

# CALPORT 300

## Electricity Meter and Instrument Transformer Test System



The CALPORT 300 is an universal test system for the comprehensive investigation of all components of a modern metering installation. Characteristic features are its wide measuring range, the high accuracy and the small dependence of disturbing.

### Advantages of the CALPORT 300

- Precision test system for AC values and all measuring modes
- Current- and voltage ranges:  
1 mA ... 120 A / 0.04 V ... 480 V / 45 Hz ... 66 Hz
- Six current inputs allows simultaneous measurements to be made of both primary and secondary currents in CT-connected metering systems
- Using several clip-on CT's at the range 100 A up to 3000 A or hot sticks for measurement on high voltage potential
- Exchangeable memory for measurement results and customer data.
- Integrated RS 232 C interface for data transfer to PC or printer and programme control via external PC.

### Functions

- Measurement of active, reactive and apparent power and their energy
- Error measurement of 3 inputs at the same time
- Display of vector diagram for analysis of the mains conditions
- Harmonics measurement
- Burden measurement and ratio test of current and voltage transformers

### Options

- Software CAMCAL for Windows or CALSOFT II
- Error compensated clip-on CT's up to 100 A
- Clip-on CT's up to 1000 A
- Flexible current transformers FLEX 3000 up to 3000 A
- A set of current cables for measurements up to 120 A
- Scanning head SH 2003 with clamp device SCD 2003

## Testing of CTs, PTs in Operating State

CALPORT 300 features wide-ranging alternatives for the testing of instrument transformers during normal measuring equipment operations, i.e. without any shutdowns or safety disconnections.

### Establishing transformer relations and transformer errors

Reference	Source	Sequence	Data Base
Prim.	LEM clamps 300A	N1	200.00 A
	Direct current inputs 12A	N2	5.0000 A
Sec.	IP <sub>1</sub> : 135.47 A	IP <sub>2</sub> : --- A	IP <sub>3</sub> : --- A
	IS <sub>1</sub> : 3.3989 A	IS <sub>2</sub> : --- A	IS <sub>3</sub> : --- A
	NP <sub>1</sub> : 200.00 A	NP <sub>2</sub> : 200.00 A	NP <sub>3</sub> : 200.00 A
	NS <sub>1</sub> : 5.0179 A	NS <sub>2</sub> : --- A	NS <sub>3</sub> : --- A
	P <sub>1</sub> : 0.9958 °	P <sub>2</sub> : --- °	P <sub>3</sub> : --- °
	E <sub>1</sub> : -0.3567 %	E <sub>2</sub> : --- %	E <sub>3</sub> : --- %

CALPORT 300 carries out these examinations by simultaneously conducting primary and secondary current measurements. Primary testing is carried out with error compensated clip-on CTs for current up to 100 A, 1000 A or flexible CTs type FLEX 3000 (for currents up to 30 A, 300 A and 3000 A). Secondary testing can be conducted directly or by using clip-on CTs.

The following are tested:

- Instrument transformer ratios
- Instrument transformer errors
- Phase angles between primary and secondary currents

### Test on high voltage potential with hot sticks (option)

PT and CT ratio tests can be performed with LiteWire sensors for voltages up to 40kV and currents up to 2000A (isolation voltage 150kV).

## Burden measurement

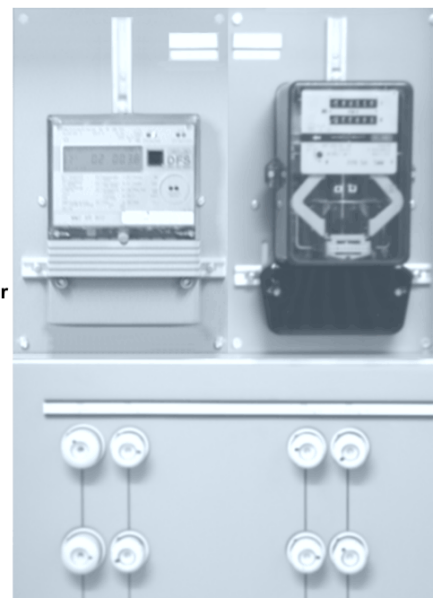
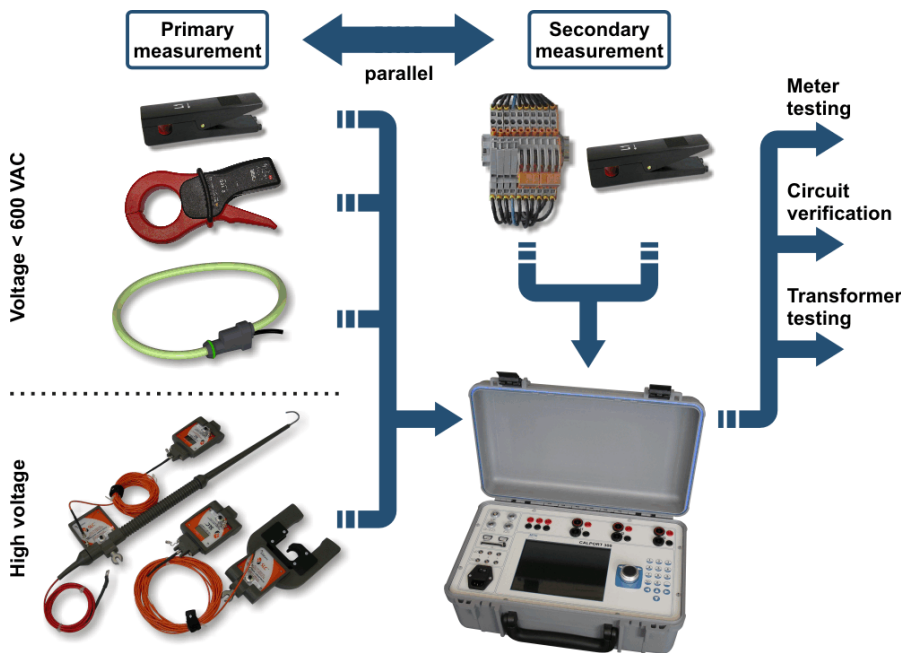
Reference	Source	Sequence	Data Base
L1	I <sub>n</sub> 5.0000 A	I	20.000 m
	SN 10.000 VA	A	4.0000 mm <sup>2</sup>
U <sub>1</sub> : 236.32mV	SB <sub>1</sub>	38.736 %	
	I <sub>1</sub>	3.5991 A	SN <sub>1</sub> 1.6415 VA
	R <sub>1</sub>	63.785mΩ	SnΣ <sub>1</sub> 3.8736 VA
	jX <sub>1</sub>	14.408mΩ	RI 89.286mΩ
	Z <sub>1</sub>	65.660mΩ	cosβ <sub>1</sub> 0.9715

Reference	Source	Sequence	Data Base
L1	U <sub>n</sub> 57.730 V	I	50.000 m
	SN 5.0000 VA	A	2.5000 mm <sup>2</sup>
U <sub>1</sub> : 57.739 V	SB <sub>1</sub>	32.294 %	
	I <sub>1</sub>	27.981mA	SN <sub>1</sub> 1.6142 VA
	G <sub>1</sub>	455.24uS	SnΣ <sub>1</sub> 1.6147 VA
	jB <sub>1</sub>	166.14uS	RI 557.14mΩ
	Y <sub>1</sub>	484.62uS	cosβ <sub>1</sub> 0.9394

Burden measurements are carried out on the secondary side of the current and voltage transformers.

CALPORT 300 fulfils all requirements for the practical implementation of load tests in the assembled state:

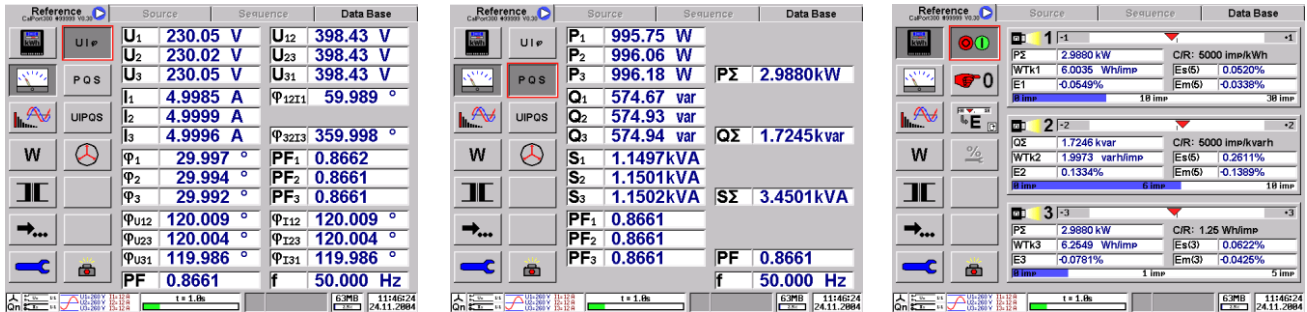
- Operation burden and nominal burden
- Burden factor and impedance



## Software and Operation

### Precise measurement and meter testing

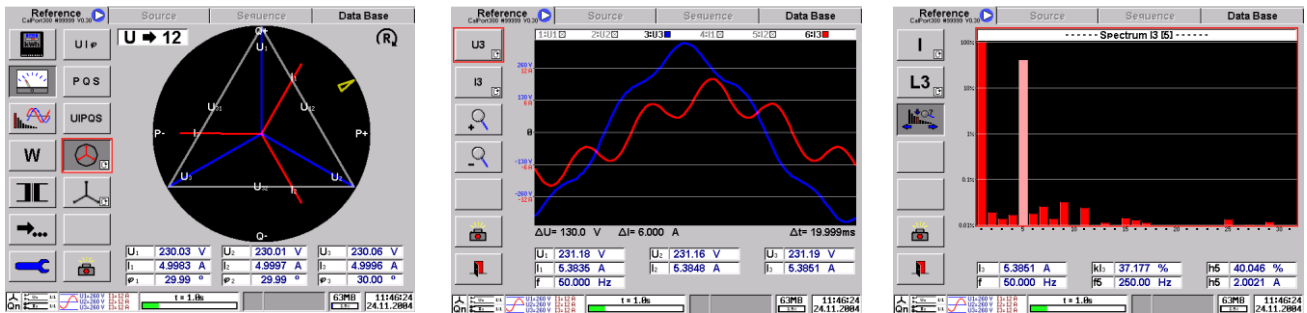
All important electrical test parameters are displayed clearly on CALPORT 300.



CALPORT 300 makes it possible to simultaneously test up to three electricity meters with varying constants (e.g. master and check meter of a 0.2S metering installation). Another option is a parallel test using the scanning head and the emitting contact output.

### Power quality analysis installation control

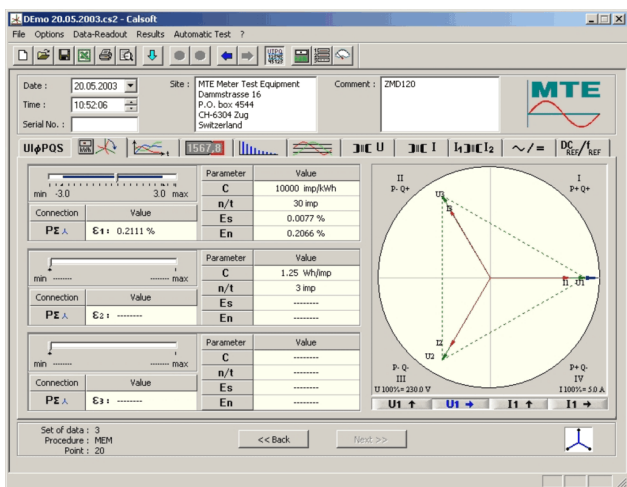
CALPORT 300 features a variety of analytical for determining the signal form and the network quality. The vector diagram of currents and voltages also makes it possible to test, for example, wiring errors in current and voltage transformer connections.



## PC-Software

The CALSOFT software package is designed to load predefined data in the CALPORT 300 and read data from the instrument, as well as displaying and processing measurement results on a PC or notebook.

CALSOFT has an additional database with meter and test sequence definitions enabling the user to prepare and standardize measurements. Automatic tests can be carried out when used together with a suitable controllable power source.



### Additional features with CALSOFT

- **Database** to predefine meters, CP/PT data of the measuring test points and to set-up automatic test sequences
- **Automatic measurement** of test sequences is possible
- **Read out** of stored data from the instrument's built-in memory, and presentation and processing of the information
- **Recording** the actual measurement values by direct periodic sampling of the unit, and presentation and processing of the information

## Technical Data CALPORT 300

Auxiliary voltage:	86 ... 264 V, 47 ... 65 Hz
Power consumption:	approx. 40 VA
Housing:	Hard plastic housing
Dimensions:	W 450 x H 180 x D 300 mm
Weight:	approx. 7 kg
Influence of auxiliary voltage on the measuring results:	≤ 0.005 % at 10 % variation
Ambient temperature:	-10°C ... +60°C
Temp. Coefficient:	≤ 0.0025 % / °C      0°C ... +40°C ≤ 0.0050 % / °C      -10°C ... +60°C
Frequency range of the measured quantities:	45 ... 66 Hz
Influence of external magnetic fields	≤ 0.15 % / mT ≤ 0.07 % / 0.5 mT

### Current measurement (I)

#### Direct

Current range:	1 mA ... 120 A	
Range:	1 mA ... 40 mA	α = 3000
	40 mA ... 120 mA	α = 1000
	120 mA ... 400 mA	α = 300
	400 mA ... 1.2 A	α = 100
	1.2 A ... 4 A	α = 30
	4 A ... 12 A	α = 10
	12 A ... 40 A	α = 3
	40 A ... 120 A	α = 1
Display range:	1.0000 mA ... 120.0000 A	
Measurement error:	E ≤ ± 0.05 %      40 mA ... 120 A of the measured value E ≤ ± 0.05 %      1 mA ... 40 mA of the measurement range final value	

#### Electronically compensated Clip-on CT's

Current range:	50 mA ... 100 A	
Range:	50 mA ... 800 mA	α = 125
	800 mA ... 4 A	α = 25
	4 A ... 20 A	α = 5
	20 A ... 100 A	α = 1
Display range:	50.00 mA ... 100.00 A	
Measurement error:	E ≤ ± 0.2%      0.5 A ... 100 A E ≤ ± 1.0%      50 mA ... 499 mA	

#### Clip-on CT's up to 1000 A

Measurement error:	E ≤ ± 0.5 %      2 A ... 1000 A of the measured value + error of the clip-on CT's	
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#### Current transformers FLEX 3000

Measurement error:	E ≤ ± 0.5 %      30 / 300 / 3000 A of the measured value + error of the clip-on CT's	
Time base:	1 (0.2 ... 9999) s	

### Voltage measurement (U)

Voltage range:	0.04 V ... 480 V	
Range:	0.04 V ... 0.4 V	β = 1200
	0.4 V ... 5 V	β = 96
	5 V ... 60 V	β = 8
	60 V ... 120 V	β = 4
	120 V ... 240 V	β = 2
	240 V ... 480 V	β = 1
Display range:	0.04000 ... 480.000 V	
Range 0.04 V ... 5 V only at I-burden measurement active		
Measurement error:	E ≤ ± 0.05 %      30 V ... 480 V of the measured value E ≤ ± 0.05 %      5 V ... 30 V of the measurement range final value E ≤ ± 0.5 %      0.04 V ... 5 V of the corresponding measurement range final value	
Time base:	1 (0.2 ... 9999) s	

### Power measurement (P, S, Q)

Power measurement per phase on range 30 ... 480 V  
The accuracy of the power is related to apparent power

#### Measurement error direct (40 mA ... 120 A):

Active power P:	E ≤ ± 0.05 %
Reactive power Q:	E ≤ ± 0.05 %
Apparent power S:	E ≤ ± 0.05 %
Longterm Drift (PQS):	≤ 0.015 % / Year

#### Measurement error with electronically compensated clip-on CT's (50 mA ... 100 A):

Active, Reactive, Apparent power P, Q, S:	E ≤ ± 0.2 %      500 mA ... 100 A of the measured value E ≤ ± 0.5 %      50 mA ... 499 mA of the measurement range final value
Display range:	6-digit for each measuring point

#### Power factor measurement (PF)

$$PF = \frac{P}{S}$$

##### Measurement error direct:

E ≤ ± 0.05 % of the measurement final range value

##### Measurement error with electronically compensated clip-on CT's:

E ≤ ± 0.20 % of the measurement final range value

Display range: -1.00000 ... 1.00000

#### Error calculation (E)

Constant range:	1 ... 1'000'000 Imp./kWh (kvarh, kVAh) 1 ... 1'000'000 Imp./Wh (varh, VAh) 1 ... 10'000 Imp./Ws (vars, VAs)
or	0.001 ... 100 Wh/Imp.
Display range:	-100.000% ... +100.000%

#### Phase angle display

Resolution: 0.1°

#### Frequency inputs 1-3

Input level:	4 ... 12 V (24V)
Input frequency:	max. 200 kHz
Auxiliary voltage:	11 ... 13 V (I ≤ 60 mA)
Min. impulse length:	≥ 1 μs

#### Frequency outputs 1-3 (fo)

Output level:	5 V TTL short-circuit-proof
Range 0.05 ... 100 A	ΣC <sub>p</sub> = 1'250 Imp./Wh

$$f_o = \frac{\Sigma P \cdot \Sigma C_p \cdot \alpha \cdot \beta}{3600}$$

α, β The factors of the highest current and voltage range reached are to be substituted here.

Output frequency: max. 60 kHz

#### Safety Requirements

- Isolation protection EN 61010-1
- CE-certified
- Degree of Protection: Device closed IP-68  
Device open IP-40
- Storage Temp.: -20°C ... +60°C
- Relative humidity: ≤ 85% at Ta ≤ 21°C
- Relative humidity: ≤ 95% at Ta ≤ 25°C  
at 30 days/year: