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Electric
Technology

PMC-680i
Advanced Utility Power Quality Analyzer

New

- 512 samples/cycle, optional 1024
- 4GB Log Memory
- IEC 62053-22 Class 0.2S Compliant
- IEC 61000-4-30 Class A Certified
- IEC 61000-4-15 Flicker
- IEC 61000-4-7 Harmonics
- Comprehensive Data Recording
- PQDIF & COMTRADE Support
- Extensive I/O Capabilities
- Industrial Grade Components
- Extended Warranty
- Optional Split-Core Current Probes
- 5.7” Color LCD Display @ 640x480
- EN50160 Compliance Reporting
- Dip/Swell, Transient and Flicker
- Disturbance Waveform Recording
- Disturbance Direction Indictor
- Optional IEC 61850 for Smart Grid
- Modbus RTU/TCP, HTTP, SNTP, SMTP
- Dual Ethernet and 2xRS-485
- Standard Tropicalization
- Extended Temperature Range

Designed For Reliability *Manufactured To Last*

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The PMC-680i is CET's Advanced Utility 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 standard DIN 192 form factor with a high resolution, backlit, color TFT LCD display. The PMC-680i satisfies such standards as IEC 62053-22 Class 0.2S, IEC 61000-4-30 Class A, IEC-61000-4-15, IEC 61000-4-7, EN50160 as well as optional IEC 61850 for Substation Automation. Further, it offers a large logging capacity with 4GB of on-board memory, extensive I/O with 8xDIs, 4xROs and 4xDOs, GPS Time Sync., dual Ethernet and two RS-485 ports. These features likely make the PMC-680i the most advanced PQ Analyzer for the Utility market today.

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
- Optional IEC61850 support for Substation Automation and Smart Grid
- Retrofit applications with optional Class 1 Split-Core Current Probes

Basic Features

- IEC 62053-22 Class 0.2S kWh metering with Multi-Tariff TOU
- 512 samples/cycle sampling, optional 1024
- 4GB on-board log memory
- Industrial-grade, high-resolution Color TFT LCD @ 640x480
- Time Sync. via IRIG-B, SNTP or GPS 1PPS output
- 256 Setpoints and 16 HS Setpoints
- Dual 100BaseT Ethernet and two RS-485 ports
- Up to 12 months of daily backup of PQ recordings in PQDIF format

Power Quality Features

- IEC 61000-4-30 Class A Certified by PSL
- IEC 61000-4-7, IEC 61000-4-15 and EN50160 Reporting
- Transients, Dips, Swells, Interruptions, Rapid Voltage Changes (RVC) and In-rush Current monitoring
- Disturbance Direction Indicator & Disturbance Waveform Recording
- Harmonic analysis up to 63rd on-board and 511th via software
- Fault Capture up to 2,000V peak to peak (400V Input Option)
- Real-time WF Capture, Trending and Statistical Reporting
- Waveform recording in COMTRADE and PQDIF file format that is compatible with the PQ View software

Front Panel Display and Web Interface

- Real-time, Harmonic Power and Energy measurements
- Real-time WF Capture of 3-phase Voltages and Currents
- PQ Log with ITIC/SEMI F47 and Waveform displays
- Harmonic & Interharmonic histogram and Phasor diagrams
- Statistical Trending
- EN50160 Report
- SOE Log
- I/O status
- Device configuration
- Diagnostics

Power Quality Metering

PQ Parameters as per IEC 61000-4-30 (Class A Certified)

- Power Frequency
- Magnitude of the Supply Voltage
- Flicker
- Supply Voltage Dips (Sags) and Swells
- Voltage Interruptions
- Transient Voltages
- Supply Voltage Unbalance
- Voltage Harmonics and Interharmonics
- Mains Signalling Voltage on the Supply Voltage
- Rapid Voltage Changes
- Measurement of Underdeviation and Overdeviation parameters

Harmonic and Interharmonic measurements

- K-Factor for Current, Crest Factor for Current and Voltage
- U and I THD, TOHD, TEHD
- U and I Individual Harmonics (%HD) from 2nd to 63rd #
- U and I Individual Interharmonics (%IHD) from 0 to 63rd #
- Harmonic kW, kvar, kVA and PF from 2nd to 63rd in RMS
- Fundamental U, I, kW, kvar, kVA 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 2nd to 63rd

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

Symmetrical Components and Unbalances

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

Transient and Dip/Swell Recording

- Transients capture as short as 40us at 512 samples or 20us at 1024 samples @ 50Hz for sub-cycle disturbances such as capacitor switching and resonance phenomena
- Dips and Swells detection @ 10ms (½ cycle at 50Hz)
- Trigger for DO, Data Recording and High-Speed Data Recording, WF Recording, Disturbance Waveform 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

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

Waveform Capture (WFC) and Waveform Recorder (WFR)

- Real-time WF Capture @ 128 samples/cycle via front panel display
- WF Recorder with 128 entries
- Simultaneous capture of 3-phase Voltage and Current inputs
- # of Cycles x Samples/Cycles with programmable # of pre-fault cycles
  - 10x1024*, 20x512, 40x256,
  - 80x128, 160x64, 320x32, 640x16
- Extended recording for up to a maximum of 4 consecutive captures
- COMTRADE file format, downloadable from the on-board FTP Server

* Only available for the 1024 sampling option

Disturbance Waveform Recorder (DWR)

- Disturbance recording of all Voltage (U1-U4) and Current (I1-I5) Inputs
  - Initial Fault: Up to 35 cycles @ 512 samples/cycle
  - Extended Fault: 150 cycles @ 16 samples/cycle
  - Steady State: 360 seconds of 1-cycle RMS recording @ 50Hz
  - Post Fault: Up to 15 cycles @ 512 samples/cycle

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PQ Event Counters

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

Metering

Basic Measurements (1-second update)

- 3-phase Voltage, Current, Power, PF and Phase Angles
- kWh, kvarh Import/Export/Net/Total and kVAh Total
- U4, I4, I5, Frequency
- Configurable timestamped measurements include 10/12-cycle, 1-second, 3-second, 10-minute and 2-hour

High-Speed Measurements

- 3-phase Voltages and Currents, U4, I4, I5, Power, PF @ ½ cycle
- Frequency @ 1 cycle

Demands

- Present and Predicted Demand for 3-phase Voltage, Current, Power, PF, U4, I4, I5, Frequency
- Present Demand of 4-phase V & I THD/TOHD/TEHD/HD 2nd to HD 63rd, and 4-phase Current K-factor
- Max/Min values per Demand Interval
- Peak Demands for This Month and Last Month, or Before the Last Reset and Since the 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 1-minute interval
  - 8 Tariffs, each providing the following information:
    - kWh/kvarh Import/Export and kVAh
    - kW/kvar Import/Export Peak Demands
    - Register rollover at 100,000,000,000 kXh

Data and Event Recorders

Non-Volatile Log Memory

- 4GB on-board Log Memory

Interval Energy Recorder (IER) Log

- kWh, kvarh Import/Export and kVAh Total, Total Harmonic kWh, kvarh Import/Export
- Programmable recording interval from 1 minute to 65535 minutes
- Support FIFO and Stop-When-Full mode

Statistical Data Recorder (SDR) Log

- Recording of the Max, Min, Avg. and 95th percentile for real-time measurements including U, I, Freq., Flicker, Harmonics and Unbalances in 16 different recorders
- Recording interval from 1 minute to 60 minutes
- 30 days @ 1-minute, 300 days @ 10-minute, 450-day @ 15-minute
- On-board trending via Front Panel display
- PQDIF file format, downloadable from the on-board FTP Server

Data Recorder and High-Speed (HS) Data Recorder

- 8 Data Recorders of 32 parameters each and 4 HS Data Recorders of 16 parameters each
- Recording interval from 1s to 40 days for Data Recorder and from 1/2 cycle to 60 cycles for HS Data Recorder
- Programmable sources
- Configurable Depths and Recording Offsets, max. depths @ 65535
- Support FIFO or Stop-When-Full mode

Max/Min Recorder (MMR) Log

- Logging of Max/Min values for real-time measurements such as U, I, kW, kvar, kVA, PF, Freq., Unbalance, K-factor, THD
- Two transfer modes:
  - Manual: Max/Min Since Last Reset/Before Last Reset
  - Automatic: Max/Min of This Month/Last Month

SOE Log

- 1024 FIFO events time-stamped to ±1ms resolution
- Setup changes, System events, Setpoint events and I/O operations

PQ Log

- 1024 FIFO entries time-stamped to ±1ms resolution
- Transient, Dip/Swell, Disturbance Direction, Interruptions, Rapid Voltage Changes, Mains Signalling Voltages...etc
- Record the time and characteristic data of the captured PQ event

Setpoints

PQ Setpoints

- Transients
- Dips/Swells
- Rapid Voltage Changes
- In-rush Current
- Harmonics
- Trigger DO, SOE Log, Data Recording, WFR or DWR

Control Setpoints

- 256 Control Setpoints and 16 High-Speed Setpoints
- Extensive monitoring sources
- Configurable thresholds and time delays
- Trigger DO, SOE Log, Data Recorder High-Speed Data Recorder, Waveform Recorder and Alarm Email

Digital Input Setpoints

- Provides control output actions in response to changes in Digital Input status
- Demand Synchronization and TOU Rate Change
- Trigger DO, SOE Log, Data Recording, High-Speed Data Recording, WFR, DWR and Alarm Email

Inputs and Outputs

Digital Inputs

- 8 channels, volts free dry contact, 24VDC internally wetted
- 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
- Time Sync. via GPS's 1PPS output

Digital Outputs

- 8 channels for control, alarming and pulsing applications
- RO1-RO2: Form A Mechanical Relay
- RO3-RO4: Form C Mechanical Relay
- DO1-DO4: Optically Isolated Solid State Relay

Communications

Ethernet Ports (P1, P2)

- Dual 10/100BaseT TCP/IP Ethernet Ports with RJ45 connector
- Simultaneous client connections for 10xModbus TCP and 12xIEC61580
- Optional 100BaseFX with ST connector (replaces one 100BaseT port)
- Protocols
  - Modbus RTU and Modbus TCP
  - HTTP, SNTP, SMTP, FTP
  - Ethernet Gateway
  - Optional IEC61850
- Firmware upgrade via Ethernet port

RS-485 (P3, P4)

- Optically isolated RS-485 port with baud rate from 1.2 to 115.2 kbps
- Modbus RTU protocol
- Time Sync. via GPS's 1PPS or IRIG-B outputs

Time Synchronization

- Battery-backed real-time clock @ 6ppm (≤ 0.5s/day)
- Time Sync. via Modbus RTU protocol, SNTP, GPS 1PPS or IRIG-B

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System Integration

PecStar iEMS

The PMC-680i is supported by CET's PecStar iEMS software. In addition, the PMC-680i 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 optional IEC 61850.

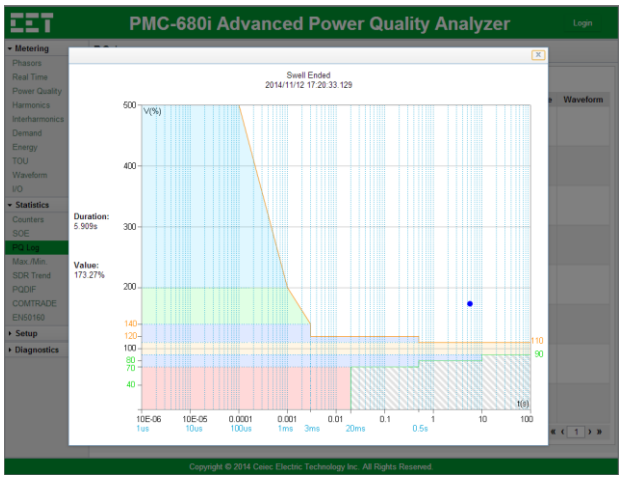
PMC Setup

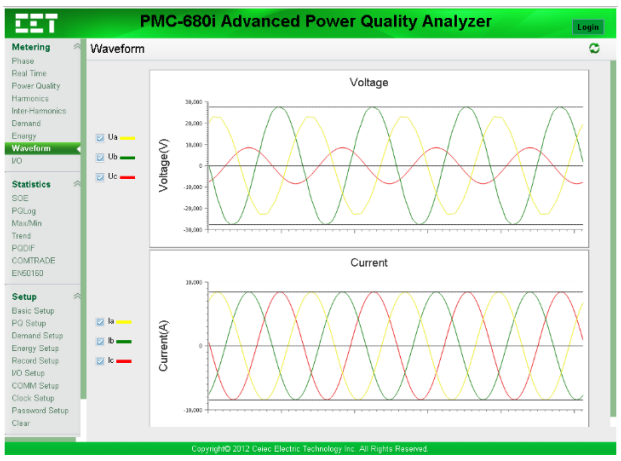
- Free Setup configuration tool
- Real-time and log display
- Remote control

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 (Google Chrome) without the use of proprietary software
- The on-board, password protected FTP Server allows logged data 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

Web Interface

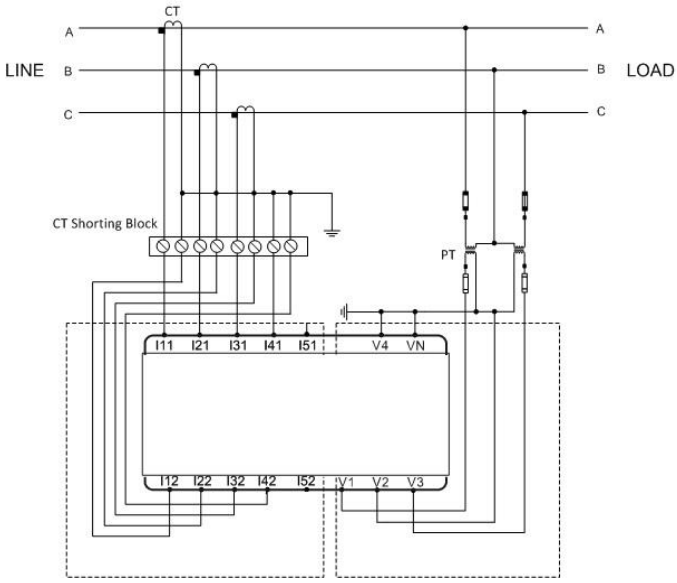




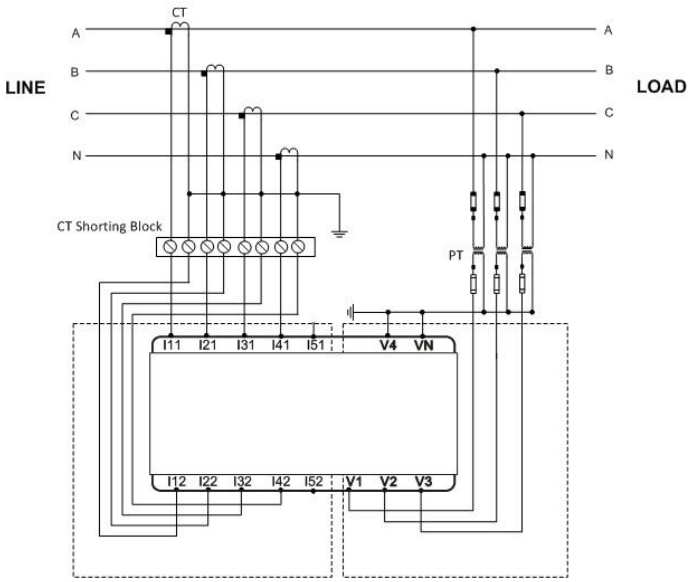
Accuracy

Parameters	Accuracy	Resolution
Voltage (U)	±0.1%	0.01V
I1, I2, I3	±0.1%	0.001A
I4, I5	±0.2%	0.001A
kW, kVA	IEC 62053-22 Class 0.2S	0.001kX
kWh, kVAh	IEC 62053-22 Class 0.2S	0.1kXh
kvar, kvarh	IEC 62053-23 Class 2	0.1kvarh
P.F.	±0.5%	0.0001
Frequency	±0.005 Hz	0.001Hz
Harmonics	IEC 61000-4-7 Class A	0.01
K-Factor	IEC 61000-4-7 Class A	0.1
Phase angles	±1°	0.1°
Symm. Components	±0.2%	0.01V/0.001A
Voltage Unbalance	±0.1 %	0.01%
Current Unbalance	±0.5%	0.01%
Pst, Plt	±5%	0.001

Typical Wiring



3-Wire Delta



4-Wire Wye

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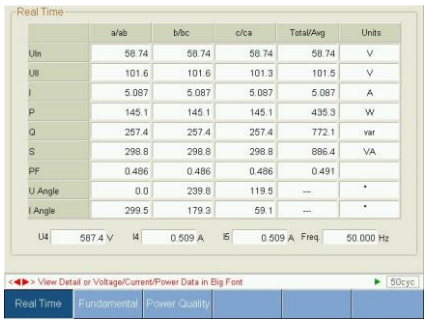
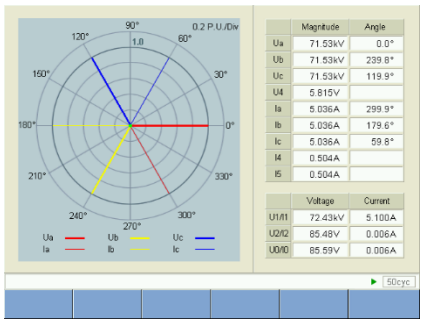
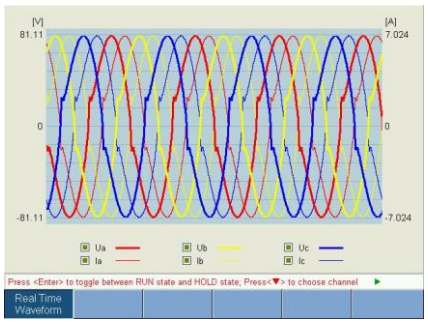
Front Panel User Interface



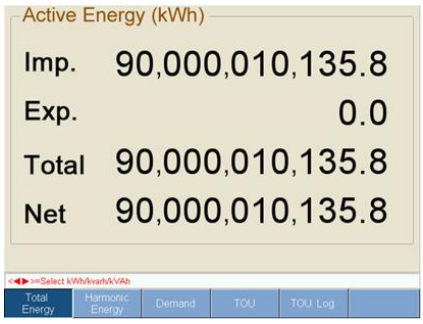
Basic Measurement



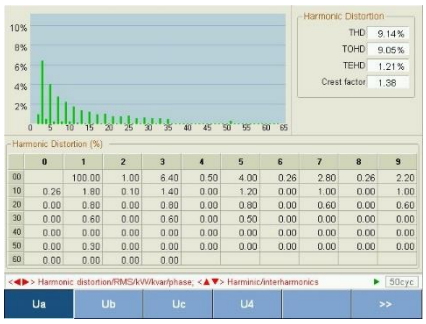
Phasors, Sequence Components & Unbalance



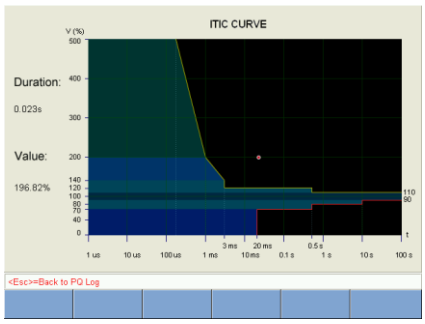
Real-time WF Capture



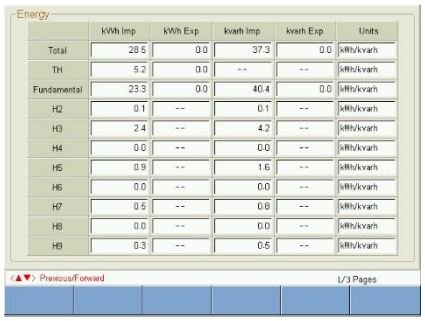
Large Character Energy Display



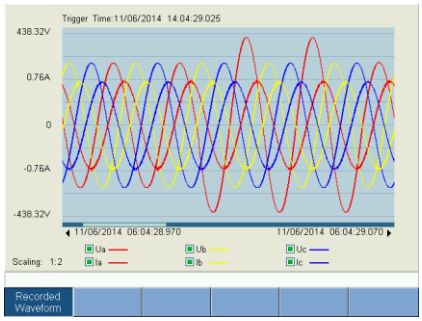
Harmonics



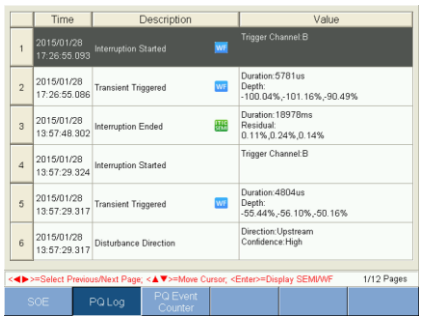
ITIC Plot



Harmonic Energy Measurements

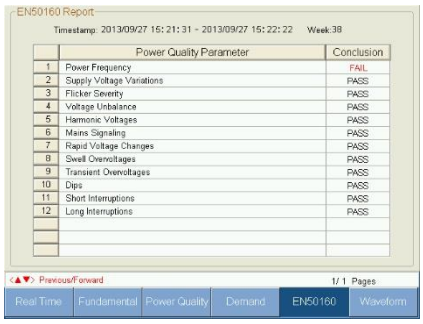


Waveform Recording

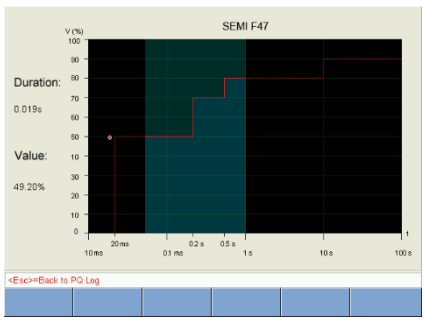


PQ Log

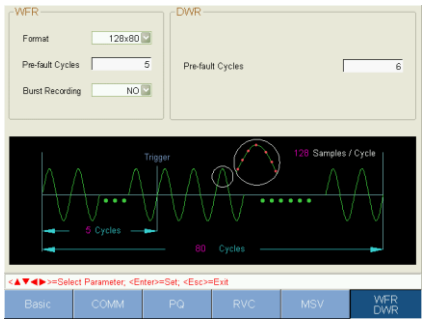
Power Quality



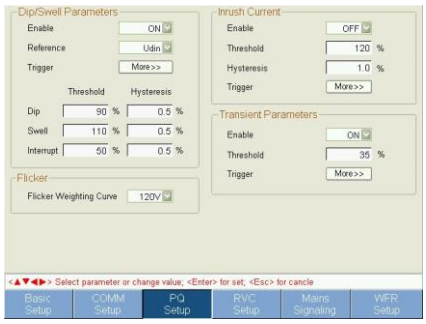
EN 50160 Report



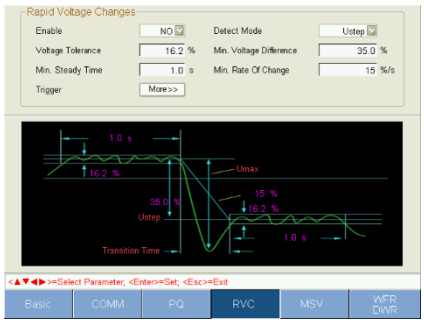
Semi F47 Plot



WFR Setup



PQ Setup



Rapid Voltage Changes Setup

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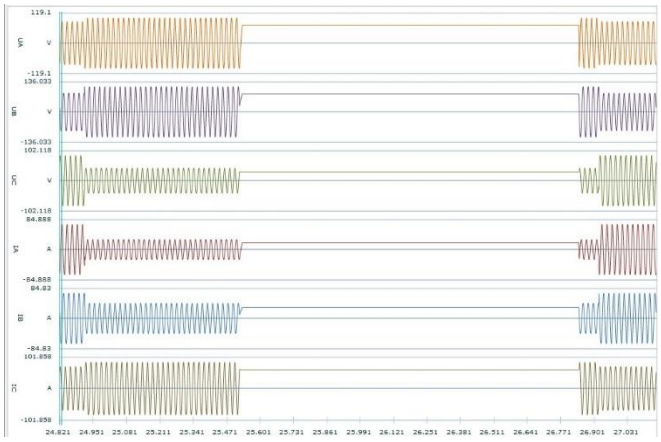
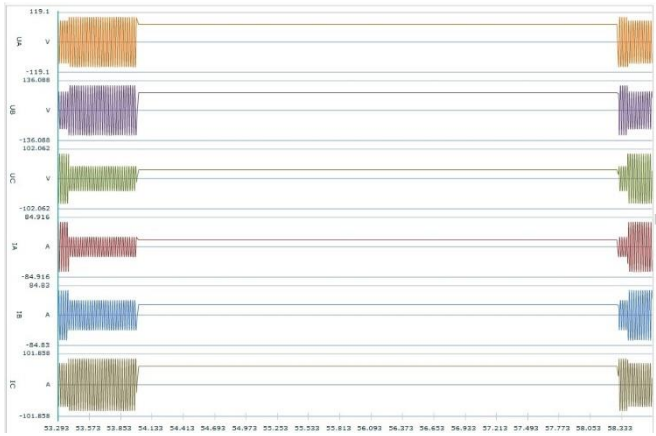
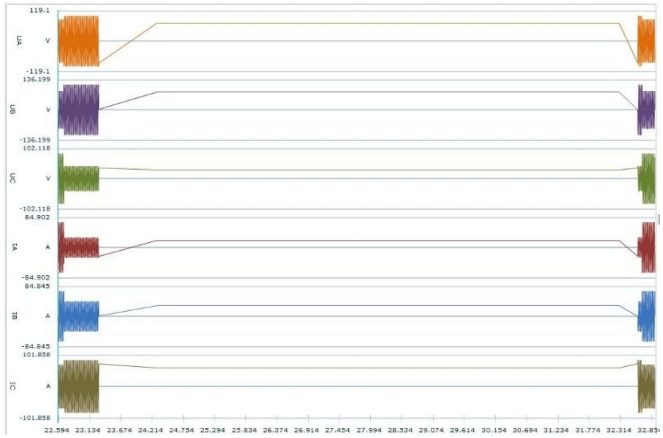
Examples of DWR at Different Resolutions



DWR @ 1024 samples/cycle for < 3s Recording

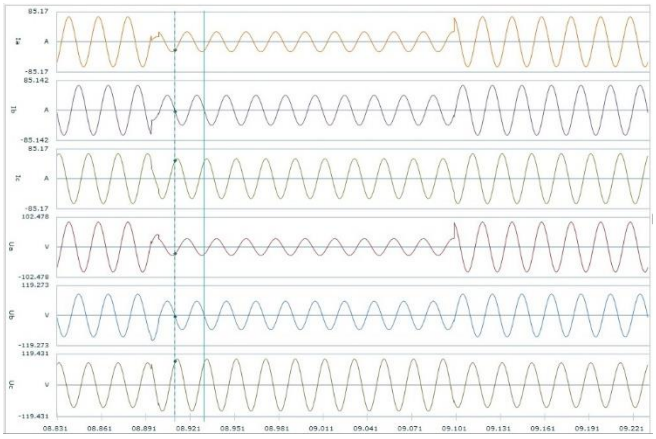


DWR @ 1024 samples/cycle for < 6s Recording

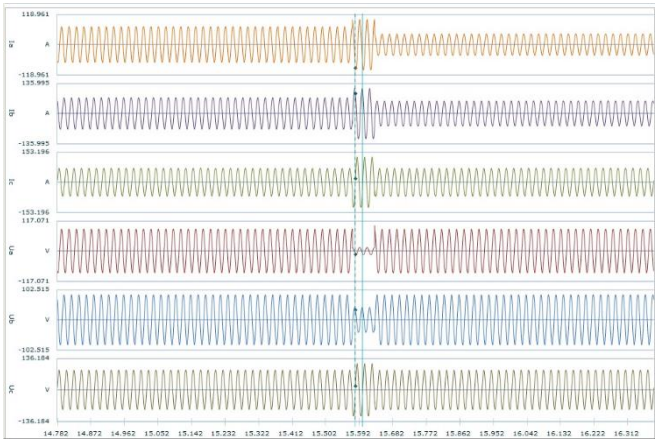


DWR @ 1024 samples/cycle for < 300s Recording

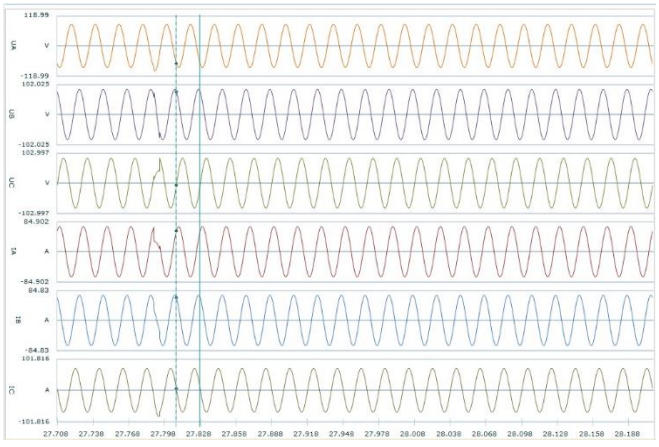
Examples of WFR at Different Resolutions



Dip/Swell Events @ 512 samples/cycle



Dip/Swell Event @ 128 samples/cycle



Transient Event @ 512 samples/cycle

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Technical Specifications

Voltage Inputs (V1, V2, V3, V4, VN)	
Standard (Un)	240VLN/415VLL
Optional (Un)	400VLN/690VLL
Range	1V to 150% Un for 240V standard 1V to 200% Un for 400V option
Overload	2xUn continuous, 4xUn for 1s
Burden	< 0.1VA per phase
PT Ratio	
Primary	1-1000000V
Secondary	100-690V
V4 Primary	1-1000000V
V4 Secondary	100-690V
Frequency	42Hz-58Hz @ 50Hz, 50Hz-70Hz @ 60Hz
Current Inputs (I11, I12, I21, I22, I31, I32, I41, I42, I51, I52)	
Standard (In)	5A (Standard), 1A (Optional)
Range	0.1% to 1000% In (I1-I3), 0.1%-300% (I4-I5)
Starting Current	0.1% In
Overload	4xIn continuous, 20xIn for 1s
Burden	< 0.5VA per phase @ 5A
Optional SCCP50	5A/50A (In/Imax) Split-Core Current Probe
CT Ratio	
Primary	1-30000A
Secondary	1-5A
I4 Primary	1-30000A
I4 Secondary	1-5A
Power Supply (L+, N-, G)	
Standard	95-250VAC/VDC ± 10%, 47-440 Hz
Optional	20-60VDC
Burden	< 10W
Digital Inputs (COM, DI1, DI2, …, DI7, DI8)	
Standard	Dry contact, 24VDC internally wetted
Sampling	1000Hz
Hysteresis	1ms minimum
Form A Relay Outputs (RO11, RO12, RO21, RO22)	
Type	Form A Mechanical Relay
Loading	5A @ 250VAC / 30VDC
Form C Relay Outputs (RO31, RO32, RO33, RO41, RO42, RO43)	
Type	Form C Mechanical Relay
Loading	8A @ 250VAC / 24VDC
Digital Outputs (COM, DO1, DO2, DO3, DO4)	
Type	Form A Solid State Relay
Isolation	Optical
Max. Load Voltage	80V
Max. Forward Current	50mA
LCD Display	
Type	Color TFT LCD, Industrial Grade
Resolution	640x480
Viewing Area	115x86 mm
Environmental Conditions	
Operating Temp.	-25°C to 70°C
Storage Temp.	-40°C to 85°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	70 kPa to 106 kPa
Pollution Degree	2
Measurement Category	CAT IV
Mechanical Characteristics	
Panel Cutout	186x186 mm
Unit Dimensions	192x192x187 mm
IP Rating	52

Standards of Compliance

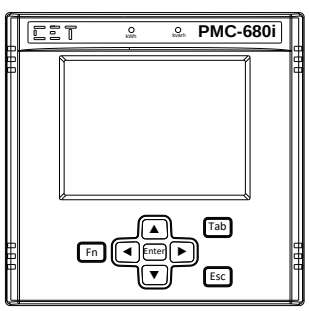
Safety Requirements		
LVD Directive 2006 / 95 / EC		EN61010-1-1-2001
Insulation		IEC 60255-5-2000
Dielectric test		
Between Power, AC circuits, and GND		2kV @ 1 minute
Between I/O, GPS and GND		500V @ 1 minute
Insulation resistance		
Between Current and GND		>100MΩ
Between Voltage and GND		>5MΩ
Between Power and AC Circuits		
Between GPS and GND		>100MΩ
Impulse voltage		
Rated input voltage > 60V		6kV, 1.2/50μs
Rated input voltage ≤ 60V		1kV, 1.2/50μs
EMC Compatibility EMC Directive 2004 / 108 / EC (EN 61326: 2006)		
Immunity (EN50082-2)		
Electrostatic discharge		IEC 61000-4-2: 2008 Level IV
Radiated field		IEC 61000-4-3: 2008 (10 V/m)
Electric Fast transient		IEC 61000-4-4: 2004 Level IV
Surge		IEC 61000-4-5: 2005 Level IV
Conducted disturbance		IEC 61000-4-6: 2008 Level III
Magnetic Field		IEC 61000-4-8: 2009 Level IV
Oscillatory wave		IEC 61000-4-12: 2006 Level III
Emission (EN50081-2)		
Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment		EN 55011: 2009 (CISPR 11)
Limits and methods of measurement of radio disturbance characteristics of information technology equipment		EN 55022: 2006+A1: 2007 (CISPR 22)
Limits for harmonic current emissions for equipment with rated current ≤16 A		EN 61000-3-2: 2006+A1: 2009
Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16 A		EN 61000-3-3: 2006
Emission standard for residential, commercial and light-industrial environments		EN 61000-6-3: 2007
Electromagnetic Emission Tests for Measuring Relays and Protection Equipment		IEC 60255-25: 2000
Mechanical Tests		
Vibration Test	Response	IEC 60255-21-1:1998 Level II
	Endurance	IEC 60255-21-1:1998 Level I
Shock Test	Response	IEC 60255-21-2:1998 Level I
	Endurance	IEC 60255-21-2:1998 Level I
Bump Test		IEC 60255-21-2:1998 Level I
Power Quality		
EN 50160		Voltage characteristics of electricity supplied by public distribution systems
IEC 61000-4-7		General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto
IEC 61000-4-15		Flicker meter - Functional and design specifications
IEC 61000-4-30 (Certified by PSL)		Testing and measurement techniques - Power quality measurement methods

Designed For Reliability *Manufactured To Last*

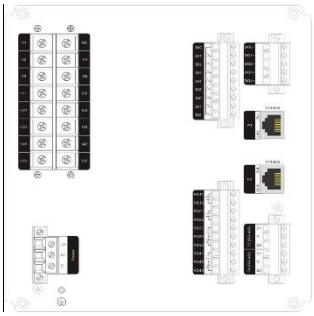
Ceiec Electric Technology

PMC-680i
Advanced Utility Power Quality Analyzer

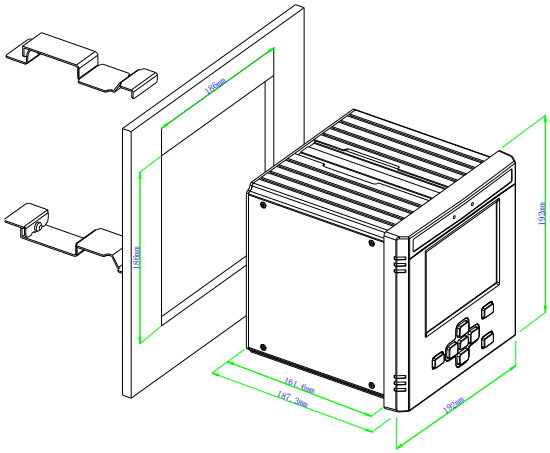
Device Views and Mounting Diagram



Front Panel



Rear Panel



Ordering Guide

Ceiec Electric Technology

Version 20150819

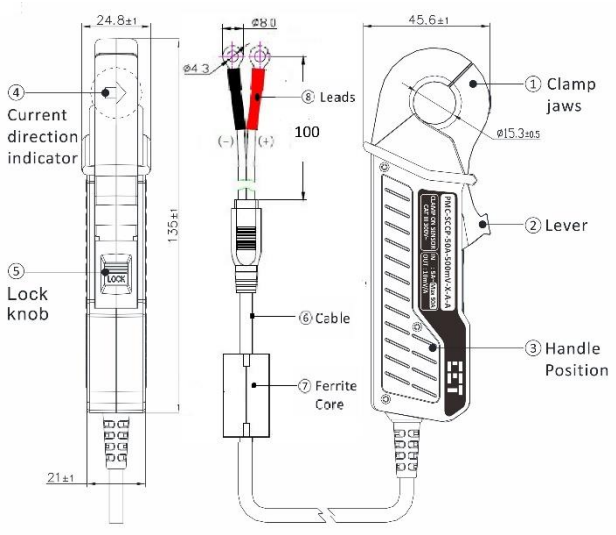
Product Code	Description
PMC-680i Advanced Power Quality Analyzer	
Sample/Cycle	
A	512 samples per cycle
B*	1024 samples per cycle
On-board Memory	
4	4GB
Input Current	
5	5A
1	1A
SCCP50*	50A Split-Core Current Probe Option Include 3x50A Split Core Current Probes
Input Voltage	
3	240VLN/415VLL
9*	400VLN/690VLL
Power Supply	
2	95-250VAC/DC, 47-440Hz
3	20-60VDC
System Frequency	
5	50Hz
6#	60Hz
I/O	
A	8 DI + 4 RO + 4 DO
Communications	
A	2 Ethernet ports
B*	2 Ethernet ports + 2 RS-485 ports
C*	1 Ethernet port + 1 Fiber port + 2 RS-485 ports
IEC61850	
X	None
A*	IEC61850 Protocol Support
Display Language	
E	English

PMC-680i	-	A	4	5	3	2	5	A	A	X	E	PMC-680i-A45325AAXE (Standard Model)

* Additional charges apply

Please consult Factory for availability

Optional 50A CATIII Split-Core Current Probe for Non-Intrusive Applications.



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