

PTS 3.3 C

Three-phase, fully automatic test system with class 0.05 reference standard and integrated three-phase current and voltage source



The PTS 3.3 C portable test system consists of an integrated three-phase current and voltage source and a three-phase electronic reference standard of accuracy class 0.05%. Characteristic features of the PTS 3.3 C are its wide measuring range, high accuracy and high tolerance to unwanted external influences.

The PTS 3.3 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 and voltage 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

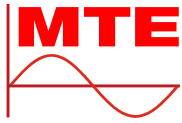
- Independent generation of single or three-phase loading conditions for verification of meters
- Active, reactive and apparent energy measurement for three phase, 3 or 4-wire, systems with integrated error calculator and pulse output
- Vector diagram, harmonics spectrum, wave form and rotary field display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

Application

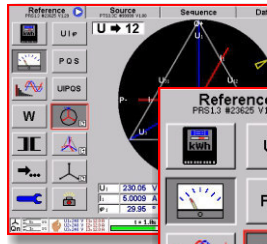
- On site meter measurements
- Verification of energy registration
- Verification of the circuit load conditions

Options

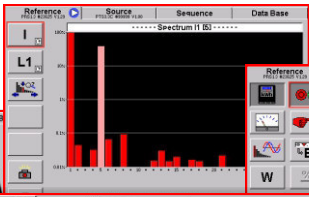
- Software CALegration
- Error compensated clip-on CT's up to 100 A



Vector diagram



Harmonics analyses



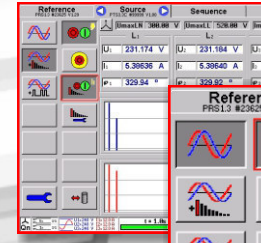
Error measurement



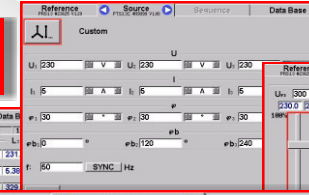
Burden measurement

Reference	Source	Sequence	Data Base
U ₁	230.04 V	I ₁	5.0002 A
U ₂	230.00 V	I ₂	4.9991 A
U ₃	230.02 V	I ₃	4.9980 A
P ₁	996.36 W	PΣ	2.9881 kW
P ₂	995.98 W	QΣ	1.7234 kvar
P ₃	995.75 W	SΣ	3.4495 kVA
Q ₁	574.61 var	PF	0.8663
Q ₂	574.41 var	f	50.002 Hz
Q ₃	574.40 var		
S ₁	1.1502 kVA		
S ₂	1.1498 kVA		
S ₃	1.1496 kVA		

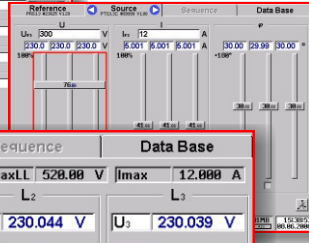
Harmonics menu



Power source setup menu



Adjustment with regulators



Reference: PTS3.3C #55999 V1.00

Source	Sequence	Data Base
U ₁	230.036 V	U ₂ 230.044 V
I ₁	5.00139 A	I ₂ 5.00131 A
φ ₁	30.00 °	φ ₂ 30.00 °
φ _{b1}	0.00 °	φ _{b2} 120.00 °
φ _{b3}		φ _{b3} 240.00 °
f	50.000 Hz	NUM

U_{max} 300.00 V, I_{max} 12.000 A

Portable Power Source

Portable Reference Standard

Customer address

MTE Motor Test Equipment AG
 Dammstrasse 16
 2104 Zug
 Switzerland
 Tel: +41 71 224 24 48
 Fax: +41 71 224 24 49
 Email: info@mte.ch
 Web: www.mte.ch
 world wide distributor
 MTE Laboratory
 Customer Information:
 Name: MTE Lab
 Address: MTE Lab
 Tel: +41 71 224 24 48
 Fax: +41 71 224 24 49
 Email: info@mte.ch
 Web: www.mte.ch
 Test conditions:
 Installation:
 Temp: 25.5 degC
 Control: Constant speed
 EntSup: Energy supply

Other checks input

01: Installation OK
 02: Meter Number OK
 03: CT Pt Wiring OK
 04: Sensing OK
 05: Other Wiring Faults
 06: Phase Rotation OK
 07: Tariff Function OK
 08: Actual Time
 09: Battery Charge
 10: Lifetime Protection
 11: Meter Counter Primary
 12: Can Counter Primary

Print preview

Customer: MTE Motor Test Equipment AG
 Dammstrasse 16
 2104 Zug
 Switzerland
 Tel: +41 71 224 24 48
 Fax: +41 71 224 24 49
 Email: info@mte.ch
 Web: www.mte.ch
 Test conditions:
 Installation:
 Temp: 25.5 degC
 Control: Constant speed
 EntSup: Energy supply

Energy type test step

W	Wh	varh	0	Wh
0000	147043.06	MWh	0	avsh
0000	247043.16	MWh	0.0	avsh
E	-2.34	%	0.0	%
W	0.1	MWh	0	avsh

Sequence setup menu

Seq	Step	Step Description	Start Time	End Time
1	1	LG ZMB410 PQ	10:00	10:05
2	2	LG ZMB410 PQ	10:05	10:10
3	3	LG ZMB410 PQ	10:10	10:15

Result menu

Meter 1	Meter 2	Meter 3
E 0.00%	0	0
E 0.00%	0	0
E 0.00%	0	0
E 0.00%	0	0
E 0.00%	0	0
E 0.00%	0	0

Reference: PTS3.3C #55999 V1.00

Source	Sequence	Data Base
S ZMB001		
M1	1 LG ZMB410 PQ	LG ZMB410 PQ No:1001
M2	2	
M3	3	

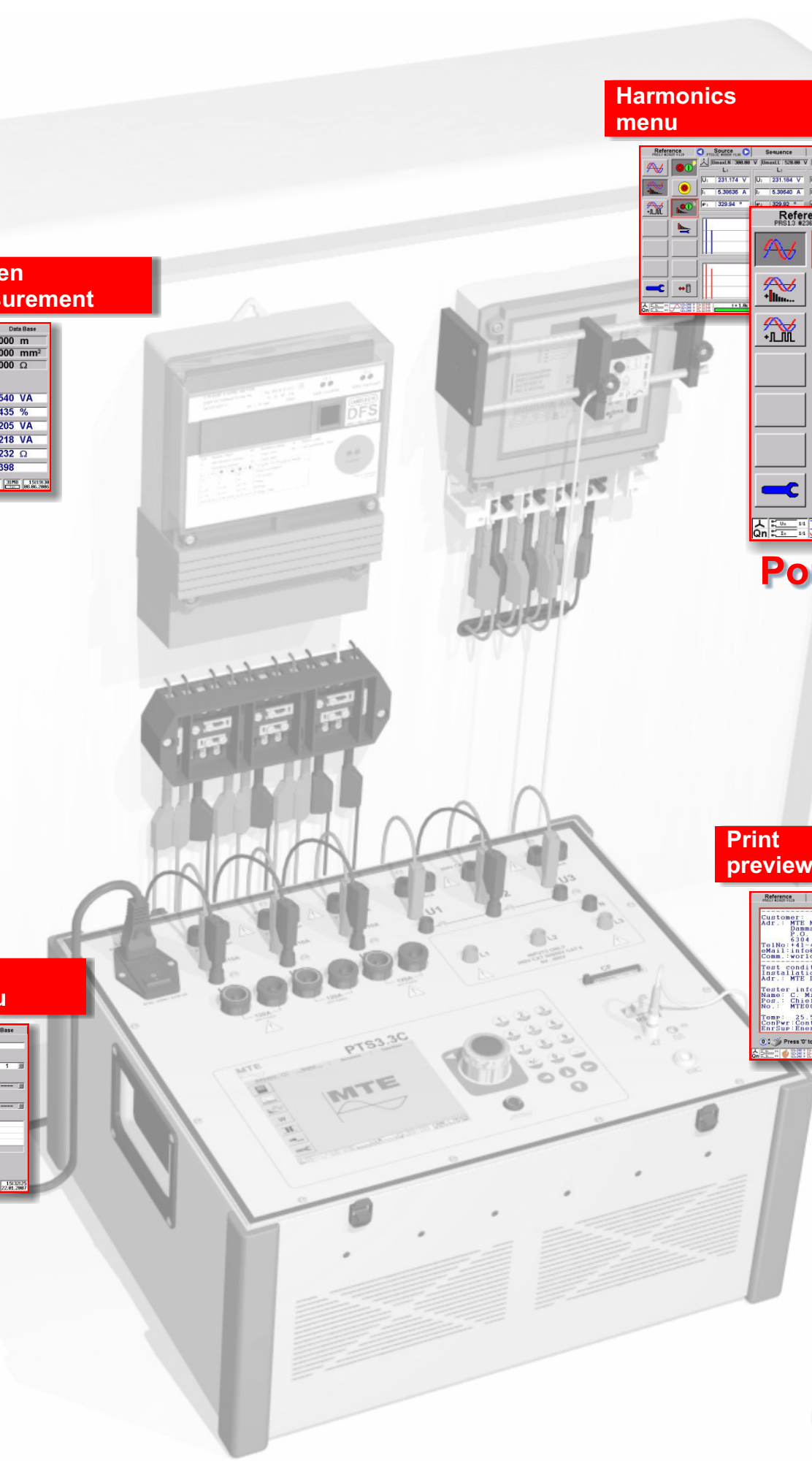
Test Sequence

01: E [?] L123 230 V 5 A f = 0°
 02: E [?] L123 230 V 5 A f = 0°
 03: E [?] L123 230 V 0.5 A f = 0°
 04: # = E [?] L123 230 V 5 A f = 0°

Seq	Step	U ₁	U ₂	U ₃	I ₁	I ₂	I ₃	P
1	1	230.0 V	230.0 V	230.0 V	5.000 A	4.999 A	4.998 A	996.1 W
2	2							
3	3							

Automatic Test Run

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



Technical Data PTS 3.3 C

General

Auxiliary voltage:	88 VAC _{min} ... 264 VAC _{max} , 47 ... 63 Hz
Power consumption:	400 VA _{max}
Housing:	Metal, rubber protectors
Dimensions:	W 465 x D 245 x H 375 mm
Weight:	approx. 22 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

Isolation protection:	CE certified
Measurement Category:	IEC 61010-1:2001
Degree of protection:	300 V CAT III, 600 V CAT II
	IP-20

Voltage Source

Range (phase - neutral):	30 V ... 480 V
Output power (per phase):	30 VA
Internal ranges (S _{max} / I _{max}):	300 V ... 480 (600) V (30 VA / 0.05 A) 150 V ... 300 V (30 VA / 0.10 A) 75 V ... 150 V (30 VA / 0.20 A) 30 V ... 75 V (30 VA / 0.40 A)
Distortion factor:	< 0.8 %
Resolution:	0.1 V
Accuracy:	0.3 % (45 Hz ... 100 Hz)
Stability:	0.03 % (30 min) / 0.1 % (1 h)
Bandwidth:	30 ... 2'000 Hz (3 dB)

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:	-180.0 ° ... +180.0 °
Resolution:	0.1 ° (45 ... 100 Hz) / 1 ° (>100 Hz)
Frequency:	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)	20 mV ... 480 V	L1, L2, L3, N U1, U2, U3, N
Current	1 mA ... 12 A	1A/10A (I1, I2, I3)
	10 mA ... 120 A	120A (I1, I2, I3)
	20 mA ... 100 A	Clamp-on CT 100A

Reference Standard - Measurement Accuracy

Voltage / Current		≤ ± E [%] ^{1 2}
Measuring Quantity	Range	Class 0.05
Voltage	30 V ... 480 V	0.05
	5 V ... 30 V	0.05
Current direct 1A/10A, 120A	40 mA ... 120 A	0.05
	1 mA ... 40 mA	0.05
Current clamp-on CT 100A	500 mA ... 100 A	0.2
	20 mA ... 500 mA	1.0
Burden Voltage(L1,L2,L3,N)	400 mV ... 5 V	0.5
	20 mV ... 400 mV	0.5

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

Power / Energy		Voltage: 30 V... 480 V (L - N)	≤ ± E [%] ^{1 2 3}
Measuring Quantity / Input I	Range		Class 0.05
Active (P), Apparent (S) Power / Energy			
Direct 1A/10A or 120A	40 mA ... 120 A		0.05
	1 mA ... 40 mA		0.05
Clamp-on CT100A	500 mA ... 100 A		0.2
	20 mA ... 500 mA		1.0
Reactive (Q) Power / Energy			
Direct 1A/10A or 120A	40 mA ... 120 A		0.05
	1 mA ... 40 mA		0.05
Clamp-on CT 100A	500 mA ... 100 A		0.4
	20 mA ... 500 mA		1.0

Influence of external magnetic fields (45 Hz ... 66 Hz): ≤ 0.07 % / 0.5 mT³

Temperature coefficient (TC):		≤ ± TC [%/°C] ³
Range		
0° C ... +40°C		0.0025
-10° C ... +50°C		0.0040

CT Burden		≤ ± E [%] ^{1 2 4}
I - Input / Range	U (L1, L2, L3, N)	
Direct 1A/10A		
	40 mA ... 12 A	400 mV ... 5 V
40 mA ... 12 A	20 mV ... 400 mV	0.05 + 0.5
Clamp-on CT 100A		
	500 mA ... 100 A	400 mV ... 5 V
500 mA ... 100 A	20 mV ... 400 mV	0.2 + 0.5

PT Burden		≤ ± E [%] ^{1 2 4}
I - Input / Range	U (L1, L2, L3, N)	
Direct 1A/10A		
	40 mA ... 12 A	30 V ... 480 V
1 mA ... 40 mA	30 V ... 480 V	0.05 + 0.05
Clamp-on CT 100A		
	20 mA ... 500 mA	30 V ... 480 V

Notes

- 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. 0.05, FS = 40 mA: E(10mA) = 40/10*0.05=0.2 %)
- 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[%]: Accuracy of operating burden Sn [VA]

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: ≥ 1µs

Meter constant

Active, Reactive, Apparent C = 72'000'000 / (ln * Un) [... / Wh]
[imp/Wh(varh,VAh)]
The meter constant depends on the highest selected internal ranges of ln, Un.

	Internal current ranges ln [A]			
	0.004	0.012	0.04	0.12
Direct 1A/10A	0.4	1.2	4	12
	4	12	40	120
Clamp-on CT 100A	0.8	4	20	100
	Internal voltage ranges Un [V]			
L1,L2,L3,N / U1,U2,U3,N	60	120	240	480

Example: ln = 12A, Un = 240V
C = 72'000'000 / (12 * 240) = 25'000
C' = C / 3'600 [imp/W(s,vars, VAs)]
fo = C' * PΣ(QΣ, SΣ)
f_{max} = 72'000'000 / (12 * 240 * 3'600) *
3 * 12 * 240 = 60'000 [imp/s]

Output frequency: