



Calmet TB51
Stationary Five Position
Three-phase Meter Test Bench



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%**

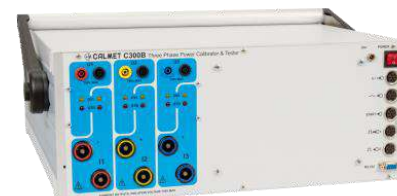
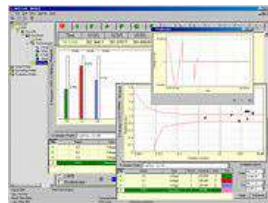
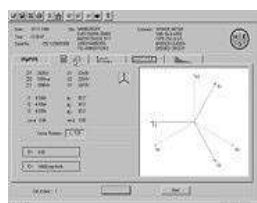


**3 phase,
0.05%**



**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

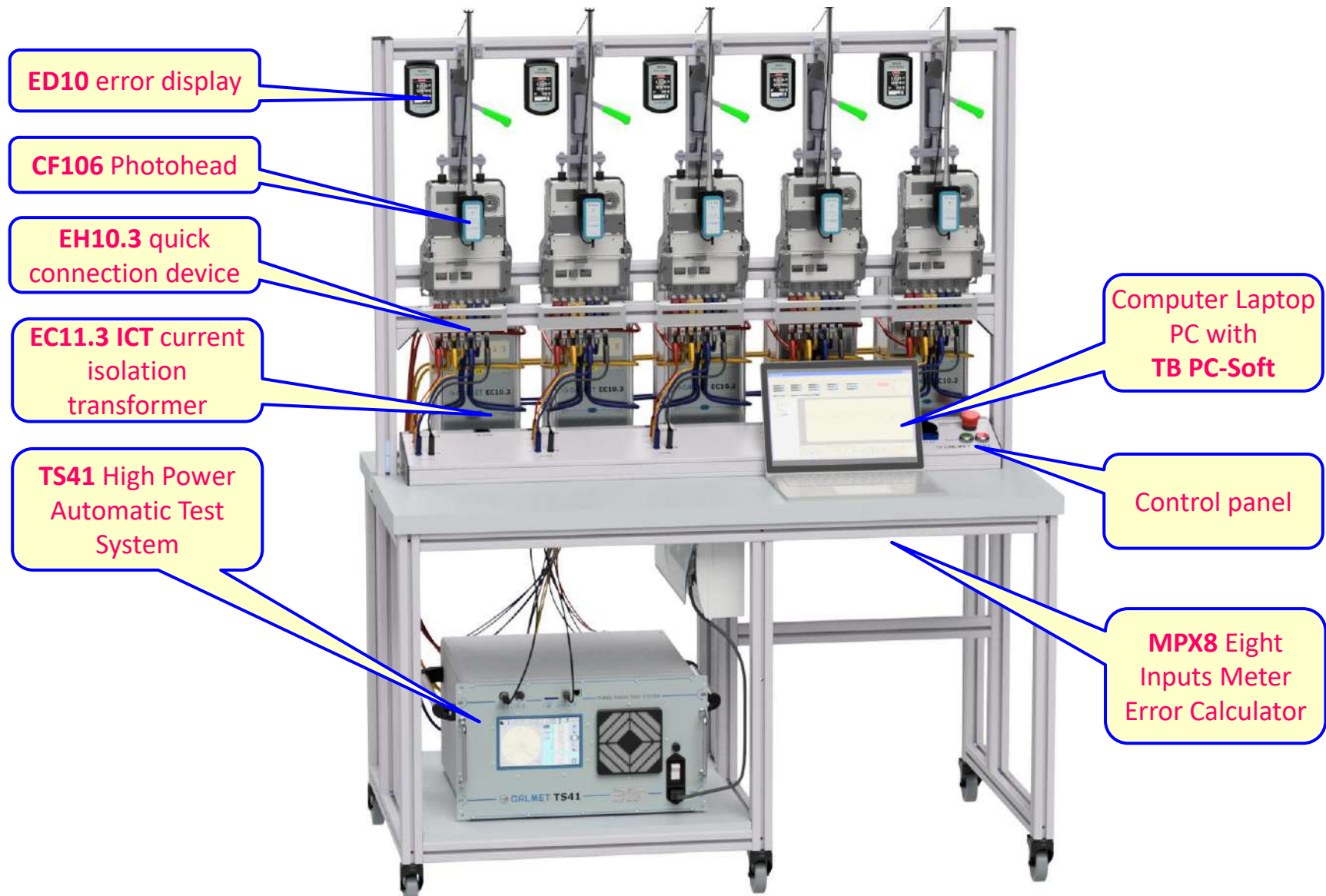
**Current and Voltage Source with
Integrated Reference Standard**



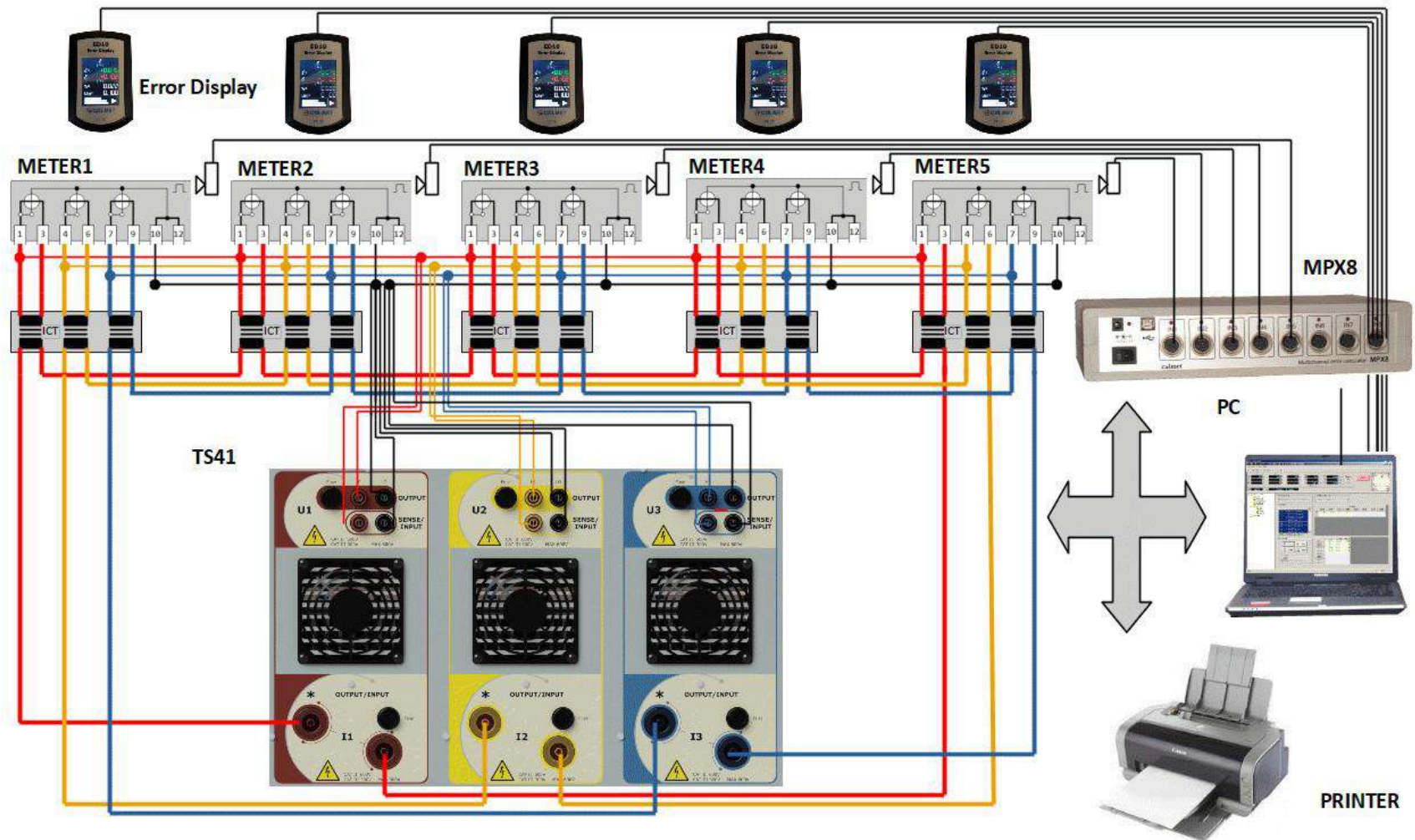
- ▶ Fully automatic procedures for meter testing
- ▶ Accuracy class **0.02%** or **0.04%** with internal reference standard
- ▶ Extremely high accuracy class with external reference standard
- ▶ Wide range of voltage **20...600V** at **150VA** and current **0.001...120A** at **300VA** per phase
- ▶ Harmonics up to 63rd and special shapes generation capability
- ▶ Simultaneously testing up to 5 meters with different constants
- ▶ Testing of single- & three-phase meters **with & without closed I-P links**
- ▶ Small size, light weight and economy powering max. 2000VA at fully possibilities according to EN-IEC 62057-1 standard
- ▶ Compact power source with internal reference standard can be applied as three-phase portable test system without need of an external PC



TB51 Front view:

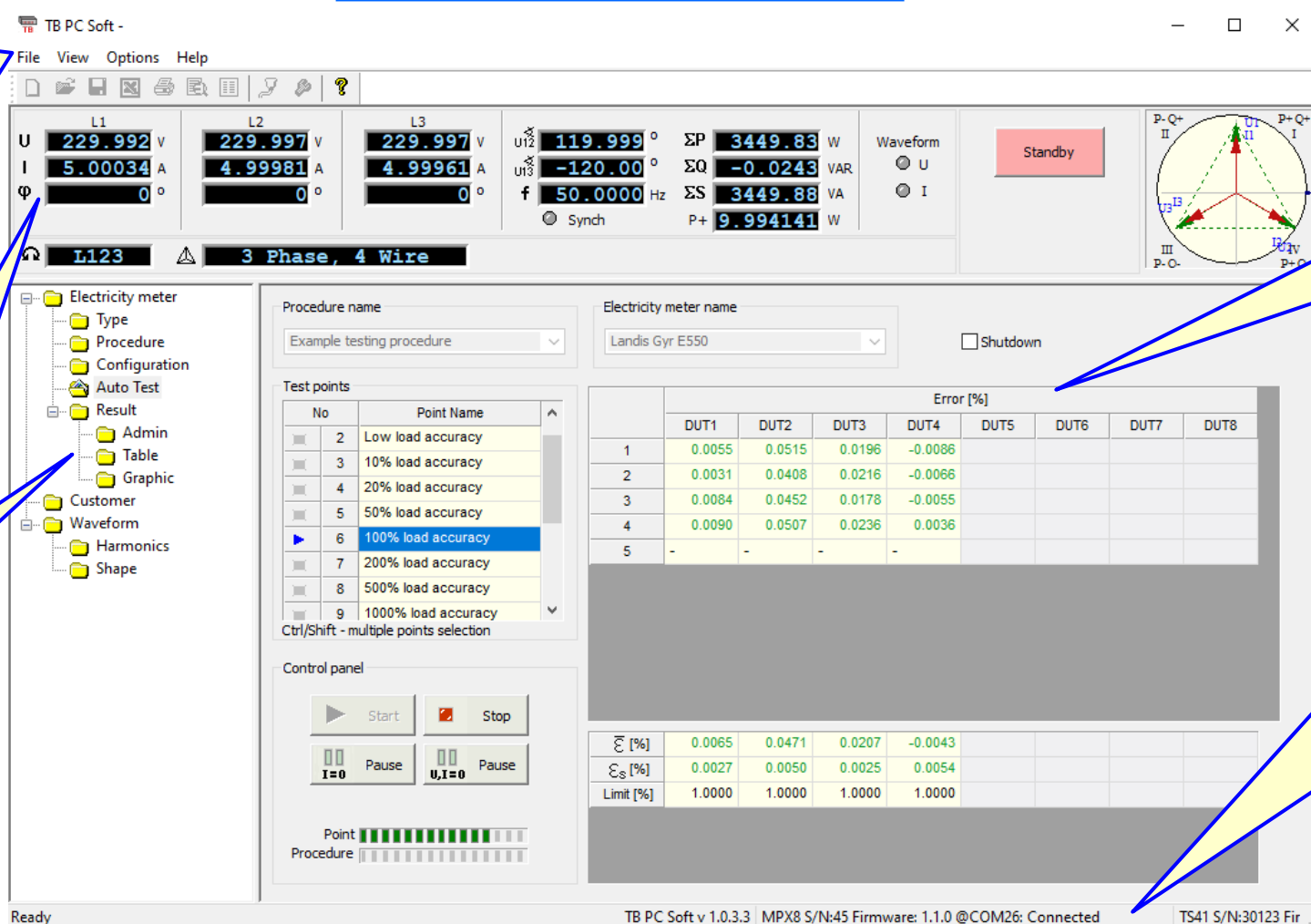


Typical configuration of Calmet TB51 Test Bench Station



TB PC-Soft functionality: Computer software TB PC-Soft is designed for control MPX8 Multichannel Meter Error Calculator, Power Source and auxiliary devices in order to full automation of electricity meters testing process

Start window of TB PC-Soft



Toolbar of software with menu

Actual settings and measurements field

Function field

Operation field

Communication status bar with information about MPX8 Multiplexer

Test points	
No	Point Name
2	Low load accuracy
3	10% load accuracy
4	20% load accuracy
5	50% load accuracy
6	100% load accuracy
7	200% load accuracy
8	500% load accuracy
9	1000% load accuracy

	Error [%]							
	DUT1	DUT2	DUT3	DUT4	DUT5	DUT6	DUT7	DUT8
1	0.0055	0.0515	0.0196	-0.0086				
2	0.0031	0.0408	0.0216	-0.0066				
3	0.0084	0.0452	0.0178	-0.0055				
4	0.0090	0.0507	0.0236	0.0036				
5	-	-	-	-				

	$\bar{\epsilon}$ [%]	ϵ_s [%]	Limit [%]
	0.0065	0.0471	0.0207
	0.0027	0.0050	0.0025
	0.0054	0.0004	0.0004

Functions of unrolling *Electricity meter* menu of TB PC-Soft

Type for entering parameters of meter under test (taken from specification data sheet or front plate) to testing electricity meters database

Procedure for entering data (load points, test conditions) to measuring procedures database

Configuration for activating impulse inputs of the MPX8 Multiplexer

Auto Test for performing automatic test of electricity meters, according to selected measuring procedure

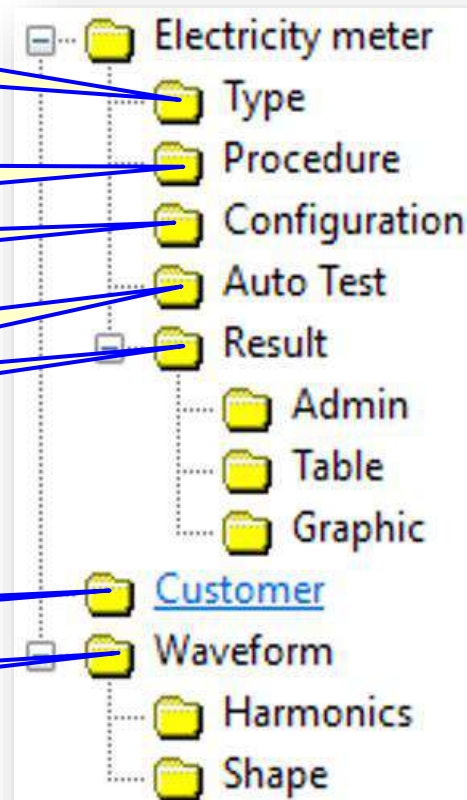
Result for visualization, edition and storing measurements results:

- **Admin** for using clients database during reports edition
- **Table** for visualization, edition and saving results in form of tables
- **Graphic** for visualization, edition and saving results in form of diagrams

Customer function contains customer database

Waveform for setting harmonic contents and shape of output signal:

- **Harmonics** for programming value and phase shift of harmonics
- **Shape** for programming different non harmonics testing shapes



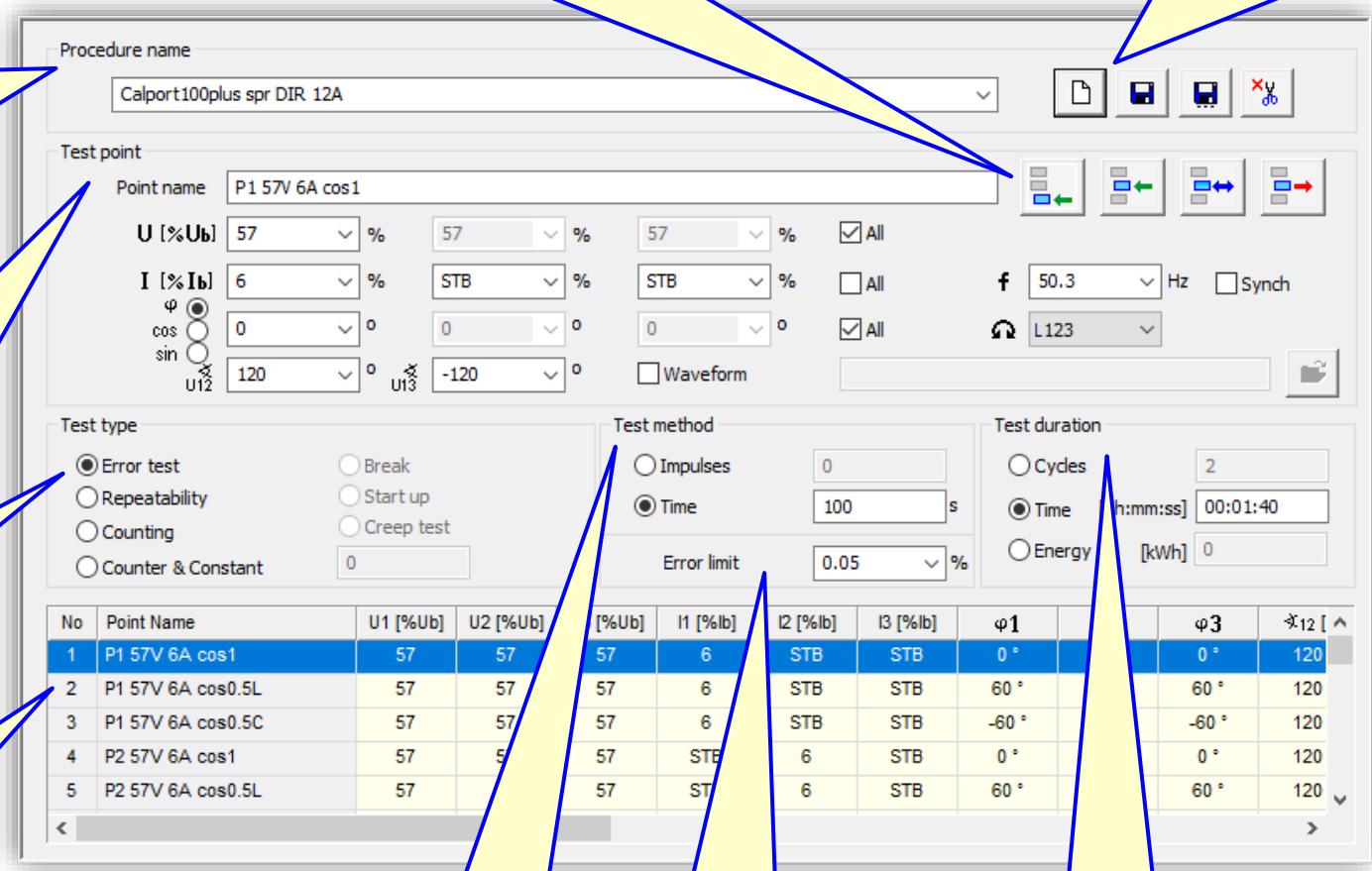
TB PC-Soft - Electricity meter **Type** setting – entering meter parameters and data to electricity meters' database

The screenshot shows the 'Electricity meter name' window with the following fields and callouts:

- Electricity meter name entering/reading:** Points to the 'Electricity meter name' text box containing 'Calport100plus spr DIR 12A'.
- Nominal / Base voltage and current entering:** Points to the 'Nominal parameters' section, specifically 'Ub - Base voltage' (230.0 V) and 'Ib - Base current' (20.0 A).
- Class of accuracy entering:** Points to the 'Class of accuracy' section, showing 'P' and '0.1 %'.
- Reset time entering for prepaid energy meters:** Points to the 'Reset' section, showing '0 s'.
- Reference meter check box:** Points to the 'Type of meter' section, where the 'Reference meter' checkbox is checked.
- Meter constant entering:** Points to the 'Meter constant' section, showing '5000.000000' and 'pulse/kWh'.
- Maximum voltage and current entering:** Points to the 'Nominal parameters' section, specifically 'Umax - Max voltage' (400.0 V) and 'Imax - Max current' (120 A).
- Frequency entering:** Points to the 'F - Frequency' section, showing '50 Hz'.
- Meter connection selection:** Points to the 'Meter connection' dropdown menu, which is set to '3 Phase, 4 Wire'.
- Direct, CT, VT buttons for selection direct electricity meter or with current and/or voltage transformer:** Points to the 'Transformer' section, where the 'Direct' checkbox is checked, and 'CT' and 'VT' checkboxes are unchecked.

The 'Comment' field at the bottom contains the text: 'Calport100plus sprawdzona dla wej prdowych bezpodrednich 12A'.

TB PC-Soft - Electricity meter testing Procedure setting – entering procedure data to measuring procedures' database



Procedure name
Calport100plus spr DIR 12A

Test point
Point name: P1 57V 6A cos1

U [%Ub]
57 % 57 % 57 % ☒ All

I [%Ib]
6 % STB % STB % ☐ All

φ
cos 0 0 0 ☒ All

sin
120 0 -120 0 ☐ Waveform

f 50.3 Hz ☐ Synch

L123

Test type
☒ Error test
☐ Repeatability
☐ Counting
☐ Counter & Constant
☐ Break
☐ Start up
☐ Creep test
 0

Test method
☐ Impulses
☒ Time
 Error limit: 0.05 %

Test duration
☐ Cycles
☒ Time
☐ Energy
 00:01:40 [kWh] 0

No	Point Name	U1 [%Ub]	U2 [%Ub]	U3 [%Ub]	I1 [%Ib]	I2 [%Ib]	I3 [%Ib]	φ1	φ2	φ3	φ12
1	P1 57V 6A cos1	57	57	57	6	STB	STB	0 °	0 °	0 °	120
2	P1 57V 6A cos0.5L	57	57	57	6	STB	STB	60 °	60 °	60 °	120
3	P1 57V 6A cos0.5C	57	57	57	6	STB	STB	-60 °	-60 °	-60 °	120
4	P2 57V 6A cos1	57	57	57	6	STB	STB	0 °	0 °	0 °	120
5	P2 57V 6A cos0.5L	57	57	57	6	STB	STB	60 °	60 °	60 °	120

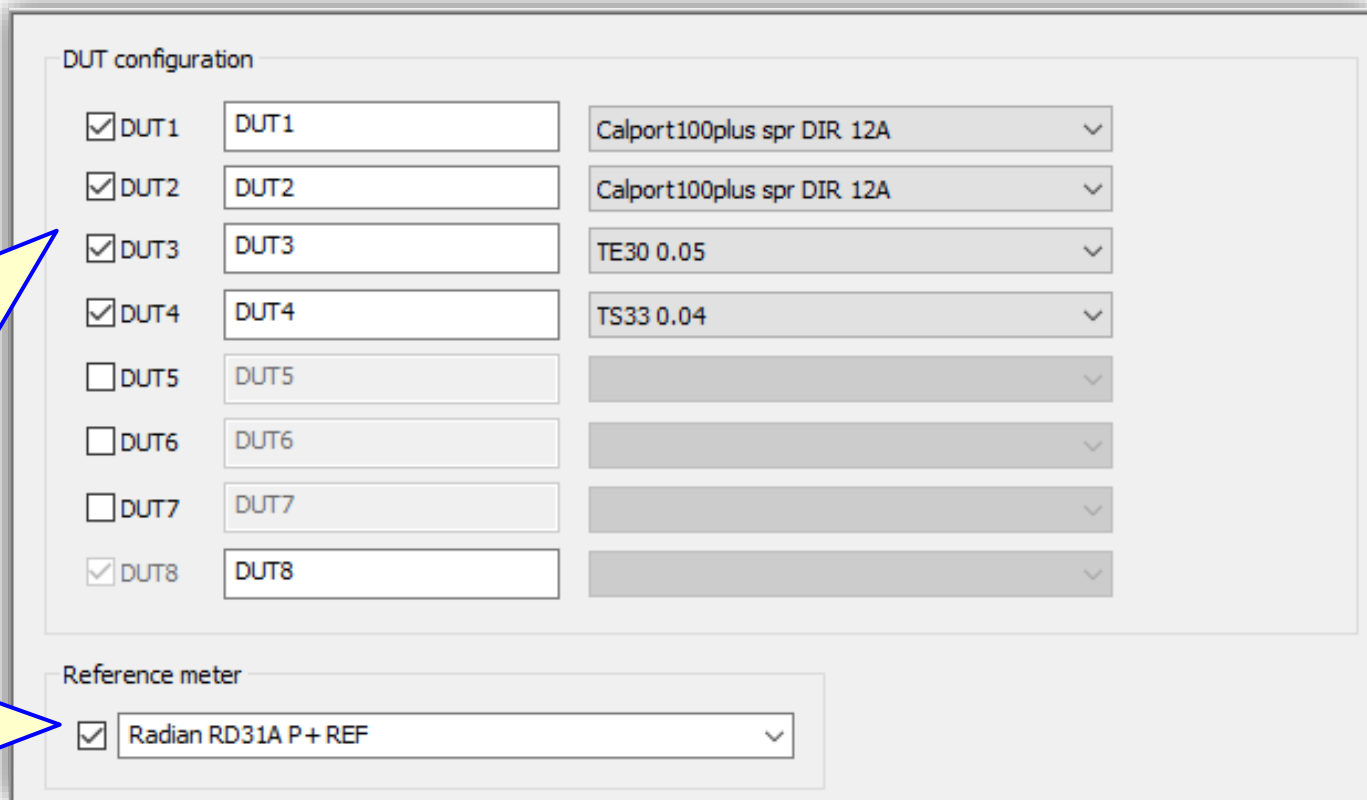
Callouts:

- Electricity meter name entering/reading
- Test point parameters: Point name, Base voltage, Base current, Phase shift, Frequency
- Test type selection
- Measuring procedure table
- Procedure table rows edition buttons
- Measuring procedure file edition
- Test method selection
- Error limit entering
- Test duration entering

TB PC-Soft - Electricity meter testing **Configuration** setting – activating impulse inputs of the MPX8 Error Calculator

*DUT configuration –
enabling or disabling
consecutive MPX8
Multiplexer inputs for
calculating error of
connected device under
test (DUT) with fields for
entering type of DUT*

*Reference meter –
enabling or disabling the
last, eighth input of
MPX8 Multiplexer as a
reference meter input*



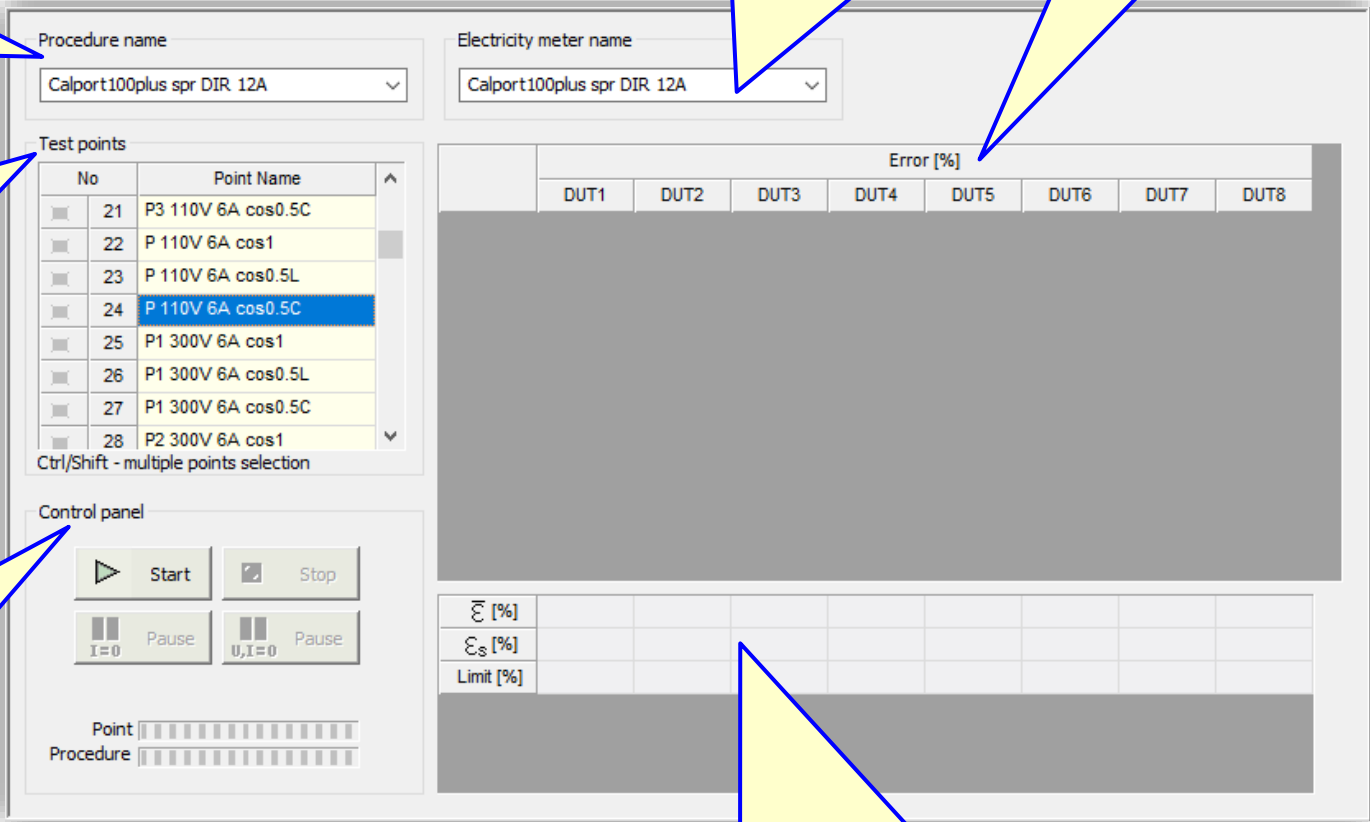
The screenshot shows the 'DUT configuration' window in the TB PC-Soft application. It contains a table for configuring eight DUT inputs and a section for the reference meter.

DUT configuration		
☒ DUT1	DUT1	Calport100plus spr DIR 12A
☒ DUT2	DUT2	Calport100plus spr DIR 12A
☒ DUT3	DUT3	TE30 0.05
☒ DUT4	DUT4	TS33 0.04
☐ DUT5	DUT5	
☐ DUT6	DUT6	
☐ DUT7	DUT7	
☒ DUT8	DUT8	

Reference meter

☒ Radian RD31A P+ REF

TB PC-Soft - Electricity meter testing **Auto Test** function – automatic test execution for selected meters, according to chosen procedure



Procedure name selection

Electricity meter name selection

Partial results table

Test points table with columns of measuring points

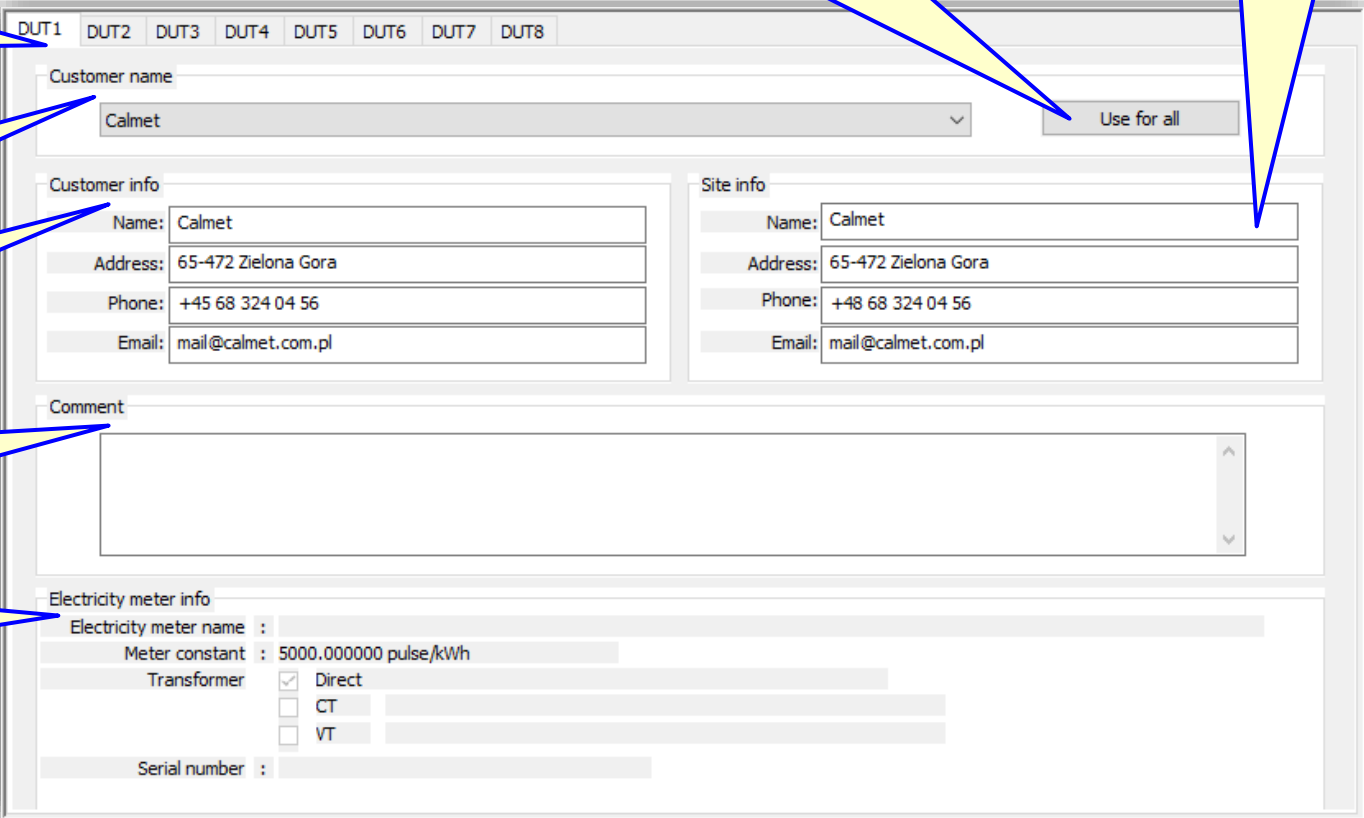
No	Point Name	Error [%]
21	P3 110V 6A cos0.5C	
22	P 110V 6A cos1	
23	P 110V 6A cos0.5L	
24	P 110V 6A cos0.5C	
25	P1 300V 6A cos1	
26	P1 300V 6A cos0.5L	
27	P1 300V 6A cos0.5C	
28	P2 300V 6A cos1	

Ctrl/Shift - multiple points selection

Control panel with Start / Stop button and Point / Procedure progress indicators

Control panel with Start / Stop button and Point / Procedure progress indicators

TB PC-Soft - Electricity meter testing **Result / Admin** function – preparing description data for measuring report edition



The screenshot shows the 'Result / Admin' function interface for preparing description data. The interface includes a tabbed menu at the top with tabs for DUT1 through DUT8. The main form is divided into several sections: 'Customer name' (a dropdown menu with 'Calmet' selected and a 'Use for all' button), 'Customer info' (fields for Name, Address, Phone, and Email), 'Site info' (fields for Name, Address, Phone, and Email), 'Comment' (a large text area), and 'Electricity meter info' (fields for Electricity meter name, Meter constant, Transformer type, and Serial number). Callouts point to specific elements: 'Number of device under test' points to the DUT tabs; 'Customer name entering' points to the 'Calmet' dropdown; 'Customer info frame' points to the 'Customer info' section; 'Comment field for additional information' points to the 'Comment' text area; 'Electricity meter info' points to the 'Electricity meter info' section; 'Use for all – the same customer name is used for all DUTs' points to the 'Use for all' button; and 'Site info frame' points to the 'Site info' section.

Number of device under test

Customer name entering

Customer info frame

Comment field for additional information

Electricity meter info

Use for all – the same customer name is used for all DUTs

Site info frame

DUT1 DUT2 DUT3 DUT4 DUT5 DUT6 DUT7 DUT8

Customer name
Calmet

Use for all

Customer info

Name: Calmet

Address: 65-472 Zielona Gora

Phone: +45 68 324 04 56

Email: mail@calmet.com.pl

Site info

Name: Calmet

Address: 65-472 Zielona Gora

Phone: +48 68 324 04 56

Email: mail@calmet.com.pl

Comment

Electricity meter info

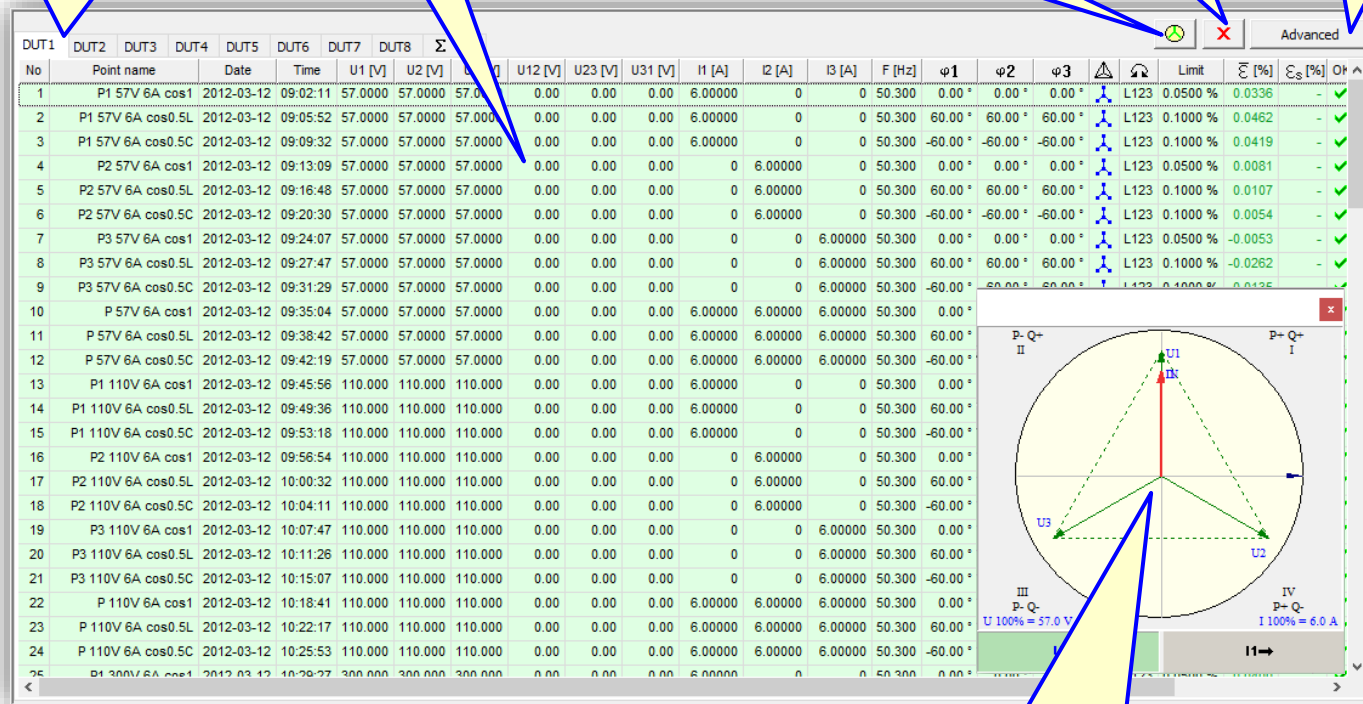
Electricity meter name :

Meter constant : 5000.000000 pulse/kWh

Transformer ☒ Direct ☐ CT ☐ VT

Serial number :

Advanced button for
table edition

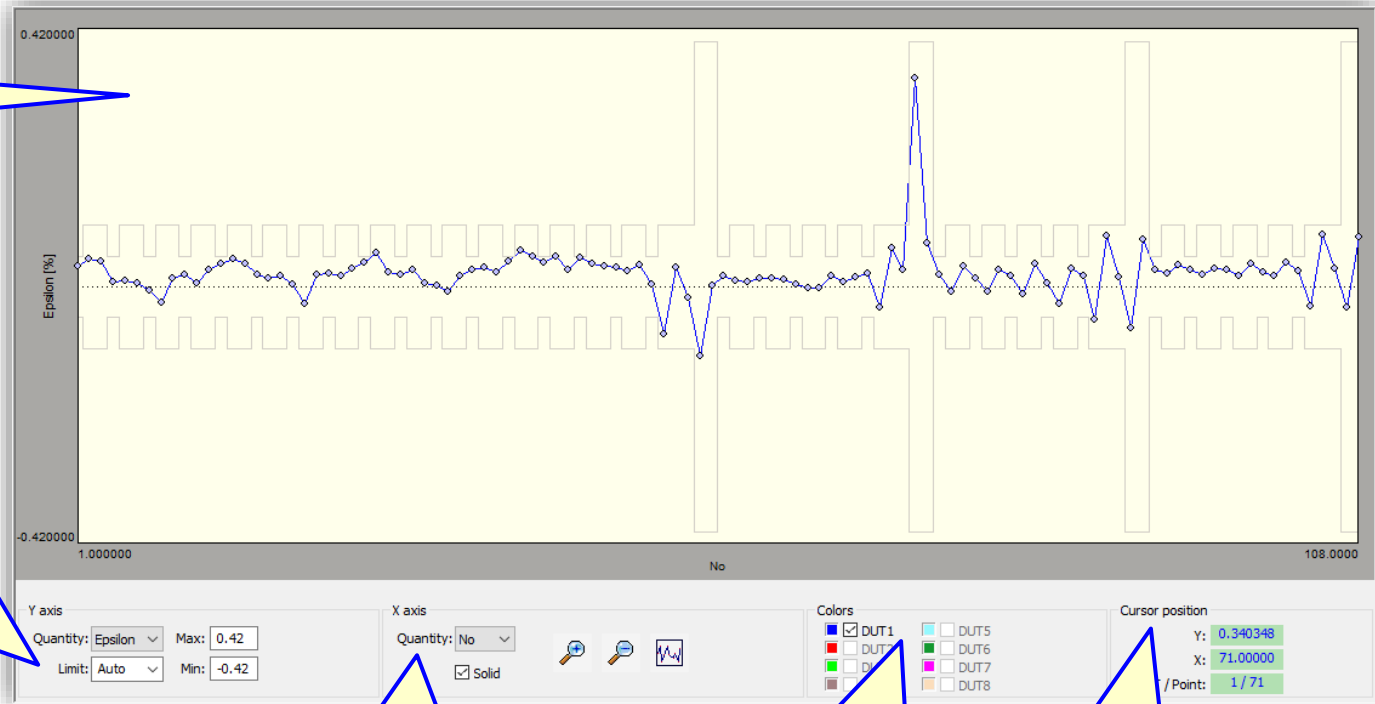


Vector diagram of selected measuring point

TB PC-Soft - Electricity meter testing **Result / Graphic** function – visualization and edition measured results in form of graph

Diagram field of error function and error limits

Y axis frame includes:
- Quantity field
- Limit field
- Max field – entering maximum function value
- Min field – entering minimum function value



X axis frame includes:
- Quantity field
- Buttons for zooming in and zooming out

Colours frame makes possible to enable/disable consecutive DUTs' charts and change their colour

Cursor position frame contains cursor's coordinates

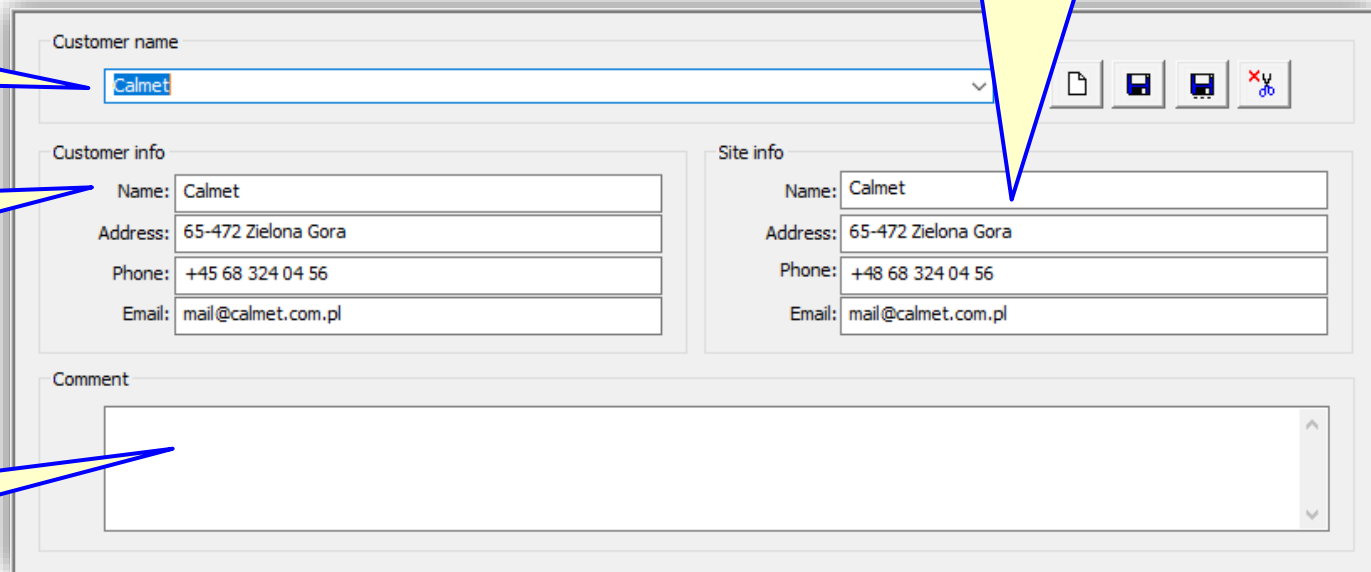
TB PC-Soft - Customer function – preparing predefined description data for measuring report

Customer name entering

Customer info frame with
edition fields

Comment field for
additional information

Site info frame with
edition fields



The screenshot shows a software window titled 'Customer name' with a dropdown menu containing 'Calmet'. Below this are two frames: 'Customer info' and 'Site info'. Each frame contains four input fields for Name, Address, Phone, and Email. The 'Customer info' fields are filled with 'Calmet', '65-472 Zielona Gora', '+45 68 324 04 56', and 'mail@calmet.com.pl' respectively. The 'Site info' fields are also filled with the same data. At the bottom is a large 'Comment' text area. To the right of the 'Customer name' dropdown are four icons: a document, a floppy disk, a printer, and a scissors icon.

Field	Customer info	Site info
Name:	Calmet	Calmet
Address:	65-472 Zielona Gora	65-472 Zielona Gora
Phone:	+45 68 324 04 56	+48 68 324 04 56
Email:	mail@calmet.com.pl	mail@calmet.com.pl

Comment

TB PC-Soft - Harmonics function – setting the magnitude and phase of harmonics

Selecting channel to
set harmonics

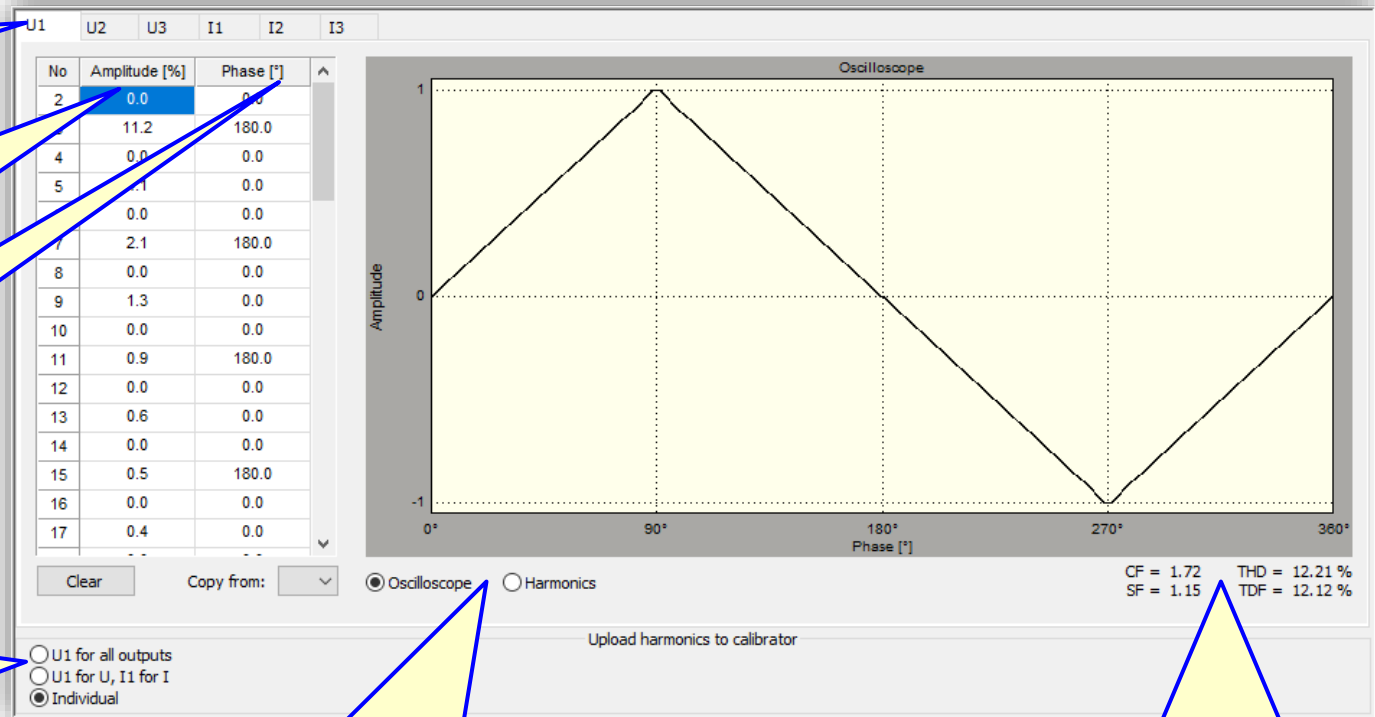
Setting the
magnitude of
harmonic in percent
of first harmonic
magnitude

Setting the phase
shift of harmonic in
degrees with
reference to the first
harmonic

Fields for selecting
channels in which
harmonics will be
programmed

Selecting mode of visualization as
graphic oscilloscope diagram

Coefficients field of programmed
shape of signal



TB PC-Soft - **Shape** function – selecting the wave shape of voltage and current

The screenshot shows the 'Shape' function interface in TB PC-Soft. It includes a channel selection bar at the top (U1, U2, U3, I1, I2, I3), a list of wave shapes on the left, an oscilloscope display in the center, and output selection radio buttons at the bottom.

Selecting channel to set wave shape

Selecting wave shapes

Fields for selecting channels in which shape will be programmed

Oscilloscope

Amplitude

Phase [°]

Upload shape to calibrator

☐ U1 for all outputs
☐ U1 for U, I1 for I
☒ Individual

TB51: how to order – versions, options, accessories

TB51 versions: accuracy class 0.02% or 0.04%

Standard scope of delivery



TS41 Automatic Test System



MPX8 Eight Inputs Meter Error Calculator



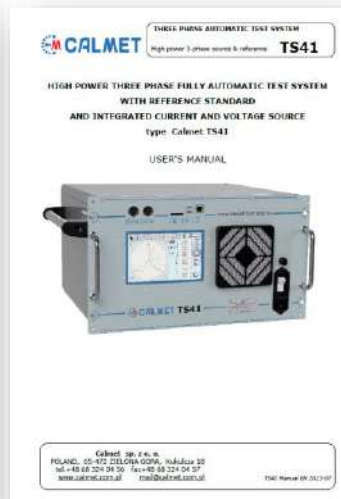
CF106 photo head (4 units)



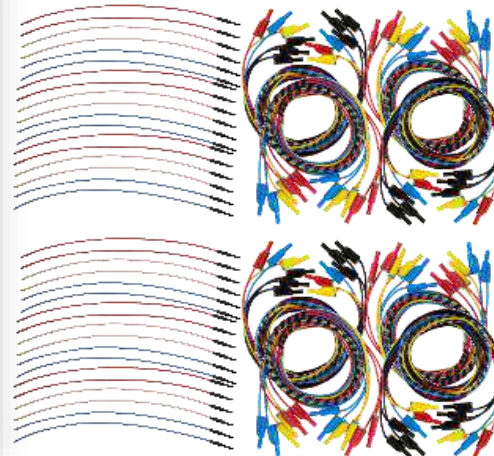
Computer Laptop PC with PC software



Manufacturer Calibration Certificate



Operation manual



Set of voltage and current cables



ER51H.3 four position testing stand for hanging 3-phase meters

TB51: how to order – versions, options, accessories

TB51 optional accessories:



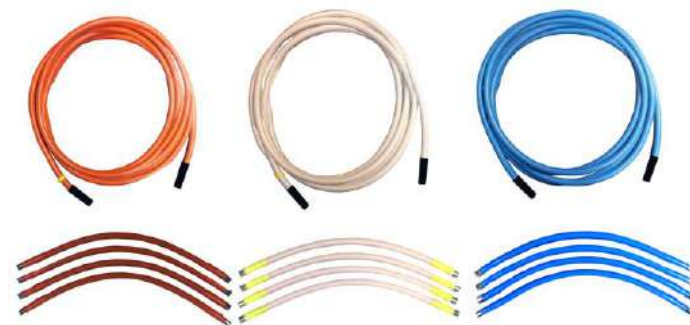
EC11.3 Isolation Transformer (4 units)



External high accuracy reference meter
Radian Research



ED10 Individual
Error Display (4 units)

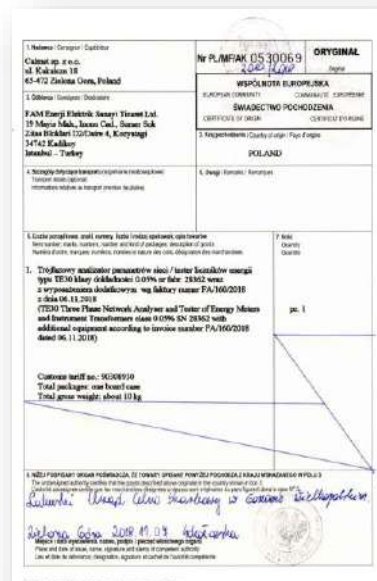


EA45 set of current cables up to 120A
(18 units) for working with ICT

Optional scope of delivery 1



Calibration Certificate from
ISO17025 accredited lab



Certificate of Origin from Customs
and Chamber of Commerce

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

TOP PRODUCTS

TS33 - Three phase Fully Automatic Test System

C300B - Power Calibrator

TE30 - Working Standard

TE30 Lite - Meter Tester

TB51 - Five Position Meter Test Bench for smart meters

PRODUCTS BY CATEGORY

Power calibrators and power quality calibrators

Multifunction calibrators

Electricity meters testers and reference standards

Instrument transformers testers

Protection relays testers

Network quality analysers

Meter test stations

Meter test stations



TB51 - Five Position Meter Test Bench for smart meters

Three phase electricity meter test bench with extremely compact design size and light weight for simultaneous and automatic testing of 5 electricity meters with different constants and with "closed link"

 Data sheet

[Read more ...](#)



TS33 option set TB1 - Three phase meter test station

Single position three phase fully automated 0.02%, 0.04% or 0.01% accuracy class test station for electricity active and reactive meter testing up to 120A with accuracy referenced to an internal reference meter

 Data sheet

[Read more ...](#)



TS41 - High Power Three-phase Fully Automatic Test System with Reference Standard and Integrated Current and Voltage Source

The Calmet TS41 test system consists of a three-phase reference meter of accuracy class 0.02% (or 0.04%) and an integrated three-phase current and voltage source up to 3x120A/600V. It makes possible automatic testing of electricity meters in meter test station

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