MTE Meter Test Equipment

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 and voltage sensors. Therefore it is possible to easily and accurately test both CT/PT 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 min. 15 minutes 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/PT ratio)

POWER QUALITY ANALYZER - Functions
- Dips / Swells / Interruptions
- Harmonics / Interharmonics / Signal voltages
- Voltage unbalance
- Flicker
- Transient capture $\geq$ 100µs (22.7 kHz)

Options
- Software CALSOFT
- Analogue modem (integrated, order with instrument)
- GSM/GPRS modem (external)
- GPS Time Synchronisation (integrated, order with instrument)
- 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)
- 1 clamp-on CT 100A for IN/IE
- 1 clamp-on CT 1000A for IN/IE
- 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 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. 50 VA
Battery:	Life keeping: ≥ 15 min Recharging time: ≤ 2 h (Load: + 10 VA)
Housing:	Hard Plastic
Dimensions:	W 307 x H 217 x D 80 mm (inclusive rubber protection)
Weight:	approx. 3.25 kg
Operation temperature:	-10 ℃ ... +60 ℃
Storage temperature:	-20 ℃ ... +60 ℃
Relative humidity:	≤ 85% at Ta ≤ 21℃
	≤ 95% at Ta ≤ 25℃, 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 (Burden)
Current	1 mA … 12 A	I1, I2, I3
	5 mA … 10 A	Clamp-on CT 10A
	10 mA … 100 A	Clamp-on CT 100A
	100 mA …1000 A	Clamp-on CT 1000A
	3 A …3000 A	FLEX 3000
Primary current	30 A …2000 A	AmpLiteWire 2000A
Primary voltage	500 V … 40 kV	VoltLiteWire 40kV

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 … <u>10</u> mA	<u>0.05</u>	<u>0.1</u>
Current clamp-on CT 10A	30 mA … 10 A	0.2	
Current clamp-on CT 100A	100 mA … 100 A	0.2 (0.5)	
Current clamp-on CT 1000A	1 A …1000 A	0.2 (0.5)	
Current FLEX 3000	300 A …3000 A		
	30 A … 300 A	0.1 + E_M	
	3 A … 30 A		
Burden Voltage (U1)	100 mV … 5 V	0.5	
	20 mV … <u>100</u> mV	<u>0.5</u>	
Current AmpLiteWire 2000A	300 A …2000 A	0.1 + E_M	
	30 A … <u>300</u> A	<u>0.1</u> + E_M	
Voltage VoltLiteWire 40kV	6 kV … 40 kV	0.1 + E_M	
	500 V … <u>6</u> kV	<u>0.1</u> + E_M	

Power / Energy	Voltage: 25 V… 600 V (U - N)	≤ ± E [%] [1][2][3]	
Measuring quantity / Input I	Range	Cl. 0.05	Cl. 0.1
Active (P), Apparent (S) Power / Energy			
Direct (I1, I2, I3)	10 mA … 12 A	0.05	0.1
	1 mA … <u>10</u> mA	<u>0.05</u>	<u>0.1</u>
Clamp-on CT 10A	30 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
	1 mA … <u>10</u> mA	<u>0.1</u>	<u>0.2</u>
Clamp-on CT 10A	30 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	
Drift / year at Power / Energy (PQS) (I direct)		0.015	0.03

		≤ ± TC [%/℃] [3]	
Temperature coefficient (TC):	Range	Cl. 0.05	Cl. 0.1
	0°C ... +40℃	0.003	0.005
	-10°C ... +60℃	0.006	0.010

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/PT Ratio	≤ ± E [%] [1][2]
Ratio error E: Sum of errors of inputs used for primary (IP, UP) and secondary (IS, US) measurements.	E_P + E_S

CT/PT Burden	≤ ± E[%] [1][2]
Operating burden Sn: Sum of errors of inputs used for voltage (U) and current (I) measurement.	E_U + E_I

Notes

[1] x.x :Related to the measuring value
<u>x.x</u> :Related to the measuring range final value (full scale, FS), $E(M) = FS/M * \underline{x.x}$ (e.g. <u>0.1</u> at FS =<u>10</u> mA, $E(2mA) = 10/2 * 0.1 = 0.5\ \%$)
[2] Fundamental frequency in the range 45 … 66 Hz
[3] S: x.x, P,Q: x.x / PF (related to apparent power), 3- and 4-wire networks
[4] E_M: Accuracy specified by manufacturer of clamp-on CT or sensor
[5] Value in brackets () valid for IN/IE input, used for PQ analysis

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
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 … 64
Interharmonics	■ 1-2 … 63-64
Signal Voltages	■ fs < 3 kHz
Flicker P_st, P_lt	■ up to 40 Hz
Unbalance	■
Transients	● 0.9 kV/≥ 100 μs (22.7 kHz)
EN 50160	●
Current	
Inputs	4
Accuracy class	■ 0.1%
Inrush	■
Harmonics	■ 2 … 64
Interharmonics	■ 1-2 … 63-64
Transients	● ≥ 100 μs (22.7 kHz)
Neutral(IN) or Earth(IE) current	●
Power	
Active (P) / Reactive (Q) / Apparent (S)	●
Harmonics P, Q, S	●
Energy	●
Communication	
USB	●
ETHERNET	●
Analogue modem (integrated)	○
GSM/GPRS modem (external)	○
Other functions	
Battery buffering at outage	● ≥ 15 min
Removable Compact Flash card memory	●
GPS time synchronisation (integrated)	○

Notes
■ Function according IEC 61000-4-30 Class A
○ Option