C300 3-Phase Power Calibrator and Tester

3 x 0...560V, 3 x 0...120A, 40...500Hz
0°...±360°

Accuracy:
0.02% or 0.05%
Innovative-Developing Enterprise Calmet Ltd.

- Calmet = CALibrators + METrology
- founded in 1989, roots come from LUMEL, big factory of measurement equipment in Poland, Zielona Gora
- designing, production, selling and servicing new kind of calibrators and electric equipment testers
- employs over 15 engineers, including 3 with Ph.D.
- cooperates with University of Zielona Gora; common projects and lectures
- since 1996 – electricity meters testing and power network parameters analysing
- since 2002 – generating and measuring network quality parameters
- since 2006 – automation of electro-utility automatic protective equipment testing
- since 2011 – automatic Test Benches for energy meter testing
C300 3-Phase Power Calibrator and Tester

Mesurement Equipment since 1989

Customer Support in problems solving

Energy meter testers, Current Transformers testers, Power quality analysers

AC/DC Voltage, Current, Power & Resistance Calibrators, Test Benches

Control Software for measurement equipment

1 phase
3 phase
3 phase, 120A
3 phase, 0.05%

3 phase U,I,ϕ,P,Q,S,E
1 phase U,I,ϕ,P,Q,S,E

1 phase U,I,ϕ,F

Multifunctions DC/AC

3 phase Test Bench
1 / 3 phase Phatnom Load 0...5A
In Manual Mode it is possible to set:
- Voltages up to 3 x 560V
- Currents up to 3 x 120A
  (360A in single phase connection)
- Frequency in range 40...500Hz
- Phase angles in range 0...360°
- Wave shapes of signals
- Signal changes in time

In Automated Mode it is possible to test:
- Electricity meters
- Protective relays
- Current transformers
- Current clamps
- Measurement transducers

Settings by PC

Only in Automated Mode

Device Under Test
**Voltage:**
- range: 0.5000V ... 560.000V
- uncertainty: ±0.02%
- short term stability: ±0.005%
- long term stability: ±0.01%
- temp. drift: ±0.0005%/1°C

**Maximum load:**
- 560mA@70V
- 280mA@140V
- 140mA@280V
- 70mA@560V
- sin distortion: 0.05%

**Current:**
- range: 0.001000A ... 120.000A
- uncertainty: ±0.02%
- short term stability: ±0.005%
- long term stability: ±0.01%
- temp. drift: ±0.0005%/1°C

**Maximum load:**
- 17V@0.5A
- 8.5V@6A
- 3.3V@20A
- 0.70V@120A
- sin distortion: 0.1%

**Frequency:**
- range: 40.000Hz... 500.000Hz
- uncertainty: ±0.005%

**Phase shift:**
- range: 0.00°... ±360.00°
- uncertainty: ±0.05°

**Power:**
- range: 0...3 x 67200 W,var,VA
- resolution: 0.00001-1W,var,VA

**Waveform:** harmonics (up to 3200Hz)

**Waveform:** interharmonics (up to 9kHz)
Example of E/P characteristics PF=1 & PF=0.5L
C300 3-Phase Power Calibrator and Tester
Dips, Interruptions, Swells, Shocks

Calibrator output signal change versus time

- **Single Voltage Dip (100ms)**
- **Periodic Voltage Swells (2 periods)**
- **Single Voltage Interruption (100ms)**
- **Single Current Shock (1 period)**
C300 is controlled via RS232/USB by PC Software
The transmission protocol (simple text e.g.: U_230,57.70,1[CR][LF]) is available for customers

Calpro 300 Basic version enables setting:
- voltages, currents, frequency, phase angles and powers
  (Symmetric and Asymmetric)
- Harmonics, Interharmonics and Special Shapes of signals
Calpro 300 PC Software allows to create Data Base with:

- **Type** of Device Under Test – properties of device like meter constant, range, class of accuracy etc.
- **Procedure** – set of load points for testing (settings of U, I, φ, f, P, Q, S, harmonics, no. of impulses...)

and then to perform testing:

- **Auto Test** – automatic testing based on Type and Procedure

and Result evaluation:

- **Result** – presentation in form of Table (user editable) or Diagram with possibility of printout or export to Excel

<table>
<thead>
<tr>
<th>No</th>
<th>Point name</th>
<th>Time</th>
<th>U1 [V]</th>
<th>U2 [V]</th>
<th>U3 [V]</th>
<th>I1 [A]</th>
<th>I2 [A]</th>
<th>I3 [A]</th>
<th>f [Hz]</th>
<th>φ1</th>
<th>φ2</th>
<th>φ3</th>
<th>Δ</th>
<th>∞</th>
<th>Limit [%]</th>
<th>ε [%]</th>
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<td>Cos 1.00 L</td>
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</table>
Calpro 300 TS (Test System) version enables automatic testing the following devices:

- **Electricity meter** function for automatic testing of meters
- **Relay** function for automatic testing of protective relays
- **Current transformer** function for automatic testing of current transformers
- **Clamp** function for automatic testing of current clamps
- **Transducer** function for automatic testing of measurement transducers
Testing Energy meter with C300 as a Source and Reference

Reference Energy is calculated on base of equation:

\[ E_{\text{Ref}} = U \times I \times \cos \phi (\sin \phi) \times t \]

Where:
- \( E_{\text{Ref}} \) – reference energy
- \( U \) – set value of voltage
- \( I \) – set value of current
- \( \cos \phi / \sin \phi \) – power factor
- \( t \) – time of impulses counting
Testing Energy meter with C300 as a Source and Error Calculator with external Reference Meter

Reference Energy is calculated on base of number of impulses and constant of any Reference Meter (Radian, ZERA, MTE....)
C300 3-Phase Power Calibrator and Tester
Current Transformer and Clamps Testing

- 1000A clamp and sum of currents
- 1000A clamp with 100 turns coil
- 100A clamp and 100A cable

CT 100A / 5A
Up to 360A in parallel