



iMeter8

Advanced Power Quality Analyzer

iMeter8



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, EN50160 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 the most advanced PQ Analyzer 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, Transients, Flickers and Disturbance monitoring
- Mains and critical feeder monitoring
- IEC 61850 support for Substation Automation and Smart Grid
- Retrofit applications with Split-Core Current Probe (SCCP)

Basic Features

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

Display & Web Server

The Front Panel display and on-board Web Server allow access to following data and configurations

- 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

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 and I5
- Present Demand of 4-phase U & I THD/TOHD/TEHD, 4-phase Current K-factor, U & I 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

Advanced Power

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 at min. 1-minute interval
- 8 Tariffs, each providing the following information:
 - kWh/kvarh Import/Export and kVAh
 - P & Q Import/Export Peak Demands
 - Register rollover at 100,000,000,000 kWh

Power Quality Features

- IEC 61000-4-30 Ed.3 Class A Compliant
- IEC 61000-4-15 & IEC 61000-4-7 Compliance
- Disturbance Direction Indicator
- Disturbance Waveform Recording
- RMS Recording and EN50160 Reporting
- Waveform recording in COMTRADE and PQDIF file format (Compatible with the PQ View software)
- Fault Capture up to 2,000V peak to peak

Power Quality Metering

PQ Parameters as per IEC 61000-4-30 Ed.3 Class A 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
- Harmonic and Interharmonic measurements for Voltage and Current

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 63rd #
- U and I Individual Interharmonics (%IHD and RMS) from 1st to 63rd #
- 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 63rd #
- 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

- Monitoring and displaying 2kHz to 150kHz realtime value at 3s
- Statistical Max., Min., Avg. & CP95 values for two frequency ranges: 2kHz~9kHz & 9kHz~150kHz with amplitude, frequency and timestamp
- Auto daily report with statistical Max., Min., Avg. & CP95 values @ 1 min interval for maximum 30 days recording (FIFO)

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
- 72s of ½ cycle RMS recording @ 50Hz or 60s @ 60Hz

Sequence and Unbalance

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

Transients, Dips, Swells & Interruptions Recording

- Transients capture as short as 20µs at 1024 samples @ 50Hz for sub-cycle disturbances such as capacitor switching and resonance phenomena
- Dips, Swells and Interruptions detection @ 10ms (½ cycle at 50Hz)
- Trigger for DO, WF Recording, Disturbance Waveform Recording, RMS Recording, DR, HSDR 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

In-rush 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

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

- Real-Time WFC @ 128 samples/cycle x 4 cycles via Front Panel
- WFR with max. 128 entries
- Support Scheduled WFR
- Simultaneous capture of 3-phase Voltage and Current Inputs
- No. of Cycles x Samples/Cycles with programmable pre-fault cycles: 375x1024, 1500x256, 3000x128
- COMTRADE file format, downloadable from the on-board Web Server or FTP

Disturbance Waveform Recorder (DWR)

- Simultaneous recording of all Voltage (U1-U4) and Current (I1-I5) Inputs
 - 128 entries
 - Initial Fault: 35 cycles @ 512 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 @ 512 samples/cycle

PQ Event Counters

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

Quality Analyzer

Data and Event Recorders

8GB on-board memory offers non-volatile recording for the following data

Interval Energy Recorder (IER) and Accumulative Energy Recorder (AER)

- Both IER Log and AER Log support recording of kWh, kvarh Import/Export and kVAh Total RMS, Total Fundamental and Total Harmonic kWh, kvarh Import/Export
- Recording Interval from 1 to 65535 minutes
- Max. Recording Depth @ 65535 records
- Support FIFO and Stop-When-Full mode

Device Log

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

Data Recorder (DR) Log

- 12 Standard DR Logs and 4 High-Speed DR Logs
- Recording Interval from 1s to 40 days for Standard DR Log and 1 to 60 cycles for High-Speed DR Log
- Up to 32 parameters for each DR Log with programmable sources such as real-time data, Harmonics, Unbalance and Demand measurements, ...etc.
- Configurable Depth and Recording Offset
- Support FIFO or Stop-When-Full Recording Mode

Statistical Data Recorder (SDR) Log

- 16 SDR Logs of 64 parameters each
- Recording of the Max, Min, Avg and 95th percentile for real-time measurements including U, I, P, Q, S, PF, Frequency, Power, PF, Harmonics, Deviations and Unbalances
- Recording interval from 0 to 60 minutes
- 30 days @ 1-minute, 300 days @ 10-minute, 450 days @ 15-minute
- PQDIF file format, downloadable from the on-board FTP Server
- Support FIFO or Stop-When-Full mode

Max/Min Recorder (MMR) Log

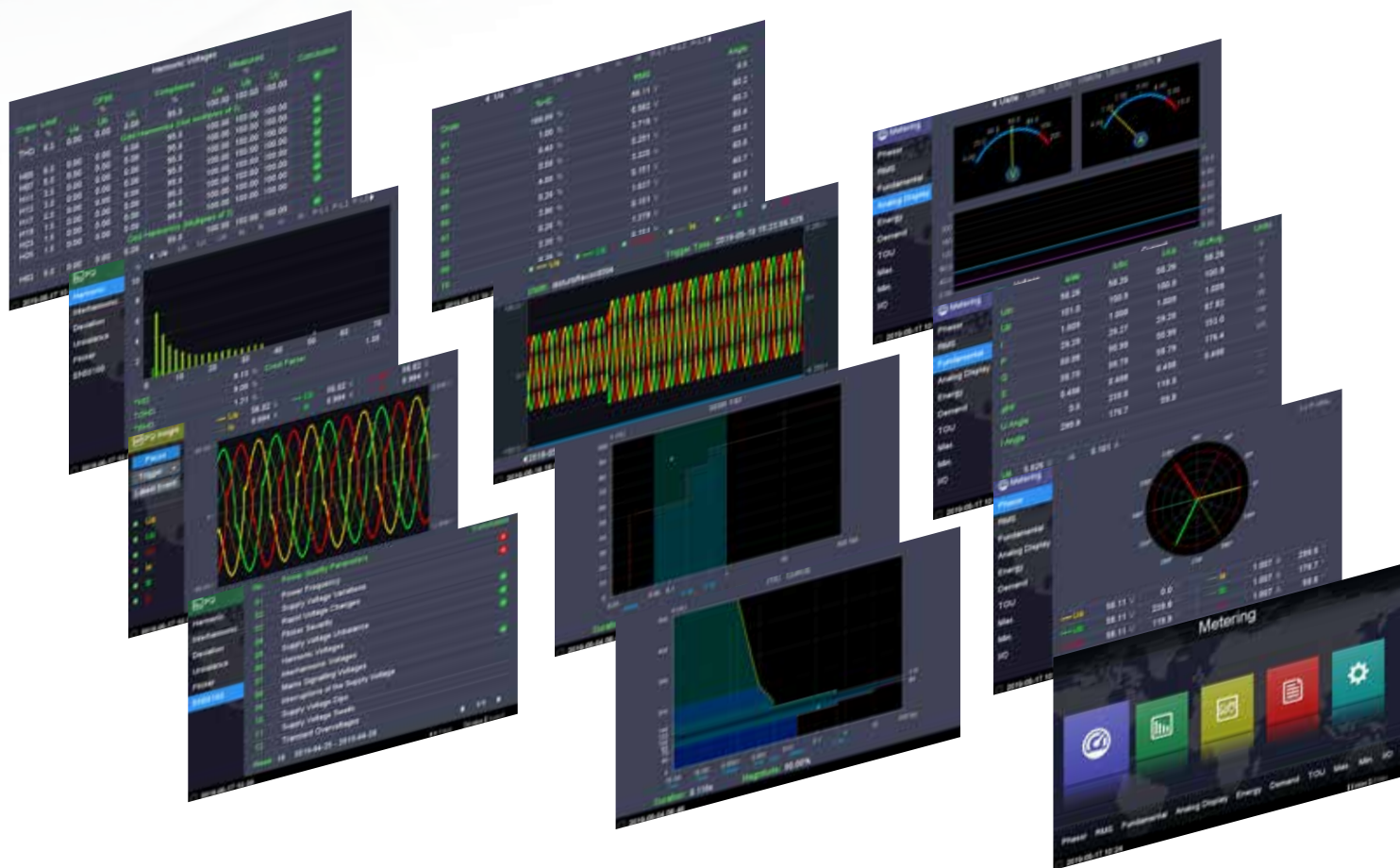
- Logging of Max/Min values for real-time True RMS measurements, Fundamental measurements, Harmonic measurements, Demands, Deviations, Unbalances and Flicker

SOE Log

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

Time Synchronization

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



iMeter8



Setpoints

PQ Setpoints

- Transients, Dips, Swells, Interruptions
- Rapid Voltage Changes
- In-rush Current
- Trigger DO, WFR, DWR, RMSR or Alarm Email

Control Setpoints

- 256 standard and 16 high-speed setpoints
- Extensive monitoring sources including U, I, P, Q, S, Demands, Harmonics, Unbalances, Deviations, Flickers, AI, ...etc.
- Configurable thresholds and time delays
- Trigger DO, DR, HS DR, WFR, DWR, RMSR or Alarm Email

Digital Input Setpoints

- Provides control output actions in response to changes in Digital Input status
- Demand Synchronization and Tariff Switch
- Trigger DO, DR, HS DR, WFR, DWR, RMSR or Alarm Email

Inputs and Outputs

Digital Inputs

- Standard 8 or optional 16 channels
- Standard volt-free dry contact with 24VDC Internal Excitation
- Optional 110VAC/DC or 220VAC/DC External Excitation
- 1000Hz sampling
- External 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 Form A Mechanical Relays for alarming and general purpose control
- Standard 3 or optional 7 SS Relays for kWh & kvarh pulsing

Analog Inputs (Optional)

- 2xAI, 0/4-20mA DC input with programmable zero and full scales

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
- Simultaneous client connections for 12xModbus TCP and 12xIEC61580
- Protocols:
 - Modbus TCP, IEC61850
 - HTTPS, SNMP, SMTP, FTP
- Built-in password protected Web Server for easy data viewing, setup configuration and firmware upgrade

RS-485

- Dual optically isolated RS-485 port with baud rate from 1.2kbps to 38.4kbps
- Protocols: Modbus RTU, Ethernet Gateway

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

- Real-time measurements display
- Export of IER, SDR and EN50160 Reports

3rd Party System Integration

- Easy integration into Substation Automation or Utility SCADA systems via Modbus RTU, Modbus TCP or IEC61850
- 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 or PQDIF 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

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	±0.003Hz	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	
Voltage Unbalance	±0.1%	0.01%
Current Unbalance	±0.5%	0.01%
Pst, Plt	±5%	0.01%

Power Supply (L+, N-, G)

Standard	95-250VAC/VDC ± 10%, 47-440Hz
Burden	< 12W
Oversvoltage Category	CATIII 300V

Digital Inputs (COM, DI1 to DI8 or DI16)

Standard	Dry contact, 24VDC internally wetted
Optional	110V/220V AC/DC externally wetted
Sampling	1000Hz
Hysteresis	1 ms minimum

Optional Form A Relay Outputs (DO1 to DO3 or DO7 + Alarm)

Type	Form A Mechanical Relay
Loading	5A @ 250VAC/30VDC

Optional Form C Relay Outputs (Alarm 1, 2, 3)

Type	Form C Mechanical Relay
Loading	8A @ 250VAC/24VDC

Optional 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

Type	0-20/4-20 mA DC
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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	CATIII 1000V

Mechanical Characteristics

Panel Cutout	186x186 mm
Unit Dimensions	192x192x182.4mm
IP Rating	52

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	
SCCP Options	SCCP-50A-500mV	5A/50A (In/Imax), Selectable
	SCCP-200A-200mV	20A/200A (In/Imax), Selectable
	SCCP-500A-500mV	500A
	SCCP-5000A-500mV	500A/5000A Selectable Rogowski Coil
CT Ratio	Primary	1-30,000A
	Secondary	1-50A
	I4 Primary	1-30,000A
	I4 Secondary	1-50A

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
V Dips, Interruptions & Variations	EN 61000-4-11: 2004
Radio Disturbances	CISPR 22: 2006, Level B

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

Standards 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

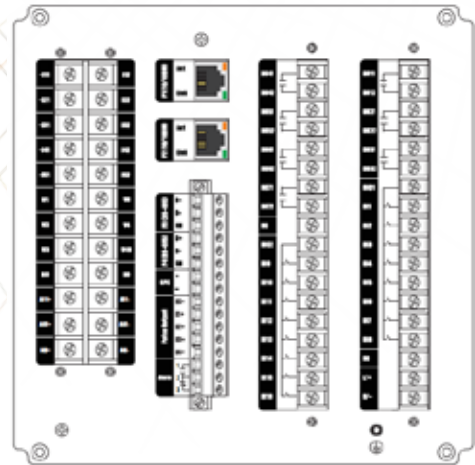
Mechanical Tests

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

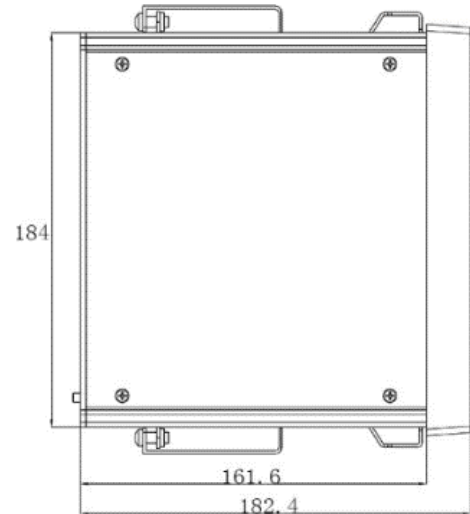
Power Quality

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
Flicker meter-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

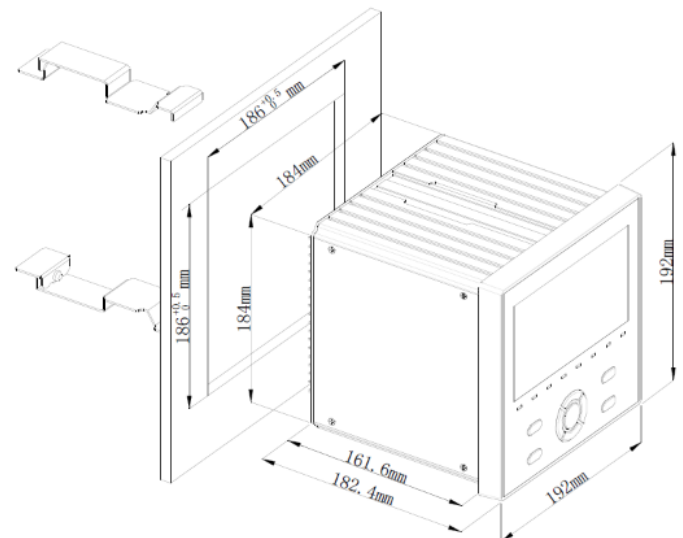
Device Dimensions



Rear Panel



Side view



Installation

Ordering Guide

Product Code											Description	
iMeter 8 Advanced Power Quality Analyzer												
Basic Feature	A											1024 samples/cycle, 8GB On-Board Memory
	B*-											1024 samples per 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											400V LN/690V LL + 20%
Power Supply			2								95-250V AC/DC ± 10%, 47-440Hz	
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 B (8xDI + 4xDO + 2xAI + 1xAO + 4xSS Pulse Outputs).

*SCCPA option does not come with any Current Clamp. Please refer to the "Optional SCCPs" section for more information.

Optional SCCPs

				
Model No.	PMC-SCCP-50A-500mV-B-A-B	PMC-SCCP-200A-200mV-B-B-B	PMC-SCCP-500A-500mV-B-B-B	PMC-SCCP-5kA-500mV-B-C-C-371/254/150/100
Measurement Range	5A (50A I _{max})	20A/200A (200A I _{max})	500A (500A I _{max})	500A/5000A Rogowski Coil (5000A I _{max})
Max. Allowable Current	50A	260A	500A	10,000A
Output Voltage	AC 10mV/A (Max. 500mV)	AC 10mV/A @ 20A AC 1mV/A @ 200A (Max. 200mV)	AC 1mV/A (Max. 500mV)	AC 1mV/A @ 500A AC 0.1mV/A @ 5000A (Max. 500mV)
Accuracy	±0.3% rdg. ±0.02% f.s.	±0.3% rdg. ±0.02% f.s.	±0.5% rdg. ±0.02% f.s.	±2.0% rdg. ±1.5mV
Protection	CAT III 300V	CAT III 600V	CAT III 600V	CAT III 1000V CAT IV 600V
Diameter	15mm	24mm	50mm	371/254/150/100 (mm)
Cable Length	3m	3m	3m	2m
Termination	BNC	BNC	BNC	BNC

*The Rogowski Coil SCCP comes with an external Universal Power Supply and an integrator.

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