



- 512/1024 samples/cycle
- IEC 62053-22 Class 0.2S Compliant
- IEC 61000-4-30 Class A
- Sag/Swell, Transient and Flicker
- Comprehensive Data Recording
- PQDIF & COMTRADE Compatible
- 5.7" Color LCD Display @ 640x480
- Dual Ethernet and RS-485
- Industrial Grade Components
- Extended Warranty
- 4GB/ 8GB on-board Log Memory
- IEC 61000-4-15 Flicker
- IEC 61000-4-7 Harmonics
- High-resolution WF recording
- High-speed Data Recording
- Extensive I/O Capabilities
- DIN 192 (186x186 Cutout)
- Modbus RTU/TCP, HTTP, SNMP, SMTP
- Standard Tropicalization
- Extended Temperature Range

*Designed For Reliability*

*Manufactured To Last*



The PMC-680i Advanced Power Quality Analyzer is CET's latest offer for the PQ compliance monitoring market. Based on our highly successful PMC-680 Utility Substation PQ Analyzer, the PMC-680i offers un-surpassed functionality by combining Class 0.2S revenue accuracy and advanced PQ monitoring in a standard DIN 192 form factor with a stunning, high-resolution, industrial grade, color TFT LCD display. The PMC-680i satisfies industry standards such as IEC 62053-22 Class 0.2S, IEC 61000-4-7, IEC-61000-4-15, IEC 61000-4-30. Further, the PMC-680i offers industry-best data logging capacity with up to 8GB of on-board memory, extensive I/O with 8xDIs, 4xRO and 4xDOs, hardware GPS time synchronization and multiple communications options that include dual Ethernet and RS-485 ports. These features make the PMC-680i one of the most advanced PQ monitor for the power sensitive industries.

### Typical Applications

- Utility and power sensitive industries such as generation plants, HV transmission networks, HV, MV and LV distribution substations at critical customers, data centers, semiconductor fabs, heavy industries and 7x24 automated manufacturing facilities
- Sag/Swell, Transient, Harmonics and Flicker monitoring
- Main incomer and critical feeder monitoring
- Substation automation

### Key Features

- Standard 512 samples/cycle sampling, optional 1024
- Harmonic analysis up to 63<sup>rd</sup> on-board and 511<sup>th</sup> via software
- IEC 62053-22 Class 0.2S revenue metering
- Up to 8GB of on-board memory
- Power quality and harmonic analysis as per IEC 61000-4-7, IEC 61000-4-15 and IEC 61000-4-30 Class A
- EN50160 PQ Compliance monitoring\*
- Industrial-grade, high-resolution Color TFT LCD @ 640x480
- GPS time synchronization via IRIG-B, SNTP or serial protocol
- 256 setpoints with programmable logic
- On-board real-time waveform, trending and statistical reporting
- Waveform recording in PQDIF and COMTRADE file format
- Standard dual Ethernet and RS485 ports

### Front Panel Display

- High-resolution 640x480, color, graphical user interface capable of displaying measurements in a variety of formats
  - 3-phase real-time measurements
  - Harmonic power and energy measurements
  - Real-time waveforms for 3-phase voltages and currents
  - EN50160 Statistical Report\*
  - Harmonic histogram and Vector diagram
  - Historical trending
  - PQ Log
  - SOE Log
  - Digital I/O status
  - Device configuration
  - Diagnostics

### Metering

#### Basic Measurements (1-second update)

- 3-phase voltage, current, power, PF and phase angles
- kWh, kvarh Import/Export/Net/Total and kVAh Total
- V4, I4, I5, Frequency

#### High-speed Measurements

- 3-phase voltages and currents, V4, I4, I5 @ ½ cycle
- Frequency\* @ 1 cycle

#### Sliding Window and Predicted Demands

- 3-phase voltage, current, power, PF, V4, I4, I5, Frequency
- Max/Min values per demand interval
- Demand synchronization with DI\*
- Peak Demands for This Month and Last Month

### Power Quality

#### International Standards Compliance

- EN 50160 Voltage characteristics of electricity supplied by public distribution systems
- IEC 61000-4-7 General guide on harmonics and inter-harmonics 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 Testing and measurement techniques - Power quality measurement methods

#### Power Quality Measurements

- Voltage Deviation for phase and line voltages
- Frequency Deviation
- Sequence Components
- Voltage and Current Unbalance based on Sequence Components
- Flickers – Pst and Plt
- Voltage Fluctuation for phase voltages

#### Harmonics Metering

- Per phase harmonic and inter-harmonic measurements
  - K-Factor for Current
  - V and I THD, TOHD, TEHD
  - V and I Magnitude (RMS and %HD<sup>#</sup>) and Phase from 2<sup>nd</sup> to 63<sup>rd</sup>
  - V and I Inter-harmonics from 1<sup>st</sup> to 63<sup>rd</sup>
  - Individual harmonic kW, kvar, kVA and PF from 2<sup>nd</sup> to 63<sup>rd</sup>
  - Harmonic total kWh and total kvarh
  - Harmonic kWh, kvarh Import/Export from 2<sup>nd</sup> to 63<sup>rd</sup>
  - Fundamental RMS for V, I, kW, kvar, kVA and Displacement PF
  - Fundamental kWh, kvarh Import/Export and kVAh Total
- Simultaneous display of harmonic measurements in histogram and tabular format on the front panel display

\* %HD can be configured as % of Fundamental or % of RMS

#### Transient Capture and Sag/Swell Detection

- Transient capture of sub-cycle disturbances such as capacitor switching events and resonance phenomenon as short as 40us @ 512 samples or 20us at 1024 samples @ 50Hz
- Sag/swell detection of fault events @ 10ms (½ cycle)
- Inrush Current monitoring based on HS Current
- Record event time, magnitude and duration data
- Trigger PQ Log, DO alarm, high-speed data and waveform recording
- Event analysis via CBEMA/SEMI F47 plot via CET's iPQMS software

#### Symmetrical Components and Unbalances

- Zero, Positive and Negative Sequence Components
- Voltage and Current Unbalance derivation based on Zero Sequence and Negative Sequence Components

## Setpoints

### Control Setpoints

- 256 control setpoints with programmable combinational logic
- 16 HS setpoints
- Extensive monitoring sources such as real-time measurements, harmonics, inter-harmonics, voltage/frequency deviation, voltage fluctuation, flickers, sequence components, unbalance, ...etc
- Configurable thresholds and time delays
- Trigger DO, SOE Log, high-speed data recording and waveform recording

### Digital Input Setpoints

- Provides control output actions in response to changes in Digital Input status
- Demand interval synchronization\*
- Trigger DO, SOE Log, high-speed Data Recording and/or Waveform Recording

## Event, Data and Waveform Recording

### Log Memory

- Standard 4GB on-board log memory, expandable to 8GB
- Daily backup of all recording in PQDIF file format for 6 months

### Interval Energy and Demand Log

- TOU capability without complicated tariff programming
- Interval recording of kWh, kvarh Import/Export and kVAh Total
- Interval recording of Demands and associated Min/Max values per demand interval
- Support FIFO

### Data Recorder Log

- Record most real-time measurements including max, min, average and 95<sup>th</sup> percentile
- Recording interval from 1 to 60 minutes
- 30 days @ 1-minute, 300 days @ 10-minute, 450-day @ 15-minute
- On-board trending via graphical front panel
- PQDIF export file format

### High-Speed Data Recording Log

- ½ cycle recording of V1 to V4 and I1 to I5 RMS values
- 128 entries with 1000 records each, i.e. 10-second recording with 1 second pre-fault and 9 seconds post fault
- Triggered by Sag/Swell, Transient, DI and Control Setpoints, and communications
- High-Speed Data Recording Log is stored as a COMTRADE file

### Waveform Capture and Recording

- Real-time waveform display through front panel
- 2 independent WF Recorders with 128 entries each
- Simultaneous capture of 4-phase voltage and current inputs
- Samples/Cycles x # of Cycles (# of pre-fault cycles) – 1024x10 (3), 512x20 (5), 256x50 (15), 128x100 (20), 64x200\*, 32x400\*, 16x1000\*
- COMTRADE file format
- Triggered by Sag/Swell Detection, Transient Capture, Control and DI Setpoints, Communications, ...etc

### SOE Log

- 2048 FIFO events time-stamped to ±1ms resolution
- Setup changes, Setpoint events and I/O operations

### PQ Log

- 1024 FIFO entries time-stamped to ±1ms resolution
- Sag/Swell and Transient detection

### Max/Min Log

- Logging of Max/Min values for real-time measurements such as Voltage, Current, Frequency, kW, kvar, kVA, PF, Freq, Unbalance, K-factor, THD of This Month and Last Month\*

## Time Synchronization

- Battery-backed real-time clock @ 6ppm (≤ 0.5s/day)
- Time Synchronization via optional IRIG-B input, SNTP or serial protocol

## Inputs and Outputs

### Digital Inputs

- 8 channels, volts free dry contact, 24VDC internally wetted
- 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\*
- 1000Hz sampling

### Digital Outputs

- Standard 8 channels for control and alarming applications
- RO1-RO2 – Form A Mechanical Relay
- RO3-RO4 – Form C Mechanical Relay
- DO1-DO4 – Solid State Relay

## Communications

### Ethernet Ports (P1, P2)

- Dual Ethernet Ports
- 10/100BaseT with RJ45 connection
- Maximum of 10 simultaneous IP connections
- Optional 100BaseFX
- Protocols
  - Modbus RTU and Modbus TCP
  - HTTP\*, SNTP, SMTP\*, FTP
  - Ethernet Gateway
  - DNP 3.0 over Ethernet\*
  - IEC61850\*
- Firmware upgrade via Ethernet port

### RS-485 (P3, P4)

- Optically isolated RS485 port
- Baud rate from 1200 to 115200bps
- Modbus RTU protocol
- GPS Time-Sync serial protocol

## System Integration

### PecStar iEMS and iQMS

The PMC-680i is supported by CET's PecStar iEMS and iQMS. In addition, the PMC-680i 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

### PMC Setup

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

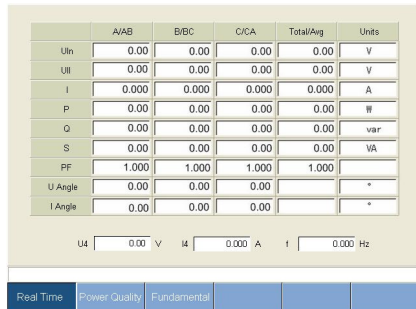
### 3<sup>rd</sup> Party System Integration

- Easy integration into Substation Automation or SCADA systems via Modbus RTU, Modbus TCP, DNP over Ethernet or IEC61850
- The on-board Web Server allows complete access to its data via a web browser without the use of any proprietary software
- The on-board FTP Server allows logged data in PQDIF or COMTRADE format to be downloaded without the use of any special software
- The downloaded files can be subsequently viewed using software that supports the industry standard PQDIF and COMTRADE file formats

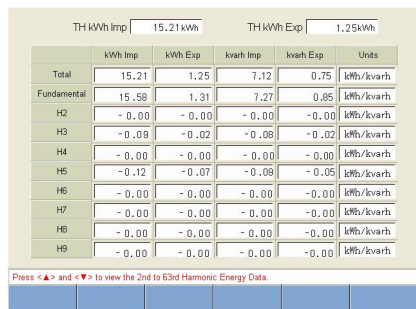
## Graphical User Interface



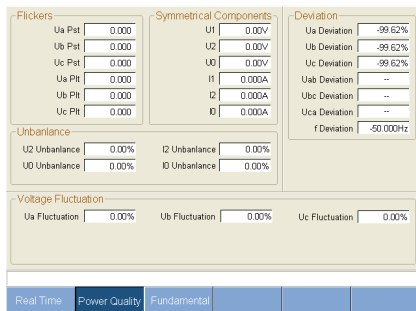
**Main Menu**



**Basic Measurements**



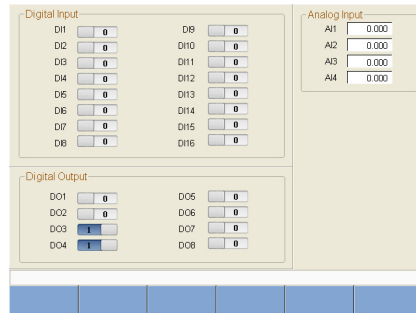
**Energy Measurements**



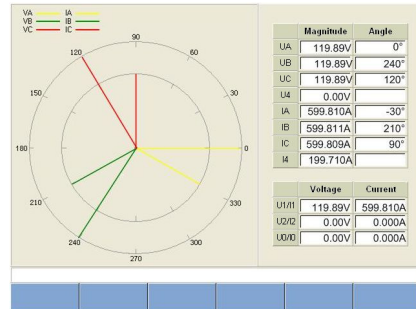
**Power Quality Measurements**



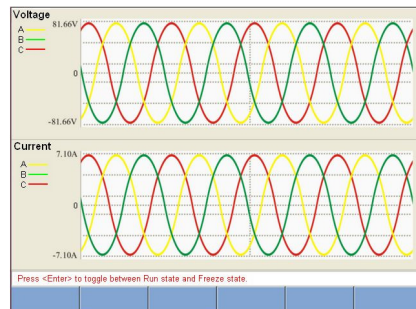
**Trending**



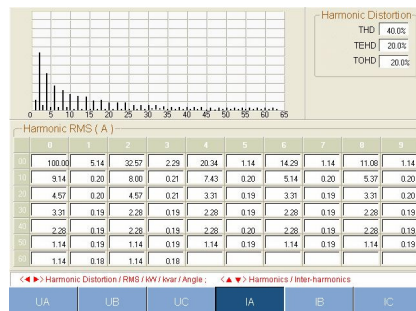
**DI/DO Status**



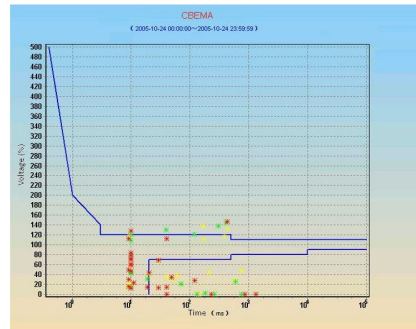
**Vector diagram with magnitude and phase**



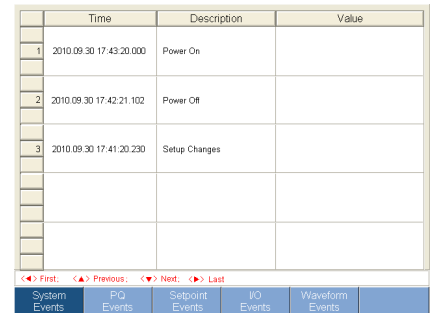
**Real-time Waveform - voltage and current**



**Harmonics**



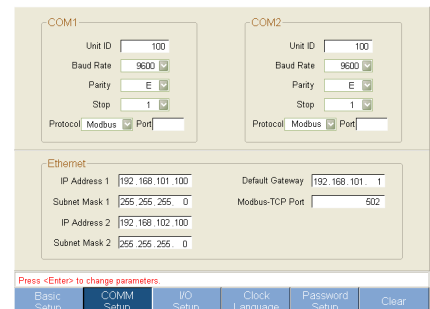
**CBEMA Plot via Software**



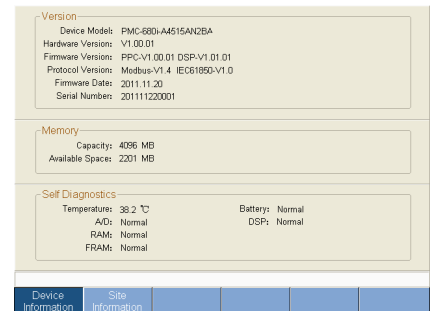
**SOE Log**



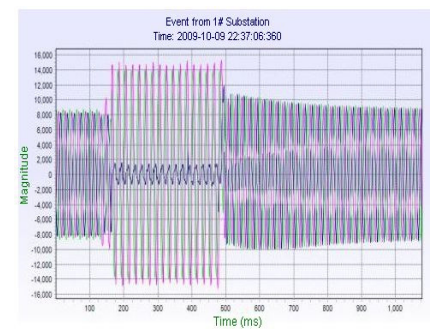
**PQ Statistical Report**



**Communication Setup**

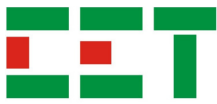


**Device Information & Self Diagnostics**



**Sag/Swell Waveform Display via Software**



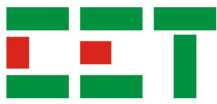


### Technical Specifications

Voltage Inputs (V1, V2, V3, V4, VN)	
Standard (Un)	400VLN/690VLL
Optional (Un)	69VLN/120VLL
Range	10% to 120% Un
PT Ratio	
Primary	1-1000000V
Secondary	100-690V
V4 Primary	1-1000000V
V4 Secondary	100-690V
Overload	2xUn continuous, 4xUn for 1s
Burden	<0.5VA per phase
Frequency	45-65Hz
Current Inputs (I11, I12, I21, I22, I31, I32, I41, I42, I51, I52)	
Standard (In)	5A
Optional (In)	1A
Range	0.1% to 200% In
CT Ratio	
Primary	1-30000A
Secondary	1-5A
I4 Primary	1-30000A
I4 Secondary	1-5A
Overload	1.2xIn continuous, 10xIn for 1s
Burden	<0.5VA per phase
Power Supply (L+, N-, G)	
Standard	95-250VAC/VDC $\pm$ 10%, 47-440 Hz
Burden	<14W
Digital Inputs (COM, DI1, DI2, ...DI7, DI8)	
Standard	Dry contact, 24VDC internally wetted
Sampling	1000Hz
Hysteresis	1ms minimum
Relay Outputs (RO11, RO12, RO21, R O22)	
Type	Form A Mechanical Relay
Loading	5A @ 250VAC / 30VDC
Relay Outputs (RO31, RO32, RO33, RO41, RO42, RO43)	
Type	Form C Mechanical Relay
Loading	5A @ 250VAC / 30VDC
Digital Outputs (COM, DO1, DO2, DO3, DO4)	
Type	Form A Solid State Relay
Isolation	Optical
Max. Load Voltage	80V
Max. Forward Current	50mA
GPS (I+, I-, SH)	
Hardware Interface	IRIG-B
LCD Display	
Type	Color TFT LCD, Industrial Grade
Resolution	640x480
View 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	80 kPa to 110 kPa
Pollution Degree	2
Measurement Category	CAT III
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 Power, AC Circuits, and GND		>100M $\Omega$
Between GPS and GND		>10M $\Omega$
Impulse voltage		
Rated input voltage > 60V		6kV, 1.2/50 $\mu$ s
Rated input voltage $\leq$ 60V		1kV, 1.2/50 $\mu$ s
EMC Compatibility		
EMC Directive 2004/108/EC (EN 61326: 2006)		
Immunity Tests		
Electrostatic discharge		IEC 61000-4-2: 2008 Level IV
Radiated fields		IEC 61000-4-3: 2008 (10 V/m)
Fast transients		IEC 61000-4-4: 2004 Level III
Surges		IEC 61000-4-5: 2005 Level III
Conducted disturbances		IEC 61000-4-6: 2008 Level III
Magnetic Fields		IEC 61000-4-8: 2009 Level IV
Oscillatory waves		IEC 61000-4-12: 2006 Level III
Electromagnetic Emission		IEC 60255-25: 2000
Emission Tests		
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 $\leq$ 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 $\leq$ 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



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# PMC-680i Advanced Power Quality Analyzer

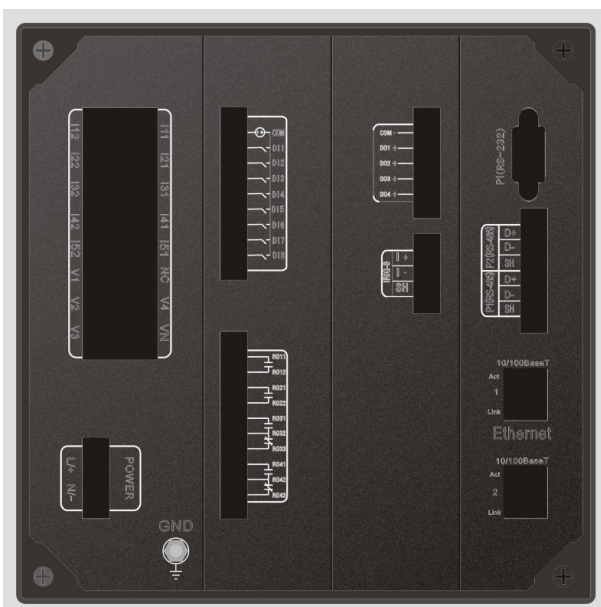
## Accuracy

Parameters	Accuracy	Resolution
Voltage	$\pm 0.1\%$	0.01V
Current	$\pm 0.1\%$	0.001A
kW, kVA	IEC 62053-22 Class 0.2S	0.001k
kWh, kVAh	IEC 62053-22 Class 0.2S	0.001kWh
kvar/kvarh	IEC 62053-23 Class 2	0.001k/0.001kvarh
P.F.	IEC 62053-22 Class 0.2S	0.001
Frequency	$\pm 0.005$ Hz	0.001Hz
Harmonics	IEC 61000-4-7 Class A	0.01%
Phase angles	$\pm 1^\circ$	0.1°
Symm. Components	$\pm 0.5\%$	0.01V/0.001A
Voltage unbalance	$\pm 0.5\%$	0.01%
Current unbalance	$\pm 0.5\%$	0.01%

## Device Views

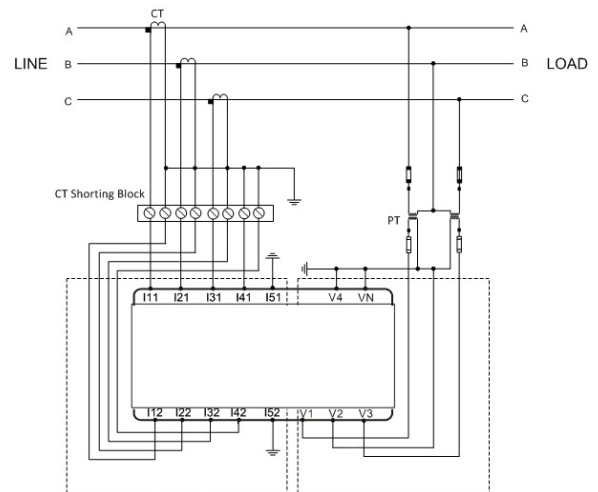


Front Panel

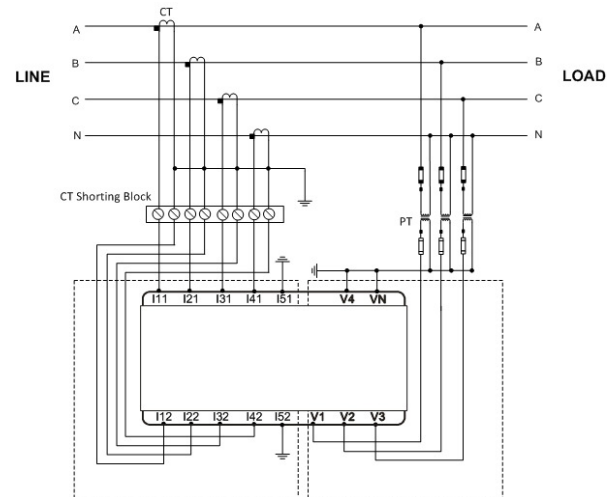


Rear Panel

## Typical Wiring



3-Wire Delta



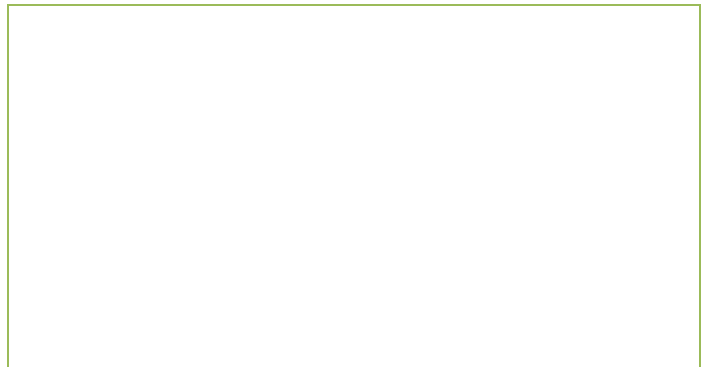
4-Wire Wye

\* Available in second release

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## Your Local Representative



Revision Date: February 16, 2012

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