

## 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 120 A error compensated UCT clamp-on CT's (included in the standard accessories set) in the range 10 mA ... 120 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 480 pixels) TFT touch screen colour display with graphical user interface
- Data transfer and communication via USB (Type B), ETHERNET or WLAN
- Built in web server for remote display of graphical user interface and remote control of the unit
- Data storage on removable SD memory card
- Independent sets of UCT clamp-on CTs allow service, calibration or later purchase of UCT 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 UCT 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 CAIntegration
- Set of 3 UCT 10.3 clamp-on CT 10A
- Set of 3 UCT120.3 clamp-on CT 120A (active error compensated)
- Set of 3 UCT 1000.3 clamp-on CT 1000A
- Set of 3 UCT LEM.3 flexible current probes FLEX 3000 (30/300/3000A)
- UCT AMP-LiteWire 3-phase adapter set for AmpLiteWire
- Primary current sensor AmpLiteWire 2000 A
- UCT VOLT-LiteWire 3-phase adapter set for VoltLiteWire
- Primary voltage sensor VoltLiteWire 40 kV

# Technical Data PWS 2.3 gen X

## General

Auxiliary supply:	Power may be taken from the auxiliary supply or the measuring circuit at: 46 VAC <sub>min</sub> ... 300 VAC <sub>max</sub> , 47 Hz ... 63 Hz 65 VDC <sub>min</sub> ... 423 VDC <sub>max</sub> Protection: up to 440 VAC <sub>max</sub>
External 12 V DC supply:	10 VDC <sub>min</sub> ... 14.4 VDC <sub>max</sub>
Frequency range:	47 Hz ... 63 Hz
Power consumption:	max. 15W / 30 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

<b>Safety</b>	CE certified
Isolation protection:	IEC 61010-1:2010
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	U1, U2, U3
	20 mV ... 3 V	U1 (Burden)
<b>Current</b>	1 mA ... 12 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
	3 A ... 3000 A	FLEX 3000
<b>Primary current</b>	30 A ... 2000 A	AmpLiteWire 2000A
<b>Primary voltage</b>	500 V ... 40 kV	VoltLiteWire 40kV

## Measurement Accuracy

Voltage / Current		≤ ± E [%] <sup>1 2 4</sup>
Measuring Quantity	Range	Cl. 0.1
<b>Voltage (U1, U2, U3, N)</b>	46 V ... 300 V	0.1
	5 V ... 25 V	0.1
<b>Current direct (I1, I2, I3)</b>	10 mA ... 12 A	0.1
	1 mA ... 10 mA	0.1
<b>Current CT 10A UCT 10.3</b>	30 mA ... 10 A	0.2
	1 mA ... 30 mA	1.0
<b>Current CT 120A UCT 120.3</b>	100 mA ... 120 A	0.2
	10 mA ... 100 mA	1.0
<b>Current CT 1000A UCT 1000.3</b>	10 A ... 1000 A	0.2
	1 A ... 10 A	1.0
<b>Current FLEX 3000 UCT LEM.3</b>	300 A ... 3000 A	0.1 + E <sub>M</sub>
	30 A ... 300 A	
	3 A ... 30 A	
<b>Burden Voltage (U1, N)</b>	100 mV ... 5 V	0.5
	20 mV ... 100 mV	0.5
<b>Current AmpLiteWire 2000A</b>	300 A ... 2000 A	0.1 + E <sub>M</sub>
	30 A ... 300 A	0.1 + E <sub>M</sub>
<b>Voltage VoltLiteWire 40kV</b>	6 kV ... 40 kV	0.1 + E <sub>M</sub>
	500 V ... 6 kV	0.1 + E <sub>M</sub>

Power / Energy		Voltage: 46 V ... 300 V (U - N)	≤ ± E [%] <sup>1 2 3</sup>
Measuring quantity / Input I	Range		Cl. 0.1
<b>Active (P), Apparent (S) Power / Energy</b>			
Direct (I1, I2, I3)	10 mA ... 12 A		0.1
	1 mA ... 10 mA		0.1
Current CT 120A UCT 120.3	100 mA ... 120 A		0.2
Curr. CT 1000A UCT 1000.3	10 A ... 1000 A		0.2
<b>Reactive (Q) Power / Energy</b>			
Direct (I1, I2, I3)	10 mA ... 12 A		0.2
	1 mA ... 10 mA		0.2
Current CT 120A UCT 120.3	100 mA ... 120 A		0.4
Curr. CT 1000A UCT 1000.3	10 A ... 1000 A		0.4
<b>Drift / year at Power / Energy (PQS) (I direct)</b>			
			0.03

Temperature coefficient (TC):		≤ ± TC [%/°C] <sup>3</sup>
Range		Cl. 0.1
0 °C ... +40 °C		0.005
-10 °C ... +50 °C		0.008

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

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

CT Ratio		≤ ± E [%] / Δφ [°] <sup>1 2 4 5</sup>
IP - Input / Range	IS (I1, I2, I3)	Cl. 0.1
<b>Current CT 120A UCT 120.3</b>		
100 mA ... 120 A	10 mA ... 12 A	0.3 / 0.3
100 mA ... 120 A	1 mA ... 10 mA	1.0 / -
<b>Current CT 1000A UCT 1000.3</b>		
10 A ... 1000 A	10 mA ... 12 A	0.3 / 0.3
1 A ... 10 A	10 mA ... 12 A	1.0 / -
<b>FLEX 3000 UCT LEM.3</b>		
300 A ... 3000 A		
30 A ... 300 A	10 mA ... 12 A	0.2 + E <sub>M</sub> / -
3 A ... 30 A		
<b>AmpLiteWire 2000A</b>		
300 A ... 2000 A	10 mA ... 12 A	0.2 + E <sub>M</sub> / -
30 A ... 300 A	10 mA ... 12 A	0.2 + 0.1 + E <sub>M</sub> / -

Frequency / Phase Angle / Power Factor		≤ ± E
Measuring Quantity	Range	Cl. 0.1
<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
- 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:	≥ 10 μs			
<b>Meter constant:</b> Active, Reactive, Apparent	C = C <sub>0</sub> / (ln * Un) C <sub>0</sub> = 36'000'000 [imp/Wh(varh,VAh)] The meter constant depends on the highest selected internal ranges ln, Un. The direct voltage input has only one range: Un = 300 V. 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 I1, I2, I3	0.012	0.12	1.2	12
Current CT 120A UCT 120.3	0.12	1.2	12	120
Current CT 1000A UCT 1000.3	1	10	100	1000
FLEX 3000	-	30	300	3000
Output frequency:	Example: Un = 300V, ln = 12 A C = 10'000 [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 = 2.77778 imp/Ws * 3 * 300V * 12A = 30'000 [imp/s] Factor 3 for 3-phase system			