

## PWS 3.3 genX

### Three-phase Portable Working Standard and Power Quality Analyzer



The PWS 3.3 genX is a combination of a Portable Working Standard of class 0.05 % and an IEC 61000-4-30 Class A compatible Power Quality Analyzer with 4 voltage (U1, U2, U3, UN, UPE) and 4 current channels (direct: I1, I2, I3 and via clamp-on CT: IN / IPE Neutral current / Protection Earth current).

The modular concept of the PWS 3.3 genX allows the extension of the direct current measurement range from 12A up to 120A and the adding of a battery pack keeps the device running in the event of interruptions in the supply voltage during Power Quality recording or when supply from measuring voltage or mains is not possible.

#### NEW FUNCTIONS

The PWS 3.3 genX enables as first MTE reference standard

- **Calibration of DC meters or DC energy measurement units** up to 1000 VDC / 200 ADC applied in EVSE Electric Vehicle Supply Equipment with CCS Type 2 connector (IEC 62196-3).
- **Calibration of digital meters, non-conventional CTs / PTs and merging units** with SV Sampled Values interface (IEC 61850-9-2 LE) in digital substations.

#### Advantages

- Large 9" (800 x 480 pixels) TFT touch screen colour display with graphical user interface
- Integrated operation manual
- Built in web server for remote display of graphical user interface and remote control of the unit
- Data transfer and communication via USB (Type B), ETHERNET or WLAN
- Data storage on removable SD memory card
- Two USB (type A) connectors for connection of peripherals like mouse, keyboard, optical readout head OKK to communicate with the meter
- Time synchronisation via GPS (option) and 1 PPS Pulse Per Second / IRIG-B signal

#### WORKING STANDARD - Functions

- Meter testing of pulse outputs (LED/disc mark/S0) and registers of active, reactive, apparent 1- or 3-phase 3- or 4-wire energy meters with 3 pulse inputs (2 configurable as pulse output).
- Measurement of electrical parameters ( $U_{\phi}$ , PQS, f, PF) including vector diagram, harmonic analysis and wave form display.
- Instrument transformer testing (CT/PT burden, CT/PT ratio)

#### POWER QUALITY ANALYZER – Functions

- Dips / Swells / Interruptions
- Harmonics / Interharmonics / Signal voltages
- Unbalance
- Flicker
- RVC Rapid Voltage Changes
- Transients

#### Options

- Software CALegration
- UCT 10.3 set of 3 clamp-on CT's 10 A
- UCT 120.3 set of 3 clamp-on CT's 120 A
- UCT 1000.3 set of 3 clamp-on CT's 1000 A
- UCT LEM.3 set of 3 flexible current probes FLEX 3000 (30/300/3000A)
- UCT 120.1 clamp-on CT 120A for IN/IPE
- UCT AMP-LiteWire 3-phase adapter set for AmpLiteWire + primary high voltage current sensor AmpLiteWire 2000 A
- UCT VOLT-LiteWire 3-phase adapter set for VoltLiteWire + primary voltage sensor VoltLiteWire 40 kV

Adapters for EVSE Electric Vehicle Supply Equipment test

- eMOB I-32.3 AC (600 V / 32 A) to test AC charging
- eMOB I-200.1 DC (1000 VDC / 200 ADC) to test DC charging



## Portable Working Standard PWS 3.3 *genX*

Auxiliary power supply:	46 ... 300 VAC, 47 ... 63 Hz (65 ... 423 VDC) Protection: up to 440 VAC
Power consumption:	max. 20 VA (+ 10 VA + 20 VA (charging)) PWS 3.3 <i>genX</i> (+ I.3 120A + Battery module)
Safety / Protection:	CE IEC 61010-1:2010 / IP-40
Measurement Category:	300V CAT IV, 600V CAT III
Operation temperature:	-10 °C ... +50 °C (Storage: -20 °C ... +60 °C)
Relative humidity:	≤ 85% at Ta ≤ 21°C ≤ 95% at Ta ≤ 25°C, 30 days / year spread

### Measurement Ranges

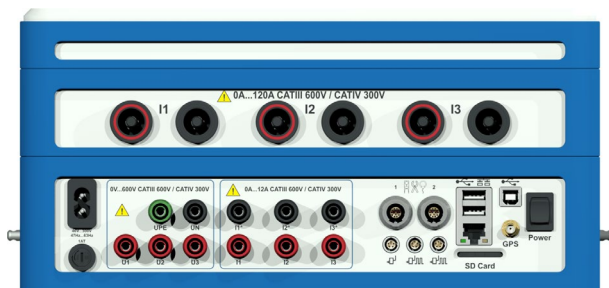
Measuring Quantity	Range	Input / Sensor
<b>Voltage (phase - neutral)</b>	5 V ... 600 V	U1, U2, U3, UPE
	10 mV ... 5 V	UPE (Burden)
	10 VDC ... 1000 VDC	U1
<b>Current</b>	1 mA ... 12 A	12 A (I1, I2, I3)
	10 mA ... 120 A	I.3 120 A (I1, I2, I3)
	1 mA ... 10 A	UCT 10.3
	10 mA ... 120 A	UCT 120.3
	100 mA ... 1000 A	UCT 1000.3
	10 mA ... 120 A	UCT 120.1 (IPE / IN)
	3 A ... 3000 A	FLEX 3000
	1 mA ... 32 A	eMOB I-32.3 AC
	1 ADC ... 200 ADC	eMOB I-200.1 DC (I1)
	<b>Primary current</b>	30 A ... 2000 A
<b>Primary voltage</b>	500 V ... 40 kV	VoltLiteWire 40kV

### Accuracy Class Power / Energy Measurement

Class	Input / Sensor
0.05	current direct 12 A / current direct 120 A
0.1	eMOB I-32.3 AC adapter / eMOB I-200.1 DC adapter
0.2	Clamp-on CT's UCT 10.3 / UCT 120.3 / UCT 1000.3

### 3 MODULES FOR VARIOUS APPLICATIONS

Module (Hard Plastic)	Dimensions [mm]	Weight [kg]
<b>PWS 3.3 <i>genX</i></b>	W 320 x H 210 x D 66	approx. 2.5
<b>I.3 120A</b>	W 320 x H 210 x D 56	approx. 2.2
<b>Battery</b>	W 320 x H 210 x D 29	approx. 1.6
<b>Fold-out stand</b>	W 320 x H 210 x D 12	approx. 0.5



### Portable Working Standard PWS 3.3 *genX* - 12A

Best for meter test, CT / PT burden and ratio test and installation check in installations with instrument transformers.



## NEW FUNCTIONS AND APPLICATIONS

### Field Testing of EVSE Electric Vehicle Supply Equipment

Calibration of AC or DC electricity meters or energy measurement units built into the charging stations for EV Electric Vehicles with connector Type 2 / CCS Type 2 (IEC 62196-2/3).

- **PWS 3.3 *genX* + eMOB I-32.3 AC adapter** with **Type 2** connector to test 3 phase AC energy accuracy up to 3 x 32 A
- **PWS 3.3 *genX* + eMOB I-200.1 DC adapter** with **CCS Type 2** connector to test DC energy accuracy up to 1000 VDC, 200 ADC



### Field Testing of Digital Meters, non-conventional CTs / PTs and Merging Units (under development)

- ETHERNET interface for IEC 61850-9-2-LE Sampled Values
- Time synchronisation: GPS and 1 PPS Pulse Per Second / IRIG-B

### Portable Working Standard PWS 3.3 *genX* - 120A

Best for use in the laboratory in combination with a power source or in the field to test direct connected meters up to 120A.



### PWS 3.3 *genX* - 12A with Battery module

Best for Power Quality Analysis or EVSE testing to keep the device running if auxiliary supply from measuring voltage or socket is interrupted or not available.



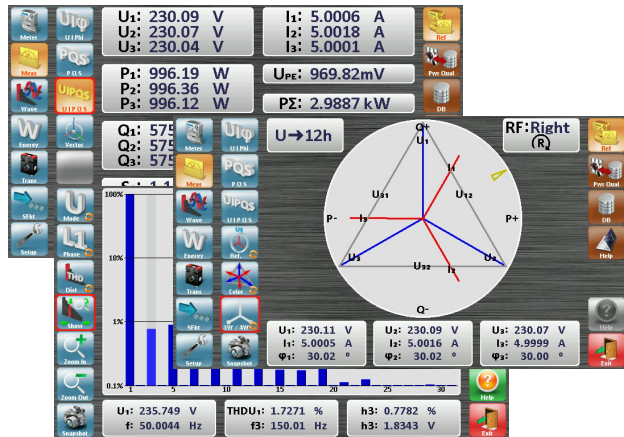
- Battery 12V, 4000 mAh (20 x NiMH 1.2V type AA) for operation up to 3 h
- Power Quality Analysis IEC 61000-4-30 Class A (0.1 %), IEC 62586-2 with 4 voltage and 4 current channels (under development)

## PORTABLE WORKING STANDARD

- **Meter Testing** Error measurement, Register test and Maximum demand test with 1 ... 3 channels



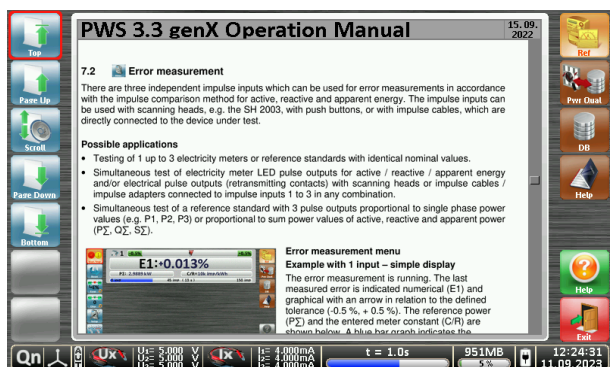
- **Installation Check** with load values, vector diagram, harmonics and waveform display



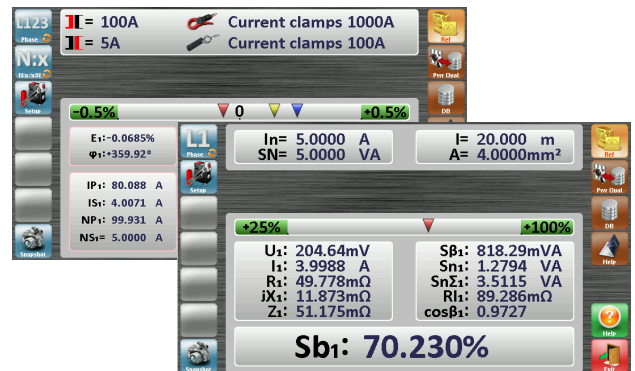
## NEW waveform trend analysis of voltages, currents within last 10s



- **Help Button** to show related chapter of operation manual

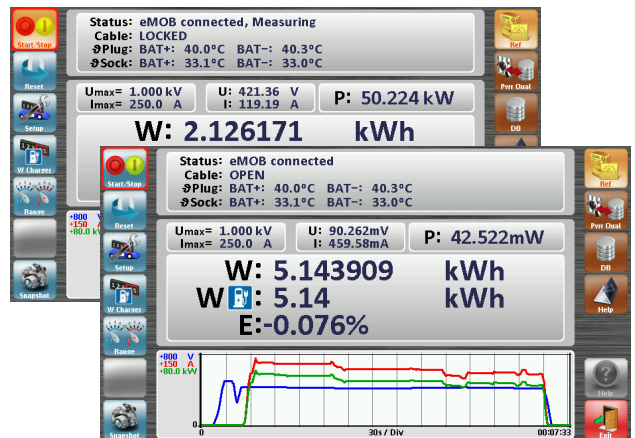


- **Instrument Transformer Testing** CT/PT burden and ratio test



- **Field test of EVSE Electric Vehicle Supply Equipment**

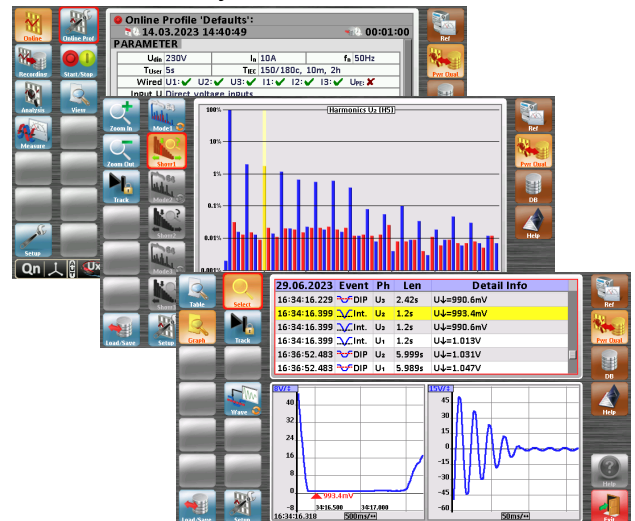
AC / DC energy register test with eMOB I-32.3 AC / eMOB I-200.1 DC  
**NEW DC energy register test** with indication of U, I, P values with trend graph of charging process, status indication and temperature supervision of plug and socket contacts of the connected adapter.



## POWER QUALITY ANALYZER

IEC 61000-4-30 class A, IEC 62586-2, EN 50160

- **PQ Online** Easy to operate fast recording / analysis of PQ parameters for trouble shooting on-site, all controlled by the touch screen display.
- **PQ Recording** Standard recording of PQ parameters on the built-in SD card based on configurable recording profiles. The recording can be controlled locally by the touch display or remote with the software CALegation via the available communication interfaces (USB, Ethernet, WLAN)
- **PQ Analysis** Flexible analysis of combinations of recorded PQ parameters in table, graph or histogram form and statistical evaluation of recordings, e.g. regarding EN 50160.
- **Measure** Real time display of load values, vector diagram and **NEW waveform trend analysis**



# Technical Data PWS 3.3 genX

## PORTABLE WORKING STANDARD

### Measurement Accuracy

Voltage / Current		$\leq \pm E$ [%] <sup>1 2 4</sup>
Measuring Quantity	Range	Class 0.05
Voltage (U1, U2, U3, UPE)	25 V ... 600 V	0.05
	5 V ... 25 V	0.05
DC Voltage (U1-N)	40 VDC ... 1000 VDC	0.05
	10 VDC ... 40 VDC	0.05
Burden Voltage (UPE)	100 mV ... 5 V	0.1
	10 mV ... 100 mV	1.0
Current direct 12 A	10 mA ... 12 A	0.05
	1 mA ... 10 mA	0.05
Current direct 120 A I.3 120 A	100 mA ... 120 A	0.05
	10 mA ... 100 mA	0.05
Current CT 10A UCT 10.3	30 mA ... 10 A	0.2
	1 mA ... 30 mA	1.0
Current CT 120A UCT 120.3	100 mA ... 120 A	0.2
	10 mA ... 100 mA	1.0
Current CT 1000A UCT 1000.3	10 A ... 1000 A	0.2
	1 A ... 10 A	1.0
Current FLEX 3000 UCT LEM.3	300 A ... 3000 A	0.1 + E <sub>M</sub>
	30 A ... 300 A	
	3 A ... 30 A	
Current direct (I1, I2, I3) eMOB I-32.3 AC	6 mA ... 32 A	0.1
	1 mA ... 6 mA	0.1
DC current direct (I1) eMOB I-200.1 DC	2 ADC ... 200 ADC	0.1
	1 ADC ... 2 ADC	0.1
Current AmpLiteWire 2000A	300 A ... 2000 A	0.1 + E <sub>M</sub>
	30 A ... 300 A	0.1 + E <sub>M</sub>
Voltage VoltLiteWire 40kV	6 kV ... 40 kV	0.1 + E <sub>M</sub>
	500 V ... 6 kV	0.1 + E <sub>M</sub>
Drift / year at voltage / current <sup>5 6</sup>		0.008

Power / Energy		Voltage: 25 V... 600 V (U - N)	$\leq \pm E$ [%] <sup>1 2 3</sup>
Measuring quantity / Input I	Range		Class 0.05
<b>Active (P), Apparent (S) and Reactive (Q) Power / Energy</b>			
Direct 12 A (I1, I2, I3)	10 mA ... 12 A		0.05
	1 mA ... 10 mA		0.05
Direct 120 A (I1, I2, I3) I.3 120 A	100 mA ... 120 A		0.05
	10 mA ... 100 mA		0.05
Current CT 120A UCT 120.3	100 mA ... 120 A		0.2
	10 mA ... 100 mA		1.0
Current CT 1000A UCT 1000.3	10 A ... 1000 A		0.2
	1 A ... 10 A		1.0
Current direct (I1, I2, I3) eMOB I-32.3 AC	6 mA ... 32 A		0.1
	1 mA ... 6 mA		0.1
Drift / year at Power / Energy (PQS) <sup>5 6</sup>			0.016

DC Power / Energy		Voltage: 40 ... 1000 VDC (U1)	$\leq \pm E$ [%] <sup>1</sup>
Measuring quantity / Input I	Range		Class 0.1
DC current direct (I1) eMOB I-200.2 DC	2 ADC ... 200 ADC		0.1
	1 ADC ... 2 ADC		0.1

Frequency / Phase Angle / Power Factor		$\leq \pm E$
Measuring Quantity	Range	Class 0.05
Frequency (f)	40 Hz ... 70 Hz	0.01 Hz
Phase Angle (φ) (I direct/CT)	0.00 ° ... 359.99°	0.02°/0.1°
Power Factor (PF) (I dir./CT)	-1.000 ... +1.000	0.0004/0.002

CT/PT Ratio		$\leq \pm E$ [%] <sup>1 2</sup>
Ratio error E: Sum of errors of inputs used for primary (IP, UP) and secondary (IS, US) measurements.		E <sub>P</sub> + E <sub>S</sub>

CT/PT Burden		$\leq \pm E$ [%] <sup>1 2</sup>
Operating burden Sn: Sum of errors of inputs used for voltage (U) and current (I) measurement.		E <sub>U</sub> + E <sub>I</sub>

#### Notes

- x.x :Related to the measuring value  
x.x :Related to the internal measuring range final value (full scale, FS),  
E(M) = FS/M \* x.x  
(e.g. 5 mA, 0.05: FS = 12 mA, E(5) = 12/5 \* 0.05 = 0.12 %)
- Fundamental frequency in the range 45 ... 66 Hz
- S: x.x, P,Q: x.x / PF, 3- and 4-wire networks
- E<sub>M</sub>: Accuracy specified by manufacturer of clamp-on CT or sensor
- Voltage 25 ... 600 V, current direct 12 A, 120 A with specification 0.05 %
- Linear regression, one measurement each month, time base 1 h

Temperature coefficient (TC):		$\leq \pm TC$ [%/°C] <sup>3</sup>
Range		Class 0.05
0° C ... +40°C		0.005
-10° C ... +50°C		0.008

Influence of external magnetic fields (45 ... 66 Hz):  $\leq 0.07$  % / 0.5 mT <sup>3</sup>

Pulse Inputs / Outputs		Inputs 2, 3 can be configured as output			
Input level:		4 ... 12 VDC (24 VDC)			
Input frequency:		max. 200 kHz			
Supply:		12 VDC (I < 60 mA)			
Output level:		5V			
Pulse length:		≥ 8μs			
<b>Meter constant:</b> Active, Reactive, Apparent		C = C <sub>0</sub> / (ln * Un) C <sub>0</sub> = 64'800'000 [imp/Wh(varh,VAh)] The meter constant depends on the highest selected internal ranges ln, Un. The actual constant CPZ <sub>1</sub> with unit [imp/Ws (vars, VAs)] is indicated on the display at frequency output. Internal current ranges ln [A]			
Direct 12 A (I1, I2, I3)		0.004	0.012	0.04	0.12
		0.4	1.2	4	12
Direct I.3 120 A (I1, I2, I3)		0.04	0.12	0.4	1.2
		4	12	40	120
Current CT 10A UCT 10.3		0.1	1	10	
Current CT 120A UCT 120.3		0.12	1.2	12	120
Current CT 1000A UCT 1000.3		1	10	100	1000
FLEX 3000 UCT LEM.3		30	300	3000	
		Internal voltage ranges Un [V]			
Direct U1, U2, U3		5	10	20	40
		75	150	300	600
Direct UPE			0.05	0.2	0.6
			75	150	300
			2	8	20
			75	150	300
Output frequency:		Example: Un = 300 V, ln = 12 A C = 18'000 [imp/Wh(varh,VAh)] CPZ <sub>1</sub> = C / 3'600 [imp/Ws (vars, VAs)] f <sub>0</sub> = CPZ <sub>1</sub> * PΣ(QΣ, SΣ) f <sub>max</sub> = CPZ <sub>1</sub> * 3 * Un * ln = 5 imp/Ws * 3 * 300V * 12A = 54'000 [imp/s] Factor 3 for 3-phase system			

### POWER QUALITY ANALYZER

Voltage	
Inputs (U1, U2, U3, UPE)	4
Accuracy class	■ 0.1%
Dips / Swells / Interruptions	■ U <sub>RMS</sub> %
Signal Voltages	■ fs < 3 kHz
Flicker P <sub>st</sub> , P <sub>lt</sub>	■ up to 40 Hz
RVC Rapid Voltage Changes	■
EN 50160	●
Current	
Inputs (direct: I1, I2, I3) / CT: IN/IPE)	4
Accuracy class	■ 0.1%
Inrush	■ U <sub>RMS</sub> %
Voltage / Current / Power	
Unbalance (U, I)	■
Harmonics (U, I, P, Q, S)	■ 2 ... 64
Interharmonics (U, I, P, Q, S)	■ 1-2 ... 63-64
Communication	
USB	●
ETHERNET	●
Other functions	
Transients (U: 0.9 kV / I: 110 % ln)	● ≥ 100 μs (24.8 kHz)
Active / Reactive / Apparent Power (PQS)	●
Active / Reactive / Apparent Energy	●
Removable SD memory card	●
Battery buffering at outage	○ Battery module 4000 mAh (20 x NiMH 1.2 V type AA) Life keeping: up to 3 h
GPS time synchronisation (integrated)	○

#### Notes

- Function according to IEC 61000-4-30 Class A and IEC 62586-2
- Option