW	H11 Voltage limit	Float	LV/MV:0.035, HV: 0.03
49860	RW	H12 Voltage limit	Float	0.005
49862	RW	H13 Voltage limit	Float	LV/MV:0.03, HV: 0.025
49864	RW	H14 Voltage limit	Float	0.005
49866	RW	H15 Voltage limit	Float	0.005
49868	RW	H16 Voltage limit	Float	0.005
49870	RW	H17 Voltage limit	Float	0.02
49872	RW	H18 Voltage limit	Float	0.005
49874	RW	H19 Voltage limit	Float	0.015
49876	RW	H20 Voltage limit	Float	0.005
49878	RW	H21 Voltage limit	Float	0.005
49880	RW	H22 Voltage limit	Float	0.005
49882	RW	H23 Voltage limit	Float	0.015
49884	RW	H24 Voltage limit	Float	0.005

49886	RW	H25 Voltage limit	Float	0.015
49888	RW	Reserved	Float	0

Table 5-1 EN50160 Parameters Setup

5.10.21 TOU Setup

5.10.21.1 Basic Setup

Register	Property	Description	Format	Range, Default*
50100	RW	Sunday Setup	UINT16	0=Weekday1* 1=Weekday2 2=Weekday3
50101	RW	Monday Setup	UINT16	
50102	RW	Tuesday Setup	UINT16	
50103	RW	Wednesday Setup	UINT16	
50104	RW	Thursday Setup	UINT16	
50105	RW	Friday Setup	UINT16	
50106	RW	Saturday Setup	UINT16	
50107	RW	TOU Switch Time	UINT32	See Note 2)
50109	RW	TOU Self-read Time	UINT16	DDHH

Table 5-1 TOU Basic Setup

Notes:

1) If DI1 is not programmed as a **Tariff Switch**, the TOU will function based on the TOU Schedule. If at least one DI (DI1) is programmed as a **Tariff Switch**, the TOU Schedule will no longer be used and the Tariff switching will be based on the status of the DIs.

2) The following table illustrates the data structure for the TOU Switch Time. For example, 0x1003140C indicates a switch time of 12:00pm on March 20th, 2016. Writing 0xFFFFFFFF to this register disables the switching between TOU Schedule.

Byte 3	Byte 2	Byte 1	Byte 0
Year-2000 (0-37)	Month (1-12)	Day (1-31)	Hour (00-23)

Table 5-2 TOU Switch Time Format

5.10.21.2 Season Setup

The iMeter 8 has two sets of Season setup parameters. The base addresses for two sets are 50200 and 50300 respectively. Register Address = Base Address + Register Offset, for example, the season #2's start date of second schedule is 50300+4 = 50304.

Offset	Property	Description		Format	Range, Default*
0	RW	Season #1: Start Date[1]		UINT16	0x0101*
1	RW	Season #1: Weekday#1 Daily Profile		UINT16	0* to 19
2	RW	Season #1: Weekday#2 Daily Profile		UINT16	
3	RW	Season #1: Weekday#3 Daily Profile		UINT16	
4	RW	Season #2: Start Date	High-order Byte: Month Low-order Byte: Day	UINT16	
5	RW	Season #2: Weekday#1 Daily Profile		UINT16	0* to 19
6	RW	Season #2: Weekday#2 Daily Profile		UINT16	
7	RW	Season #2: Weekday#3 Daily Profile		UINT16	
8	RW	Season #3: Start Date		UINT16	See Season #2: Start Date
9	RW	Season #3: Weekday#1 Daily Profile		UINT16	0* to 19
10	RW	Season #3: Weekday#2 Daily Profile		UINT16	
11	RW	Season #3: Weekday#3 Daily Profile		UINT16	
12	RW	Season #4: Start Date		UINT16	See Season #2: Start Date
13	RW	Season #4: Weekday#1 Daily Profile		UINT16	0* to 19
14	RW	Season #4: Weekday#2 Daily Profile		UINT16	
15	RW	Season #4: Weekday#3 Daily Profile		UINT16	
16	RW	Season #5: Start Date		UINT16	See Season #2: Start Date
17	RW	Season #5: Weekday#1 Daily Profile		UINT16	0* to 19
18	RW	Season #5: Weekday#2 Daily Profile		UINT16	
19	RW	Season #5: Weekday#3 Daily Profile		UINT16	
20	RW	Season #6: Start Date		UINT16	See Season #2: Start Date
21	RW	Season #6: Weekday#1 Daily Profile		UINT16	0* to 19
22	RW	Season #6: Weekday#2 Daily Profile		UINT16	
23	RW	Season #6: Weekday#3 Daily Profile		UINT16	
24	RW	Season #7: Start Date		UINT16	See Season #2: Start Date
25	RW	Season #7: Weekday#1 Daily Profile		UINT16	0* to 19
26	RW	Season #7: Weekday#2 Daily Profile		UINT16	
27	RW	Season #7: Weekday#3 Daily Profile		UINT16	
28	RW	Season #8: Start Date		UINT16	See Season #2: Start Date
29	RW	Season #8: Weekday#1 Daily Profile		UINT16	0* to 19

30	RW	Season #8: Weekday#2 Daily Profile	UINT16	
31	RW	Season #8: Weekday#3 Daily Profile	UINT16	
32	RW	Season #9: Start Date	UINT16	See Season #2: Start Date
33	RW	Season #9: Weekday#1 Daily Profile	UINT16	0* to 19
34	RW	Season #9: Weekday#2 Daily Profile	UINT16	
35	RW	Season #9: Weekday#3 Daily Profile	UINT16	
36	RW	Season #10: Start Date	UINT16	See Season #2: Start Date
37	RW	Season #10: Weekday#1 Daily Profile	UINT16	0* to 19
38	RW	Season #10: Weekday#2 Daily Profile	UINT16	
39	RW	Season #10: Weekday#3 Daily Profile	UINT16	
40	RW	Season #11: Start Date	UINT16	See Season #2: Start Date
41	RW	Season #11: Weekday#1 Daily Profile	UINT16	0* to 19
42	RW	Season #11: Weekday#2 Daily Profile	UINT16	
43	RW	Season #11: Weekday#3 Daily Profile	UINT16	
44	RW	Season #12: Start Date	UINT16	See Season #2: Start Date
45	RW	Season #12: Weekday#1 Daily Profile	UINT16	0* to 19
46	RW	Season #12: Weekday#2 Daily Profile	UINT16	
47	RW	Season #12: Weekday#3 Daily Profile	UINT16	

Table 5-1 Season Setup

Notes:

1) **Start Date** for Season#1 is Jan. 1st and cannot be modified.
2) Setting a Season's **Start Date** as 0xFFFF terminates the TOU's Season settings. All subsequent Seasons' setup parameters will be ignored since the previous Season's duration is from its **Start Date** to the end of the year.
3) The **Start Date** of a particular Season must be later than the previous Season's.

5.10.21.3 Daily Profile Setup

The iMeter 8 has two sets of Daily Profile setup parameters, one for each TOU.

Register		Property	Description	Format
DP #1	DP #2			
50400~50423	50900~50923	RW	Daily Profile #1	See **Table 5-115**
50424~50447	50924~50947	RW	Daily Profile #2	
50448~50471	50948~50971	RW	Daily Profile #3	
50472~50495	50972~50995	RW	Daily Profile #4	
50496~50519	50996~51019	RW	Daily Profile #5	
50520~50543	51020~51043	RW	Daily Profile #6	
50544~50567	51044~51067	RW	Daily Profile #7	
50568~50591	51068~51091	RW	Daily Profile #8	
50592~50615	51092~50615	RW	Daily Profile #9	
50616~50639	51116~51139	RW	Daily Profile #10	
50640~50663	51140~51163	RW	Daily Profile #11	
50664~50687	51164~51187	RW	Daily Profile #12	
50688~50711	51188~51211	RW	Daily Profile #13	
50712~50735	51212~51235	RW	Daily Profile #14	
50736~50760	51236~51260	RW	Daily Profile #15	
50760~50783	51260~51283	RW	Daily Profile #16	
50784~50807	51284~51307	RW	Daily Profile #17	
50808~50831	51308~51331	RW	Daily Profile #18	
50832~50855	51332~51355	RW	Daily Profile #19	
50856~50879	51356~51379	RW	Daily Profile #20	

Table 5-1 Daily Profile#1 & #2 Setup

Offset	Property	Description		Format	Note
+0	RW	Period #1 Start Time		UINT16	0x0000
+1	RW	Period #1 Tariff		UINT16	0=T1, …, 7=T8
+2	RW	Period #2 Start Time	High-order Byte: Hour	UINT16	0 ≤ Hour < 24
			Low-order Byte: Min		Min = 0, 15, 30, 45
+3	RW	Period #2 Tariff		UINT16	0=T1, …, 7=T8
+4	RW	Period #3 Start Time		UINT16	See Period #2 Start Time
+5	RW	Period #3 Tariff		UINT16	0=T1, …, 7=T8
+6	RW	Period #4 Start Time		UINT16	See Period #2 Start Time
+7	RW	Period #4 Tariff		UINT16	0=T1, …, 7=T8
+8	RW	Period #5 Start Time		UINT16	See Period #2 Start Time
+9	RW	Period #5 Tariff		UINT16	0=T1, …, 7=T8
+10	RW	Period #6 Start Time		UINT16	See Period #2 Start Time
+11	RW	Period #6 Tariff		UINT16	0=T1, …, 7=T8

+12	RW	Period #7 Start Time	UINT16	See Period #2 Start Time
+13	RW	Period #7 Tariff	UINT16	0=T1, …, 7=T8
+14	RW	Period #8 Start Time	UINT16	See Period #2 Start Time
+15	RW	Period #8 Tariff	UINT16	0=T1, …, 7=T8
+16	RW	Period #9 Start Time	UINT16	See Period #2 Start Time
+17	RW	Period #9 Tariff	UINT16	0=T1, …, 7=T8
+18	RW	Period #10 Start Time	UINT16	See Period #2 Start Time
+19	RW	Period #10 Tariff	UINT16	0=T1, …, 7=T8
+20	RW	Period #11 Start Time	UINT16	See Period #2 Start Time
+21	RW	Period #11 Tariff	UINT16	0=T1, …, 7=T8
+22	RW	Period #12 Start Time	UINT16	See Period #2 Start Time
+23	RW	Period #12 Tariff	UINT16	0=T1, …, 7=T8

Table 5-2 Daily Profile Data Structure Setup

Notes:

1) **Daily Profile #1's Period #1 Start Time** is always 00:00 and cannot be modified.
2) Setting a Period's **Start Time** as 0xFFFF terminates the Daily Profile's settings. All later Daily Profile' setup parameters will be ignored, and the previous Period's duration is from its **Start Time** to the end of the day.
3) The minimum interval of a period is 15 minutes.
4) The **Start Time** of a particular Period must be later than the previous Period's.

5.10.21.4 Alternate Days Setup

The Alternate Days has higher priority than the season, which means if one day is set as alternate day, then this day's rate distribution will according to Alternate Days schedule.

The iMeter 8 has two sets of Alternate Days setup parameters, one for each TOU. The Base Addresses for the two sets are 51400 and 51700, respectively, where the Register Address = Base Address + Offset. For example, the register address for TOU #2's Alternative Day #2's Date is: 51700+3 = 51703.

Offset	Property	Description	Format	Note, Default*
0	RW	Alternate Day #1 Date[1]	UINT32	See Notes 1)
2	RW	Alternate Day #1 Daily Profile	UINT16	0* to 19
3	RW	Alternate Day #2 Date[1]	UINT32	See Notes 1)
5	RW	Alternate Day #2 Daily Profile	UINT16	0* to 19
6	RW	Alternate Day #3 Date[1]	UINT32	See Notes 1)
8	RW	Alternate Day #3 Daily Profile	UINT16	0* to 19
9	RW	Alternate Day #4 Date[1]	UINT32	See Notes 1)
11	RW	Alternate Day #4 Daily Profile	UINT16	0* to 19
12	RW	Alternate Day #5 Date[1]	UINT32	See Notes 1)
14	RW	Alternate Day #5 Daily Profile	UINT16	0* to 19
15	RW	Alternate Day #6 Date[1]	UINT32	See Notes 1)
17	RW	Alternate Day #6 Daily Profile	UINT16	0* to 19
18	RW	Alternate Day #7 Date[1]	UINT32	See Notes 1)
19	RW	Alternate Day #7 Daily Profile	UINT16	0* to 19
21	RW	Alternate Day #8 Date[1]	UINT32	See Notes 1)
22	RW	Alternate Day #8 Daily Profile	UINT16	0* to 19
24	RW	Alternate Day #9 Date[1]	UINT32	See Notes 1)
25	RW	Alternate Day #9 Daily Profile	UINT16	0* to 19
27	RW	Alternate Day #10 Date[1]	UINT32	See Notes 1)
29	RW	Alternate Day #10 Daily Profile	UINT16	0* to 19
…		…		
240	RW	Alternate Day #81 Date[1]	UINT32	See Notes 1)
162	RW	Alternate Day #81 Daily Profile	UINT16	0* to 19
243	RW	Alternate Day #82 Date[1]	UINT32	See Notes 1)
245	RW	Alternate Day #82 Daily Profile	UINT16	0* to 19
246	RW	Alternate Day #83 Date[1]	UINT32	See Notes 1)
248	RW	Alternate Day #83 Daily Profile	UINT16	0* to 19
249	RW	Alternate Day #84 Date[1]	UINT32	See Notes 1)
251	RW	Alternate Day #84 Daily Profile	UINT16	0* to 19
252	RW	Alternate Day #85 Date[1]	UINT32	See Notes 1)
254	RW	Alternate Day #85 Daily Profile	UINT16	0* to 19
255	RW	Alternate Day #86 Date[1]	UINT32	See Notes 1)
256	RW	Alternate Day #86 Daily Profile	UINT16	0* to 19
258	RW	Alternate Day #87 Date[1]	UINT32	See Notes 1)
260	RW	Alternate Day #87 Daily Profile	UINT16	0* to 19
261	RW	Alternate Day #88 Date[1]	UINT32	See Notes 1)

263	RW	Alternate Day #88 Daily Profile	UINT16	0* to 19
264	RW	Alternate Day #89 Date[1]	UINT32	See Notes 1)
266	RW	Alternate Day #89 Daily Profile	UINT16	0* to 19
267	RW	Alternate Day #90 Date[1]	UINT32	See Notes 1)
269	RW	Alternate Day #90 Daily Profile	UINT16	0* to 19

Table 5-1 Alternate Days Setup

Notes:

1) The following table illustrates the data structure of the Date register:

Byte 3	Byte 2	Byte 1	Byte 0
Reserved	Year-2000 (0-37)	Month (1-12)	Day (1-31)

Table 5-2 Date Format

When the Year and/or Month are set as **0xFF**, it means the Alternate Day is repetitive by year and/or month, i.e. the same day of every year or every month is an Alternate Day.

5.11 File Transfer Register

5.11.1 File Path and Name

The WFR, DWR and RMSR Log are stored in the iMeter 8's non-volatile memory with COMTRADE file format and will not suffer any loss in the event of power failure. Each WFR, DWR and RMSR record will generate 3 files in their folders.

- **WFR Log**

/faultRecord: faultRecordXXX.cfg, faultRecordXXX.dat and faultRecordXXX.hdr.

Short file names for the three files are WFR_xxx.cfg, WFR_xxx.dat and WFR_XXX.hdr, respectively.

- **DWR Log**

/disturbRecord: disturbRecordXXX.cfg, disturbRecordXXX.dat and disturbRecordXXX.hdr.

Short file names for the three files are DWR_xxx.cfg, DWR_xxx.dat and DWR_xxx.cfg, respectively.

- **RMSR Log**

/rmsRecord: rmsRecordxxx.cfg, rmsRecordxxx.dat, rmsRecordxxx.hdr.

Short file names for the three files are RMSR_xxx.cfg, RMSR_xxx.dat, RMSR_xxx.cfg, respectively.

XXX stands for the WFR / DWR / RMSR Log Location (please refer to **Section 5.1 Basic Measurement.**

5.11.2 Reading File

The file can be read via file transfer register, the following description shows how to read files.

1. Write short file name into **File Name** register, for example: WFR#1_129.cfg. If the file doesn't exist or failed to open, the device will return Illegal Data Value error code (0x03).
2. (Optional) Write specified offset address in **File Offset** register if a specific file wants to be read, otherwise no need to write or read the register and the file will be read from the beginning.

   When read file sequentially, the **File Offset** register will be arranged automatically as long as **File Data Buffer** and **File Offset** are read simultaneously. Otherwise, the device will return Illegal Data Value error code (0x03) once writing an invalid file offset into the register.
3. Read register 59500 and achieve file size.
4. Read File Data Buffer registers and achieve file data of the frame. After finished reading data, file offset will be added automatically, and data of file buffer will be updated automatically.
5. Repeat step 4 until the valid data being read equals to file size, and finished reading the file.
6. Writing a new File Name under any status means to start a new file reading process.

5.11.3 Register Address

Register	Property	Description	Format	Range/Note
59400~59499	RW	File Name[1]	Char	Writing relative path of file in a frame, end with \0.
59500	RO	File Size[2]	UINT32	File size of being transferred currently
59502	RW	File Offset	UINT32	
59504	RO	Valid Number of Data Bytes in the Frame	UINT16	

59505~59626	RO	File Data Buffer	Char	0~244

Table 5-1 File Transfer Register

5.12 Control Setup

5.12.1 Alarm/DO Control

The Alarm/DO Control registers are implemented as both "Write-Only" Modbus Coil Registers (0XXXXX) and Modbus Holding Registers (4XXXXX), which can be controlled with the Force Single Coil command (Function Code 0x05) or the Preset Multiple Hold Registers (Function Code 0x10). The iMeter 8 does not support the Read Coils command (Function Code 0x01) because Alarm/DO Control registers are "Write-Only". The DO Status register 0310 should be read instead to determine the current DO status.

The iMeter 8 adopts the ARM before EXECUTE operation for the remote control of its Digital Outputs if this function is enabled through the **Arm Before Execute Enable** Setup register (40301), which is disabled by default. Before executing an OPEN or CLOSE command on a Relay Output, it must be "Armed" first. This is achieved by writing the value 0xFF00 to the appropriate register to "Arm" a particular DO operation. The DO will be "Disarmed" automatically if an "Execute" command is not received within 15 seconds after it has been "Armed". If an "Execute" command is received without first having received an "Arm" command, the meter ignores the "Execute" command and returns the 0x04 exception code.

Register	Property	Description	Format	Note
9100	WO	Arm Alarm Close	UINT16	Writing "0xFF00"
9101	WO	Execute Alarm Close	UINT16	
9102	WO	Arm Alarm Open	UINT16	
9103	WO	Execute Alarm Open	UINT16	
9104	WO	Arm DO1 Close	UINT16	
9105	WO	Execute DO1 Close	UINT16	
9106	WO	Arm DO1 Open	UINT16	
9107	WO	Execute DO1 Open	UINT16	
9108	WO	Arm DO2 Close	UINT16	
9109	WO	Execute DO2 Close	UINT16	
9110	WO	Arm DO2 Open	UINT16	
9111	WO	Execute DO2 Open	UINT16	
9112	WO	Arm DO3 Close	UINT16	
9113	WO	Execute DO3 Close	UINT16	
9114	WO	Arm DO3 Open	UINT16	
9115	WO	Execute DO3 Open	UINT16	
9116	WO	Arm DO4 Close	UINT16	
9117	WO	Execute DO4 Close	UINT16	
9118	WO	Arm DO4 Open	UINT16	
9119	WO	Execute DO4 Open	UINT16	
9120	WO	Arm DO5 Close	UINT16	
9121	WO	Execute DO5 Close	UINT16	
9122	WO	Arm DO5 Open	UINT16	
9123	WO	Execute DO5 Open	UINT16	
9124	WO	Arm DO6 Close	UINT16	
9125	WO	Execute DO6 Close	UINT16	
9126	WO	Arm DO6 Open	UINT16	
9127	WO	Execute DO6 Open	UINT16	
9128	WO	Arm DO7 Close	UINT16	
9129	WO	Execute DO7 Close	UINT16	
9130	WO	Arm DO7 Open	UINT16	
9131	WO	Execute DO7 Open	UINT16	

Table 5-1 DO Control

5.12.2 Clear/Reset Control

Register	Property	Description	Format	Note
9200	WO	Send Test Email[1]	UINT16	Writing "0xFF00" to a particular register will perform the specified function.
9201	WO	Clear DI1 Counter	UINT16	
9202	WO	Clear DI2 Counter	UINT16	
9203	WO	Clear DI3 Counter	UINT16	
9204	WO	Clear DI4 Counter	UINT16	
9205	WO	Clear DI5 Counter	UINT16	
9206	WO	Clear DI6 Counter	UINT16	
9207	WO	Clear DI7 Counter	UINT16	

9208	WO	Clear DI8 Counter	UINT16	
9209	WO	Clear DI9 Counter[2]	UINT16	
9210	WO	Clear DI10 Counter[2]	UINT16	
9211	WO	Clear DI11 Counter[2]	UINT16	
9212	WO	Clear DI12 Counter[2]	UINT16	
9213	WO	Clear DI13 Counter[2]	UINT16	
9214	WO	Clear DI14 Counter[2]	UINT16	
9215	WO	Clear DI15 Counter[2]	UINT16	
9216	WO	Clear DI16 Counter[2]	UINT16	
9217	WO	Clear All DI Counters	UINT16	
9218	WO	Disable Front Panel DO Control	UINT16	
9219	WO	Clear All Data[3]	UINT16	
9220~9221	WO	Reserved		
9222	WO	Clear Device Self-diagnosis Event	UINT16	0xFF00
9250~9252	WO	Reserved	UINT16	
9253	WO	Manual Trigger WFR	UINT16	Fixed as 0xFF00
9254	WO	Manual Trigger RMSR	UINT16	
9255	WO	Manual Trigger DWR	UINT16	
9256	WO	Manual Trigger TOU Transient Log	UINT16	
9257	WO	Manual Trigger TOU Log	UINT16	
9258	WO	Manual Switch TOU Schedules	UINT16	
9259~9260	WO	Reserved	UINT16	
9261	WO	Clear SOE Log	UINT16	Fixed as 0xFF00
9262	WO	Clear PQ Log	UINT16	
9263	WO	Clear Energy Registers[4]	UINT16	
9264	WO	Clear Interval Energy Log (IER)	UINT16	
9625	WO	Clear Accumulative Energy Log (AER)	UINT16	
9266~9274	WO	Reserved	UINT16	
9275	WO	Clear Plt Log	UINT16	Fixed as 0xFF00
9276	WO	Clear Pst Log	UINT16	
9277	WO	Clear WFR	UINT16	
9278	WO	Clear DWR	UINT16	
9279~9281	WO	Reserved	UINT16	
9282	WO	Clear All MM Log[5]	UINT16	Fixed as 0xFF00
9283	WO	Clear Max. Log#1[6]	UINT16	
9284	WO	Clear Max. Log#2[6]	UINT16	
9285	WO	Clear Max. Log#3[6]	UINT16	
9286	WO	Clear Max. Log#4[6]	UINT16	
9287	WO	Reserved	UINT16	
9288	WO	Clear Min. Log#1[6]	UINT16	Fixed as 0xFF00
9289	WO	Clear Min. Log#2[6]	UINT16	
9290	WO	Clear Min. Log#3[6]	UINT16	
9291	WO	Clear Min. Log#4[6]	UINT16	
9292	WO	Reserved	UINT16	
9293	WO	Clear All Demand[7]	UINT16	Fixed as 0xFF00
9294	WO	Clear Present Max. Demand [8]	UINT16	
9295	WO	Clear EN50160 Log	UINT16	
9296	WO	Reserved	UINT16	
9297	WO	Clear SDR Log #1	UINT16	Fixed as 0xFF00
9298	WO	Clear SDR Log #2	UINT16	Fixed as 0xFF00
9299	WO	Clear SDR Log #3	UINT16	Fixed as 0xFF00
9300	WO	Clear SDR Log #4	UINT16	Fixed as 0xFF00
9301	WO	Clear SDR Log #5	UINT16	Fixed as 0xFF00
9302	WO	Clear SDR Log #6	UINT16	Fixed as 0xFF00
9303	WO	Clear SDR Log #7	UINT16	Fixed as 0xFF00
9304	WO	Clear SDR Log #8	UINT16	Fixed as 0xFF00
9305	WO	Clear SDR Log #9	UINT16	Fixed as 0xFF00
9306	WO	Clear SDR Log #10	UINT16	Fixed as 0xFF00
9307	WO	Clear SDR Log #11	UINT16	Fixed as 0xFF00
9308	WO	Clear SDR Log #12	UINT16	Fixed as 0xFF00
9309	WO	Clear SDR Log #13	UINT16	Fixed as 0xFF00
9310	WO	Clear SDR Log #14	UINT16	Fixed as 0xFF00
9311	WO	Clear SDR Log #15	UINT16	Fixed as 0xFF00
9312	WO	Clear SDR Log #16	UINT16	Fixed as 0xFF00
9313	WO	Clear All SDR Logs	UINT16	Fixed as 0xFF00
9314	WO	Clear DR Log #1	UINT16	Fixed as 0xFF00
9315	WO	Clear DR Log #2	UINT16	Fixed as 0xFF00

9316	WO	Clear DR Log #3	UINT16	Fixed as 0xFF00
9317	WO	Clear DR Log #4	UINT16	Fixed as 0xFF00
9318	WO	Clear DR Log #5	UINT16	Fixed as 0xFF00
9319	WO	Clear DR Log #6	UINT16	Fixed as 0xFF00
9320	WO	Clear DR Log #7	UINT16	Fixed as 0xFF00
9321	WO	Clear DR Log #8	UINT16	Fixed as 0xFF00
9322	WO	Clear All DR Logs	UINT16	Fixed as 0xFF00
9323~9331	WO	Reserved	UINT16	
9332	WO	Clear Dip Counter	UINT16	Fixed as 0xFF00
9333	WO	Clear Swell Counter	UINT16	Fixed as 0xFF00
9334	WO	Clear Interruption Counter	UINT16	Fixed as 0xFF00
9335	WO	Clear Transient Counter	UINT16	Fixed as 0xFF00
9336	WO	Clear RVC Counter	UINT16	Fixed as 0xFF00
9337	WO	Clear Inrush Current Counter	UINT16	Fixed as 0xFF00
9338	WO	Reserved	UINT16	
9339	WO	Clear MSV#1 Counter	UINT16	Fixed as 0xFF00
9340	WO	Clear MSV#2 Counter	UINT16	Fixed as 0xFF00
9341	WO	Clear MSV#3 Counter	UINT16	Fixed as 0xFF00
9342	WO	Clear All PQ Counter	UINT16	Fixed as 0xFF00
9343	WO	Clear All TOU Data	UINT16	Fixed as 0xFF00
9344	WO	Trigger Demo Swell Event	UINT16	Fixed as 0xFF00
9345	WO	Trigger Demo Dip Event	UINT16	Fixed as 0xFF00
9346	WO	Trigger Demo Interruption Event	UINT16	Fixed as 0xFF00
9347	WO	Trigger Demo Transient Event	UINT16	Fixed as 0xFF00
9348	WO	Trigger Demo Inrush Current Event	UINT16	Fixed as 0xFF00
9349	WO	Trigger Demo RVC Event	UINT16	Fixed as 0xFF00
9350	WO	Trigger Demo Motor start Event	UINT16	Fixed as 0xFF00
9351	WO	Clear RMSR Log	UINT16	Fixed as 0xFF00
9352	WO	Clear All Events	UINT16	Fixed as 0xFF00
9353	WO	Reserved	UINT16	
9354	WO	Clear Daily Report Log	UINT16	Fixed as 0xFF00
9355	WO	Clear 2-150kHz Conducted Emission Records	UINT16	Fixed as 0xFF00
9536	WO	Clear Frequency Deviation Records	UINT16	Fixed as 0xFF00

Table 5-1 Clear/Reset Control Register

Notes:

1) The **Send Test Email** register can verify if the SMTP functions normally providing the SMTP configurations are correct.
2) Clear DI9 to DI16 registers are valied only when the iMeter 8 is equipped with corresponding options.
3) Writing 0xFF00 to the **Clear All Data** register will clear all the data stored in iMeter 8 and reboot the meter.
4) Writing 0xFF00 to the **Clear Energy Register** will clear all INT32, INT64 Energy and Harmonic Energy measurements.
5) Writing 0xFF00 to the **Clear All MM Log** register will clear all Max./Min. Logs (Max Demand Logs are excluded).
6) Writing 0xFF00 to the **Clear Max./Min. Log #X** register to clear the Max./Min. log of This Month (Since Last Reset) when the **Self-Read Time** register is set for automatic Self-Read operation. The Max./Min. log of Last Month will not be cleared. If the **Self-Read Time** register is set for manual operation with a register value of 0xFFFF, the Max./Min. log of This Month (Since Last Reset) will be transferred to the Max./Min. log of Last Month (Before Last Reset) and then cleared.
7) Writing 0xFF00 to the **Clear All Demand** register to clear the Present/Predicated Demand, as well as This/Last Max. Demand.
8) Writing 0xFF00 to the **Clear This Max. Demand** Log register to clear Max. Demand Log of This Month (Since Last Reset) when the **Self-Read Time** register is set for automatic Self-Read operation. The Max. Demand of Last Month will not be cleared. If the **Self-Read Time** register is set for manual operation with a register value of 0xFFFF, the Peak Demand of This Month (Since Last Reset) will be transferred to the Peak Demand of Last Month (Before Last Reset) and then cleared.

5.13 Time Registers

There are two sets of Time registers supported by the iMeter 8 - Year / Month / Day / Hour / Minute / Second (Registers # 60000 to 60002 for 6-digit addressing and Registers # 9000 to 9002 for 5-digit addressing) and UNIX Time (Registers # 60004 to 600005 for 6-digit addressing and Registers # 9004 to 9005 for 5-digit addressing). When sending time to the iMeter 8 over Modbus communications, care should be taken to only write one of the two Time register sets. All registers within a Time register set must be written in a single transaction. If registers 60000 to 60004 (or 9000 to 9004 for 5-digit addressing) are being written to at the same time, both Time register sets will be updated to reflect the new time specified in the UNIX Time register set 60004 (9004) where the time specified in registers 60000 to 60003 (9000-9003 for 5-digit addressing) will be ignored. Writing to the Millisecond register 60003 (9003 for 5-digit addressing) is optional during a Time Set operation. When broadcasting time, the function code must be set to 0x10 (Pre-set Multiple Registers). Incorrect date or time values will be rejected by the meter.

Register	Property	Description	Format	Note

60000	9000	RW	High-order Byte: Year	UINT16	0-37 (Year-2000)
			Low-order Byte: Month		1 to 12
60001	9001	RW	High-order Byte: Day	UINT16	1 to 31
			Low-order Byte: Hour		0 to 23
60002	9002	RW	High-order Byte: Minute	UINT16	0 to 59
			Low-order Byte: Second		0 to 59
60003	9003	RW	Millisecond	UINT16	0 to 999
60004 ~ 60005	9004 ~ 9005	RW	UNIX Time	UINT32	0x386D4380 to 0x 7FE8177F The corresponding time is 2000.01.01 00:00:00 to 2037.12.31 23:59:59 (GMT 0:00 Time Zone)
60006	9006	RW	Symbol for Time Sync.	UINT16	0=Unsync, 1=Sync.

Table 5-1 Time Registers

5.14 Information

5.14.1 Meter Information

Register		Property	Description	Format	Note
60200~60219	9800~9819	RO	Meter Model[1]	Char	See Note 1
60220	9820	RO	Firmware Version	UINT16	e.g. 10000 shows the version is V1.00.00
60221	9821	RO	Modbus Version	UINT16	e.g. 10 shows the version is V1.0
60222	9822	RO	IEC 61850 Version	UINT16	e.g.0100 means the version is V01.00 e.g. 0000 means no 61850 support or 61850 version number error
60223	9823	RO	Hardware Version	UINT16	e.g. 10 shows the version is V1.0
60224	9824	RO	PPC Firmware Update Date: Year-2000	UINT16	e.g. 130709 means July 9,2013
60225	9825	RO	PPC Firmware Update Date: Month	UINT16	
60226	9826	RO	PPC Firmware Update Date: Day	UINT16	
60227	9827	RO	Serial Number	UINT32	e.g. 1701030100 means the 100th PEM353 that was manufactured on January 3rd, 2017
60229	9829	RO	Reserved		
60230	9830	RO	Feature Code[2]	UINT32	
60232	9832	RO	Reserved		
60233	9833	RO	Device Temperature (°C)	Float	
60235	9835	RO	PPC Diagnostics Info.	UINT32	Bit0: System Parameters Error Bit1: Secret Parameters Error Bit2: DSP Error Bit3: Memory Configuration Error
60237	9837	RO	DSP Diagnostics Info.	UINT32	Bit0: AD Error
60239	9839	RO	Reserved	UINT32	
60241	9841	RO	Reserved	UINT32	
60243	9843	RO	MAC 1 Address-01	UINT16	0x00A0
60244	9844	RO	MAC 1 Address-23	UINT16	0x1EA0
60245	9845	RO	MAC 1 Address-45	UINT16	0xAAA0
60246	9846	RO	MAC 2 Address-01	UINT16	0x00A0
60247	9847	RO	MAC 2 Address-23	UINT16	0x1EA1
60248	9848	RO	MAC 2 Address-45	UINT16	0xAAA0
60249	9849	RO	Memory Capacity	UINT16	Units: MB
60250	9850	RO	Remaining Memory	UINT16	Units: MB

Table 5-1 Meter Information

Notes:

1) The **Meter Model** appears in registers 60200 to 60219 and contains the ASCII encoding of the string "iMeter 8-A5925ANAAE" as shown in the following table.

Register	Value(Hex)	ANSCII

60200	9800	0x69	i
60201	9801	0x4D	M
60202	9802	0x65	e
60203	9803	0x74	t
60204	9804	0x65	e
60205	9805	0x72	r
60206	9806	0x20	Null
60207	9807	0x38	8
60208	9808	0x2D	-
60209	9809	0x41	A
60210	9810	0x35	5
60211	9811	0x39	9
60212	9812	0x32	2
60213	9813	0x35	5
60214	9814	0x41	A
60215	9815	0x4E	N
60216	9816	0x41	A
60217	9817	0x41	A
60218	9818	0x45	E
60219	9819	0x20	Null

Table 5-2 ASCII Encoding of "iMeter 8-A5925ANAAE"

2) The following table illustrates the iMeter 8's Feature Code:

BIT	Description	Value	Meaning	Model
1, 0	Samples/Cycles	00	1024 samples/cycle, 8GB	A
3, 2	Current Input	00	5A	5
		01	1A	1
		10	CT Clamp	SCCPA
5, 4	Voltage Input	00	57.7V/100V	1
		01	220/380V	3
		10	57.7/100V~400/690V, Resistance Input	9
6	Power Supply	0	95-250VDC/AC±10%, 47-440Hz	2
8, 7	System Frequency	0	50Hz	5
		1	60Hz	6
10, 9	I/O	00	8DI+4DO	A
		01	8DI+4DO+2AI+1AO	B
		10	16DI+8DO	C
11, 12	DI Excitation Type	00	24 VDC Internal	N
		01	110V AC/DC External	1
		10	220V AC/DC External	2
14, 13	Communications Port	00	2x100BaseT + 2xRS-485	A
16, 15	GPS Type	00	Differential-mode	A
17	Language	0	English	E
		1	Chinese	C
28, 29	Basic Feature	00	Class A Power Quality Monitoring	A
		01	Class A Power Quality Monitoring + Conduct Emission in the 2-150kHz Range	B
30	Model	0	PMC-680i	X
		1	iMeter 8	A

Table 5-3 Feature Code

5.14.2 Device Tag Information

Register	Property	Description	Format	Note
40600	RW	Supply Company Tag 1[1]	Char	Devtag 0
40630	RW	Supply Company Tag 2	Char	Devtag 1
40660	RW	Substation Name	Char	Devtag 2
40690	RW	Voltage Level	Char	Devtag 3

Table 5-1 Device Tag Information

Notes:

1) However, the iMeter 8's Front Panel Interface supports the display of up to 39 characters only.

5.14.3 Circuit Tag Information

Register	Property	Description	Format	Note
52000	RW	Circuit Name	Char	16 characters
52008	RW	Bus Name	Char	

52038	RW	Monitoring Name	Char	
52068	RW	Monitoring Voltage Level	Char	
52098	RW	Assets Management ID	Char	
52128	RW	Monitoring Network ID	Char	
52158	RW	Commissioning Date	Char	
52188	RW	Exclusive Use (Yes/No)	Char	
52218	RW	Minimum Short Circuit Capacity	Char	
52248	RW	Power Supply Capacity	Char	
52278	RW	Customer Usage Agreement	Char	
52308	RW	Comtrade Tag	Char	60 characters

Table 5-1 Circuit Tag Information

Appendix A – Source Parameters for DR, SDR and Max./Min. Recorder

DR, SDR and Max./Min. Recorder Source Parameters

Key ID				Parameters	Key ID				Parameters
50-cycle	150-cycle	10-min	2-hour		50-cycle	150-cycle	10-min	2-hour	
1	10001	20001	30001	FREQ	1711	11711	21711	31711	∑kVAc TH ABS
2	10002	20002	30002	Ua	1715	11715	21715	31715	∑kW TH
3	10003	20003	30003	Ub	1716	11716	21716	31716	∑kvar TH
4	10004	20004	30004	Uc	1717	11717	21717	31717	∑kVA TH
5	10005	20005	30005	U4	1718	11718	21718	31718	PF Avg. TH
6	10006	20006	30006	Uln Avg.	1719	11719	21719	31719	∑kW Fund.
7	10007	20007	30007	Uab	1720	11720	21720	31720	∑kvar Fund.
8	10008	20008	30008	Ubc	1721	11721	21721	31721	∑kVA Fund.
9	10009	20009	30009	Uca	1722	11722	21722	31722	dPF
10	10010	20010	30010	Ull Avg.	1723	11723	21723	31723	∑kW H02
11	10011	20011	30011	Ia	1724	11724	21724	31724	∑kvar H02
12	10012	20012	30012	Ib	1725	11725	21725	31725	∑kVA H02
13	10013	20013	30013	Ic	1726	11726	21726	31726	PF Avg. 02
14	10014	20014	30014	I4	1727	11727	21727	31727	∑kW H03
15	10015	20015	30015	I5	1728	11728	21728	31728	∑kvar H03
16	10016	20016	30016	I Avg.	1729	11729	21729	31729	∑kVA H03
17	10017	20017	30017	∑kWa	1730	11730	21730	31730	PF Avg. H03
18	10018	20018	30018	∑kWb					…
19	10019	20019	30019	∑kWc	1963	11963	21963	31963	∑kW H62
20	10020	20020	30020	∑kW	1964	11964	21964	31964	∑kvar H62
21	10021	20021	30021	∑kvara	1965	11965	21965	31965	∑kVA H62
22	10022	20022	30022	∑kvarb	1966	11966	21966	31966	PF Avg. H62
23	10023	20023	30023	∑kvarc	1967	11967	21967	31967	∑kW H63
24	10024	20024	30024	∑kvar	1968	11968	21968	31968	∑kvar H63
25	10025	20025	30025	∑kVAa	1969	11969	21969	31969	∑kVA H63
26	10026	20026	30026	∑kVAb	1970	11970	21970	31970	PF Avg. H63
27	10027	20027	30027	∑kVAc	1971	11971	21971	31971	∑kWa Fund.
28	10028	20028	30028	∑kVA	1972	11972	21972	31972	∑kWb Fund.
29	10029	20029	30029	PFa	1973	11973	21973	31973	∑kWc Fund.
30	10030	20030	30030	PFb	1974	11974	21974	31974	∑kvara Fund.
31	10031	20031	30031	PFc	1975	11975	21975	31975	∑kvarb Fund.
32	10032	20032	30032	PF Avg.	1976	11976	21976	31976	∑kvarc Fund.
33	10033	20033	30033	Ua Dev.	1977	11977	21977	31977	∑kVAa Fund.
34	10034	20034	30034	Ub Dev.	1978	11978	21978	31978	∑kVAb Fund.
35	10035	20035	30035	Uc Dev.	1979	11979	21979	31979	∑kVAc Fund.
36	10036	20036	30036	Uab Dev.	1980	11980	21980	31980	dPFa
37	10037	20037	30037	Ubc Dev.	1981	11981	21981	31981	dPFb
38	10038	20038	30038	Uca Dev.	1982	11982	21982	31982	dPFc
39	10039	20039	30039	Ua Over Dev.	1983	11983	21983	31983	∑kWa H02
40	10040	20040	30040	Ub Over Dev.	1984	11984	21984	31984	∑kWb H02
41	10041	20041	30041	Uc Over Dev.	1985	11985	21985	31985	∑kWc H02
42	10042	20042	30042	Uab Over Dev.	1986	11986	21986	31986	∑kvara H02
43	10043	20043	30043	Ubc Over Dev.	1987	11987	21987	31987	∑kvarb H02
44	10044	20044	30044	Uca Over Dev.	1988	11988	21988	31988	∑kvarc H02
45	10045	20045	30045	Ua Under Dev.	1989	11989	21989	31989	∑kVAa H02
46	10046	20046	30046	Ub Under Dev.	1990	11990	21990	31990	∑kVAb H02
47	10047	20047	30047	Uc Under Dev.	1991	11991	21991	31991	∑kVAc H02
48	10048	20048	30048	Uab Under Dev.	1992	11992	21992	31992	PFa H02
49	10049	20049	30049	Ubc Under Dev.	1993	11993	21993	31993	PFb H02
50	10050	20050	30050	Uca Under Dev.	1994	11994	21994	31994	PFc H02
51	10051	20051	30051	Freq. Dev.					…
52	10052	20052	30052	Ua Fluctuation	2715	12715	22715	32715	∑kWa H63
53	10053	20053	30053	Ub Fluctuation	2716	12716	22716	32716	∑kWb H63
54	10054	20054	30054	Uc Fluctuation	2717	12717	22717	32717	∑kWc H63
55	10055	20055	30055	U0 Unb.	2718	12718	22718	32718	∑kvara H63
56	10056	20056	30056	U2 Unb.	2719	12719	22719	32719	∑kvarb H63
57	10057	20057	30057	I0 Unb.	2720	12720	22720	32720	∑kvarc H63
58	10058	20058	30058	I2 Unb.	2721	12721	22721	32721	∑kVAa H63
59	10059	20059	30059	U0	2722	12722	22722	32722	∑kVAb H63
60	10060	20060	30060	U2	2723	12723	22723	32723	∑kVAc H63
61	10061	20061	30061	U1	2724	12724	22724	32724	PFa H63

62	10062	20062	30062	I0	2725	12725	22725	32725	PFb H63
63	10063	20063	30063	I2	2726	12726	22726	32726	PFc H63
64	10064	20064	30064	I1	2727	12727	22727	32727	Ua TIHD
65	10065	20065	30065	Ia TDD	2728	12728	22728	32728	Ub TIHD
66	10066	20066	30066	Ib TDD	2729	12729	22729	32729	Uc TIHD
67	10067	20067	30067	Ic TDD	2730	12730	22730	32730	U4 TIHD
68	10068	20068	30068	I4 TDD	2731	12731	22731	32731	Ua TOIHD
69	10069	20069	30069	I5 TDD	2732	12732	22732	32732	Ub TOIHD
70	10070	20070	30070	Ia TDD Odd	2733	12733	22733	32733	Uc TOIHD
71	10071	20071	30071	Ib TDD Odd	2734	12734	22734	32734	U4 TOIHD
72	10072	20072	30072	Ic TDD Odd	2735	12735	22735	32735	Ua TEIHD
73	10073	20073	30073	I4 TDD Odd	2736	12736	22736	32736	Ub TEIHD
74	10074	20074	30074	I5 TDD Odd	2737	12737	22737	32737	Uc TEIHD
75	10075	20075	30075	Ia TDD Even	2738	12738	22738	32738	U4 TEIHD
76	10076	20076	30076	Ib TDD Even	2739	12739	22739	32739	Ia TIHD
77	10077	20077	30077	Ic TDD Even	2740	12740	22740	32740	Ib TIHD
78	10078	20078	30078	I4 TDD Even	2741	12741	22741	32741	Ic TIHD
79	10079	20079	30079	I5 TDD Even	2742	12742	22742	32742	I4 TIHD
80	10080	20080	30080	Ia K-Factor	2743	12743	22743	32743	I5 TIHD
81	10081	20081	30081	Ib K-Factor	2744	12744	22744	32744	Ia TOIHD
82	10082	20082	30082	Ic K-Factor	2745	12745	22745	32745	Ib TOIHD
83	10083	20083	30083	I4 K-Factor	2746	12746	22746	32746	Ic TOIHD
84	10084	20084	30084	I5 K-Factor	2747	12747	22747	32747	I4 TOIHD
85	10085	20085	30085	Ia Crest Factor	2748	12748	22748	32748	I5 TOIHD
86	10086	20086	30086	Ib Crest Factor	2749	12749	22749	32749	Ia TEIHD
87	10087	20087	30087	Ic Crest Factor	2750	12750	22750	32750	Ib TEIHD
88	10088	20088	30088	I4 Crest Factor	2751	12751	22751	32751	Ic TEIHD
89	10089	20089	30089	I5 Crest Factor	2752	12752	22752	32752	I4 TEIHD
90	10090	20090	30090	Ua Crest Factor	2753	12753	22753	32753	I5 TEIHD
91	10091	20091	30091	Ub Crest Factor	2754	12754	22754	32754	Ua IHD00
92	10092	20092	30092	Uc Crest Factor	2755	12755	22755	32755	Ub IHD00
93	10093	20093	30093	U4 Crest Factor	2756	12756	22756	32756	Uc IHD00
94	10094	20094	30094	Ua MSV #1	2757	12757	22757	32757	U4 IHD00
95	10095	20095	30095	Ub MSV #1	2758	12758	22758	32758	Ua IHD01
96	10096	20096	30096	Uc MSV #1	2759	12759	22759	32759	Ub IHD01
97	10097	20097	30097	Ua MSV #2	2760	12760	22760	32760	Uc IHD01
98	10098	20098	30098	Ub MSV #2	2761	12761	22761	32761	U4 IHD01
99	10099	20099	30099	Uc MSV #2	...	...			...
100	10100	20100	30100	Ua MSV #3	3006	13006	23006	33006	Ua IHD63
101	10101	20101	30101	Ub MSV #3	3007	13007	23007	33007	Ub IHD63
102	10102	20102	30102	Uc MSV #3	3008	13008	23008	33008	Uc IHD63
103	10103	20103	30103	Ua THD	3009	13009	23009	33009	U4 IHD63
104	10104	20104	30104	Ub THD	3010	13010	23010	33010	Ia IHD00
105	10105	20105	30105	Uc THD	3011	13011	23011	33011	Ib IHD00
106	10106	20106	30106	U4 THD	3012	13012	23012	33012	Ic IHD00
107	10107	20107	30107	Ua TOHD	3013	13013	23013	33013	I4 IHD00
108	10108	20108	30108	Ub TOHD	3014	13014	23014	33014	I5 IHD00
109	10109	20109	30109	Uc TOHD	3015	13015	23015	33015	Ia IHD01
110	10110	20110	30110	U4 TOHD	3016	13016	23016	33016	Ib IHD01
111	10111	20111	30111	Ua TEHD	3017	13017	23017	33017	Ic IHD01
112	10112	20112	30112	Ub TEHD	3018	13018	23018	33018	I4 IHD01
113	10113	20113	30113	Uc TEHD	3019	13019	23019	33019	I5 IHD01
114	10114	20114	30114	U4 TEHD	...	...			...
115	10115	20115	30115	Ia THD	3325	13325	23325	33325	Ia IHD63
116	10116	20116	30116	Ib THD	3326	13326	23326	33326	Ib IHD63
117	10117	20117	30117	Ic THD	3327	13327	23327	33327	Ic IHD63
118	10118	20118	30118	I4 THD	3328	13328	23328	33328	I4 IHD63
119	10119	20119	30119	I5 THD	3329	13329	23329	33329	I5 IHD63
120	10120	20120	30120	Ia TOHD	3330	13330	23330	33330	Ua TIH RMS
121	10121	20121	30121	Ib TOHD	3331	13331	23331	33331	Ub TIH RMS
122	10122	20122	30122	Ic TOHD	3332	13332	23332	33332	Uc TIH RMS
123	10123	20123	30123	I4 TOHD	3333	13333	23333	33333	U4 TIH RMS
124	10124	20124	30124	I5 TOHD	3334	13334	23334	33334	Ua TOIH RMS
125	10125	20125	30125	Ia TEHD	3335	13335	23335	33335	Ub TOIH RMS
126	10126	20126	30126	Ib TEHD	3336	13336	23336	33336	Uc TOIH RMS
127	10127	20127	30127	Ic TEHD	3337	13337	23337	33337	U4 TOIH RMS
128	10128	20128	30128	I4 TEHD	3338	13338	23338	33338	Ua TEIH RMS

129	10129	20129	30129	I5 TEHD	3339	13339	23339	33339	Ub TEIH RMS
130	10130	20130	30130	Uab Fund.	3340	13340	23340	33340	Uc TEIH RMS
131	10131	20131	30131	Ubc Fund.	3341	13341	23341	33341	U4 TEIH RMS
132	10132	20132	30132	Uca Fund.	3342	13342	23342	33342	Ia TIH RMS
133	10133	20133	30133	Ua Fluct. CPM	3343	13343	23343	33343	Ib TIH RMS
134	10134	20134	30134	Ub Fluct. CPM	3344	13344	23344	33344	Ic TIH RMS
135	10135	20135	30135	Uc Fluct. CPM	3345	13345	23345	33345	I4 TIH RMS
…	…	…	…		3346	13346	23346	33346	I5 TIH RMS
500	10500	20500	30500	Ua HD00	3347	13347	23347	33347	Ia TOIH RMS
501	10501	20501	30501	Ub HD00	3348	13348	23348	33348	Ib TOIH RMS
502	10502	20502	30502	Uc HD00	3349	13349	23349	33349	Ic TOIH RMS
503	10503	20503	30503	U4 HD00	3350	13350	23350	33350	I4 TOIH RMS
504	10504	20504	30504	Ua HD01	3351	13351	23351	33351	I5 TOIH RMS
505	10505	20505	30505	Ub HD01	3352	13352	23352	33352	Ia TEIH RMS
506	10506	20506	30506	Uc HD01	3353	13353	23353	33353	Ib TEIH RMS
507	10507	20507	30507	U4 HD01	3354	13354	23354	33354	Ic TEIH RMS
…	…	…	…	…	3355	13355	23355	33355	I4 TEIH RMS
748	10748	20748	30748	Ua HD62	3356	13356	23356	33356	I5 TEIH RMS
749	10749	20749	30749	Ub HD62	3357	13357	23357	33357	Ua IH00 RMS
750	10750	20750	30750	Uc HD62	3358	13358	23358	33358	Ub IH00 RMS
751	10751	20751	30751	U4 HD62	3359	13359	23359	33359	Uc IH00 RMS
752	10752	20752	30752	Ua HD63	3360	13360	23360	33360	U4 IH00 RMS
753	10753	20753	30753	Ub HD63	3361	13361	23361	33361	Ua IH01 RMS
754	10754	20754	30754	Uc HD63	3362	13362	23362	33362	Ub IH01 RMS
755	10755	20755	30755	U4 HD63	3363	13363	23363	33363	Uc IH01 RMS
756	10756	20756	30756	Ia HD00	3364	13364	23364	33364	U4 IH01 RMS
757	10757	20757	30757	Ib HD00	…	…	…	…	…
758	10758	20758	30758	Ic HD00	3609	13609	23609	33609	Ua IH63 RMS
759	10759	20759	30759	I4 HD00	3610	13610	23610	33610	Ub IH63 RMS
760	10760	20760	30760	I5 HD00	3611	13611	23611	33611	Uc IH63 RMS
761	10761	20761	30761	Ia HD01	3612	13612	23612	33612	U4 IH63 RMS
762	10762	20762	30762	Ib HD01	3613	13613	23613	33613	Ia IH00 RMS
763	10763	20763	30763	Ic HD01	3614	13614	23614	33614	Ib IH00 RMS
764	10764	20764	30764	I4 HD01	3615	13615	23615	33615	Ic IH00 RMS
765	10765	20765	30765	I5 HD01	3616	13616	23616	33616	I4 IH00 RMS
…	…	…	…	…	3617	13617	23617	33617	I5 IH00 RMS
1066	11066	21066	31066	Ia HD62	3618	13618	23618	33618	Ia IH01 RMS
1067	11067	21067	31067	Ib HD62	3619	13619	23619	33619	Ib IH01 RMS
1068	11068	21068	31068	Ic HD62	3620	13620	23620	33620	Ic IH01 RMS
1069	11069	21069	31069	I4 HD62	3621	13621	23621	33621	I4 IH01 RMS
1070	11070	21070	31070	I5 HD62	3622	13622	23622	33622	I5 IH01 RMS
1071	11071	21071	31071	Ia HD63	…	…	…	…	…
1072	11072	21072	31072	Ib HD63	3928	13928	23928	33928	Ia IH63 RMS
1073	11073	21073	31073	Ic HD63	3929	13929	23929	33929	Ib IH63 RMS
1074	11074	21074	31074	I4 HD63	3930	13930	23930	33930	Ic IH63 RMS
1075	11075	21075	31075	I5 HD63	3931	13931	23931	33931	I4 IH63 RMS
1076	11076	21076	31076	Ua TH RMS	3932	13932	23932	33932	I5 IH63 RMS
1077	11077	21077	31077	Ub TH RMS	3933	13933	23933	33933	Ua Angle
1078	11078	21078	31078	Uc TH RMS	3934	13934	23934	33934	Ub Angle
1079	11079	21079	31079	U4 TH RMS	3935	13935	23935	33935	Uc Angle
1080	11080	21080	31080	Ua TOH RMS	3936	13936	23936	33936	U4 Angle
1081	11081	21081	31081	Ub TOH RMS	3937	13937	23937	33937	Ia Angle
1082	11082	21082	31082	Uc TOH RMS	3938	13938	23938	33938	Ib Angle
1083	11083	21083	31083	U4 TOH RMS	3939	13939	23939	33939	Ic Angle
1084	11084	21084	31084	Ua TEH RMS	3940	13940	23940	33940	I4 Angle
1085	11085	21085	31085	Ub TEH RMS	3941	13941	23941	33941	I5 Angle
1086	11086	21086	31086	Uc TEH RMS	3942	13942	23942	33942	Ua Fund. Angle
1087	11087	21087	31087	U4 TEH RMS	3943	13943	23943	33943	Ub Fund. Angle
1088	11088	21088	31088	Ia TH RMS	3944	13944	23944	33944	Uc Fund. Angle
1089	11089	21089	31089	Ib TH RMS	3945	13945	23945	33945	U4 Fund. Angle
1090	11090	21090	31090	Ic TH RMS	3946	13946	23946	33946	Ua H02 Angle
1091	11091	21091	31091	I4 TH RMS	3947	13947	23947	33947	Ub H02 Angle
1092	11092	21092	31092	I5 TH RMS	3948	13948	23948	33948	Uc H02 Angle
1093	11093	21093	31093	Ia TOH RMS	3949	13949	23949	33949	U4 H02 Angle
1094	11094	21094	31094	Ib TOH RMS	…	…	…	…	…
1095	11095	21095	31095	Ic TOH RMS	4190	14190	24190	34190	Ua H63 Angle
1096	11096	21096	31096	I4 TOH RMS	4191	14191	24191	34191	Ub H63 Angle

1097	11097	21097	31097	I5 TOH RMS	4192	14192	24192	34192	Uc H63 Angle
1098	11098	21098	31098	Ia TEH RMS	4193	14193	24193	34193	U4 H63 Angle
1099	11099	21099	31099	Ib TEH RMS	4194	14194	24194	34194	Ia Fund. Angle
1100	11100	21100	31100	Ic TEH RMS	4195	14195	24195	34195	Ib Fund. Angle
1101	11101	21101	31101	I4 TEH RMS	4196	14196	24196	34196	Ic Fund. Angle
1102	11102	21102	31102	I5 TEH RMS	4197	14197	24197	34197	I4 Fund. Angle
1103	11103	21103	31103	Ua DC Component	4198	14198	24198	34198	I5 Fund. Angle
1104	11104	21104	31104	Ub DC Component	4199	14199	24199	34199	Ia H02 Angle
1105	11105	21105	31105	Uc DC Component	4200	14200	24200	34200	Ib H02 Angle
1106	11106	21106	31106	U4 DC Component	4201	14201	24201	34201	Ic H02 Angle
1107	11107	21107	31107	Ua Fund.	4202	14202	24202	34202	I4 H02 Angle
1108	11108	21108	31108	Ub Fund.	4203	14203	24203	34203	I5 H02 Angle
1109	11109	21109	31109	Uc Fund.	…	…			…
1110	11110	21110	31110	U4 Fund.	4504	14504	24504	34504	Ia H63 Angle
1111	11111	21111	31111	Ua H02 RMS	4505	14505	24505	34505	Ib H63 Angle
1112	11112	21112	31112	Ub H02 RMS	4506	14506	24506	34506	Ic H63 Angle
1113	11113	21113	31113	Uc H02 RMS	4507	14507	24507	34507	I4 H63 Angle
1114	11114	21114	31114	U4 H02 RMS	4508	14508	24508	34508	I5 H63 Angle
1115	11115	21115	31115	Ua H03 RMS					
1116	11116	21116	31116	Ub H03 RMS	5000	15000	25000	35000	Uab DC Component
1117	11117	21117	31117	Uc H03 RMS	5001	15001	25001	35001	Ubc DC Component
1118	11118	21118	31118	U4 H03 RMS	5002	15002	25002	35002	Uca DC Component
				…	5003	15003	25003	35003	Uab Fund. RMS
1351	11351	21351	31351	Ua H62 RMS	5004	15004	25004	35004	Ubc Fund. RMS
1352	11352	21352	31352	Ub H62 RMS	5005	15005	25005	35005	Uca Fund. RMS
1353	11353	21353	31353	Uc H62 RMS	5006	15006	25006	35006	Uab H02 RMS
1354	11354	21354	31354	U4 H62 RMS	5007	15007	25007	35007	Ubc H02 RMS
1355	11355	21355	31355	Ua H63 RMS	5008	15008	25008	35008	Uca H02 RMS
1356	11356	21356	31356	Ub H63 RMS	…	…			…
1357	11357	21357	31357	Uc H63 RMS	5189	15189	25189	35189	Uab H63 RMS
1358	11358	21358	31358	U4 H63 RMS	5190	15190	25190	35190	Ubc H63 RMS
1359	11359	21359	31359	Ia DC Component	5191	15191	25191	35191	Uca H63 RMS
1360	11360	21360	31360	Ib DC Component	5192	15192	25192	35192	Uab DC Component
1361	11361	21361	31361	Ic DC Component	5193	15193	25193	35193	Ubc DC Component
1362	11362	21362	31362	I4 DC Component	5194	15194	25194	35194	Uca DC Component
1363	11363	21363	31363	I5 DC Component	5195	15195	25195	35195	Uab H01 HD
1364	11364	21364	31364	Ia Fund.	5196	15196	25196	35196	Ubc H01 HD
1365	11365	21365	31365	Ib Fund.	5197	15197	25197	35197	Uca H01 HD
1366	11366	21366	31366	Ic Fund.	5198	15198	25198	35198	Uab H02 HD
1367	11367	21367	31367	I4 Fund.	5199	15199	25199	35199	Ubc H02 HD
1368	11368	21368	31368	I5 Fund.	5200	15200	25200	35200	Uca H02 HD
1369	11369	21369	31369	Ia H02 RMS	…	…	…	…	…
1370	11370	21370	31370	Ib H02 RMS	5381	15381	25381	35381	Uab H63 HD
1371	11371	21371	31371	Ic H02 RMS	5382	15382	25382	35382	Ubc H63 HD
1372	11372	21372	31372	I4 H02 RMS	5383	15383	25383	35383	Uca H63 HD
1373	11373	21373	31373	I5 H02 RMS					
1374	11374	21374	31374	Ia H03 RMS	5390	15390	25390	35390	Uab IH02 RMS
1375	11375	21375	31375	Ib H03 RMS	5391	15391	25391	35391	Ubc IH02 RMS
1376	11376	21376	31376	Ic H03 RMS	5392	15392	25392	35392	Uca IH02 RMS
1377	11377	21377	31377	I4 H03 RMS					
1378	11378	21378	31378	I5 H03 RMS	5573	15573	25573	35573	Uab IH63 RMS
…	…	…	…	…	5574	15574	25574	35574	Ubc IH63 RMS
1669	11669	21669	31669	Ia H62 RMS	5575	15575	25575	35575	Uca IH63 RMS
1670	11670	21670	31670	Ib H62 RMS	5576	15576	25576	35576	Uab IH00 HD
1671	11671	21671	31671	Ic H62 RMS	5577	15577	25577	35577	Ubc IH00 HD
1672	11672	21672	31672	I4 H62 RMS	5578	15578	25578	35578	Uca IH00 HD
1673	11673	21673	31673	I5 H62 RMS					
1674	11674	21674	31674	Ia H63 RMS	5765	15765	25765	35765	Uab IH63 HD
1675	11675	21675	31675	Ib H63 RMS	5766	15766	25766	35766	Ubc IH63 HD
1676	11676	21676	31676	Ic H63 RMS	5767	15767	25767	35767	Uca IH63 HD
1677	11677	21677	31677	I4 H63 RMS	5768	15768	25768	35768	Uab THD
1678	11678	21678	31678	I5 H63 RMS	5769	15769	25769	35769	Ubc THD
1679	11679	21679	31679	∑kWa TH	5770	15770	25770	35770	Uca THD
1680	11680	21680	31680	∑kWb TH	5771	15771	25771	35771	Uab TOHD
1681	11681	21681	31681	∑kWc TH	5772	15772	25772	35772	Ubc TOHD
1682	11682	21682	31682	∑kvara TH	5773	15773	25773	35773	Uca TOHD
1683	11683	21683	31683	∑kvarb TH	5774	15774	25774	35774	Uab TEHD

1684	11684	21684	31684	∑kvarc TH	5775	15775	25775	35775	Ubc TEHD
1685	11685	21685	31685	∑kVAa TH	5776	15776	25776	35776	Uca TEHD
1686	11686	21686	31686	∑kVAb TH	5777	15777	25777	35777	Uab Angle
1687	11687	21687	31687	∑kVAc TH	5778	15778	25778	35778	Ubc Angle
1688	11688	21688	31688	PFa TH	5779	15779	25779	35779	Uca Angle
1689	11689	21689	31689	PFb TH	5780	15780	25780	35780	Uab Fund. Angle
1690	11690	21690	31690	PFc TH	5781	15781	25781	35781	Ubc Fund. Angle
1691	11691	21691	31691	∑kWa TH SUM	5782	15782	25782	35782	Uca Fund. Angle
1692	11692	21692	31692	∑kWb TH SUM	5783	15783	25783	35783	Uab H02 Angle
1693	11693	21693	31693	∑kWc TH SUM	5784	15784	25784	35784	Ubc H02 Angle
1694	11694	21694	31694	∑kvara TH SUM	5785	15785	25785	35785	Uca H02 Angle
1695	11695	21695	31695	∑kvarb TH SUM					
1696	11696	21696	31696	∑kvarc TH SUM	5966	15966	25966	35966	Uab H63 Angle
1697	11697	21697	31697	∑kVAa TH SUM	5967	15967	25967	35967	Ubc H63 Angle
1698	11698	21698	31698	∑kVAb TH SUM	5968	15968	25968	35968	Uca H63 Angle
1699	11699	21699	31699	∑kVAc TH SUM	5969	15969	25969	35969	Uab THD
1703	11703	21703	31703	∑kWa TH ABS	5970	15970	25970	35970	Ubc THD
1704	11704	21704	31704	∑kWb TH ABS	5971	15971	25971	35971	Uca THD
1705	11705	21705	31705	∑kWc TH ABS	5972	15972	25972	35972	Uab TOHD
1706	11706	21706	31706	∑kvara TH ABS	5973	15973	25973	35973	Ubc TOHD
1707	11707	21707	31707	∑kvarb TH ABS	5974	15974	25974	35974	Uca TOHD
1708	11708	21708	31708	∑kvarc TH ABS	5975	15975	25975	35975	Uab TEHD
1709	11709	21709	31709	∑kVAa TH ABS	5976	15976	25976	35976	Ubc TEHD
1710	11710	21710	31710	∑kVAb TH ABS	5977	15977	25977	35977	Uca TEHD

Key ID	Parameters	Key ID	Parameters	Key ID	Parameters
50001	Ua Pst	55004	DI	55014	DI9 Pulse Count
50002	Ub Pst	55005	DO	55015	DI10 Pulse Count
50003	Uc Pst	55006	DI1 Pulse Count	55016	DI11 Pulse Count
50004	Ua Plt	55007	DI2 Pulse Count	55017	DI12 Pulse Count
50005	Ub Plt	55008	DI3 Pulse Count	55018	DI13 Pulse Count
50006	Uc Plt	55009	DI4 Pulse Count	55019	DI14 Pulse Count
55000	AI1	55010	DI5 Pulse Count	55020	DI15 Pulse Count
55001	AI2	55011	DI6 Pulse Count	55021	DI16 Pulse Count
55002	AI3	55012	DI7 Pulse Count		
55003	AI4	55013	DI8 Pulse Count		

Demand Data ID

Key ID	Parameters	Key ID	Parameters	Key ID	Parameters
Present Demand					
51001	Ua	51036	PFa	51071	Uc THD
51002	Ub	51037	PFb	51072	U4 THD
51003	Uc	51038	PFc	51073	Ia THD
51004	Uln Avg.	51039	PF Avg.	51074	Ib THD
51005	U4	51040	Freq.	51075	Ic THD
51006	Uab	51041	Ua Dev.	51076	I4 THD
51007	Ubc	51042	Ub Dev.	51077	I5 THD
51008	Uca	51043	Uc Dev.	51078	Ua TOHD
51009	Ull Avg.	51044	Uab Dev.	51079	Ub TOHD
51010	Ia	51045	Ubc Dev.	51080	Uc TOHD
51011	Ib	51046	Uca Dev.	51081	U4 TOHD
51012	Ic	51047	Ua Over Dev.	51082	Ia TOHD
51013	I Avg.	51048	Ub Over Dev.	51083	Ib TOHD
51014	I4	51049	Uc Over Dev.	51084	Ic TOHD
51015	I5	51050	Uab Over Dev.	51085	I4 TOHD
51016	kWa Imp.	51051	Ubc Over Dev.	51086	I5 TOHD
51017	kWb Imp.	51052	Uca Over Dev.	51087	Ua TEHD
51018	kWc Imp.	51053	Ua Under Dev.	51088	Ub TEHD
51019	kW Total Imp.	51054	Ub Under Dev.	51089	Uc TEHD
51020	kWa Exp.	51055	Uc Under Dev.	51090	U4 TEHD
51021	kWb Exp.	51056	Uab Under Dev.	51091	Ia TEHD
51022	kWc Exp.	51057	Ubc Under Dev.	51092	Ib TEHD
51023	kW Total Exp.	51058	Uca Under Dev.	51093	Ic TEHD
51024	kvara Imp.	51059	Freq. Dev.	51094	I4 TEHD
51025	kvarb Imp.	51060	U0 Unb.	51095	I5 TEHD

51026	kvarc Imp.	51061	U2 Unb.	51096	Ia Fund.
51027	kvar Total Imp.	51062	I0 Unb.	51097	Ib Fund.
51028	kvara Exp.	51063	I2 Unb.	51098	Ic Fund.
51029	kvarb Exp.	51064	Ia K-Factor	51099	I4 Fund.
51030	kvar c Exp.	51065	Ib K-Factor	51100	I5 Fund.
51031	kvar Total Exp.	51066	Ic K-Factor	51101	AI1
51032	kVAa	51067	I4 K-Factor	51102	AI2
51033	kVAb	51068	I5 K-Factor	51103	AI3
51034	kVAc	51069	Ua THD	51104	AI4
51035	kVA Total	51070	Ub THD	51071	
Predicted Demand					
52001	Ua Pred.	52015	I5 Pred.	52029	kvarb Exp. Pred.
52002	Ub Pred.	52016	kWa Imp. Pred.	52030	kvarc Exp. Pred.
52003	Uc Pred.	52017	kWb Imp. Pred.	52031	kvar Total Exp. Pred.
52004	Uln Pred.	52018	kWc Imp. Pred.	52032	kVAa Pred.
52005	U4 Pred.	52019	kW Total Imp. Pred.	52033	kVAb Pred.
52006	Uab Pred.	52020	kWa Exp. Pred.	52034	kVAc Pred.
52007	Ubc Pred.	52021	kWb Exp. Pred.	52035	kVA Total Pred.
52008	Uca Pred.	52022	kWc Exp. Pred.	52036	PFa Pred.
52009	Ull Avg. Pred.	52023	kW Total Exp. Pred.	52037	PFb Pred.
52010	Ia Pred.	52024	kvara Imp. Pred.	52038	PFc Pred.
52011	Ib Pred.	52025	kvarb Imp. Pred.	52039	PF Avg. Pred.
52012	Ic Pred.	52026	kvarc Imp. Pred.	52040	Freq. Pred.
52013	I Avg. Pred.	52027	kvar Total Imp. Pred.		
52014	I4 Pred.	52028	kvara Exp. Pred.		
Max./Min. Demand					
53001	kW Total Imp. Max.	53010	Ib Fund. Max.	54006	Ia Last Max.
53002	kW Total Exp. Max.	53011	Ic Fund. Max.	54007	Ib Last Max.
53003	kvar Total Imp. Max.	53012	I4 Fund. Max.	54008	Ic Last Max.
53004	kvar Total Exp. Max.	53013	I5 Fund. Max.	54009	Ia Fund. Last Max.
53005	kVA Total Max.	54001	kW Total Imp. Last Max.	54010	Ib Fund. Last Max.
53006	Ia Max.	54002	kW Total Exp. Last Max.	54011	Ic Fund. Last Max.
53007	Ib Max.	54003	kvar Total Imp. Last Max.	54012	I4 Fund. Last Max.
53008	Ic Max.	54004	kvar Total Exp. Last Max.	54013	I5 Fund. Last Max.
53009	Ia Fund. Max.	54005	kVA Total Last Max.	54006	

Appendix B – SDR Default Setting

Parameter	SDR 1	SDR 2	SDR 3	SDR 4
Recording Interval	10	10	10	10
Recording Mode[2]	1=FIFO	1=FIFO	1=FIFO	1=FIFO
Number of Parameters[5]	59	53	61	63
Parameter 1	Freq.	Ua Angle	Ua THD	Ua TH RMS
Parameter 2	Ua RMS	Ub Angle	Ub THD	Ub TH RMS
Parameter 3	Ub RMS	Uc Angle	Uc THD	Uc TH RMS
Parameter 4	Uc RMS	U4 Angle	U4 THD	U4 TH RMS
Parameter 5	U4 RMS	Uab Angle	Ia THD	Ia TH RMS
Parameter 6	ULN RMS Avg	Ubc Angle	Ib THD	Ib TH RMS
Parameter 7	Uab RMS	Uca Angle	Ic THD	Ic TH RMS
Parameter 8	Ubc RMS	Ia Angle	I4 THD	I4 TH RMS
Parameter 9	Uca RMS	Ib Angle	I5 THD	Pa TH
Parameter 10	ULL RMS Avg	Ic Angle	Ua TOHD	Pb TH
Parameter 11	Ia RMS	I4 Angle	Ub TOHD	Pc TH
Parameter 12	Ib RMS	I5 Angle	Uc TOHD	P Total TH
Parameter 13	Ic RMS	Ua Fund. Angle	U4 TOHD	Qa TH
Parameter 14	I4 RMS	Ub Fund. Angle	Ia TOHD	Qb TH
Parameter 15	I5 RMS	Uc Fund. Angle	Ib TOHD	Qc TH
Parameter 16	Current RMS Avg	U4 Fund. Angle	Ic TOHD	Q Total TH
Parameter 17	Pa	Uab Fund. Angle	I4 TOHD	Sa TH
Parameter 18	Pb	Ubc Fund. Angle	I5 TOHD	Sb TH
Parameter 19	Pc	Uca Fund. Angle	Ua TEHD	Sc TH
Parameter 20	P Total	Ia Fund. Angle	Ub TEHD	S Total TH
Parameter 21	Qa	Ib Fund. Angle	Uc TEHD	P.F.a TH
Parameter 22	Qb	Ic Fund. Angle	U4 TEHD	P.F.b TH
Parameter 23	Qc	I4 Fund. Angle	Ia TEHD	P.F.c TH
Parameter 24	Q Total	I5 Fund. Angle	Ib TEHD	P.F. TH
Parameter 25	Sa	U0	Ic TEHD	Ua DC Component
Parameter 26	Sb	U2	I4 TEHD	Ub DC Component
Parameter 27	Sc	U1	I5 TEHD	Uc DC Component
Parameter 28	S Total	I0	Ia K-Factor	U4 DC Component
Parameter 29	PFa	I2	Ib K-Factor	Uab DC Component
Parameter 30	PFb	I1	Ic K-Factor	Ubc DC Component
Parameter 31	PFc	U2 Unbalance	I4 K-Factor	Uca DC Component
Parameter 32	PF Total	I2 Unbalance	I5 K-Factor	Ia DC RMS
Parameter 33	Ua Fund. RMS	U0 Unbalance	Ia TDD	Ib DC RMS
Parameter 34	Ub Fund. RMS	I0 Unbalance	Ib TDD	Ic DC RMS
Parameter 35	Uc Fund. RMS	Ua Deviation	Ic TDD	I4 DC RMS
Parameter 36	U4 Fund. RMS	Ub Deviation	I4 TDD	Ua HD01
Parameter 37	Uab Fund. RMS	Uc Deviation	I5 TDD	Ub HD01
Parameter 38	Ubc Fund. RMS	Uab Deviation	Ua TIHD	Uc HD01
Parameter 39	Uca Fund. RMS	Ubc Deviation	Ub TIHD	U4 HD01
Parameter 40	Ia Fund. RMS	Uca Deviation	Uc TIHD	Ua HD02
Parameter 41	Ib Fund. RMS	Ua Over Deviation	U4 TIHD	Ub HD02
Parameter 42	Ic Fund. RMS	Ub Over Deviation	Ia TIHD	Uc HD02
Parameter 43	I4 Fund. RMS	Uc Over Deviation	Ib TIHD	U4 HD02
Parameter 44	Pa Fund.	Uab Over Deviation	Ic TIHD	Ua HD03
Parameter 45	Pb Fund.	Ubc Over Deviation	I4 TIHD	Ub HD03
Parameter 46	Pc Fund.	Uca Over Deviation	Ua TOIHD	Uc HD03
Parameter 47	P Total Fund.	Ua Under Deviation	Ub TOIHD	U4 HD03
Parameter 48	Qa Fund.	Ub Under Deviation	Uc TOIHD	Ua HD04
Parameter 49	Qb Fund.	Uc Under Deviation	U4 TOIHD	Ub HD04
Parameter 50	Qc Fund.	Uab Under Deviation	Ia TOIHD	Uc HD04
Parameter 51	Q Total Fund.	Ubc Under Deviation	Ib TOIHD	U4 HD04
Parameter 52	Sa Fund.	Uca Under Deviation	Ic TOIHD	Ua HD05
Parameter 53	Sb Fund.	Freq. Deviation	I4 TOIHD	Ub HD05
Parameter 54	Sc Fund.	Uab THD	Ua TEIHD	Uc HD05
Parameter 55	S Total Fund.	Ubc THD	Ub TEIHD	U4 HD05
Parameter 56	dPFa	Uca THD	Uc TEIHD	Ua HD06
Parameter 57	dPFb	Uab TOHD	U4 TEIHD	Ub HD06
Parameter 58	dPFc	Ubc TOHD	Ia TEIHD	Uc HD06
Parameter 59	dPF Total	Uca TOHD	Ib TEIHD	U4 HD06
Parameter 60		Uab TEHD	Ic TEIHD	Ua HD07

Parameter 61		Ubc TEHD	I4 TEIHD	Ub HD07
Parameter 62		Uca TEHD		Uc HD07
Parameter 63				U4 HD07
Parameter 64				
Parameter	**SDR 5**	**SDR 6**	**SDR 7**	**SDR 8**
Recording Interval	10	10	10	10
Recording Mode[2]	1=FIFO	1=FIFO	1=FIFO	1=FIFO
Number of Parameters[5]	64	64	62	63
Parameter 1	Ua HD08	Ua HD24	Ua HD40	Ia HD08
Parameter 2	Ub HD08	Ub HD24	Ub HD40	Ib HD08
Parameter 3	Uc HD08	Uc HD24	Uc HD40	Ic HD08
Parameter 4	U4 HD08	U4 HD24	U4 HD40	Ia HD09
Parameter 5	Ua HD09	Ua HD25	Ua HD41	Ib HD09
Parameter 6	Ub HD09	Ub HD25	Ub HD41	Ic HD09
Parameter 7	Uc HD09	Uc HD25	Uc HD41	Ia HD10
Parameter 8	U4 HD09	U4 HD25	U4 HD41	Ib HD10
Parameter 9	Ua HD10	Ua HD26	Ua HD42	Ic HD10
Parameter 10	Ub HD10	Ub HD26	Ub HD42	Ia HD11
Parameter 11	Uc HD10	Uc HD26	Uc HD42	Ib HD11
Parameter 12	U4 HD10	U4 HD26	U4 HD42	Ic HD11
Parameter 13	Ua HD11	Ua HD27	Ua HD43	Ia HD12
Parameter 14	Ub HD11	Ub HD27	Ub HD43	Ib HD12
Parameter 15	Uc HD11	Uc HD27	Uc HD43	Ic HD12
Parameter 16	U4 HD11	U4 HD27	U4 HD43	Ia HD13
Parameter 17	Ua HD12	Ua HD28	Ua HD44	Ib HD13
Parameter 18	Ub HD12	Ub HD28	Ub HD44	Ic HD13
Parameter 19	Uc HD12	Uc HD28	Uc HD44	Ia HD14
Parameter 20	U4 HD12	U4 HD28	U4 HD44	Ib HD14
Parameter 21	Ua HD13	Ua HD29	Ua HD45	Ic HD14
Parameter 22	Ub HD13	Ub HD29	Ub HD45	Ia HD15
Parameter 23	Uc HD13	Uc HD29	Uc HD45	Ib HD15
Parameter 24	U4 HD13	U4 HD29	U4 HD45	Ic HD15
Parameter 25	Ua HD14	Ua HD30	Ua HD46	Ia HD16
Parameter 26	Ub HD14	Ub HD30	Ub HD46	Ib HD16
Parameter 27	Uc HD14	Uc HD30	Uc HD46	Ic HD16
Parameter 28	U4 HD14	U4 HD30	U4 HD46	Ia HD17
Parameter 29	Ua HD15	Ua HD31	Ua HD47	Ib HD17
Parameter 30	Ub HD15	Ub HD31	Ub HD47	Ic HD17
Parameter 31	Uc HD15	Uc HD31	Uc HD47	Ia HD18
Parameter 32	U4 HD15	U4 HD31	U4 HD47	Ib HD18
Parameter 33	Ua HD16	Ua HD32	Ua HD48	Ic HD18
Parameter 34	Ub HD16	Ub HD32	Ub HD48	Ia HD19
Parameter 35	Uc HD16	Uc HD32	Uc HD48	Ib HD19
Parameter 36	U4 HD16	U4 HD32	U4 HD48	Ic HD19
Parameter 37	Ua HD17	Ua HD33	Ua HD49	Ia HD20
Parameter 38	Ub HD17	Ub HD33	Ub HD49	Ib HD20
Parameter 39	Uc HD17	Uc HD33	Uc HD49	Ic HD20
Parameter 40	U4 HD17	U4 HD33	U4 HD49	Ia HD21
Parameter 41	Ua HD18	Ua HD34	Ua HD50	Ib HD21
Parameter 42	Ub HD18	Ub HD34	Ub HD50	Ic HD21
Parameter 43	Uc HD18	Uc HD34	Uc HD50	Ia HD22
Parameter 44	U4 HD18	U4 HD34	U4 HD50	Ib HD22
Parameter 45	Ua HD19	Ua HD35	Ia HD02	Ic HD22
Parameter 46	Ub HD19	Ub HD35	Ib HD02	Ia HD23
Parameter 47	Uc HD19	Uc HD35	Ic HD02	Ib HD23
Parameter 48	U4 HD19	U4 HD35	Ia HD03	Ic HD23
Parameter 49	Ua HD20	Ua HD36	Ib HD03	Ia HD24
Parameter 50	Ub HD20	Ub HD36	Ic HD03	Ib HD24
Parameter 51	Uc HD20	Uc HD36	Ia HD04	Ic HD24
Parameter 52	U4 HD20	U4 HD36	Ib HD04	Ia HD25
Parameter 53	Ua HD21	Ua HD37	Ic HD04	Ib HD25
Parameter 54	Ub HD21	Ub HD37	Ia HD05	Ic HD25
Parameter 55	Uc HD21	Uc HD37	Ib HD05	Ia HD26
Parameter 56	U4 HD21	U4 HD37	Ic HD05	Ib HD26
Parameter 57	Ua HD22	Ua HD38	Ia HD06	Ic HD26
Parameter 58	Ub HD22	Ub HD38	Ib HD06	Ia HD27
Parameter 59	Uc HD22	Uc HD38	Ic HD06	Ib HD27

Parameter 60	U4 HD22	U4 HD38	Ia HD07	Ic HD27
Parameter 61	Ua HD23	Ua HD39	Ib HD07	Ia HD28
Parameter 62	Ub HD23	Ub HD39	Ic HD07	Ib HD28
Parameter 63	Uc HD23	Uc HD39		Ic HD28
Parameter 64	U4 HD23	U4 HD39		
Parameter	**SDR 9**	**SDR 10**	**SDR 11**	**SDR 12**
Recording Interval	10	10	10	10
Recording Mode[2]	1=FIFO	1=FIFO	1=FIFO	1=FIFO
Number of Parameters[5]	63	63	60	64
Parameter 1	Ia HD29	Ia HD50	Ia H17 RMS	Ia H32 RMS
Parameter 2	Ib HD29	Ib HD50	Ib H17 RMS	Ib H32 RMS
Parameter 3	Ic HD29	Ic HD50	Ic H17 RMS	Ic H32 RMS
Parameter 4	Ia HD30	Ia H02 RMS	I4 H17 RMS	I4 H32 RMS
Parameter 5	Ib HD30	Ib H02 RMS	Ia H18 RMS	Ia H33 RMS
Parameter 6	Ic HD30	Ic H02 RMS	Ib H18 RMS	Ib H33 RMS
Parameter 7	Ia HD31	I4 H02 RMS	Ic H18 RMS	Ic H33 RMS
Parameter 8	Ib HD31	Ia H03 RMS	I4 H18 RMS	I4 H33 RMS
Parameter 9	Ic HD31	Ib H03 RMS	Ia H19 RMS	Ia H34 RMS
Parameter 10	Ia HD32	Ic H03 RMS	Ib H19 RMS	Ib H34 RMS
Parameter 11	Ib HD32	I4 H03 RMS	Ic H19 RMS	Ic H34 RMS
Parameter 12	Ic HD32	Ia H04 RMS	I4 H19 RMS	I4 H34 RMS
Parameter 13	Ia HD33	Ib H04 RMS	Ia H20 RMS	Ia H35 RMS
Parameter 14	Ib HD33	Ic H04 RMS	Ib H20 RMS	Ib H35 RMS
Parameter 15	Ic HD33	I4 H04 RMS	Ic H20 RMS	Ic H35 RMS
Parameter 16	Ia HD34	Ia H05 RMS	I4 H20 RMS	I4 H35 RMS
Parameter 17	Ib HD34	Ib H05 RMS	Ia H21 RMS	Ia H36 RMS
Parameter 18	Ic HD34	Ic H05 RMS	Ib H21 RMS	Ib H36 RMS
Parameter 19	Ia HD35	I4 H05 RMS	Ic H21 RMS	Ic H36 RMS
Parameter 20	Ib HD35	Ia H06 RMS	I4 H21 RMS	I4 H36 RMS
Parameter 21	Ic HD35	Ib H06 RMS	Ia H22 RMS	Ia H37 RMS
Parameter 22	Ia HD36	Ic H06 RMS	Ib H22 RMS	Ib H37 RMS
Parameter 23	Ib HD36	I4 H06 RMS	Ic H22 RMS	Ic H37 RMS
Parameter 24	Ic HD36	Ia H07 RMS	I4 H22 RMS	I4 H37 RMS
Parameter 25	Ia HD37	Ib H07 RMS	Ia H23 RMS	Ia H38 RMS
Parameter 26	Ib HD37	Ic H07 RMS	Ib H23 RMS	Ib H38 RMS
Parameter 27	Ic HD37	I4 H07 RMS	Ic H23 RMS	Ic H38 RMS
Parameter 28	Ia HD38	Ia H08 RMS	I4 H23 RMS	I4 H38 RMS
Parameter 29	Ib HD38	Ib H08 RMS	Ia H24 RMS	Ia H39 RMS
Parameter 30	Ic HD38	Ic H08 RMS	Ib H24 RMS	Ib H39 RMS
Parameter 31	Ia HD39	I4 H08 RMS	Ic H24 RMS	Ic H39 RMS
Parameter 32	Ib HD39	Ia H09 RMS	I4 H24 RMS	I4 H39 RMS
Parameter 33	Ic HD39	Ib H09 RMS	Ia H25 RMS	Ia H40 RMS
Parameter 34	Ia HD40	Ic H09 RMS	Ib H25 RMS	Ib H40 RMS
Parameter 35	Ib HD40	I4 H09 RMS	Ic H25 RMS	Ic H40 RMS
Parameter 36	Ic HD40	Ia H10 RMS	I4 H25 RMS	I4 H40 RMS
Parameter 37	Ia HD41	Ib H10 RMS	Ia H26 RMS	Ia H41 RMS
Parameter 38	Ib HD41	Ic H10 RMS	Ib H26 RMS	Ib H41 RMS
Parameter 39	Ic HD41	I4 H10 RMS	Ic H26 RMS	Ic H41 RMS
Parameter 40	Ia HD42	Ia H11 RMS	I4 H26 RMS	I4 H41 RMS
Parameter 41	Ib HD42	Ib H11 RMS	Ia H27 RMS	Ia H42 RMS
Parameter 42	Ic HD42	Ic H11 RMS	Ib H27 RMS	Ib H42 RMS
Parameter 43	Ia HD43	I4 H11 RMS	Ic H27 RMS	Ic H42 RMS
Parameter 44	Ib HD43	Ia H12 RMS	I4 H27 RMS	I4 H42 RMS
Parameter 45	Ic HD43	Ib H12 RMS	Ia H28 RMS	Ia H43 RMS
Parameter 46	Ia HD44	Ic H12 RMS	Ib H28 RMS	Ib H43 RMS
Parameter 47	Ib HD44	I4 H12 RMS	Ic H28 RMS	Ic H43 RMS
Parameter 48	Ic HD44	Ia H13 RMS	I4 H28 RMS	I4 H43 RMS
Parameter 49	Ia HD45	Ib H13 RMS	Ia H29 RMS	Ia H44 RMS
Parameter 50	Ib HD45	Ic H13 RMS	Ib H29 RMS	Ib H44 RMS
Parameter 51	Ic HD45	I4 H13 RMS	Ic H29 RMS	Ic H44 RMS
Parameter 52	Ia HD46	Ia H14 RMS	I4 H29 RMS	I4 H44 RMS
Parameter 53	Ib HD46	Ib H14 RMS	Ia H30 RMS	Ia H45 RMS
Parameter 54	Ic HD46	Ic H14 RMS	Ib H30 RMS	Ib H45 RMS
Parameter 55	Ia HD47	I4 H14 RMS	Ic H30 RMS	Ic H45 RMS
Parameter 56	Ib HD47	Ia H15 RMS	I4 H30 RMS	I4 H45 RMS
Parameter 57	Ic HD47	Ib H15 RMS	Ia H31 RMS	Ia H46 RMS
Parameter 58	Ia HD48	Ic H15 RMS	Ib H31 RMS	Ib H46 RMS

Parameter 59	Ib HD48	I4 H15 RMS	Ic H31 RMS	Ic H46 RMS
Parameter 60	Ic HD48	Ia H16 RMS	I4 H31 RMS	I4 H46 RMS
Parameter 61	Ia HD49	Ib H16 RMS		Ia H47 RMS
Parameter 62	Ib HD49	Ic H16 RMS		Ib H47 RMS
Parameter 63	Ic HD49	I4 H16 RMS		Ic H47 RMS
Parameter 64				I4 H47 RMS
Parameter	**SDR 13**	**SDR 14**	**SDR 15**	**SDR 16**
Recording Interval	10	10	10	10
Recording Mode[2]	1=FIFO	1=FIFO	1=FIFO	1=FIFO
Number of Parameters[5]	64	64	64	52
Parameter 1	Ia H48 RMS	Ua IHD13	Ua IHD29	Ua IHD45
Parameter 2	Ib H48 RMS	Ub IHD13	Ub IHD29	Ub IHD45
Parameter 3	Ic H48 RMS	Uc IHD13	Uc IHD29	Uc IHD45
Parameter 4	I4 H48 RMS	U4 IHD13	U4 IHD29	U4 IHD45
Parameter 5	Ia H49 RMS	Ua IHD14	Ua IHD30	Ua IHD46
Parameter 6	Ib H49 RMS	Ub IHD14	Ub IHD30	Ub IHD46
Parameter 7	Ic H49 RMS	Uc IHD14	Uc IHD30	Uc IHD46
Parameter 8	I4 H49 RMS	U4 IHD14	U4 IHD30	U4 IHD46
Parameter 9	Ia H50 RMS	Ua IHD15	Ua IHD31	Ua IHD47
Parameter 10	Ib H50 RMS	Ub IHD15	Ub IHD31	Ub IHD47
Parameter 11	Ic H50 RMS	Uc IHD15	Uc IHD31	Uc IHD47
Parameter 12	I4 H50 RMS	U4 IHD15	U4 IHD31	U4 IHD47
Parameter 13	Ua IHD00	Ua IHD16	Ua IHD32	Ua IHD48
Parameter 14	Ub IHD00	Ub IHD16	Ub IHD32	Ub IHD48
Parameter 15	Uc IHD00	Uc IHD16	Uc IHD32	Uc IHD48
Parameter 16	U4 IHD00	U4 IHD16	U4 IHD32	U4 IHD48
Parameter 17	Ua IHD01	Ua IHD17	Ua IHD33	Ua IHD49
Parameter 18	Ub IHD01	Ub IHD17	Ub IHD33	Ub IHD49
Parameter 19	Uc IHD01	Uc IHD17	Uc IHD33	Uc IHD49
Parameter 20	U4 IHD01	U4 IHD17	U4 IHD33	U4 IHD49
Parameter 21	Ua IHD02	Ua IHD18	Ua IHD34	Ua IHD50
Parameter 22	Ub IHD02	Ub IHD18	Ub IHD34	Ub IHD50
Parameter 23	Uc IHD02	Uc IHD18	Uc IHD34	Uc IHD50
Parameter 24	U4 IHD02	U4 IHD18	U4 IHD34	U4 IHD50
Parameter 25	Ua IHD03	Ua IHD19	Ua IHD35	Ia IHD00 RMS
Parameter 26	Ub IHD03	Ub IHD19	Ub IHD35	Ib IHD00 RMS
Parameter 27	Uc IHD03	Uc IHD19	Uc IHD35	Ic IHD00 RMS
Parameter 28	U4 IHD03	U4 IHD19	U4 IHD35	I4 IHD00 RMS
Parameter 29	Ua IHD04	Ua IHD20	Ua IHD36	Ia IHD01 RMS
Parameter 30	Ub IHD04	Ub IHD20	Ub IHD36	Ib IHD01 RMS
Parameter 31	Uc IHD04	Uc IHD20	Uc IHD36	Ic IHD01 RMS
Parameter 32	U4 IHD04	U4 IHD20	U4 IHD36	I4 IHD01 RMS
Parameter 33	Ua IHD05	Ua IHD21	Ua IHD37	Ia IHD02 RMS
Parameter 34	Ub IHD05	Ub IHD21	Ub IHD37	Ib IHD02 RMS
Parameter 35	Uc IHD05	Uc IHD21	Uc IHD37	Ic IHD02 RMS
Parameter 36	U4 IHD05	U4 IHD21	U4 IHD37	I4 IHD02 RMS
Parameter 37	Ua IHD06	Ua IHD22	Ua IHD38	Ia IHD03 RMS
Parameter 38	Ub IHD06	Ub IHD22	Ub IHD38	Ib IHD03 RMS
Parameter 39	Uc IHD06	Uc IHD22	Uc IHD38	Ic IHD03 RMS
Parameter 40	U4 IHD06	U4 IHD22	U4 IHD38	I4 IHD03 RMS
Parameter 41	Ua IHD07	Ua IHD23	Ua IHD39	Ia IHD04 RMS
Parameter 42	Ub IHD07	Ub IHD23	Ub IHD39	Ib IHD04 RMS
Parameter 43	Uc IHD07	Uc IHD23	Uc IHD39	Ic IHD04 RMS
Parameter 44	U4 IHD07	U4 IHD23	U4 IHD39	I4 IHD04 RMS
Parameter 45	Ua IHD08	Ua IHD24	Ua IHD40	Ia IHD05 RMS
Parameter 46	Ub IHD08	Ub IHD24	Ub IHD40	Ib IHD05 RMS
Parameter 47	Uc IHD08	Uc IHD24	Uc IHD40	Ic IHD05 RMS
Parameter 48	U4 IHD08	U4 IHD24	U4 IHD40	I4 IHD05 RMS
Parameter 49	Ua IHD09	Ua IHD25	Ua IHD41	Ia IHD06 RMS
Parameter 50	Ub IHD09	Ub IHD25	Ub IHD41	Ib IHD06 RMS
Parameter 51	Uc IHD09	Uc IHD25	Uc IHD41	Ic IHD06 RMS
Parameter 52	U4 IHD09	U4 IHD25	U4 IHD41	I4 IHD06 RMS
Parameter 53	Ua IHD10	Ua IHD26	Ua IHD42	
Parameter 54	Ub IHD10	Ub IHD26	Ub IHD42	
Parameter 55	Uc IHD10	Uc IHD26	Uc IHD42	
Parameter 56	U4 IHD10	U4 IHD26	U4 IHD42	
Parameter 57	Ua IHD11	Ua IHD27	Ua IHD43	

Parameter 58	Ub IHD11	Ub IHD27	Ub IHD43	
Parameter 59	Uc IHD11	Uc IHD27	Uc IHD43	
Parameter 60	U4 IHD11	U4 IHD27	U4 IHD43	
Parameter 61	Ua IHD12	Ua IHD28	Ua IHD44	
Parameter 62	Ub IHD12	Ub IHD28	Ub IHD44	
Parameter 63	Uc IHD12	Uc IHD28	Uc IHD44	
Parameter 64	U4 IHD12	U4 IHD28	U4 IHD44	

Appendix C – DR Default Setting

Parameter	DR 1	DR 2	DR 3	DR 4
Trigger Mode	1	1	1	1
Recording Mode	1	1	1	1
Recording Interval	900	900	900	900
Offset Time	0	0	0	0
Number of Parameters	32	32	29	27
Parameter 1	Uab	Uab Demand	Uab Deviation	Ua THD
Parameter 2	Ubc	Ubc Demand	Ubc Deviation	Ub THD
Parameter 3	Uca	Uca Demand	Uca Deviation	Uc THD
Parameter 4	Ull avg	Ull avg Demand	Ua Deviation	Uab THD
Parameter 5	Ia	Ia Demand	Ub Deviation	Ubc THD
Parameter 6	Ib	Ib Demand	Uc Deviation	Uca THD
Parameter 7	Ic	Ic Demand	Uab Over Deviation	Ia THD
Parameter 8	I avg	I avg Demand	Ubc Over Deviation	Ib THD
Parameter 9	P Total	P Total Imp Demand	Uca Over Deviation	Ic THD
Parameter 10	Q Total	Q Total Imp Demand	Ua Over Deviation	Ia TDD
Parameter 11	S Total	S Total Demand	Ub Over Deviation	Ib TDD
Parameter 12	P.F. Total	P.F. Total Demand	Uc Over Deviation	Ic TDD
Parameter 13	Freq	Freq Demand	Uab Under Deviation	Ia K-Factor
Parameter 14	Ua	Ua Demand	Ubc Under Deviation	Ib K-Factor
Parameter 15	Ub	Ub Demand	Uca Under Deviation	Ic K-Factor
Parameter 16	Uc	Uc Demand	Ua Under Deviation	Ua Crest Factor
Parameter 17	Uln avg	Uln avg Demand	Ub Under Deviation	Ub Crest Factor
Parameter 18	Pa	Pa Imp. Demand	Uc Under Deviation	Uc Crest Factor
Parameter 19	Pb	Pb Imp. Demand	Freq. Deviation	Ia Crest Factor
Parameter 20	Pc	Pc Imp. Demand	U0 Unbalance	Ib Crest Factor
Parameter 21	Qa	Qa Imp. Demand	I0 Unbalance	Ic Crest Factor
Parameter 22	Qb	Qb Imp. Demand	U2 Unbalance	Ua Pst
Parameter 23	Qc	Qc Imp. Demand	I2 Unbalance	Ub Pst
Parameter 24	Sa	Sa Demand	U0 (Zero Sequence)	Uc Pst
Parameter 25	Sb	Sb Demand	U1 (+ve Sequence)	Ua Plt
Parameter 26	Sc	Sc Demand	U2 (-ve Sequence)	Ub Plt
Parameter 27	P.F.a	P.F.a Demand	I0 (Zero Sequence)	Uc Plt
Parameter 28	P.F.b	P.F.b Demand	I1 (+ve Sequence)	
Parameter 29	P.F.c	P.F.c Demand	I2 (-ve Sequence)	
Parameter 30	U4	U4 Demand		
Parameter 31	I4	I4 Demand		
Parameter 32	I5	I5 Demand		
Parameter	**DR 5**	**DR 6**	**DR 7**	**DR 8**
Trigger Mode	0	0	0	0
Recording Mode	1	1	1	1
Recording Interval	900	900	900	900
Recording Offset	0	0	0	0
No. of Parameters	0	0	0	0
Parameter 1				
…				
Parameter 32				

Appendix D - Event Classification

SOE Event Classification

Event Classification	Sub-Classification	Description	SOE
1=System	0	Power On	None
	1	Power Off	None
	2	Change System Parameters	None
	3	Change Secret Parameters	None
	4	Set Clock	None
	5	Clear All Historical Data	None
	6	Restore Factory Defaults	None
	7	Format Device	
	8	Clear System Parameters	None
	9	Clear Secret Parameters	None
	10	Clear SOE Log	None
	11	Clear PQ Log	
	12	Clear SDR	0~15=SDR# 1~SDR# 16, writing 0xFFFFFFFF to clear all SDRs
	13	Clear Standard DR	0~7=DR# 1~DR# 8, writing 0xFFFFFFFF to clear all DRs
	14	Reserved	
	15	Clear Energy	None
	16	Clear IER Log	
	17	Clear DI Counter	0~7=DI# 1~DI# 8, writing 0xFFFFFFFF to clear all DI Counters
	18	Clear Flicker Log	0=Pst, 1=Plt
	19	Clear Waveform Recorder	
	20	Clear Disturbance Recorder	
	21	Clear MSV Log	0=MSV# 1, 1=MSV# 2, 2=MSV# 3,
	22	Clear All Max./Min. Log	
	23	Clear Max. Log	0-3=Max. Log# 1 Max. Log# 4
	24	Clear Min. Log	0-3=Min. Log# 1 Min. Log# 4
	25	Clear Demand	0=Clear Peak Demand of This Month 1= Clear All Demand
	26	Clear EN50160	
	27	Reserved	
	28	Clear PQ Counter	0=Dips, 1=Swells, 2=Interruptions, 3=Transient, 4=RVC 5=Inrush Current, 6=Reserved, 7~9=MSV# 1~MSV# 3 10=All PQ Counters
	29	Clear TOU Log	
	30	Trigger TOU Transient Record	
	31	Set TOU Energy Bottom Value	None
	32	Manual Triggered TOU Log	None
	33	Switch TOU Schedule	0=Manual #1 to #2 1= Manual. #2 to #1 2=Auto. #1 to #2 3=Auto. #2 to #1
	34	Hardware Alarm	Device self-test PPC Device self-test DSP
	35	Hardware is working normally	None
	36	Reserved	
	37	Set AI to Zero	
	38	Clear RMSR Log	
	39	Format Memory	
	40	DI Control TOU Tariff-Switch	Uint32: TOU No. before switching Uint32: TOU No. after switching
	41	DI Control TOU Tariff-Start	Uint32: TOU No.
	42	DI Control TOU Tariff-End	None
	43	No Memory Card	None
	44	Auditing Log exceeds 90% memory	None
	45	Auditing Log process exit abnormally	None
	46	Reserved	
	47	Reserved	
	48	Clear Device self-diagnose Log	None

	49	Reserved	
	50	Clear AER Log	
	51	Clear All Events	
	52-58	Reserved	
	59	Clear 2-150kHz Daily Heat Map	
2=Standard Setpoint	0	Over Setpoint Active	UINT32: Setpoint Parameters FP32: The Setpoint Active / Inactive limit (should be consistent with real-time-limit) UINT32: Setpoint #X (0-255)
		Phase Loss Alarm	
		Phase Reversal Alarm	
	1	Over Setpoint Return	UINT32: Setpoint Parameters FP32: The Setpoint Active/ Inactive limit (be consistent with real-time-limit) UINT32: Setpoint #X (0-15) FP32: Max. during Setpoint UINT32: Duration
		Phase Loss Alarm	
		Phase Reversal Alarm	
	128	Under Setpoint Active	See Over Setpoint Active
		Phase Loss Alarm	
		Phase Reversal Alarm	
	129	Under Setpoint Return	See Over Setpoint Return
		Phase Loss Alarm	
		Phase Reversal Alarm	
3=HS Setpoint	0	Over Setpoint Active	UINT32: Setpoint Parameters FP32: The Setpoint Active/ Inactive limit (be consistent with real-time-limit) UINT32: Setpoint #X (0-255)
	1	Over Setpoint Return	UINT32: Setpoint Parameters FP32: The Setpoint Active/ Inactive limit (be consistent with real-time-limit) UINT32: Setpoint #X (0-15) FP32: Max. during Setpoint UINT32: Duration
	128	Under Setpoint Active	See Over Setpoint Active
	129	Under Setpoint Return	See Over Setpoint Return
4=Reserved	-	-	-
5=WFR	0	Reserved	-
	1	Dips/Swells Trigger WFR	None
	2	Transient Trigger WFR	
	3	Standard Setpoint Trigger WFR	UINT32: Standard Setpoint Number
	4	High-speed Setpoint Trigger WFR	UINT32: HS Setpoint Number
	5	DI Setpoint Trigger WFR	UINT32: DI Number
	6	Rapid Voltage Changes Trigger WFR	
	7	Inrush Current Trigger WFR	
	8	Manual Triggered WFR	
	9	Timed WFR	
6=DWR	0	Reserved	-
	1	Dips/Swells Trigger DWR	
	2	Transient Trigger DWR	
	3	Standard Setpoint Trigger DWR	UINT32: Standard Setpoint Number
	4	High-speed Setpoint Trigger DWR	UINT32: HS Setpoint Number
	5	DI Setpoint Trigger DWR	UINT32: DI Number
	6	Rapid Voltage Changes Trigger DWR	
	7	Inrush Current Trigger DWR	
	8	Manual Trigger DWR	
	9	DWR End	
7=MSV Recorder	0	Detected Signalling Voltage Trigger MSV Recorder	UINT32: 0~2=MSV#1~MSV#3
8=Standard DR	0	DI Operated Trigger DR	UINT32: 0~7=Standard DR#1~Standard DR#8
	1	DI Released Trigger DR	
	2	DI Parameters changes Trigger DR	
	3	Standard Setpoint Active Trigger DR	
	4	Standard Setpoint Return Trigger DR End	
	5	Standard Setpoint Parameters Change Trigger DR End	
	6	HS Setpoint Active Trigger DR	

	7	HS Setpoint Return Trigger DR End	
	8	HS Setpoint Parameters Change Trigger DR End	
	9	Dips/Swells Active Trigger DR	
	10	Dips/Swells Return Trigger DR End	
	11	Dips/Swells Parameters Change Trigger DR End	
9=Reserved	-	-	-
10=RMSR Log	0	Reserved	
	1	Dips/Swells trigger RMS Log	
	2	Transient trigger RMS Log	
	3	Standard Setpoint trigger RMS Log	
	4	HS Setpoint trigger RMS Log	
	5	DI Changes trigger RMS Log	
	6	RVC trigger RMS Log	
	7	Inrush Current trigger RMS Log	
	8	Manual trigger RMS Log	

PQ Log Classification

PQ Log Classification	Sub-Classification	Description	PQ Value Scale/Option
0X81: Dip/Swell	0	Voltage Swells Start	UINT32: Start Phase Bit0: Phase A, Bit1: Phase B, Bit2: Phase C Bit3: Phase AB, Bit4: Phase BC, Bit5: Phase CA
	1	Voltage Swells End	FP32: Residual Voltage Max./Min. (%) UINT32: Duration (ms) FP32: Ua Residual FP32: Ub Residual FP32: Uc Residual FP32: Ua Benchmark FP32: Ub Benchmark FP32: Uc Benchmark
	2	Voltage Dips Start	UINT32: Start Phase Bit0: Phase A, Bit1: Phase B, Bit2: Phase C Bit3: Phase AB, Bit4: Phase BC, Bit5: Phase CA
	3	Voltage Dips Swell End	FP32: Residual Voltage Max./Min. (%) UINT32: Duration (ms) FP32: Ua Residual FP32: Ub Residual FP32: Uc Residual FP32: Ua Benchmark FP32: Ub Benchmark FP32: Uc Benchmark
	4	Voltage Interruption Start	UINT32: Start Phase Bit0: Phase A, Bit1: Phase B, Bit2: Phase C Bit3: Phase AB, Bit4: Phase BC, Bit5: Phase CA
	5	Voltage Interruption End	FP32: Residual Voltage Max./Min. (%) UINT32: Duration (ms) FP32: Ua Residual FP32: Ub Residual FP32: Uc Residual FP32: Ua Benchmark FP32: Ub Benchmark FP32: Uc Benchmark
	6	Dips Location Detective	UINT32: Location 0=UpStream, 1=DownStream UINT32: Reliability 0=Low, 1=Middle, 2=High
	7	Dips/Swells Start	None
	8	Dips/Swells End	FP32: Ua Residual Max./Min. (%) FP32: Ub Residual Max./Min. (%) FP32: Uc Residual Max./Min. (%) FP32: Uc Residual FP32: Ua Benchmark

			FP32: Ub Benchmark FP32: Uc Benchmark
0X82: Transient	0	Voltage Transient	FP32: Disturbance Max./Min. (%) UINT32: Duration (μs) FP32: Ua Disturbance (%) FP32: Ub Disturbance (%) FP32: Uc Disturbance (%) FP32: Ua Benchmark FP32: Ub Benchmark FP32: Uc Benchmark
0X83: Inrush Current	0	Inrush Ia Active	None
	1	Inrush Ib Active	
	2	Inrush Ic Active	
	3	Inrush Ia Inactive	UINT32: Duration (μs) FP32: Phase Current Disturbance (%) FP32: I_{rms} during Disturbance UINT32: Start Time (s) UINT32: Start Time (ms)
	4	Inrush Ib Inactive	
	5	Inrush Ic Inactive	
0X84:RVC	0	Rapid Voltage Change	UINT32: Start Time (s) UINT32: Start Time (ms) UINT32: Duration (μs) FP32: Max. Voltage Change Rate FP32: Steady Voltage Change Rate UINT32: Start Phase Bit0: Phase A, Bit1: Phase B, Bit2: Phase C Bit3: Phase AB, Bit4: Phase BC, Bit5: Phase CA
0X85:MSV	0	MSV #1 Active	FP32: Frequency (Hz) uint32: Phase Bit0: Phase A, Bit1: Phase B, Bit2: Phase C Bit3: Phase AB, Bit4: Phase BC, Bit5: Phase CA
	1	MSV #1 Inactive	FP32: Frequency (Hz) FP32: Ua MSV Max. (%) FP32: Ub MSV Max. (%) FP32: Uc MSV Max. (%)
	2	MSV #2 Active	FP32: Frequency (Hz) uint32: Phase Bit0: Phase A, Bit1: Phase B, Bit2: Phase C Bit3: Phase AB, Bit4: Phase BC, Bit5: Phase CA
	3	MSV #2 Inactive	FP32: Frequency (Hz) FP32: Ua MSV Max. (%) FP32: Ub MSV Max. (%) FP32: Uc MSV Max. (%)
	4	MSV #3 Active	FP32: Frequency (Hz) uint32: Phase Bit0: Phase A, Bit1: Phase B, Bit2: Phase C Bit3: Phase AB, Bit4: Phase BC, Bit5: Phase CA
	5	MSV #3 Inactive	FP32: Frequency (Hz) FP32: Ua MSV Max. (%) FP32: Ub MSV Max. (%) FP32: Uc MSV Max. (%)

Appendix E - Technical Specifications

Voltage Inputs (V1, V2, V3, VN, V4, V4N)	
Standard (Un)	400VLN/690VLL +20%
Range	1% to 200% Un for 400VLN nominal
Overload	2xUn continuous, 4xUn for 1s
Burden	< 0.5VA/per phase
PT Ratio	
Primary	1-1,000,000V
Secondary	1-1,500V
V4 Primary	1-1,000,000V
V4 Secondary	1-1,500V
Frequency	40Hz-60Hz @ 50Hz, 48Hz-72Hz @ 60Hz
Current Inputs (I11, I12, I21, I22, I31, I32, I41, I42, I51, I52)	
Standard (In)	5A (Standard), 1A (Optional)
Range	1% to 400% In
Starting Current	0.1% In
Overload	4xIn continuous, 20xIn for 1s
Burden	< 0.5VA/per phase @ 5A, < 0.1VA/per phase @ 1A
Optional SCCP Options	Split-Core Current Probe Input @ 500mV
SCCP-50A-500mV	5A/50A (In/Imax), max. 500mV Output
SCCP-200A-200mV	20A/200A (In/Imax), max. 200mV Output
SCCP-500A-500mV	500A Imax, max. 500mV Output
SCCP-5000A-500mV	Selectable 500A/5000A (Imax) Rogowski Coil, max. 500mV Output
CT Ratio	
Primary	1-30,000A
Secondary	1-50A
I4 Primary	1-30,000A
I4 Secondary	1-50A
Power Supply (L+, N-, G)	
Standard	95-250VAC/VDC ± 10%, 47-440 Hz
Burden	< 12W
Overvoltage Category	CATIII 300V
Digital Inputs (COM, DI1 to DI8 or optional DI1 to DI16)	
Standard	Dry contact, 24VDC internally wetted
Optional	110V/220V AC/DC externally wetted
Sampling	1000Hz
Hysteresis	1ms minimum
Form A Relay Outputs (DO1 to DO3 or optional DO1 to DO7)	
Type	Form A Mechanical Relay
Loading	5A @ 250VAC / 30VDC
Form C Relay Outputs (Alarm 1, 2, 3)	
Type	Form C Mechanical Relay
Loading	8A @ 250VAC / 24VDC
Pulse Outputs (E1+, E1-, E2+, E2-, E3+, E3-, E4+, E4-)	
Type	Form A Solid State Relay
Isolation	Optical
Max. Load Voltage	30V DC
Max. Forward Current	100mA
Optional Analog Input (AI1+, AI1-, AI2+, AI2-)	
Type	0-20 / 4-20 mA DC
Overload	24 mA maximum
Optional Analog Output (AO+, AO-)	
Type	0-20 / 4-20 mA
Loading	500Ω maximum
Overload	24 mA maximum
Environmental Conditions	
Operating Temp.	-25°C to 70°C
Storage Temp.	-40°C to 85°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	63 kPa to 110 kPa
Pollution Degree	II
Measurement Category	1000V CAT III
Mechanical Characteristics	
Panel Cutout	186x186 mm
Unit Dimensions	192x192x182.4 mm
IP Rating	52

Accuracy

Parameters	Accuracy	Resolution
Voltage (U)	±0.1%	0.001V
I1, I2, I3	±0.1%	0.001A
	SCCP Option: ±0.1% + Error of SCCP	
I4	±0.1%	
I5	±0.5%	
P, Q, S	±0.2%	0.001kX
	SCCP Option: ±0.5%	
kWh, kVAh	IEC 62053-22 Class 0.2S	0.1kXh
	SCCP Option: IEC 62053-21 Class 1	
kvarh	IEC 62053-24 Class 0.5S	0.1kvarh
	SCCP Option: IEC 62053-24 Class 1	
P.F.	±0.2%	0.001
	SCCP Option: ±0.5%	
Frequency	±0.003 Hz	0.001Hz
Harmonics	IEC 61000-4-7 Class A	0.001
K-Factor	IEC 61000-4-7 Class A	0.001
Phase angles	±0.2°	0.1°
	SCCP Option: ±0.2° + Phase Error of SCCP	
U Unbalance	±0.1 %	0.01%
I Unbalance	±0.5%	0.01%
Pst, Plt	±5%	0.01%

Appendix F - Standard of Compliance

Safety Requirements		
CE LVD 2014 / 35 / EU		EN61010-1: 2010 EN61010-2-030: 2010
Electrical safety in low voltage distribution systems up to 1000Vac and 1500 Vdc		IEC 61557-12: 2018 (PMD)
Insulation AC Voltage: 2kV @ 1 minute Insulation Resistance: >100MΩ Impulse voltage: 6kV, 1.2/50µs		IEC 62052-11: 2003 IEC 62053-22: 2003 EN 61010-1: 2010
EMC Compatibility CE EMC Directive 2014 / 30 / EU (EN 61326: 2013)		
Immunity (EN 50082-2)		
Electrostatic discharge		EN 61000-4-2: 2009
Radiated fields		EN 61000-4-3: 2006+A1: 2008+A2: 2010
Fast transients		EN 61000-4-4: 2012
Surges		EN 61000-4-5: 2014+A1: 2017
Conducted disturbances		EN 61000-4-6: 2014
Magnetic Fields		EN 61000-4-8: 2010
V Dips, Interruptions & Variations		EN 61000-4-11:2004+A1: 2017
Emission (EN 50081-2)		
Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment		EN 55011: 2016
Limits and methods of measurement of radio disturbance characteristics of information technology equipment		EN 55032: 2015
Limits for harmonic current emissions for equipment with rated current ≤16 A		EN 61000-3-2: 2014
Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16 A		EN 61000-3-3: 2013
Emission standard for Industrial environments		EN 61000-6-4: 2007+A1: 2011
Mechanical Tests		
Vibration Test	Response	IEC 255-2-1:1989
	Endurance	IEC 255-2-1:1989
Shock Test	Response	IEC 255-2-2
	Endurance	IEC 255-2-2
Bump Test		IEC 255-2-2
Power Quality		
Voltage characteristics of electricity supplied by public distribution systems		EN 50160
General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto		IEC 61000-4-7
Flickermeter - Functional and design specifications		IEC 61000-4-15
Testing and measurement techniques - Power quality measurement methods		IEC 61000-4-30 Ed.3 Class A Compliant

Appendix G - Ordering Guide

CET Electric Technology

Version 20190808

Product Code	Description
iMeter 8 Advanced Power Quality Analyzer	
Basic Fature	
A	1024 samples/cycle, 8GB On-Board Memory
B~	1024 samples/cycle, 8GB On-Board Memory IEC 61000-4-30 Ed. 3 Class A Compliant with 2-150kHz Measurement
Input Current	
5	5A
1	1A
SCCPA^	SCCP Option for use with CT Clamps with max. 500mV output.
Input Voltage	
9	400VLN/690VLL + 20%
Power Supply	
2	95-250VAC/DC ± 10%, 47-440Hz
3	20-60VDC (Future Consideration)
System Frequency	
5	50Hz
6	60Hz
I/O	
A	8xDI + 4xDO + 4xSS Pulse Outputs
B*	8xDI + 4xDO + 2xAI + 1xAO + 4xSS Pulse Outputs
C*	16xDI + 8xDO + 4xSS Pulse Outputs
DI Excitation	
N	Dry Contact (@24VDC Self-Excitation)
1	110V AC/DC External Excitation
2	220V AC/DC External Excitation
Communications	
A	2x100BaseT + 2xRS-485
Time Sync.	
A	GPS, IRIG-B
Display Language	
E	English

iMeter 8	-	A	5	9	2	5	A	N	A	A	E	iMeter 8-A5925ANAAE (Standard Model)

*Additional charges apply

~ This option does not support I/O option of B (8xDI + 4xDO + 2xAI + 1xAO + 4xSS Pulse Outputs).

^ The SCCPA option is comptaible with the SCCP models listed in the "SCCP Option" sheet. This option does not come with any Current Clamp. Please refer to the "SCCP Option" sheet for more information and order the desired model and quantity as a separate item.

Contact us

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