



Calmet TE30

Three Phase Network Analyser and
Tester of Electricity Meters and
Instrument Transformers



Calmet Sp. z o.o.

- ❑ Calmet = **CAL**ibrators + **MET**rology
- ❑ 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 25 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
- ❑ since **2019** – new group of Automatic Test Systems

**Customer Support
in problems solving**

**Measurement Equipment
since 1989**

**Energy meter testers, Current
Transformers testers, Power
quality analysers**

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



**1 phase,
0,2%**

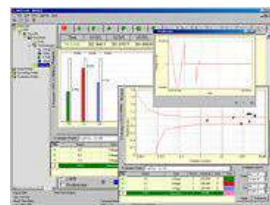
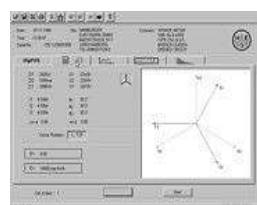


**3 phase,
0.05%**



**3 phase,
120A, 0.02%**

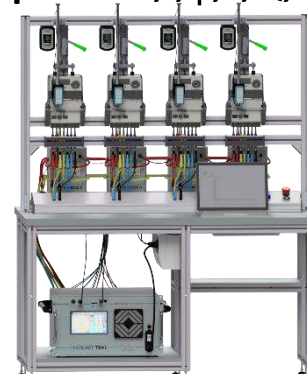
**Control Software for
measurement equipment**



3 phase U,I,φ,P,Q,S,E



1 phase U,I,φ,P,Q,S,E



3 phase Test Bench



Multifunctions DC/AC

**Current and Voltage Source with
Integrated Reference Standard**



Testing whole measurement system!

Accuracy of all kind of
Electricity Meters ϵ [%]

CT/PT burden,
ratio, phase shift
error

Electromechanical
Meters

Electronic (static)
Meters

4-Quadrants
Meters

Max Demand
Meters

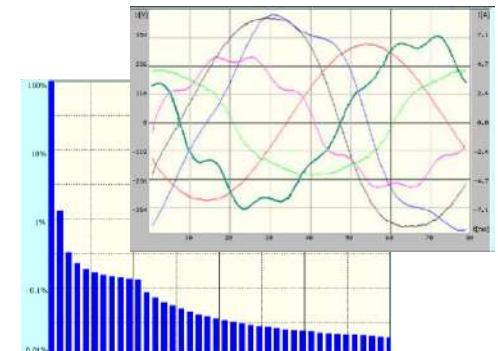


Connection
errors



TE30

Power Quality
in point of
measurement

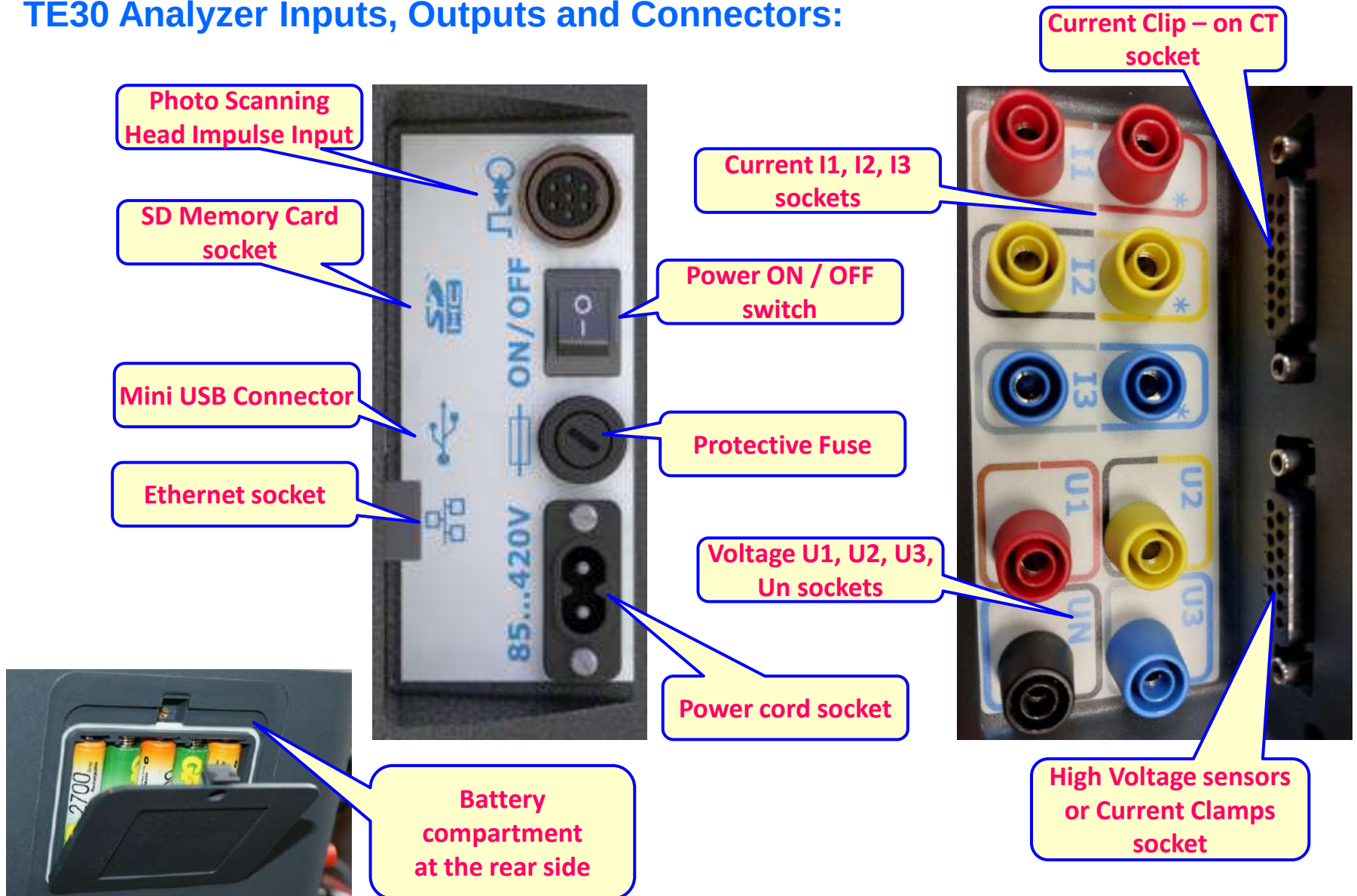


- ▶ Measure of power network parameters and Meters testing in accuracy class **0.05** or **0.1**
- ▶ Voltage range **0.05...600V**
- ▶ Current range **0.001...12(100)(1000)(30/300/3000)A**
- ▶ Testing of energy meters, potential and current transformers (**CT / PT**)
- ▶ Recording and analyse of **Power Quality**
- ▶ **Vector, oscilloscope**, bar and trend charts of three phase network
- ▶ Automatic Meter Constant recognition
- ▶ Automatic setting of measurement conditions
- ▶ Powering from measurement network 50...450V AC and from internal battery with its own charger
- ▶ Big 7-inch full colour touch screen and computer software Calmet TE30 PC-Soft
- ▶ Reading data and remote controlled via **USB, Ethernet, Bluetooth**
- ▶ Recording data on flash memory SD card up to **32GB**
- ▶ Calibration Certificate



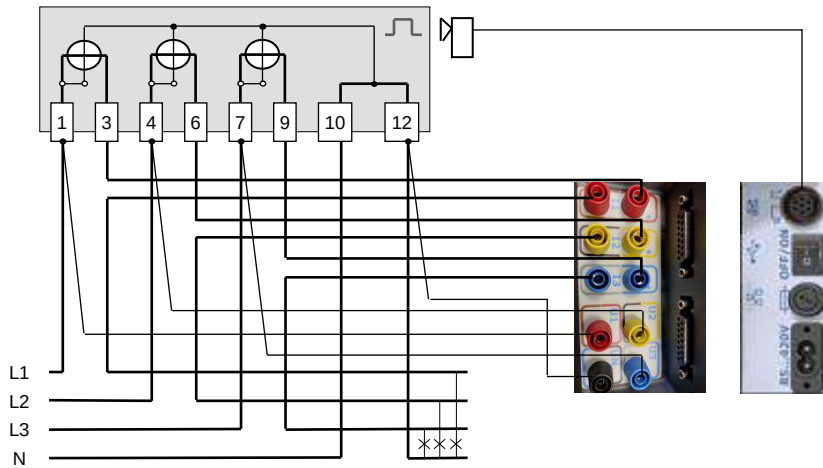
				U1=auto U2=auto U3=auto	I1=auto I2=auto I3=auto			09:13:16 17-04-2014		

TE30 Analyzer Inputs, Outputs and Connectors:

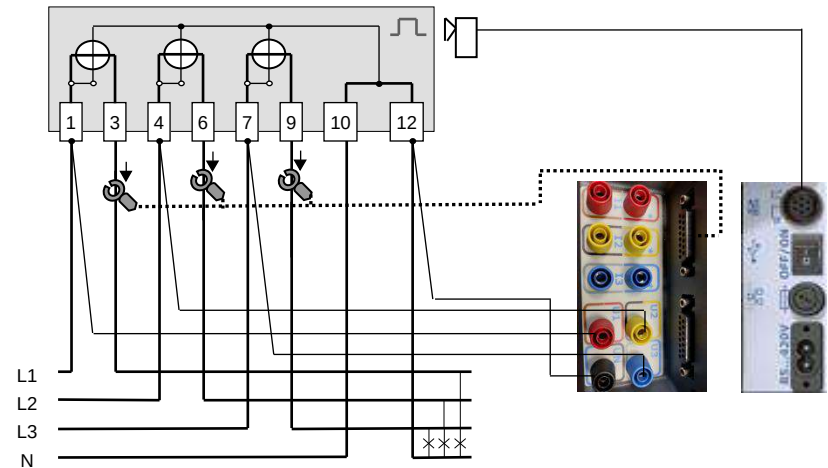


All possible types of connection: 1P2W, 3P4W, 3P3W, ... , direct or with clamps

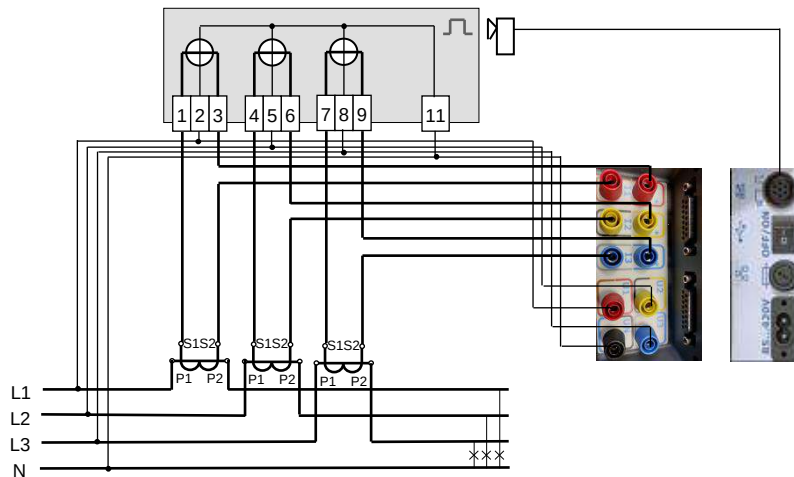
Electricity meter testing – direct connection



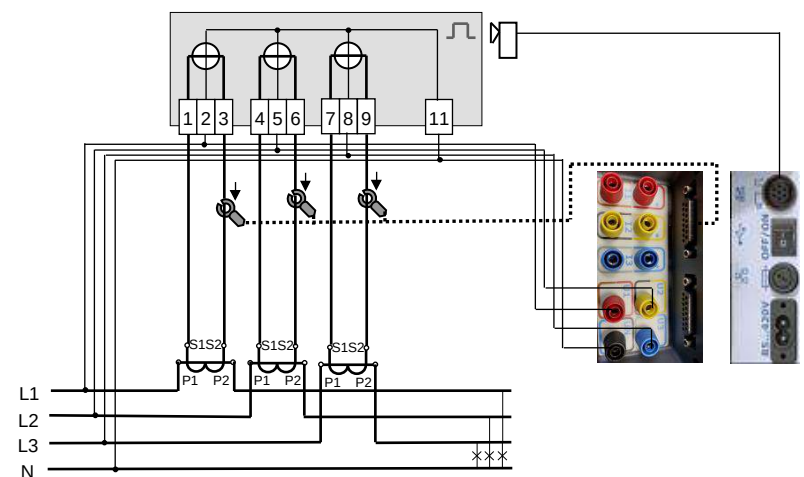
Electricity meter testing – connection with clamps



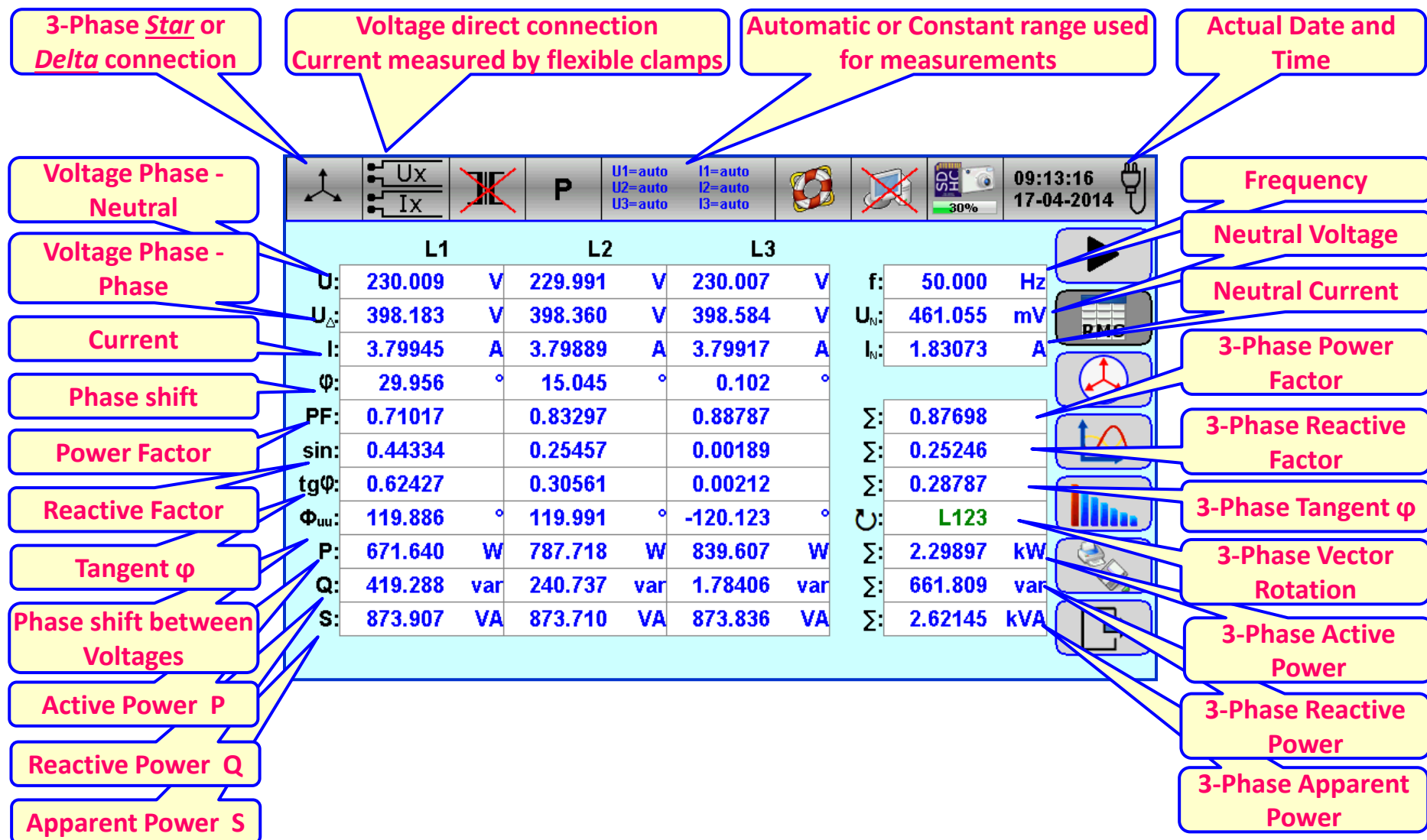
Electricity meter (CT) testing – direct connection



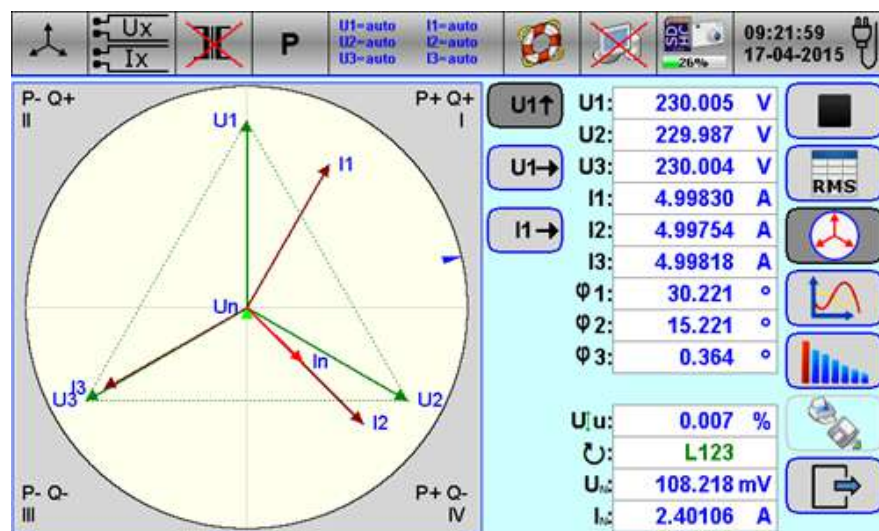
Electricity meter testing (CT) – connection with clamps



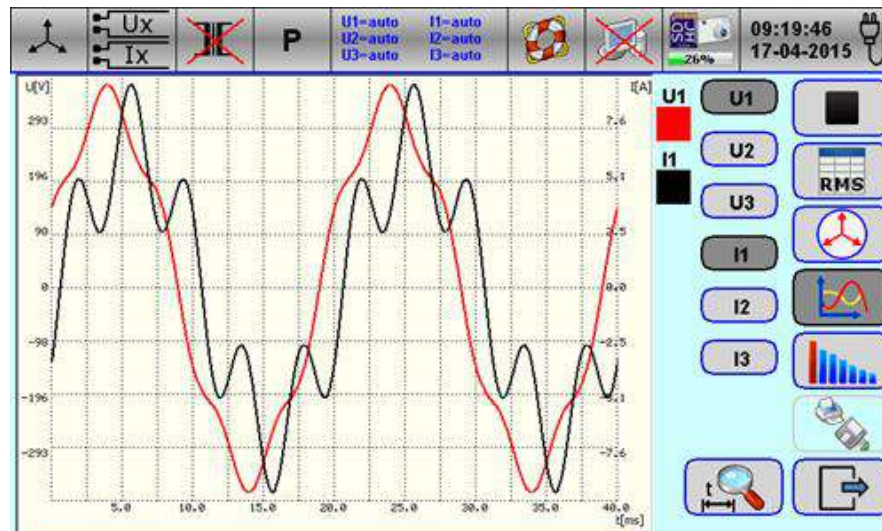
RMS measurement results and TE30 Analyzer configuration:



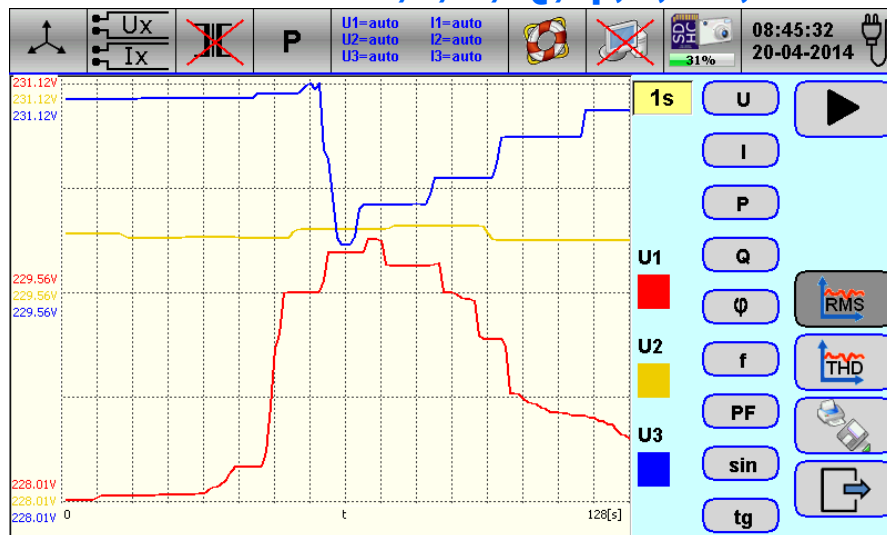
Vector diagram with calculated U_n & I_n



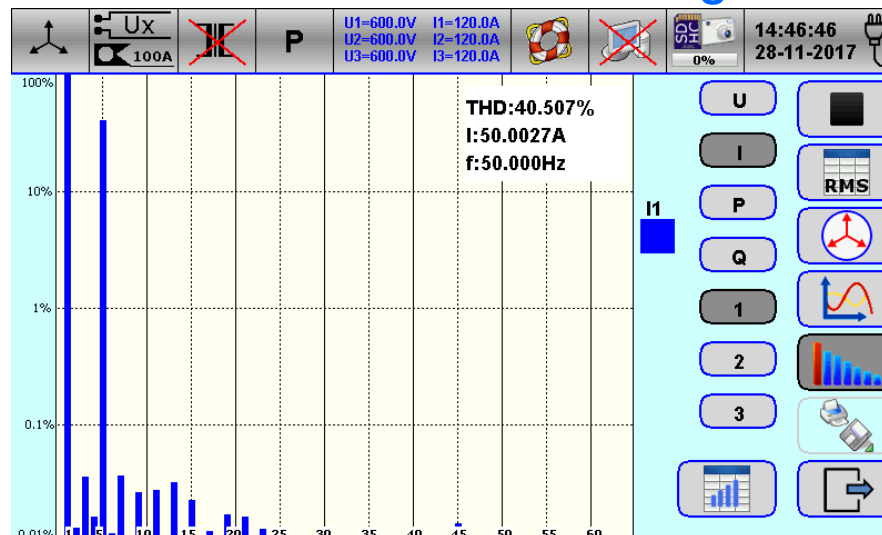
Oscilloscope of U1, U2, U3, I1, I2, I3



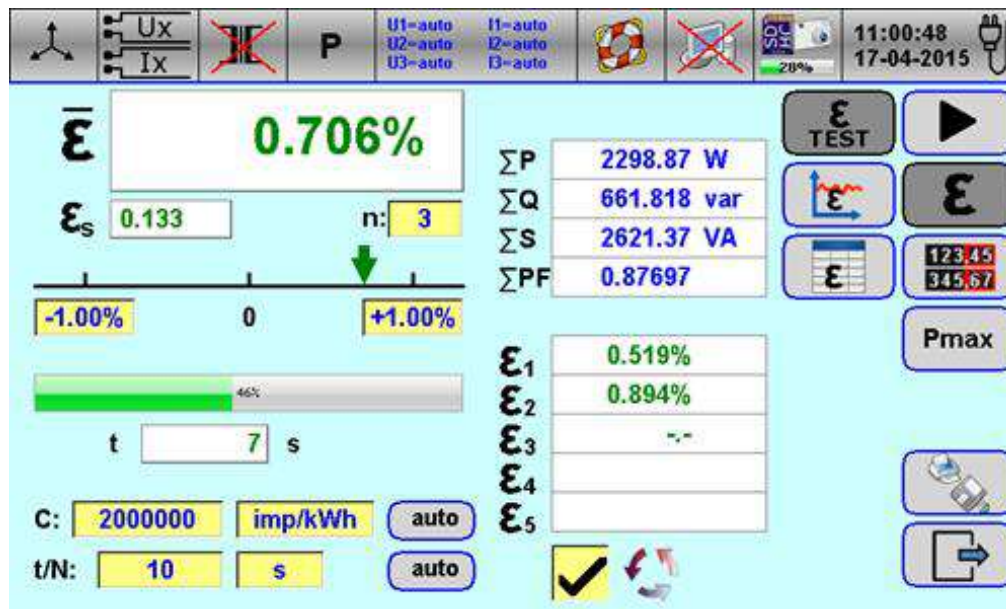
Time trend of U, I, P, Q, ϕ , f, PF, ...



Harmonics table & bar diagram



Energy meter testing on site and in laboratory



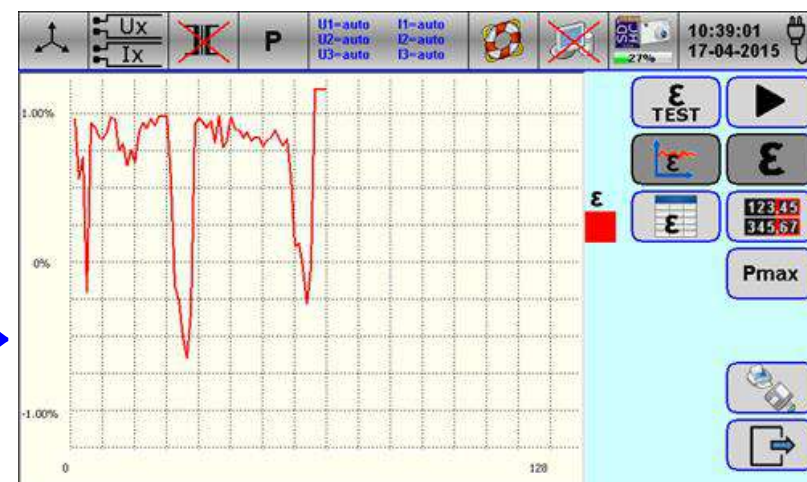
- ▶ function of computing meter error (partial errors, average error, standard deviation) directly in percentages [%] with method of setting time of measurement or number of impulses,
- ▶ function of automatic identification energy meter constant,
- ▶ function of automatic determining measurement time or number of pulses.

Results of testing are presented as:

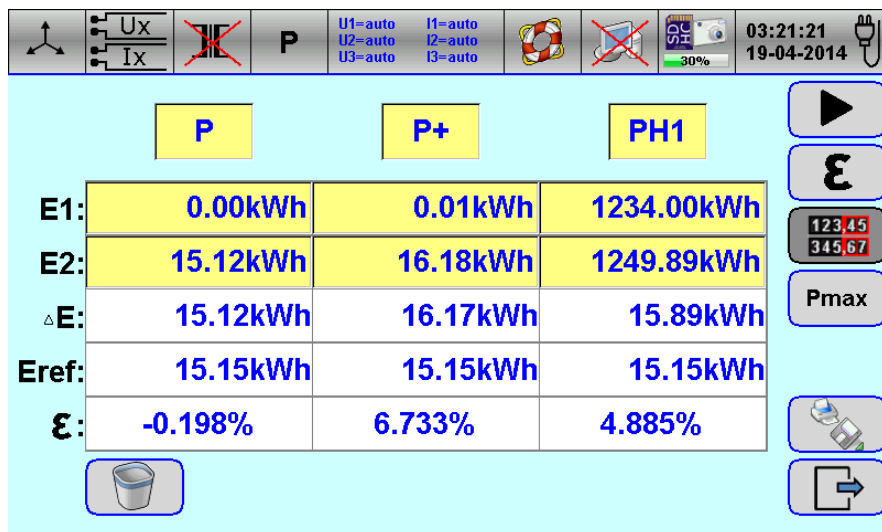
No	⌚	P[W]	Q[VAR]	Limit[%]	ε[%]	εs[%]	OK
53	10:35:54	4354.51	2513.27	1.000	0.785	0.031	✓
54	10:36:05	4446.65	2566.44	1.000	0.834	0.017	✓
55	10:36:18	4367.10	2520.52	1.000	0.577	0.231	✓
56	10:36:30	3864.66	2230.56	1.000	0.113	0.173	✓
57	10:36:42	3362.10	1940.91	1.000	0.130	0.243	✓
58	10:36:54	2859.78	1650.98	1.000	-0.043	0.196	✓
59	10:37:06	2357.62	1361.12	1.000	-0.290	0.303	✓
60	10:37:18	2038.78	1176.61	1.000	-0.038	0.272	✓
61	10:37:30	2139.21	1234.57	1.000	1.247	0.068	✗
62	10:37:42	2239.67	1292.54	1.000	1.233	0.062	✗
63	10:37:54	2340.15	1350.53	1.000	1.247	0.083	✗
64	10:38:06	2440.61	1408.50	1.000	1.119	0.084	✗

← TABLE

CHART →

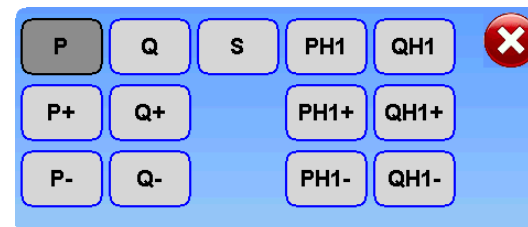


Energy meter Register testing on site and laboratory



	P	P+	PH1
E1:	0.00kWh	0.01kWh	1234.00kWh
E2:	15.12kWh	16.18kWh	1249.89kWh
ΔE:	15.12kWh	16.17kWh	15.89kWh
Eref:	15.15kWh	15.15kWh	15.15kWh
ε:	-0.198%	6.733%	4.885%

- ▶ function of energy measurement with method of setting time periods for verification of energy meter Register directly in percent [%],

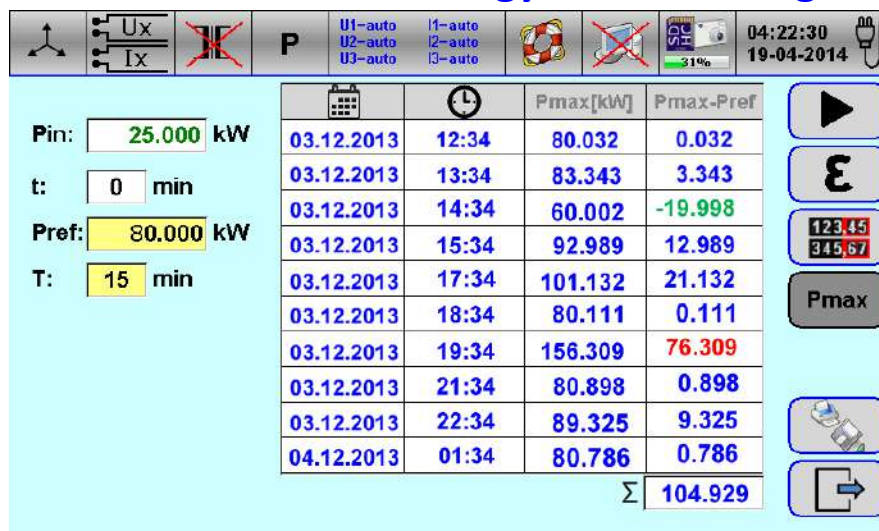


- ▶ function of energy measurement for power P, P+, P-, Q, Q+, Q-, S,

- ▶ function of energy measurement for the first (fundamental) harmonic of active power PH1 and reactive power QH1,

IEC 62053-24/Ed.1 Static meters for reactive energy at fundamental frequency (classes 0,5 S, 1 S and 1)

Maximum Demand Energy meter testing



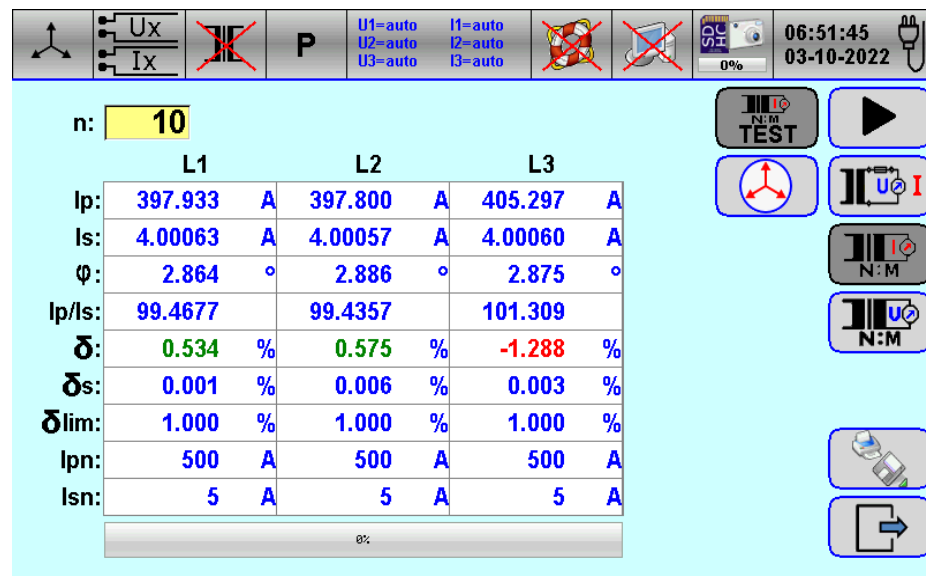
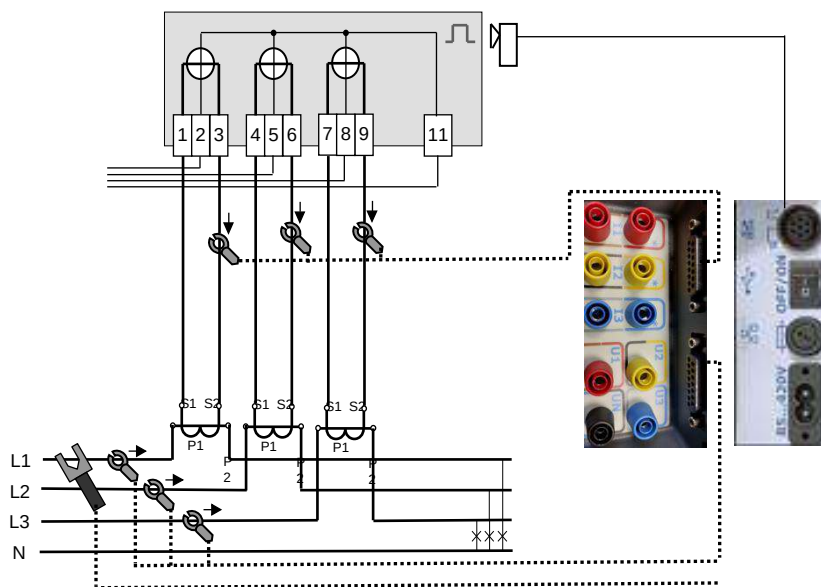
	Pmax[kW]	Pmax-Pref
03.12.2013 12:34	80.032	0.032
03.12.2013 13:34	83.343	3.343
03.12.2013 14:34	60.002	-19.998
03.12.2013 15:34	92.989	12.989
03.12.2013 17:34	101.132	21.132
03.12.2013 18:34	80.111	0.111
03.12.2013 19:34	156.309	76.309
03.12.2013 21:34	80.898	0.898
03.12.2013 22:34	89.325	9.325
04.12.2013 01:34	80.786	0.786
Σ	104.929	

- ▶ function of maximum power measuring for testing of maximum demand energy meters,

CT, PT Transformers testing (LV & MV, voltage and current, simultaneously in three phases) directly on site: ratio error and phase shift error testing

Connection diagram

CT Ratio error and phase error testing

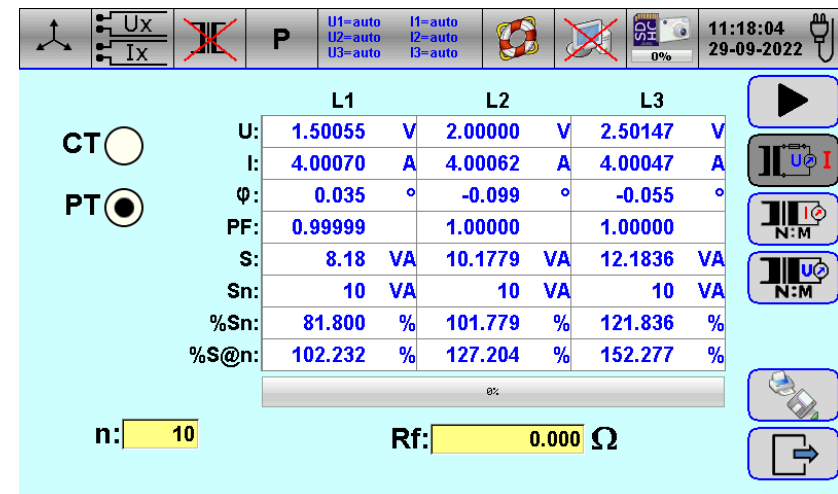
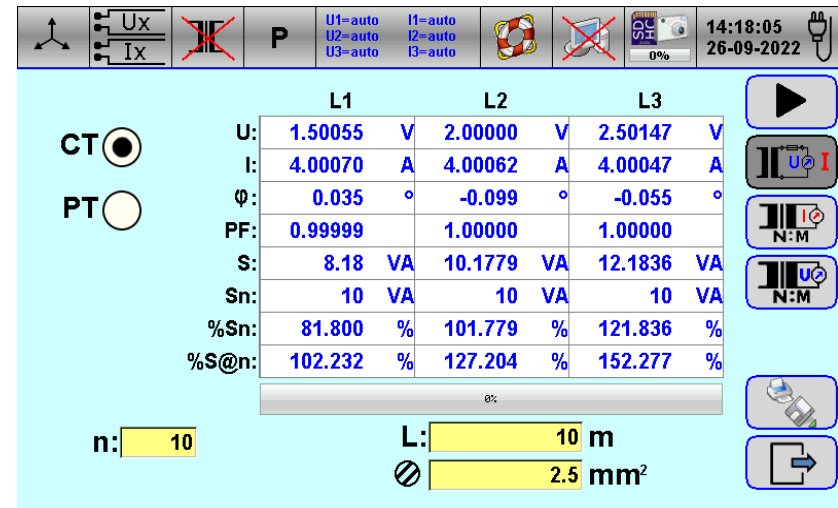
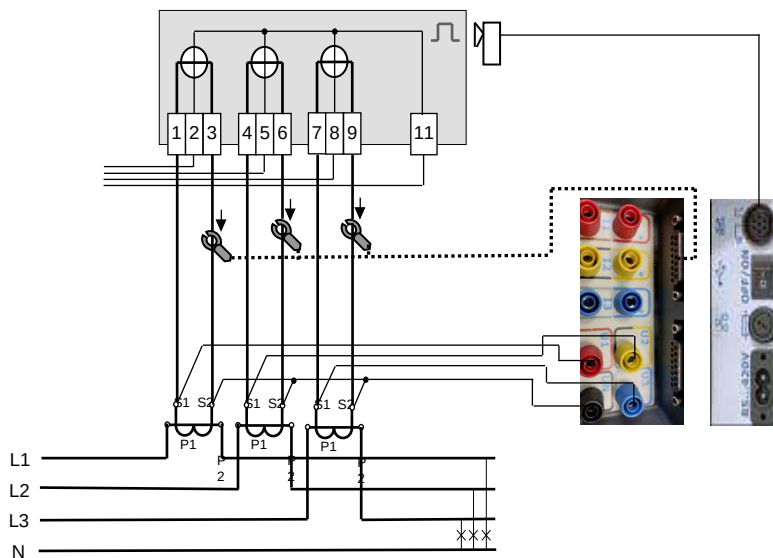


- ▶ function of computing transformer ratio error directly in percent [%]
- ▶ function of computing phase shift error [°]

CT, PT Transformers testing (LV i MV, voltage and current, simultaneously in three phases) directly on site: CT / PT burden testing

Test can be done by taking into account the length (L) and cross-section of connection wires and serial fuse (Rf) resistance

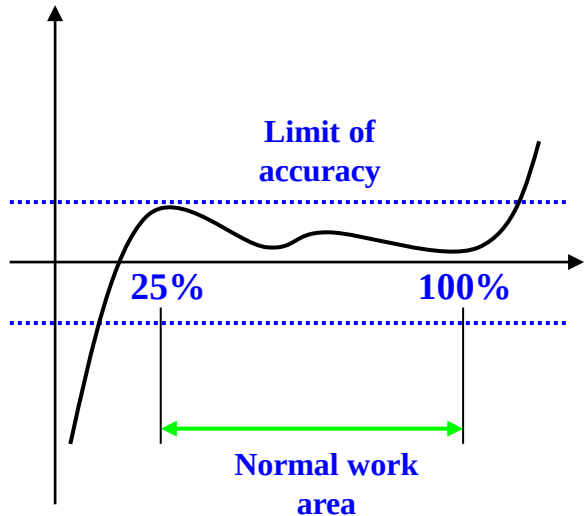
CT Burden testing



Why the transformer burden (load) is so important?!

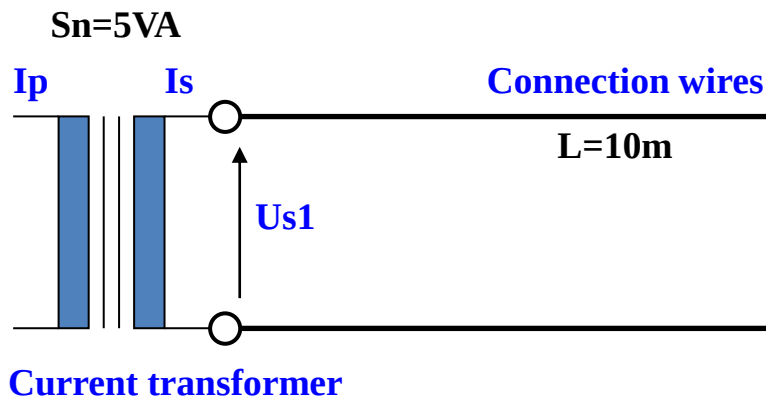
CT Transformer testing: burden testing

ε – ratio error [%]



CT – current transformer can operate with stated accuracy only between 25% - 100% of burden (load). In case of **too long**, or **too thin** wire dimension or **too small load**, the result, secondary current can be **out of accuracy** limits

[%] transformer power rating S_n

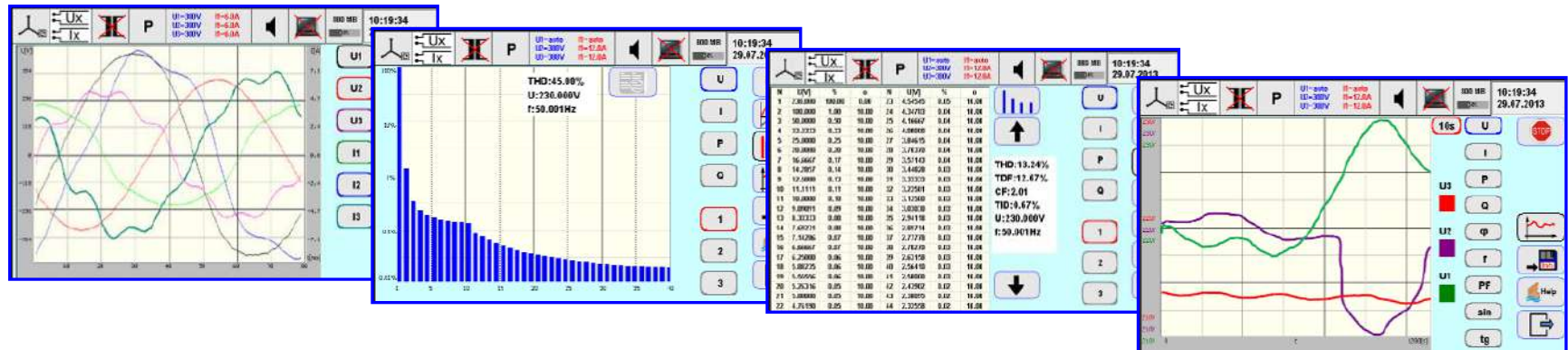


Example (power loss in cables):

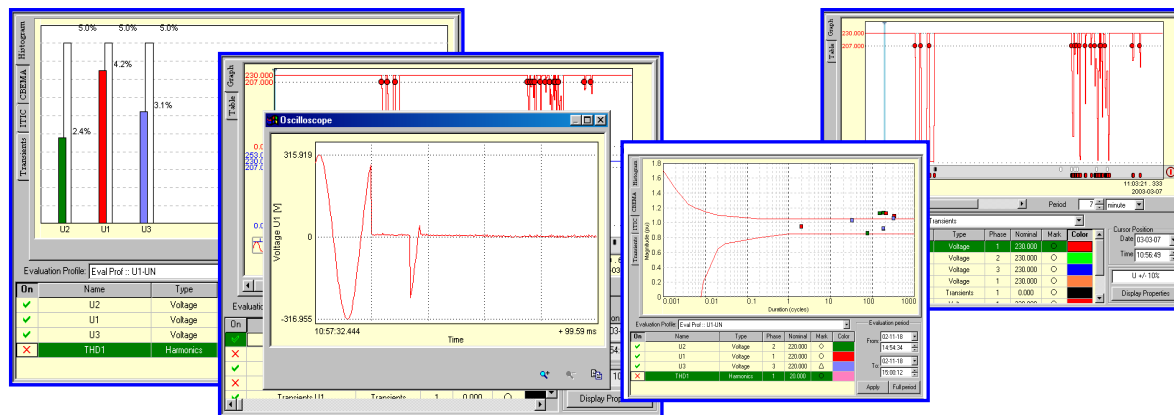
$$R_p = \frac{\rho_{cu} \cdot l}{S} = \frac{0,0175\Omega \frac{mm^2}{m} \cdot 2 \cdot 10m}{1mm^2} = 0,35\Omega$$

$$P_p = I_2^2 \cdot R_p = 5^2 A \cdot 0,35\Omega = 8,75VA$$

Function of power quality analyser + recording



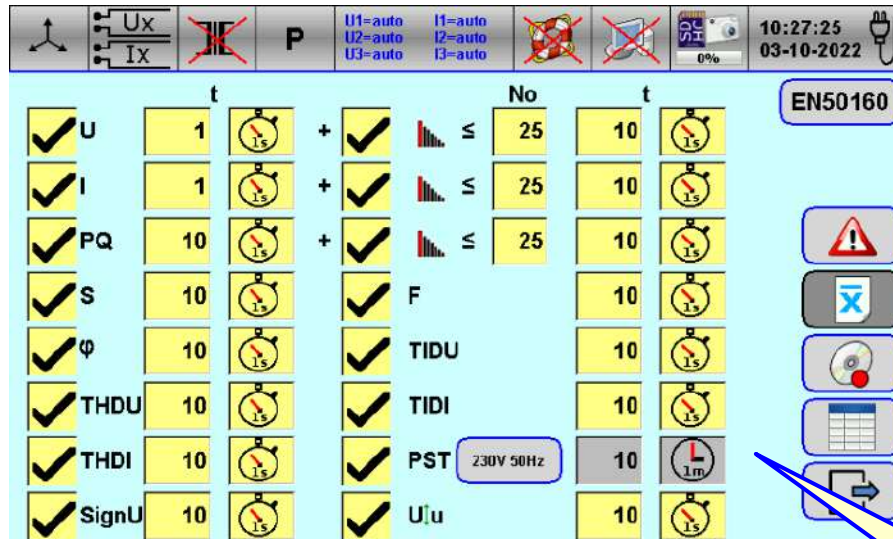
► measuring of power quality parameters according to IEC 61000-4-30 class A with visualization of measurement results in the real time mode



► analyzing of measurement results for EN 50160 compatibility or individual requirements of user

► recording of power network parameters in the SD Flash 4-32GB memory, which gives (8192x64)x106 sets of network parameters or long-term registration of power quality

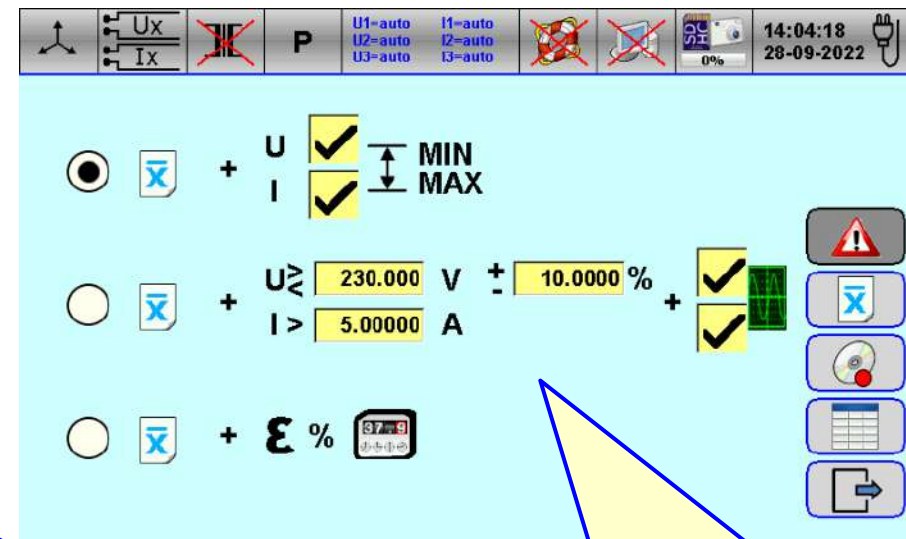
Function of power quality analyser + recording



Top bar: Ux, Ix, P, U1=auto, I1=auto, U2=auto, I2=auto, U3=auto, I3=auto, 10:27:25, 03-10-2022

Parameter	Value	Unit	Limit	Time
U	1	V	25	10
I	1	A	25	10
PQ	10	%	25	10
S	10	VA		10
ϕ	10	°		10
THDU	10	%		10
THDI	10	%		10
SignU	10			10

Right side: EN50160, warning icon, average icon, RMS icon, error icon, SD card icon, export icon.



Top bar: Ux, Ix, P, U1=auto, I1=auto, U2=auto, I2=auto, U3=auto, I3=auto, 14:04:18, 28-09-2022

Recording method selection: MIN, MAX, AVERAGE, OUTSIDE LIMITS, ENERGY METER ERROR.

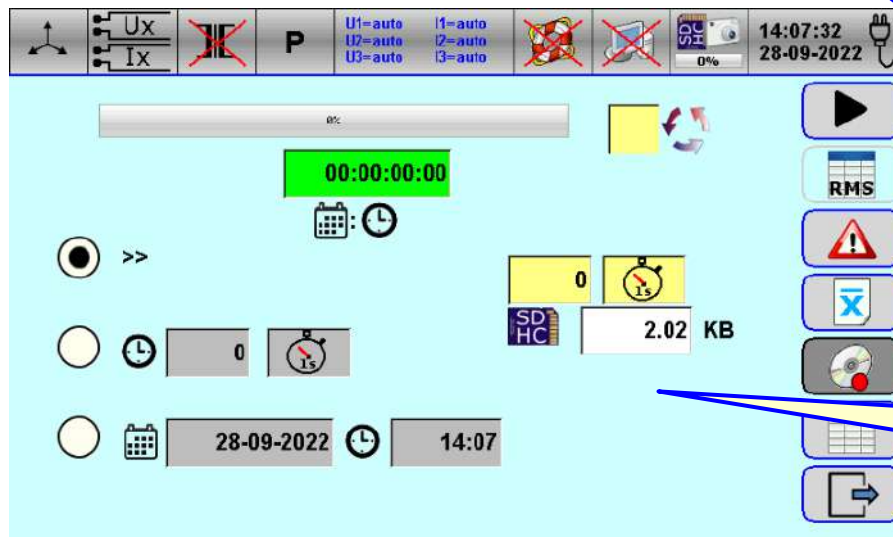
Parameters and averaging times: U ≥ 230.000 V, I > 5.00000 A, 10.0000 %, 10.0000 %.

Time length of recording and start date & time: 28-09-2022, 14:07.

selecting recording method: average value, max / min value, outside limits, every Energy Meter error

selecting recorded parameters and averaging times

selecting time length of recording and start date & time



Top bar: Ux, Ix, P, U1=auto, I1=auto, U2=auto, I2=auto, U3=auto, I3=auto, 14:07:32, 28-09-2022

Recording start time: 00:00:00:00

Recording start date: 28-09-2022

Recording start time: 14:07

Recording length: 2.02 KB

Right side: play icon, RMS icon, warning icon, average icon, SD card icon, error icon, export icon.

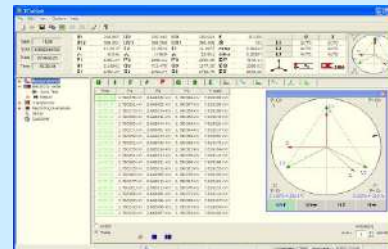
TE30 Analyzer's equipment delivered in price:

- TE30 analyzer class 0.05 or 0.1 with Basic function;
- Power supply cord;
- Fuse T500mA@230V (2pcs);
- Memory SD card (8GB);
- Operation manual of analyzer;
- Warranty card;
- Manufacturer calibration certificate;



TE30 Analyzer's optional equipment:

- Calmet TE30 PC-Soft with operation manual and USB mini / USB A interface cable,



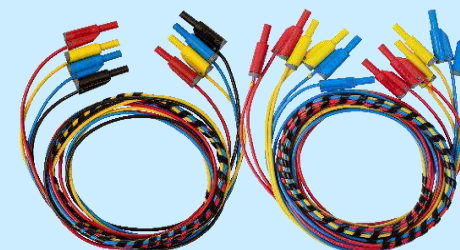
- REC function - recording of power network parameters,



- AD100EXT extension for powering TE30 from measurement network,



- EA34 set of safety measurement cables (10pcs),



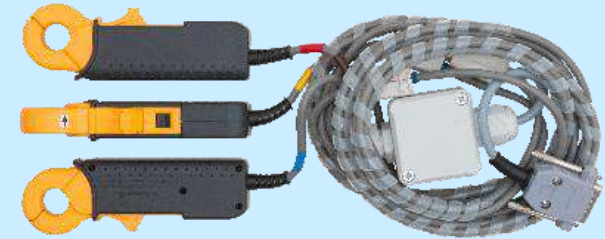
TE30 Analyzer's optional equipment:

- EA20 additional accessories (handlers and terminals 21pcs) of safety cables,
- CF106H photo head with holder for inductive meter and meter with LED,
- DR200D miniature thermal printer with Bluetooth,
- ET30 transportation case,
- ET31/ET32 transportation case for additional accessories,



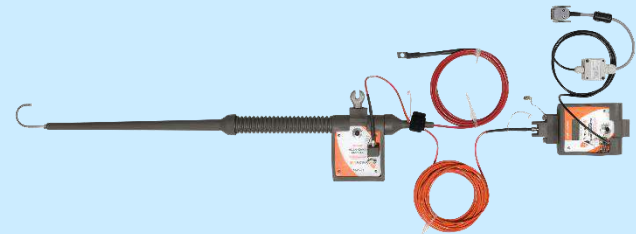
TE30 Analyzer's optional equipment:

- **CT10AC** electronic compensated clamps up to 12A (1compl),
- **CT100AC** electronic compensated clamps up to 120A (1compl),
- **CT1000AC** electronic compensated clamps up to 1200A (1compl),
- **FCT3000AC.B** electronic compensated flexible clamps in ranges 30/300/3000A (1compl),



TE30 Analyzer's optional equipment:

- AmpLiteWire 2000A primary current sensors up to 2000A for LV and MV nets (1pc),
- VoltLiteWire 40kV primary sensors up to 40kV (1pc),
- rechargeable battery NiMH AA R6 1.2V 2700mAh (5pcs),
- Calmet TE30 option set 01 (Calmet TE30+ET30+CT100AC+CF106H+EA34+EA20).



**TE30 Analyzer set
ready for operation**



Contact:

Calmet Sp. z o.o., Kukulcza 18 Street, 65-472 Zielona Gora, Poland EU

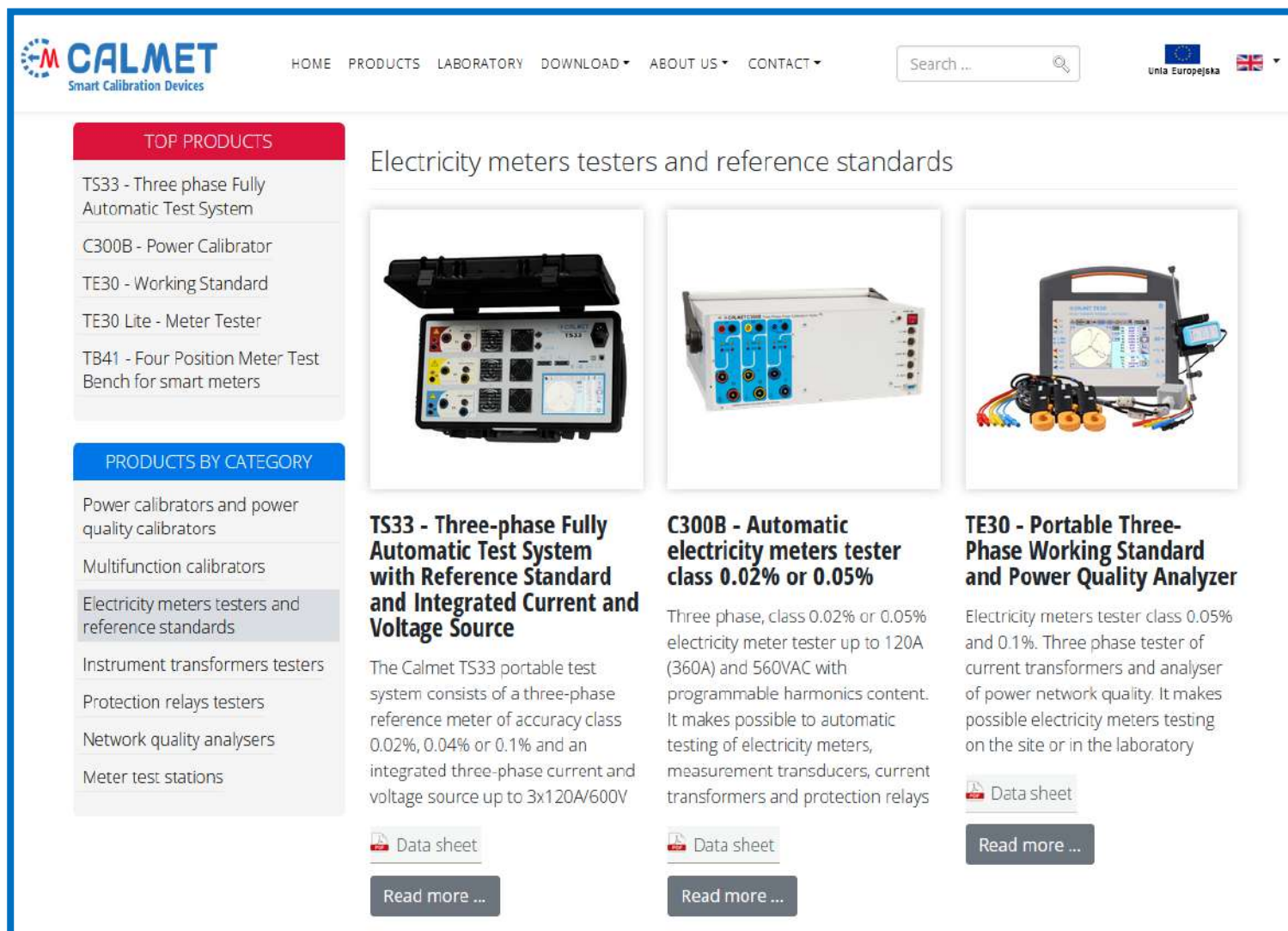
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Fax: +48 68 324 04 57

To see more devices and information visit our Web site: www.calmet.com.pl



The screenshot shows the CALMET website with a navigation bar at the top containing links for HOME, PRODUCTS, LABORATORY, DOWNLOAD, ABOUT US, and CONTACT. A search bar is also present. The main content area is titled "Electricity meters testers and reference standards" and features three product cards:

- TS33 - Three-phase Fully Automatic Test System with Reference Standard and Integrated Current and Voltage Source**: A portable test system consisting of a three-phase reference meter and an integrated three-phase current and voltage source.
- C300B - Automatic electricity meters tester class 0.02% or 0.05%**: A three-phase, class 0.02% or 0.05% electricity meter tester up to 120A (360A) and 560VAC with programmable harmonics content.
- TE30 - Portable Three-Phase Working Standard and Power Quality Analyzer**: An electricity meters tester class 0.05% and 0.1%. Three phase tester of current transformers and analyser of power network quality.

Each product card includes an image of the device, a brief description, a "Data sheet" link, and a "Read more ..." button. A sidebar on the left lists "TOP PRODUCTS" and "PRODUCTS BY CATEGORY".

or contact by e-mail: mail@calmet.com.pl