

PTS 3.1 C

Single-phase test system with class 0.1 reference standard and integrated single-phase current and voltage source



The PTS 3.1 C portable test system consists of an integrated single-phase current and voltage source and a single-phase electronic reference standard of accuracy class 0.1 %. Characteristic features of the PTS 3.1 C are its wide measuring range, high accuracy and high tolerance to unwanted external influences.

The PTS 3.1 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 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-phase loading conditions for verification of meters
- Active, reactive and apparent energy measurement for single phase 2-wire systems with integrated error calculator and pulse output
- Vector diagram, harmonics spectrum and wave form display for analysis of the mains conditions
- Burden measurement of Current Transformer (CT) and Potential Transformer (PT)
- Ratio testing of Current Transformers (CT)

Uses

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

Options

- Software CALSOFT
- Error compensated clip-on CT up to 100 A
- Clip-on CT up to 1000 A
- Flexible current transformer FLEX 3000 up to 3000 A



Vector
diagram

Harmonics
analyses

Error
measurement

Burden
measurement

Harmonics
menu

RCS Ripple
control signals

Power source
setup menu

Adjustment
with regulators

Portable Power Source

Portable Reference Standard

Customer
address

Other checks
input

Print
preview

Energy type
test step

Sequence
setup menu

Result
menu

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

Automatic Test Run

Technical Data PTS 3.1 C

General

Auxiliary voltage:	88 VAC _{min} ... 264 VAC _{max} , 47 ... 63 Hz
Power consumption:	320 VA _{max}
Housing:	Hard plastic, rubber protectors
Dimensions:	W 430 x D 218 x H 250 mm
Weight:	approx. 11 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 61010-1:2002
Degree of protection:	300 V CAT III, 600 V CAT II IP-20

Voltage Source

Range (phase - neutral):	30 V ... 480 V
Output power:	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:	1 mA ... 120 A
Output power:	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)	5 V ... 500 V	L1, N or U1
	20 mV ... 5 V	L1, N (CT Burden)
Current	1 mA ... 12 A	1A/10A (I1)
	10 mA ... 120 A	120A (I1)
	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, N, U1)	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	0.5 + E _M
	30 A ... 300 A	
	3 A ... 30 A	
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

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

Temperature coefficient (TC):	≤ ± TC [%/°C] ³	
	Range	Class 0.1
	0 °C ... +40 °C	0.015
	-10 °C ... +50 °C	0.025

CT Burden		≤ ± E [%] ^{1 2 5}
I (I1)	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)	U (L1, 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)	
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
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- ³ Fundamental frequency in the range 45 ... 66 Hz
- ⁴ S: x.x, P,Q: x.x / PF (related to apparent power)
- ⁵ E[%]: Accuracy of operating burden Sn [VA]
- ⁶ E[%]: Accuracy of ratio E; Δφ[°]: Phase shift of phase displacement φ.

Pulse Input

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 = 72'000'000 / (ln * Un) [...] / Wh The meter constant depends on the highest selected internal ranges of In, Un.
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Internal current ranges In [A]				
Direct I1	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, N or U1	250		500	

Example: In = 12A, Un = 250V
C = 72'000'000 / (12 * 250) = 24'000
C' = C / 3'600 [imp/Ws(vars, VAs)]
fo = C' * P (Q, S)
f_{max} = 72'000'000 / (12 * 250 * 3'600) *
12 * 250 = 20'000 [imp/s]

Output frequency: