



PWS 3.3

Three-phase Portable Working Standard and Power Quality Analyzer



The PWS 3.3 is a combination of a three-phase Portable Working Standard of class 0.05% or 0.1% and an IEC 61000-4-30 Class A compatible Power Quality Analyzer with 3 voltage and 4 current channels.

The Working Standard is used to test single and three phase meters, instrument transformers and installations on site.

The Power Quality Analyzer is used to resolve disputes at contractual applications, for statistical surveys, including EN 50160 reporting, and for online troubleshooting of different kind of power quality problems.

The unit can be used with various types of clamp-on CTs and current sensors. Therefore it is possible to easily and accurately test both CT and direct connected meters.

The unit can be powered either from the measuring circuit or from an auxiliary single-phase supply. Power Quality Analysis is battery buffered during 15 min in case of an outage.

Advantages

- Two instruments in one compact case
- Large 6,4" (640 x 480 pixels) colour TFT display with graphical user interface
- Data transfer and communication via USB or ETHERNET
- Data storage on removable Compact Flash 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
- 1 clamp-on CT current input for IN/IE
- 2 clamp-on CT current inputs for I1, I2, I3

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

POWER QUALITY ANALYZER - Functions

- Dips / Swells / Interruptions
- Harmonics / Interharmonics / Signal voltages
- Voltage unbalance
- Flicker
- Transient capture $\geq 200\mu\text{s}$ (10 kHz)

Options

- Software CALSOFT
- Analog modem (integrated, order with instrument)
- GSM modem (external)
- GPS Time Synchronisation (integrated, order with instrument)
- Set of 1 or 3 clamp-on CT 10A
- Set of 1 or 3 clamp-on CT 100A (active error compensated)
- Set of 1 or 3 clamp-on CT 1000A
- Set of 3 flexible current probes LEMflex 30/300/3000 A
- 3- or 1-phase adapter for AmpLiteWire
- Primary current sensor AmpLiteWire 2000 A

Technical Data PWS 3.3

General

Auxiliary supply:	Power may be taken from the auxiliary supply or the measuring circuit at 46 V ... 300 V / 47 ... 63 Hz
Power consumption:	max. 25 VA
Battery:	Life keeping: approx. 15 min (display off) Recharging time: ≤ 2 h
Housing:	Hard Plastic
Dimensions:	W 300 x H 210 x D 80 mm (inclusive rubber protection)
Weight:	approx. 3.25 kg
Operation temperature:	-10 °C ... +60 °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 IV, 600V CAT III
Degree of protection:	IP-40

Measurement Range

Measuring Quantity	Range	Input / Sensor
Voltage (phase - neutral)	5 V ... 600 V	U1, U2, U3
	20 mV ... 5 V	U1, U2, U3 (Burden)
Current	1 mA ... 12 A	I1, I2, I3
	1 mA ... 10 A	Clamp-on CT 10A
	10 mA ... 100 A	Clamp-on CT 100A
	1 A ... 1000 A	Clamp-on CT 1000A
	3 A ... 3000 A	LEMflex 3000A
Primary current	30 A ... 2000 A	AmpliteWire 2000A

PORTABLE WORKING STANDARD

Measurement Accuracy

Voltage / Current		≤ ± E [%] ^{1 2 4 5}	
Measuring Quantity	Range	Cl. 0.05	Cl. 0.1
Voltage (U1, U2, U3, N)	25 V ... 600 V	0.05	0.1
	5 V ... 25 V	<u>0.05</u>	<u>0.1</u>
Current direct (I1, I2, I3)	10 mA ... 12 A	0.05	0.1
	1 mA ... 10 mA	<u>0.05</u>	<u>0.1</u>
Current clamp-on CT 10A	10 mA ... 10 A	0.2 (0.5)	
Current clamp-on CT 100A	100 mA ... 100 A	0.2 (0.5)	
Current clamp-on CT 1000A	20 A ... 1000 A	0.2 (0.5)	
Current LEMflex 3000A	300 A ... 3000 A	0.1 + E _M	
	30 A ... 300 A		
	3 A ... 30 A		
Burden Voltage (U1, U2, U3)	100 mV ... 5 V	0.5	
	20 mV ... 100 mV	<u>0.5</u>	
Current AmpliteWire 2000A	300 A ... 2000 A	0.1 + E _M	
	30 A ... 300 A	<u>0.1 + E_M</u>	

Power / Energy		Voltage: 25 V ... 600 V (U - N)		≤ ± E [%] ^{1 2 3}	
Measuring quantity / Input I	Range	Cl. 0.05	Cl. 0.1	Cl. 0.05	Cl. 0.1
Active (P), Apparent (S) Power / Energy					
Direct (I1, I2, I3)	10 mA ... 12 A	0.05	0.1	<u>0.05</u>	<u>0.1</u>
	1 mA ... 10 mA				
Clamp-on CT 10A	10 mA ... 10 A	0.2			
Clamp-on CT 100A	100 mA ... 100 A	0.2			
Clamp-on CT 1000A	1 A ... 1000 A	0.2			
Reactive (Q) Power / Energy					
Direct (I1, I2, I3)	10 mA ... 12 A	0.1	0.2	<u>0.1</u>	<u>0.2</u>
	1 mA ... 10 mA				
Clamp-on CT 10A	10 mA ... 10 A	0.4			
Clamp-on CT 100A	100 mA ... 100 A	0.4			
Clamp-on CT 1000A	1 A ... 1000 A	0.4			

Temperature coefficient (TC):		≤ ± TC [%/°C] ³	
Range		Cl. 0.05	Cl. 0.1
0 °C ... +40 °C		0.010	0.015
-10 °C ... +60 °C		0.015	0.025

Frequency / Phase Angle / Power Factor		≤ ± E	
Measuring Quantity	Range	Cl. 0.05	Cl. 0.1
Frequency (f)	40 Hz ... 70 Hz	0.01 Hz	
Phase Angle (φ)	0.00 ° ... 359.99 °	0.1 °	
Power Factor (PF)	-1.000 ... +1.000	0.002	

CT Ratio	≤ ± E [%] ^{1 2}
Ratio error E_i, E_t: Sum of errors of inputs used for primary (IP) and secondary (IS) current measurements.	E _{IP} + E _{IS}

CT/PT Burden	≤ ± E [%] ^{1 2}
Operating burden S_n: Sum of errors of inputs used for voltage (U) and current (I) measurement.	E _U + E _I

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_M: Accuracy specified by manufacturer of clamp-on CT or sensor
- Value in brackets () valid for IN/IE input, used for PQ analysis

Pulse Input / output

output can be configured as 2nd input

Input level:	4 ... 12 VDC (24 VDC)
Input frequency:	max. 200 kHz
Supply:	12 VDC (I < 60 mA)
Output level:	5V
Pulse length:	≥ 10µs
Meter constant: Active, Reactive, Apparent [imp/Wh(varh,VAh)]	C = 36'000'000 / (In * Un) The meter constant depends on the highest selected internal ranges In, Un. Example: Un = 300V, In = 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 _{max} = 36'000'000 / (12 * 300 * 3'600) * 3 * 12 * 300 = 30'000 [imp/s]

POWER QUALITY ANALYZER

Voltage	
Inputs	3
Accuracy class	■ 0.1%
Dips / Swells / Interruptions	■ U _{RMS} ½
Harmonics	■ 2 - 63
Interharmonics	■ 2 - 63
Signal Voltages	■ fs < 3 kHz
Flicker P _{st} , P _{it}	■ up to 40 Hz
Unbalance	■
Transients	● 0.9 kV / ≥ 200 µs (10 kHz)
EN 50160	●
Current	
Inputs	4
Accuracy class	■ 0.1%
Inrush	■
Harmonics	■ 2 - 63
Interharmonics	■ 2 - 63
Transients	● ≥ 200 µs (10 kHz)
Neutral(IN) or Earth(IE) current	●
Power	
Active (P) / Reactive (Q) / Apparent (S)	●
Harmonics P, Q, S	●
Power Factor	●
Energy	●
Communication	
USB	●
ETHERNET	●
Modem (analog, integrated)	○
Modem (GSM, external)	○
Other functions	
Battery buffering at outage (display off)	● 15 min
Removable Compact Flash card memory	●
GPS time synchronisation	○

Notes

- Function according IEC 61000-4-30 Class A
- Option

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Subject to alterations

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