

## PWS 2.3 genX

Three-phase Portable Working Standard for Testing Electricity Meters and Instrument Transformers



The PWS 2.3 genX Portable Working Standard is a three-phase portable electronic meter test unit of accuracy class 0.1%, used for testing single and three-phase electricity meters on site. The PWS 2.3 genX allows checking of all meter installation parameters and associated circuits.

The unit can be used either with a direct connection in the range of 1 mA ... 12 A, or by using a set of 3 active 100 A error compensated clamp-on CT's (included in the standard accessories set) in the range 10 mA ... 100 A. It is therefore possible to easily and accurately measure both CT and direct connected meters.

The unit can be powered either from the measuring circuit or from an auxiliary single-phase supply.

### Advantages

- Large 7" (800 x 600 pixels) TFT touch screen colour display with graphical user interface
- Data transfer and communication via USB (Type B), WLAN or ETHERNET
- Data storage on removable SD memory card
- Independent sets of clamp-on CTs allow service, calibration or later purchase of clamp-on CTs without factory return of the device.

### Measurement Inputs

- 3 voltage inputs U1, U2, U3
- 3 direct current inputs I1, I2, I3
- 2 clamp-on CT current inputs for I1, I2, I3

### 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 2 pulse inputs (1 configurable as pulse output).
- Measurement of electrical parameters (UI  $\phi$ , PQS, f, PF) including vector diagram, harmonic analysis and wave form display.
- Instrument transformer testing (CT/PT burden, CT/PT ratio)

### Options

- Software CALegration
- Set of 3 clamp-on CT 10A
- Set of 3 clamp-on CT 100A (active error compensated)
- Set of 3 clamp-on CT 1000A
- Set of 3 flexible current probes FLEX 3000 (30/300/3000A)
- 3-phase adapter set for AmpLiteWire
- Primary current sensor AmpLiteWire 2000 A
- 3-phase adapter set for VoltLiteWire
- Primary voltage sensor VoltLiteWire 40 kV

# Technical Data PWS 2.3 gen X

## General

Auxiliary supply: (Operation)	46 VAC <sub>min</sub> ... 300 VAC <sub>max</sub> 65 VDC <sub>min</sub> ... 423 VDC <sub>max</sub>
Auxiliary supply: (External DC)	10 VDC <sub>min</sub> ... 14.4 VDC <sub>max</sub>
Frequency range:	47 Hz ... 63 Hz
Power consumption:	max. 20 VA
Housing:	Hard Plastic
Dimensions:	W 308 x H 173 x D 70 mm
Weight:	approx. 1.5 kg
Operation temperature:	-10 °C ... +50 °C
Storage temperature:	-20 °C ... +60 °C
Relative humidity:	≤ 85% at Ta ≤ 21°C ≤ 95% at Ta ≤ 25°C, 30 days / year spread

## Safety

CE certified

Isolation protection:	IEC 61010-1:2002
Measurement Category:	300V CAT III
Degree of protection:	IP-40

## Measurement Range

Measuring Quantity	Range	Input / Sensor
<b>Voltage (phase - neutral)</b>	0 V ... 300 V 20 mV ... 3 V	U1, U2, U3 U1 (Burden)
<b>Current</b>	1 mA ... 12 A 1 mA ... 10 A 10 mA ... 100 A 1 A ... 1000 A 3 A ... 3000 A	I1, I2, I3 Clamp-on CT 10A Clamp-on CT 100A Clamp-on CT 1000A FLEX 3000
<b>Primary current</b>	30 A ... 2000 A	AmpLiteWire 2000A
<b>Primary voltage</b>	20 V ... 20 kV	VoltLiteWire 40kV

## PORTABLE WORKING STANDARD

### Measurement Accuracy

Voltage / Current	Range	≤ ± E [%] <sup>1,2,4</sup>
<b>Voltage (U1, U2, U3, N)</b>	46 V ... 300 V 5 V ... 25 V	<b>Cl. 0.1</b> 0.1 <u>0.1</u>
<b>Current direct (I1, I2, I3)</b>	10 mA ... 12 A 1 mA ... 10 mA	0.1 <u>0.1</u>
<b>Current clamp-on CT 10A</b>	10 mA ... 10 A 1 mA ... 10 mA	0.2 1.0
<b>Current clamp-on CT 100A</b>	100 mA ... 100 A 1 mA ... 100 mA	0.2 1.0
<b>Current clamp-on CT 1000A</b>	10 A ... 1000 A 1 A ... 10 A	0.2 1.0
<b>Current FLEX 3000</b>	300 A ... 3000 A 30 A ... 300 A 3 A ... 30 A	0.1 + E <sub>M</sub>
<b>Burden Voltage (U1, N)</b>	100 mV ... 5 V 20 mV ... 100 mV	0.5 <u>0.5</u>
<b>Current AmpLiteWire 2000A</b>	300 A ... 2000 A 30 A ... 300 A	0.1 + E <sub>M</sub> <u>0.1</u> + E <sub>M</sub>
<b>Voltage VoltLiteWire 20kV</b>	3 kV ... 20 kV 200 V ... 3 kV	0.1 + E <sub>M</sub> <u>0.1</u> + E <sub>M</sub>

Power / Energy	Voltage: 46 V... 300 V (U - N)	≤ ± E [%] <sup>1,2,3</sup>
<b>Measuring quantity / Input I</b>	Range	<b>Cl. 0.1</b>
<b>Active (P), Apparent (S) Power / Energy</b>		
Direct (I1, I2, I3)	10 mA ... 12 A 1 mA ... 10 mA	0.1 <u>0.1</u>
Clamp-on CT100A	100 mA ... 100 A	0.2
Clamp-on CT1000A	20 A ... 1000 A	0.2
<b>Reactive (Q) Power / Energy</b>		
Direct (I1, I2, I3)	10 mA ... 12 A 1 mA ... 10 mA	0.2 <u>0.2</u>
Clamp-on CT 100A	100 mA ... 100 A	0.4
Clamp-on CT1000A	20 A ... 1000 A	0.4
<b>Drift / year at Power / Energy (PQS) (I direct)</b>		0.03

Temperature coefficient (TC):	Range	≤ ± TC [%/°C] <sup>3</sup>
	0° C ... +40°C	<b>Cl. 0.1</b> 0.005
	-10° C ... +60°C	0.008

CT Burden	U (U1 - N)	≤ ± E [%] <sup>1,2,5</sup>
I (current direct I1)	100 mV ... 3 V	<b>Cl. 0.1</b> 0.6
10 mA ... 12 A	20 mV ... <u>100</u> mV	0.1 + <u>0.5</u>

PT Burden	U (U1 - N)	≤ ± E [%] <sup>1,2,5</sup>
I (Current direct I1)	46 V ... 300 V	<b>Cl. 0.1</b> 0.2
10 mA ... 12 A	46 V ... 300 V	0.1 + <u>0.1</u>

CT Ratio	IS (I1, I2, I3)	≤ ± E [%] / Δφ [°] <sup>1,2,6</sup>
IP - Input / Range		<b>Cl. 0.1</b>
Clamp-on CT 100A		
100 mA ... 100 A	10 mA ... 12 A	0.3 / 0.3
100 mA ... 100 A	1 mA ... <u>10</u> mA	1.0 / -
Clamp-on CT 1000A		
20 A ... 1000 A	10 mA ... 12 A	0.3 / 0.3
1 A ... 20 A	10 mA ... 12 A	1.0 / -
FLEX 3000		
300 A ... 3000 A	10 mA ... 12 A	0.2 + E <sub>M</sub> / -
30 A ... 300 A		
3 A ... 30 A		
AmpLiteWire 2000A		
300 A ... 2000 A	10 mA ... 12 A	0.2 + E <sub>M</sub> / -
30 A ... <u>300</u> A	10 mA ... 12 A	<u>0.2</u> + 0.1 + E <sub>M</sub> / -

Frequency / Phase Angle / Power Factor	Range	≤ ± E
<b>Measuring Quantity</b>		<b>Cl. 0.1</b>
<b>Frequency (f)</b>	40 Hz ... 70 Hz	0.01 Hz
<b>Phase Angle (φ)</b>	0.00 ° ... 359.99°	0.1 °
<b>Power Factor (PF)</b>	-1.000 ... +1.000	0.002

### Notes

- x.x: Related to the measuring value  
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E(M) = FS/M \* x.x (e.g. 0.1 at FS = 10 mA, E(2mA) = 10/2 \* 0.1 = 0.5 %)
- Fundamental frequency in the range 45 ... 66 Hz
- S: x.x, P, Q: x.x / PF (related to apparent power), 3- and 4-wire networks
- E<sub>M</sub>: Accuracy specified by manufacturer of clamp-on CT or sensor
- Value in brackets () valid for IN/IE input, used for PQ analysis
- E[%]: Accuracy of ratio E<sub>i</sub>, E<sub>t</sub>; Δφ[°]: Phase shift of phase displacement φ<sub>p</sub>, φ<sub>s</sub>.

### Pulse Input / output

Input 1 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:	≥ 10μs
<b>Meter constant:</b>	C = 36'000'000 / (ln * Un) The meter constant depends on the highest selected internal ranges ln, Un. Example: Un = 300V, ln = 12 A C = 10'000 [imp/Wh (varh, VAh)]
Output frequency:	C' = C / 3'600 [imp/Ws (vars, VAs)] fo = C' * PΣ (QΣ, SΣ) f <sub>max</sub> = 36'000'000 / (12 * 300 * 3'600) * 3 * 12 * 300 = 30'000 [imp/s]