MTE Meter Test Equipment

PTS 2.3 C

Three-phase, fully automatic test system with a class 0.1 reference standard and integrated three-phase current source

The PTS 2.3 C portable test system consists of an integrated three-phase current source unit and a three-phase electronic reference standard of accuracy class 0.1. Characteristic features of the PTS 2.3 C are its wide measuring range, high accuracy and high tolerance to unwanted external influences.

The PTS 2.3 C allows the monitoring of meter installations as well as analysis of the local mains conditions.

Advantages

- Easy verification of meters under precise load conditions, using the built-in, compact, current source
- Automatic operation with predefined load points without the need for an external PC
- Exchangeable Compact Flash (CF) memory card for measurement results and customer data
- Display of vector diagram and phase sequence for analysis of the supply conditions
- User-friendly system for data input and operation of combined source and reference meter
- The system may be used either as a stand-alone reference standard meter, or together with the integrated power source

Functions

- Independent generation of single or three-phase current loading conditions for verification of meters using the incoming supply voltage
- Active, reactive and apparent energy measurement for three phase, 3 or 4-wire, systems with integrated error calculator and pulse output
- Vector diagram, harmonics spectrum, wave form and rotary field display for analysis of the mains conditions
- Burden measurement of Current Transformer (CT) and Potential Transformer (PT)
- Ratio testing of Current Transformers (CT)

Application

- On site meter measurements
- Verification of energy registration
- Verification of the circuit load conditions

Options

- Software CALegration
- Error compensated clip-on CT's up to100 A
- Clip-on CT's up to1000 A
- Flexible current transformers FLEX 3000 up to 3000 A

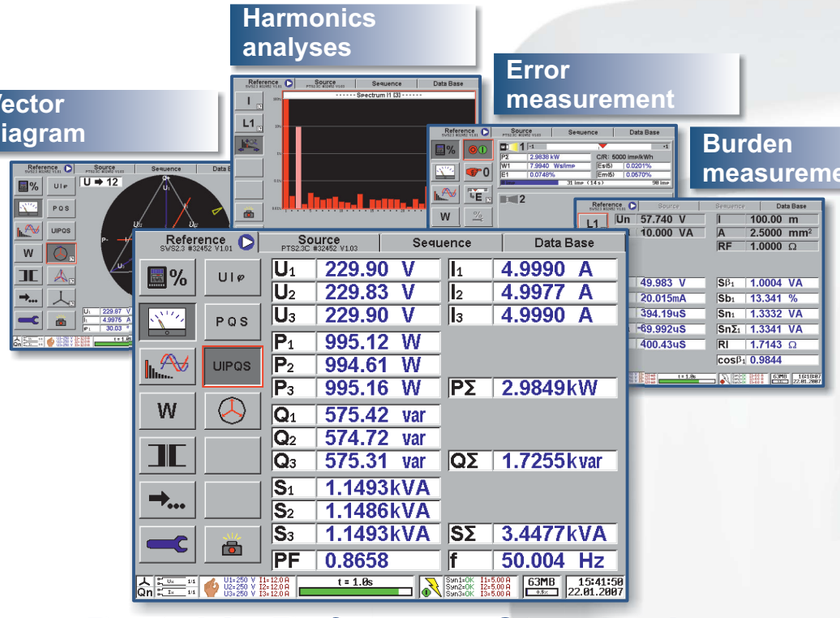
MTE

Vector diagram

Harmonics analyses

Error measurement

Burden measurement

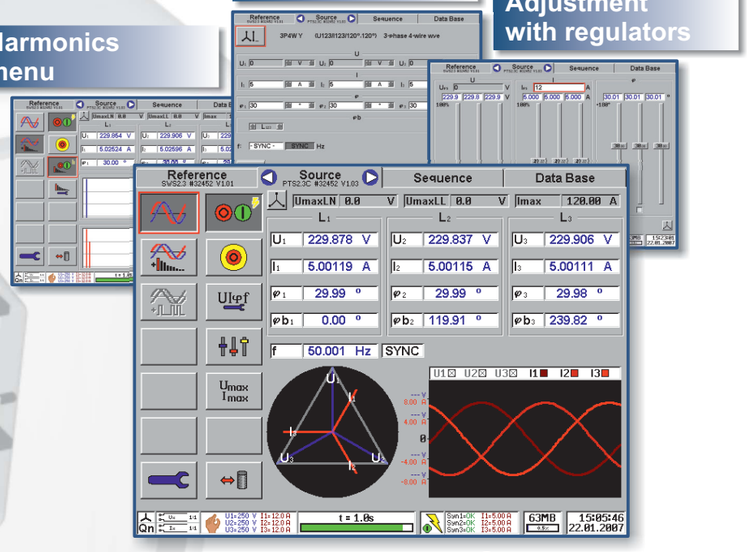


Portable Reference Standard

Harmonics menu

Power source setup menu

Adjustment with regulators

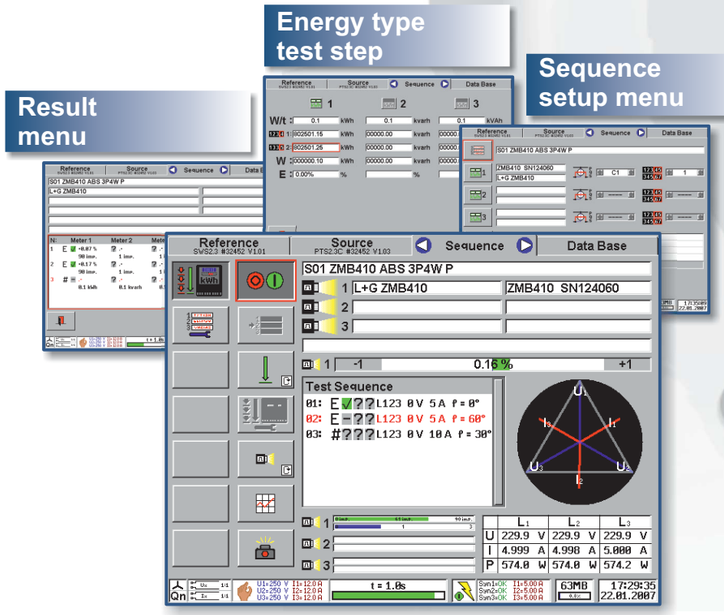


Portable Power Source

Result menu

Energy type test step

Sequence setup menu

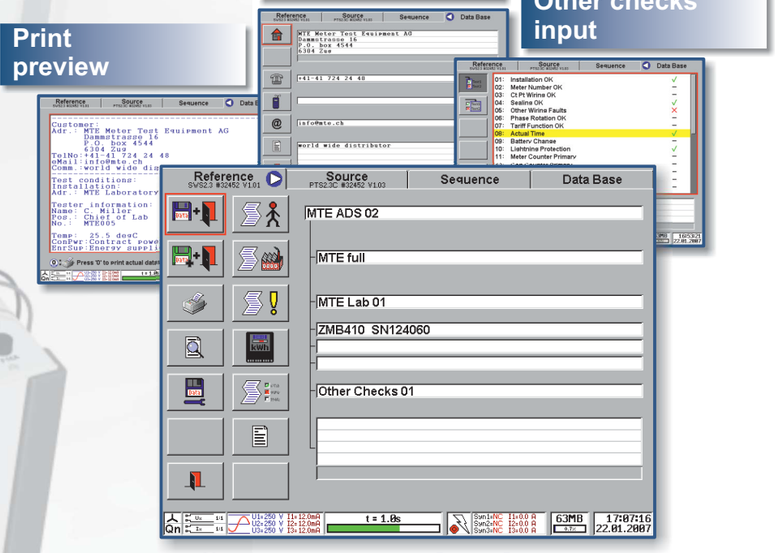


Automatic Test Run

Print preview

Customer address

Other checks input



Storage and printout of results together with administrative data set (ADS)

Technical Data PTS 2.3 C

General

Auxiliary voltage:	88 VAC_{min} ... 264 VAC_{max}, 47 … 63 Hz
Power consumption:	320 VA_{max}
Dimensions:	W 430 x D 218 x H 250 mm
Weight:	approx. 13.5 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:	300 V CAT III, 600 V CAT II
Degree of protection:	IP-20

Current Source

Range (per phase):	1 mA … 120 A
Output power (per phase):	60 VA
Internal ranges (S_{max} / U_{max}):	10 A … 120 A (60 VA / 0.5 V) 1 A … 10 A (25 VA / 2.5 V) 1 mA … 1 A (10 VA / 10 V)
Distortion factor:	< 0.8 %
Resolution:	min. 1 mA
Accuracy:	0.5 % (45 Hz … 100 Hz)
Stability:	0.03 % (30 min) / 0.1 % (1 h)
Bandwidth:	30 … 1'000 Hz (3 dB)
Phase angle:	-180.00 ° … +180.00 °
Resolution:	0.1 ° (45 … 100 Hz) / 1 ° (>100 Hz) **Mode LINE (fn):** 45 Hz … 65 Hz * *synchronized to input voltage **Mode NUM (f):** 45 Hz … 400 Hz
Resolution:	0.1 Hz (45 … 100 Hz) / 1 Hz (>100 Hz)

Reference Standard - Measurement Range

Measuring Quantity	Range	Input / Sensor
Voltage (phase - neutral)	5 V … 500 V	L1, L2, L3, N
	20 mV … 5 V	L1, N (CT Burden)
Current	1 mA … 12 A	1A/10A (I1, I2, I3)
	10 mA … 120 A	100A (I1, I2, I3)
	10 mA … 100 A	Clamp-on CT 100A
	100 mA …1000 A	Clamp-on CT 1000A
	3 A …3000 A	FLEX 3000

Reference Standard - Measurement Accuracy

Voltage / Current		≤ ± E [%] [1 2 4]
Measuring Quantity	Range	**Class 0.1**
Voltage (L1, L2, L3, N)	30 V … 500 V	0.1
	5 V … 30 V	0.1
Current direct 1A/10A, 100A	120 mA … 120 A	0.1
	1 mA … 120 mA	0.1
Current clamp-on CT 100A	100 mA … 100 A	0.2
Current clamp-on CT 1000A	20 A …1000 A	0.2
Current FLEX 3000	300 A …3000 A 30 A … 300 A 3 A … 30 A	0.5 + E_M
Burden Voltage(L1,N)	500 mV … 5 V	0.5
	20 mV … 500 mV	0.5

Power / Energy Voltage: 30 V… 500 V (L - N)		≤ ± E [%] [1 2 3]
Measuring Quantity / Input I	Range	**Class 0.1**
Active (P), Apparent (S) Power / Energy		
Direct 1A/10A or 120A	120 mA … 120 A	0.1
	1 mA … 120 mA	0.1
Clamp-on CT100A	100 mA … 100 A	0.2
Clamp-on CT1000A	20 A …1000 A	0.2
Reactive (Q) Power / Energy		
Direct 1A/10A or 120A	120 mA … 120 A	0.2
	1 mA … 120 mA	0.2
Clamp-on CT 100A	100 mA … 100 A	0.4
Clamp-on CT1000A	20 A …1000 A	0.4
Drift / year at Power / Energy (PQS) (I direct)		0.03

Influence of external magnetic fields (45 Hz … 66 Hz): ≤ 0.07 % / 0.5 mT [3]

Temperature coefficient (TC):

	≤ ± TC [%/°C] [3]
Range	**Class 0.1**
0° C ... +40°C	0.005
-10° C ... +50°C	0.008

CT Burden		≤ ± E [%] [1 2 5]
I (I1, I2, I3))	U (L1, N)	
120 mA … 120 A	500 mV … 5 V	0.6
120 mA … 120 A	20 mV … 500 mV	0.1 + 0.5

PT Burden		≤ ± E [%] [1 2 5]
I (I1, I2, I3)	U (L1, L2, L3, N)	
120 mA … 120A	30 V … 500 V	0.2
1 mA … 120 mA	30 V … 500 V	0.1 + 0.1

CT Ratio		≤ ± E [%] / Δφ [°] [1 2 6]
IP - Input / Range	IS (I1, I2, I3)	
Clamp-on CT 100A		
100 mA … 100 A	120 mA … 120 A	0.3 / 0.3
100 mA … 100 A	1 mA … 120 mA	0.2 + 0.1 / -
Clamp-on CT 1000A		
20 A …1000 A	120 mA … 120 A	0.3 / 0.3
20 A …1000 A	1 mA … 120 mA	0.2 + 0.1 / -
FLEX 3000		
300 A …3000 A	120 mA … 120 A	0.6 + E_M / -
30 A … 300 A	1 mA … 120 mA	0.5 + E_M + 0.1 / -
3 A … 30 A		

Frequency / Phase Angle / Power Factor		≤ ± E
Measuring Quantity	Range	
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

Notes

[1] x.x :Related to the measuring value
x.x :Related to the measuring range final value (full scale, FS),
E(M) = FS/M * x.x (e.g. 0.1, FS =120 mA: E(20mA) = 120/20*0.1=0.6 %)

[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] E[%]: Accuracy of operating burden Sn [VA]

[6] E[%]: Accuracy of ratio E; Δφ[°]: Phase shift of phase displacement φ.

Pulse Input

	Suitable for scanning head type SH 2003
Input level:	4 … 12 VDC (24 VDC)
Input frequency:	max. 200 kHz
Input supply:	12 VDC (I < 60 mA)

Pulse Output

Output level:	5V
Pulse length:	≥ 10µs

Meter constant

Active, Reactive, Apparent [imp/Wh(varh,VAh)]: C = 24'000'000 / (In * Un) [… / Wh]
The meter constant depends on the highest selected internal ranges of In, Un.

	Internal current ranges In [A]			
Direct I1, I2, I3	0.12	1.2	12	120
Clamp-on CT 100A	0.10	1.0	10	100
Clamp-on CT 1000A	1.0	10	100	1000
	Internal voltage ranges Un [V]			
Direct L1, L2, L3, N	250		500	

Output frequency:
Example: In = 12A, Un = 250V
C = 24'000'000 / (12 * 250) = 8'000
C' = C / 3'600 [imp/Ws(vars, VAs)]
fo = C' *PΣ(QΣ, SΣ)
f_{max} = 24'000'000 / (12 * 250 * 3'600) *
3 * 12 * 250 = 20'000 [imp/s]