

microPMU



OVERVIEW

Measure and understand the complex and dynamic power flows in distribution grids and microgrids with the microPMU.

The microPMU is like a microscope that has micro-second resolution and ultra-precise accuracy needed for distribution grid applications.

The microPMU is ideal for projects that need ultra-precise synchrophasor measurements for investigating stability and impedance questions. The microPMU can also be used for real-time control applications using the IEEE C37.118.2-2011 protocol.

APPLICATIONS

- Monitor and understand stability of microgrids or distribution grids, and backup power systems
- Event identification and characterization
- Topology change detection (open/closed state of switches)
- Detection of cyber attacks rehearsals at substations

FEATURES

- Ultra-accurate phasor measurements: TVE 0.01%
- Simultaneous recording and streaming of synchrophasors
- Fast recording / streaming rate: 100/sec at 50Hz and 120/sec at 60Hz
- Voltage and current phasors, frequency, active / reactive powers, power factor
- Compliant with IEEE C37.118.1-2011 and C37.118.2-2011
- Compatible with OpenPDC, and with Powerside microPMU plotting application software
- 30 days of micro-synchrophasor measurement stored in internal memory
- Download recordings via FTP
- Configuration / firmware update via FTP or Web
- Ultra precise mode for grid stability analysis or low latency mode for control applications
- Easy to install. Can be installed on electrical panels, on distribution poles, pad mount transformers and more
- Supports connections via PTs and CTs
- Fully isolated GPS receiver / antenna with cable delay auto-compensation

MAINS VOLTAGE INPUT CHANNELS	
Connection	L1, L2, L3, N PQube 3 screw terminals (max torque 5 inch-pounds (0.6Nm))
Voltage Measurement Range	0 VAC ~ 750VAC L-E (0 VAC ~ 1300 VAC L-L)
Voltage Measurement Channels	Line-to-Earth, Neutral-to-Earth
Mains Configuration	3-phase delta, 3-phase wye/star, single-phase, split-single-phase
Frequency Range	Nominal 50 Hz, 60 Hz
Sampling Rate	25,600 samples/s @ 50Hz and 30,720 samples/s @ 60Hz
Installation Category	PQube 3 tested up to 5100VAC isolation to Earth UL/IEC 61010 tested, approval pending CAT IV UL/IEC 61010 for voltages up to 300 VAC L-N (equivalent to 480 VAC L-L), CAT III for voltages up to 600VAC L-N. Pollution degree 2. UL/IEC 61010 approved
TVE (Total Vector Error)	Typical TVE $\pm 0,01\%$ Typical short-term TVE stability for differential measurements: $\pm 0,002\%$
Amplitude Resolution	0,0002%FS (2 PPM)
Amplitude Accuracy ($\pm\%$ rdg $\pm\%$ FS)	$\pm 0,050\%$ (10VAC ~ 750VAC L-E). Typical: $\pm 0,010\%$ (120VAC ~ 600VAC L-E)
Angle Resolution	0.001° (noise floor - useful for short-term difference measurements)
Angle Accuracy ($\pm\%$ rdg $\pm\%$ FS)	$\pm 0,010^\circ$ 1 Standard Deviation Typical: $\pm 0,003^\circ$
CURRENT INPUT CHANNELS	
Measurement Channels	8 inputs differential voltage inputs (range 0.333Vrms or 10Vpk, input impedance 33.3 k Ω , crest factor 3.5) <i>Note: 3 phase current channels streamed via IEEE C37.118-2 communication protocol</i>
Current range	0-6000A with split-core CT's (Call us for ranges > 6000A)
Sampling Rate	25,600 samples/s @ 50Hz and 30,720 samples/s @ 60Hz
Wire Connection	Screw terminal (Max torque 2 inch-pounds (0,25Nm)) Min. 28AWG (0,8 mm ²), Max. 16AWG (1,31mm ²). 600V UL- recognized insulation required
POWER MEASUREMENTS	
DEFINITIONS	
Watts (power)	Sum of per-phase active fundamental power
Volt-Amps (apparent power)	Sum of per-phase product of RMS voltage and RMS current, taken over the measurement interval
Power Factor	Fundamental power factor—ratio of Watts to Volt-Amps
VARs (volt-amps reactive)	Fundamental VARs
MODES OF OPERATION	
ULTRA PRECISE MODE	Recordings to Internal Memory Streaming according to C37.118.2-2011 (both simultaneously)
Parameters	3 voltage and 3 current phasor angle and magnitude, frequency, ROCOF Active / reactive powers, power factor (recorded only)
LOW LATENCY MODE	Using P-Filter* (streaming IEEE C37.118.2 only) Using M-Filter* (streaming IEEE C37.118.2 only)
Parameters	Latency: 50 ms typical 4 voltage and 8 current phasors, frequency, 4 analog channels
TECHNICAL SPECIFICATIONS	
Dimensions (L x W x H)	4.33 in X 2.89 in X 3.08 in (metric: 11.0 cm X 7.34 cm X 7.82 cm), 35 mm DIN rail mountable
Operating Environment (temp., hum., alt.)	-20 ~ 65 °C (55 °C with PM2 AUX load), 5 ~ 95% RH (inside use), <2000 m above sea level (for EMC immunity, overvoltage, and other conditions, see full specs)
Power Supply (AC)	24 VAC $\pm 10\%$ at 50/60/400 Hz, 1.5A max (PSL's PM1 and PM2 modules supply microPMU compatible power at 100-240 VAC 50/60 Hz, and 120-370 VDC)
(DC)	$\pm 24 \sim 48$ VDC $\pm 10\%$ (polarity independent), 1A max. Power over Ethernet (PoE) compatible
Internal memory	32 GB up to 30 days of synchrophasor data
Data backup	16 GB (up to 128GB) micro SD card or USB 2.0 thumb drive
Clock Synchronization	GPS receiver and antenna provided with the microPMU
Communication	Ethernet port RJ-45, 10/100 (optional wireless and cell modem)
Communication protocols	FTP or HTTP (secure FTPS and HTTPS), IEEE C37.118-2.2011

*Amplitude & angle accuracies are dependent when using the low latency mode

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