

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 C37.118.1-2011 interface.

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
- Streaming according to C37.118.1-2011
- Fully compatible with OpenPDC, and with PSL microPMU plotting application software
- 30 days of micro-synchrophasor measurement stored in internal memory
- Recordings can be downloaded via FTP
- Configuration / firmware update via FTP or Web pages (HTTP)
- Ultra precise mode (for grid stability analysis) or low latency mode (for control applications)
- Easy installation (can be installed in electrical panels, on distribution poles, pad mount transformers..)
- 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))
Frequency Range	Nominal 50 Hz, 60 Hz
Mains Configuration	Single-phase, split-single-phase, delta, wye/star
Range of Nominal Input Voltage	100 VAC ~ 960 VAC L-L (69 VAC ~ 480 VAC L-N)
Measurement Channels	Line-to-Earth, Neutral-to-Earth
Sampling Rate	25,600 samples/s @ 50Hz and 30,720 samples/s @ 60Hz
Measurement Range	0 VAC ~ 750VAC L-N (0 VAC ~ 1300 VAC L-L)
Isolation	PQube 3 tested up to 5100VAC isolation to Earth UL/IEC 61010 tested, approval pending
Installation Category	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 test pending
TVE (Total Vector Area)	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-N). Typical: $\pm 0,010\%$ (120V - 600VAC L-N)
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 Type	External current transformer, voltage-type secondary – Screw terminal (Max torque 2 inch-pounds (0,25Nm))
CT Input Ratio Range	1:1 to 50000:1
Nominal Input	0.333 V RMS
Input Impedance	33.3k Ω
Crest Factor	3.5 ($\pm 1,17$ Vpk)
Sampling Rate	25,600 samples/s @ 50Hz and 30,720 samples/s @ 60Hz
Wire Connection	Min. 28AWG (0,8 mm ²), Max. 16AWG (1,31mm ²). 600V UL- recognized insulation required
POWER MEASUREMENTS	
DEFINITIONS	
Watts (power)	Sum of true instantaneous per-phase power
Volt-Amps (apparent power)	Sum of per-phase product of RMS voltage and RMS current, taken over the measurement interval
Power Factor	True 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 C37.118.1-2011 (both simultaneously)
Parameters	3 voltage and 3 current phasors, frequency Active / reactive powers, power factor (recorded only)
LOW LATENCY MODE	Using P-Filter* (streaming according to C37.118) Using M-Filter* (streaming according to C37.118) Latency: 50 ms typical
Parameters	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 PQube 3 compatible power at 100~240 VAC 50/60 Hz, and 120~370 VDC)
(DC)	± 24 ~ 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 Mandatory
Communication	Ethernet port RJ-45, 10/100 (optional wireless and cell modem)
Communication protocols	FTP or HTTP (secure FTPS and HTTPS)

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