



- True RMS @ 1024 Samples/Cycle
- IEC 62053-22 Class 0.2S Compliant
- IEC 61000-4-30 Class A Certified
- IEC 61000-4-15 Flickermeter
- PQ Disturbance Detection
- Disturbance Waveform Recording
- Comprehensive SDR and Energy Logs
- 1xEthernet and 2xRS-485
- Modbus RTU/TCP, HTTP, SNTP, SMTP
- Extended Temperature Range
- Extended Warranty
- 5.7" Color LCD Display @ 640x480
- 2 GB Log Memory
- EN50160 Compliance Reporting
- IEC 61000-4-7 Harmonics/Interharmonics
- WF Recording in COMTRADE Format
- ½ cycle RMS Recorder
- 40 Programmable Setpoints
- IEC 61850 Support (Optional)
- DIN 144 (138x138 Cutout)
- Industrial Grade Components
- Standard Tropicalization



The iMeter 7 is CET's Advanced PQ Analyzer designed for the compliance monitoring market as it offers unsurpassed functionality by combining Class 0.2S Accuracy and advanced PQ Features in a compact DIN 144 form factor with a stunning, High-Resolution, Color TFT LCD display. The iMeter 7 satisfies such standards as IEC 62053-22 Class 0.2S, IEC 61000-4-30 Class A Edition 2, IEC 61000-4-15, IEC 61000-4-7, EN 50160 and optional IEC 61850 for Smart Grid applications. Further, the iMeter 7 offers 2GB on-board memory, extensive I/O with 8xDIs, 4xROs, 2xSS Pulse Outputs, multiple Time Sync. methods, one 100BaseT Ethernet and two RS-485 ports. These features likely make the iMeter 7 one of the most advanced PQ Analyzers for an intelligent Power Quality Monitoring System.

### Typical Applications

- PQ monitoring at HV, MV and LV Utility Substations
- Data Centers, Semiconductor Fabs, Heavy Industries
- 7x24 Automated Manufacturing Facilities
- Dips, Swells, Interruptions, Transients, Flickers & Harmonics Monitoring
- Mains and critical feeder monitoring
- Optional IEC 61850 support for Smart Grid

### Basic Features

- IEC 62053-22 Class 0.2S kWh metering with Multi-Tariff TOU
- True RMS @ 1024 samples/cycle sampling
- 2GB on-board log memory
- Industrial-grade, 5.7", High-Resolution Color TFT LCD @ 640x480
- 8xDigital Inputs, 4xRelay Outputs & 2xSS Pulse Outputs
- Time Sync. via SNTP, GPS 1PPS or IRIG-B inputs
- 16 High-Speed and 24 Standard Setpoints
- Standard 100BaseT Ethernet and 2xRS-485 ports

### Power Quality Features

- IEC 61000-4-30 Edition 2 Class A Certified
- IEC 61000-4-15, IEC 61000-4-7 and EN 50160 Reporting
- Dips, Swells, Interruptions, Transients, Rapid Voltage Changes, Inrush Current, Mains Signalling Voltage and Flicker monitoring
- Real-time Waveform Capture (WFC), Waveform Recording (WFR) & Disturbance WF Recording (DWR)
- Disturbance Direction Indicator
- Harmonic and Interharmonic Analysis up to 63<sup>rd</sup>
- Waveform recording in COMTRADE file format

### 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 WFC of 3-phase U & I @ 128 samples/cycle x 4 cycles
- 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 Edition 2 Class A Certified

- Power Frequency
- Magnitude of the Supply Voltage
- Flicker
- Supply Voltage Dips/Swells
- Voltage Interruptions
- Transient Voltages
- Supply Voltage Unbalance
- Voltage Harmonics and Interharmonics
- Mains Signalling Voltage on the Supply Voltage
- Rapid Voltage Changes
- Measurement of Over and Under Deviation Parameters

#### Harmonic and Interharmonic Measurements

- K-Factor for Current, Crest Factor for Current and Voltage
- U and I THD, TOHD, TEHD, TIHD, TEIHD and TOIHD
- U and I Individual Harmonics (%HD, RMS and Angle) from 2<sup>nd</sup> to 63<sup>rd</sup>#
- U and I Individual Interharmonics (%IHD and RMS) from 0 to 63<sup>rd</sup>#
- Total Harmonic P, Q, S and PF
- Harmonic P, Q, S, and PF from 2<sup>nd</sup> to 63<sup>rd</sup>
- Fundamental U, I, P, Q, S, Phase Angle, and Displacement PF
- Fundamental kWh, kvarh Import/Export/Net/Total
- Total Harmonic kWh, kvarh Import/Export/Net/Total
- Total Harmonic kWh, kvarh Import/Export from 2<sup>nd</sup> to 63<sup>rd</sup>

#%HD and %IHD can be configured as % of Fundamental, % of U/I nominal or % of RMS

#### Sequence and Unbalance

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

#### Dips, Swells, Interruptions and Transients Recording

- Dips, Swells, Interruptions detection @ 10ms (½ cycle at 50 Hz)
- Transients capture as short as 40us at 512 samples @ 50 Hz for sub-cycle disturbances such as capacitor switching and resonance phenomena
- Trigger for RO, WFR, DWR, RMS Recording, SOE and Alarm Email
- Display of ITIC or SEMI F47 plot as well as the Event WFR or DWR on the Front Panel and Web Interface

#### Rapid Voltage Changes (RVC)

- Detection of a quick transition in RMS Voltage between two steady-states

#### 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

#### PQ Event Counters

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

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

- Real-time WFC @ 128 samples/cycle x 4 cycles via Front Panel and Web Interface
- WFR with max. 128 entries
- Simultaneous capture of 3-Phase Voltage and Current Inputs  
No. of Cycles x Samples/Cycles with programmable pre-fault cycles: 10x1024, 20x512, 40x256, 80x128, 160x64, 320x32, 640x16
- COMTRADE file format, downloadable from the on-board Web Server or FTP Server

#### Disturbance Waveform Recording (DWR)

- 128 entries
- Simultaneous recording of all Voltage (U1-U4) and Current (I1-I4) Inputs
  - Initial Fault: 35 cycles @ 256 samples/cycle
  - Extended Fault: Up to 150 cycles @ 16 samples/cycle
  - Steady State: Up to 360 seconds of 1-cycle absolute peak values
  - Post Fault: 15 cycles @ 256 samples/cycle

#### RMS Recorder (RMSR)

- 128 entries
- 8 parameters 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



## Metering

### Basic Measurements (1-second update)

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

### High-Speed Measurements for Event Detection

- 3-phase U, I, P, Q, S and PF as well as U4 and I4 @ ½ cycle
- Frequency @ 5 cycles

### Demands

- Present and Predicted Demand for 3-phase U, I, P, Q, S, PF as well as U4, I4 and Frequency
- Present Demand of 4-phase U & I THD/TOHD/TEHD, 4-phase Current K-Factor, U & I Unbalance, Over Deviation & Under Deviation of Voltage and Frequency, 4-phase Fundamental Current
- Maximum Demand for This Month & Last Month (or Since the Last Reset & Before the Last Reset)
- Demand Synchronization with DI

### Multi-Tariff TOU Capability

- Two independent sets of TOU Schedules
  - 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 Maximum Demands timestamped
    - Register rollover at 100,000,000,000.000 kWh
- 12 Historical Logs for Energy and Max. Demand

## Data and Event Recorders

### Non-Volatile Log Memory

- 2 GB on-board log memory

### 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/Harmonic kWh, kvarh Import/Export.
- Recording interval from 1 to 65535 minutes
- Max. Recording Depth @ 65535 records for IER and AER individually
- Support FIFO and Stop-When-Full Mode

### Statistical Data Recorder (SDR)

- 8 SDR logs of 64 parameters each
- Recording of Max., Min., Avg. and 95<sup>th</sup> percentile for Real-time Measurements including U, I, Freq., P, Q, S, PF, Harmonics, Deviations and Unbalances
- Recording Interval from 0 to 60 minutes
- 90 days @ 3-minute, 300 days @ 10-minute, 450 days @ 15-minute
- Downloadable via DiagSys software
- Support FIFO or Stop-When-Full Mode

### Max./Min. Recorder (MMR)

- 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 the Last Reset & Before the 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 Voltage, etc.
- Record the characteristics data of Setpoint event as well as Waveform, ITIC and SEMI F47 Curve for PQ events

### Device Log

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

## Setpoints

### PQ Setpoints

- Transients, Dips, Swells, Interruptions
- Rapid Voltage Change
- Inrush Current
- Trigger RO, SOE Log, WFR, DWR, RMSR and Alarm Email

### Control Setpoints

- 16 High-speed (½ cycle) Setpoint and 24 Standard (1s) Setpoint
- Extensive monitoring sources including U, I, P, Q, S, Demands, Harmonics, Unbalances, Deviations, Flickers, Phase Reversal, etc.
- Configurable thresholds and time delays
- Trigger RO, SOE Log, WFR, DWR, RMSR and Alarm Email

## Inputs and Outputs

### Digital Inputs

- Standard 8 channels, volt free dry contact, 24VDC Internal Excitation
- 1000Hz sampling for status monitoring with programmable debounce
- Pulse counting for collecting WAGES (Water, Air, Gas, Electricity, Steam) information
- Demand Synchronization
- Tariff Switching based on DI Status

### Digital Outputs

- Standard 6 channels for control, alarming and pulsing applications
- RO1-RO4: Form A Mechanical Relay
- DO1+/DO1-, DO2+/DO2-: Optically isolated Solid State Relay

## Communications

### RS-485 (P1, P2)

- Dual optically isolated RS-485 ports with baud rate from 1.2kbps to 38.4kbps
- Protocol supported: Modbus RTU, Ethernet Gateway
- Time Sync. via P1 with GPS 1PPS or IRIG-B outputs

### Ethernet Port (P3)

- 1x10/100BaseT with RJ45 connector
- Built-in Web Server for easy data viewing, firmware upgrade and setup configuration
- Protocol supported: Modbus TCP, HTTP, SNMP, SMTP, FTP and optional IEC 61850
- Multiple simultaneous client connections:
  - 8xModbus TCP
  - 8xIEC 61850 (optional)

## Time Synchronization

- Battery-backed Real-time clock @ 6ppm (≤ 0.5s/day)
- Time Synchronization via Modbus RTU/TCP, SNMP, GPS 1PPS and IRIG-B

## System Integration

### Pecstar iEMS

- The iMeter 7 is supported by CET's PecStar iEMS.
- In addition, the iMeter 7 can be easily integrated into other 3<sup>rd</sup> 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 Logs as well as EN50160 Reports
- Generation and export of self-defined PQ Analysis Reports

### 3<sup>rd</sup> Party System Integration

- Easy integration into Substation Automation or Utility SCADA systems via Modbus RTU, Modbus TCP or IEC 61850
- The on-board Web Server allows complete 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 waveform records in COMTRADE format to be downloaded without any special software. The downloaded waveform files can be subsequently viewed using software that supports the industry standard COMTRADE file format.



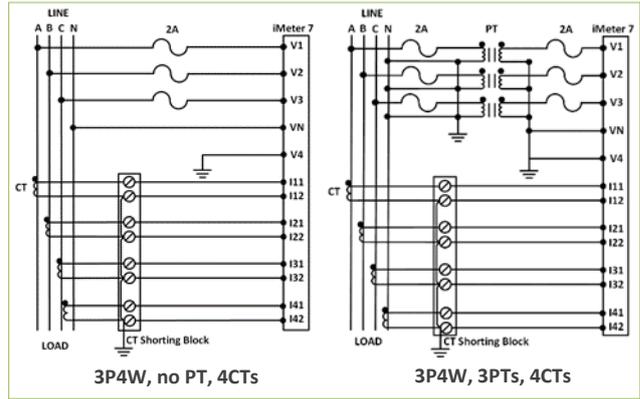
**Accuracy**

Parameters	Accuracy	Resolution
Voltage	±0.1%	0.01V
Current	±0.1%	0.001A
P, Q, S	±0.2%	0.001W/var/VA
PF	±0.5%	0.001
Frequency	±0.003Hz	0.001Hz
kWh, kVAh	IEC 62053-22 Class 0.2S	0.1kXh
kvarh	IEC 62053-24 Class 0.5S IEC 62053-23 Class 2	0.1kvarh
Harmonics	IEC 61000-4-7 Class A	0.001
K-Factor	IEC 61000-4-7 Class A	0.01
Phase Angle	±0.2°	0.1°
Voltage Unbalance	±0.1 %	0.01%
Current Unbalance	±0.5%	0.01%
Pst, Plt	±5%	0.001
Dip/Swell/Interruption	Voltage: ±0.2%Un Duration: ±1 cycle	0.01%

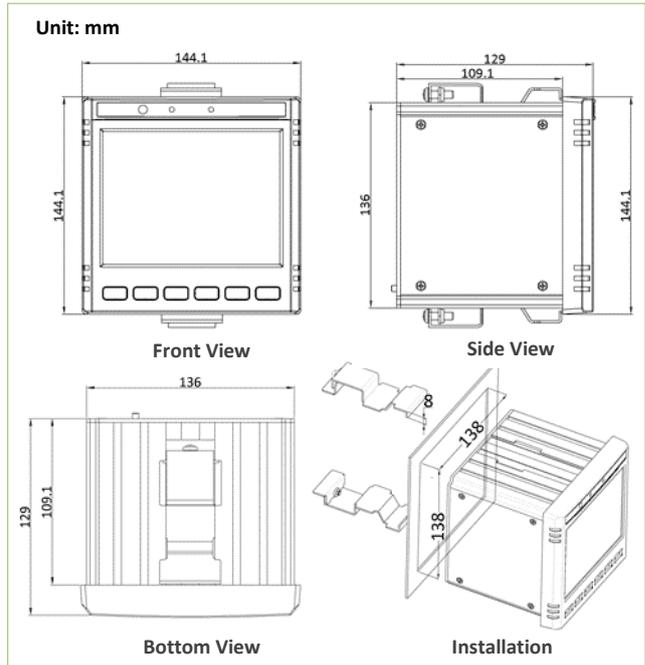
**Technical Specifications**

Voltage Inputs (V1, V2, V3, VN, V4)	
Standard (Un)	400VLN/690VLL+ 20%
Range	10V to 120% Un for 400VLN nominal
Overload	1.2xUn continuous, 4xUn for 1s
Burden	< 0.1VA/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)	
Standard (In)	5A (Standard), 1A (Optional)
Range	1% to 400% In
Starting Current	0.1% In
Overload	4xIn continuous, 10xIn for 1s
Burden	< 0.5VA/per phase @ 5A < 0.1VA/per phase @ 1A
CT Ratio	
Primary	1-30,000A
Secondary	1-50A
I4 Primary	1-30,000A
I4 Secondary	1-50A
Power Supply (L+, N-)	
Standard	95-250VAC/VDC ± 10%, 47-440Hz
Optional	20-60VDC
Burden	< 22VA / 9W
Overvoltage Category	CAT III 300V
Digital Inputs (DIC, DI1, DI2, DI3, DI4, DI5, DI6, DI7, DI8)	
Standard	Dry contact, 24VDC internally wetted
Sampling	1000Hz
Hysteresis	1ms minimum
Relay Outputs (RO11/RO12, RO21/RO22, RO31/RO32, RO41/RO42)	
Type	Form A Mechanical Relay
Loading	5A @ 250VAC/30VDC
SS Pulse Outputs (DO1+, DO1-, DO2+, DO2-)	
Type	Form A Solid State Relay
Isolation	Optical
Max. Load Voltage	30VDC
Max. Forward Current	50mA
Environmental Conditions	
Operating Temperature	-25°C to 70°C
Storage Temperature	-40°C to 85°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	63 kPa to 110 kPa
Pollution Degree	2
Measurement Category	CAT IV 1000V
Mechanical Characteristics	
Panel Cutout	138x138 mm
Unit Dimensions	144x144x129 mm
IP Rating	52

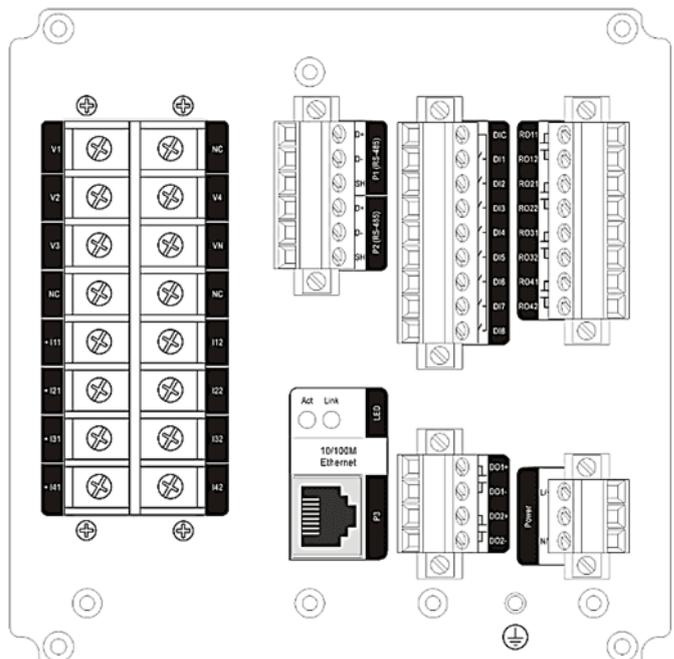
**Typical Wiring**



**Device Views and Mounting Diagram**



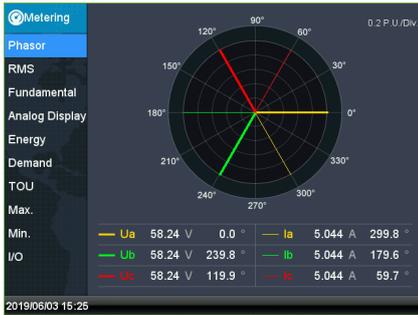
**Rear Panel**



## Front Panel User Interface



Main Menu



Phasor Diagram



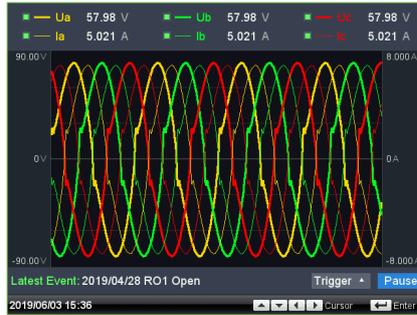
RMS Metering



Harmonic Spectrum



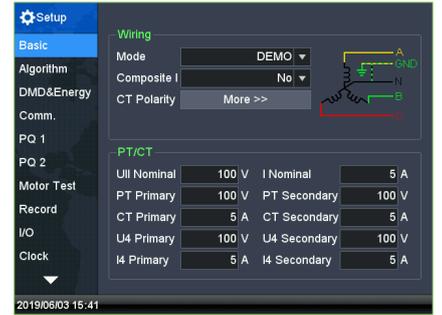
EN50160 Report



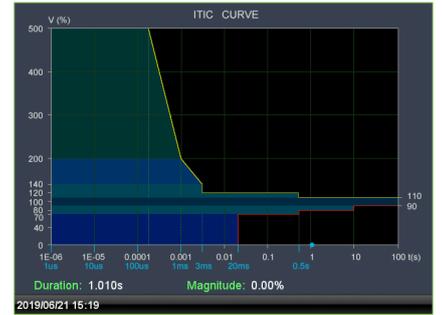
Real-Time WF Capture



SOE Log

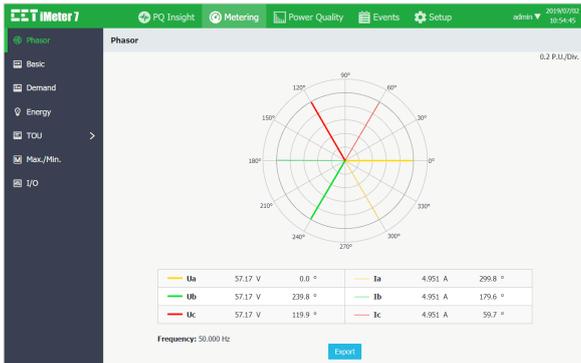


Basic Setup



ITIC Curve

## Web Interface



Metering-> Phasor



ITIC Curve



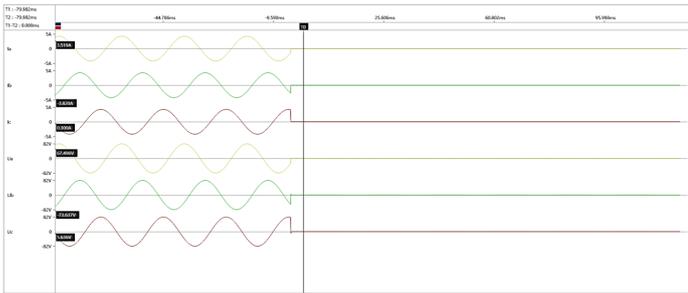
PQ Insight-> Real-Time Waveform



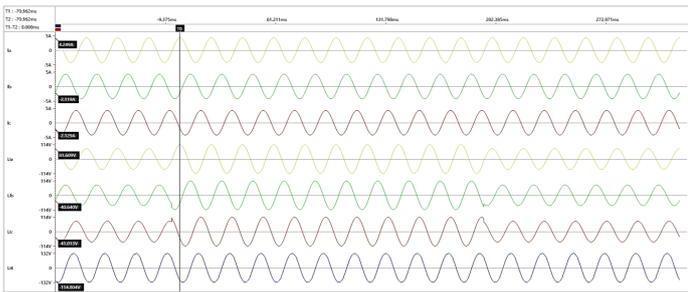
SEMI F47 Curve



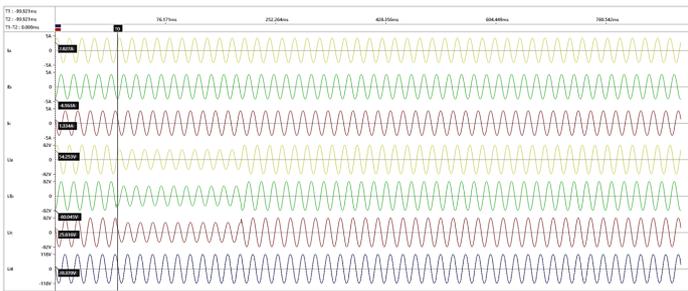
WFR Examples at Different Resolutions



Interruption Event @ 1024 samples/cycle x 10 cycles

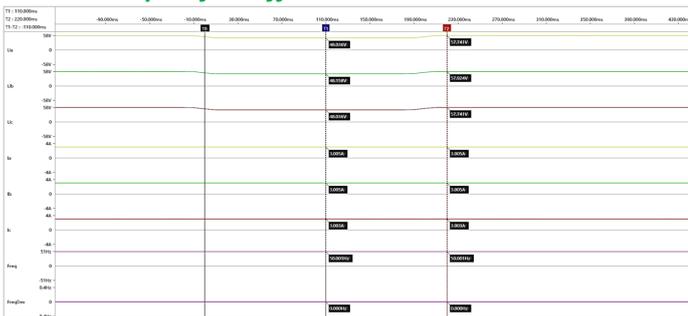


Swell Event @ 512 samples/cycle x 20 cycles



Dip Event @ 256 samples/cycle x 40 cycles

RMSR Examples for Different Events

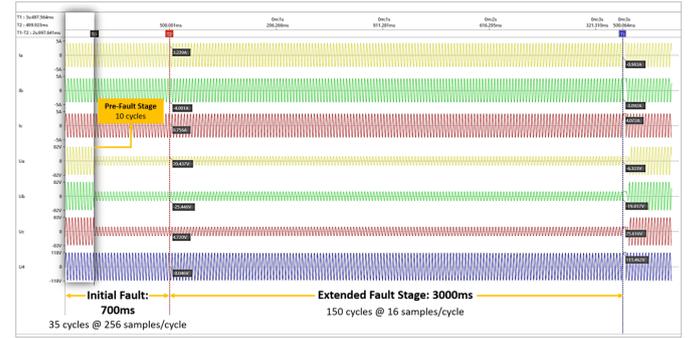


RMSR Triggered by a Dip Event

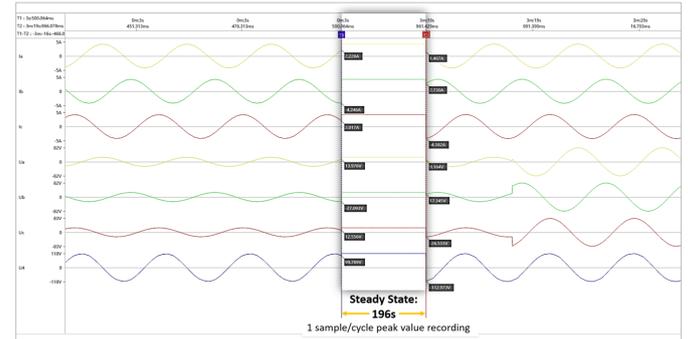


RMSR Triggered by a Swell Event

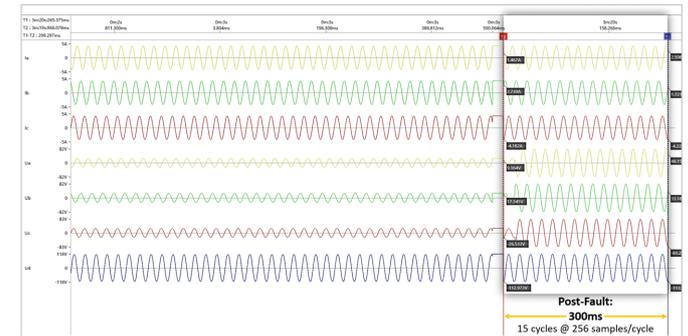
DWR Example of a 199.70 seconds Dip Event



Initial Fault @ 256 x 35 cycles and Extended Fault @ 16 x 150 cycles



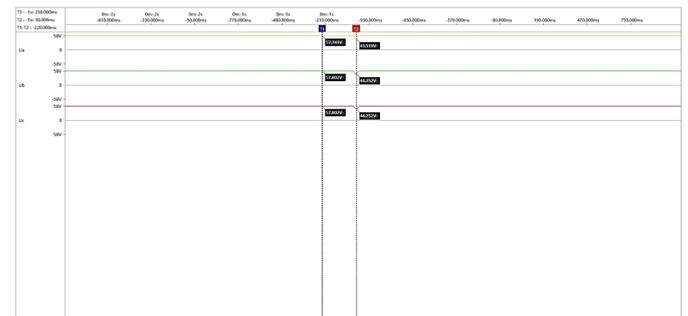
Steady State Capture @ ~196s of 1-cycle Peak Values



Post Fault Capture @ 256 samples/cycle x 15 cycles



RMSR Triggered by a 220ms Interruption Event



RMSR Triggered by a Transient Event



**Standards of Compliance**

Safety Requirements	
CE LVD 2014 / 35 / EU	EN 61010-1: 2010 EN 61010-2-030: 2010
Electrical Safety In low Voltage Distribution Systems up to 1000Vac and 1500 Vdc	IEC 61557-12: 2018 (PMD)
Insulation	IEC 62052-11: 2003 IEC 62053-22: 2003 EN 61010-1: 2010
AC Voltage: 2kV @ 1 minute Insulation Resistance: >100MΩ Impulse Voltage: 6kV, 1.2/50μs	
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
EMC Compatibility CE EMC Directive 2014 / 30 / EU (EN 61326: 2013)	
Immunity (EN50082-2)	
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
Voltage Dips and Interruptions	EN 61000-4-11:2004+A1: 2017
Ring Wave	EN 61000-4-12:2017
Emission (EN50081-2)	
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
Power Quality	
Voltage Characteristics Of Electricity Supplied by Public Distribution Systems	EN 50160
General Guide on Harmonic And Interharmonic Measurements and Instrumentation, for Power Supply Systems and Equipment Connected Thereto	IEC 61000-4-7
Flicker Meter - Functional and Design Specifications	IEC 61000-4-15
Testing and Measurement Techniques - Power Quality Measurement Methods	IEC 61000-4-30 Edition 2 Class A Certified

**Ordering Guide**

Product Code		Description
iMeter 7 Advanced Power Quality Monitor		
<b>Input Current</b>		
5		5A
1		1A
<b>Input Voltage</b>		
9		400VLN/690VLL + 20%
<b>Power Supply</b>		
2		95-250VAC/DC ± 10%, 47-440Hz
3		20-60VDC
<b>System Frequency</b>		
5		50Hz
6		60Hz
<b>I/O</b>		
A		8xDI + 4xRO (Mechanical Relay) + 2xDO (Solid State Relay)
<b>Communications</b>		
A		2xRS-485 + 1x100BaseT
<b>IEC 61850</b>		
X		No
A*		Support IEC61850 Protocol
<b>Display Language</b>		
E		English
iMeter 7 - 5 9 2 5 A A X E		iMeter 7-5925AAE (Standard Model)

\*Additional charges apply

**IEC 61000-4-30 Class A Edition 2 Certificate**



**Your Local Representative**

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