

Calmet TB41
Stationary Four Position
Three-phase Meter Test Bench



CALMET Sp. z o.o.

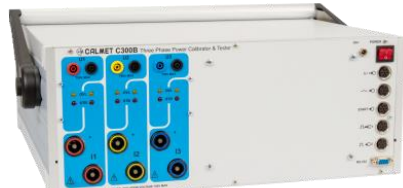
- ❑ Calmet = **CAL**ibrators + **MET**rology
- ❑ founded in **1989**, roots come from LUMEL, big factory of measurement equipment in Poland, Zielona Gora
- ❑ designing, production, selling and servicing new kind of calibrators and electric equipment testers
- ❑ employs over 25 engineers, including 3 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

Measurement Equipment since 1989

Customer Support in problems solving

Energy meter testers, Current Transformers testers, Power quality analysers

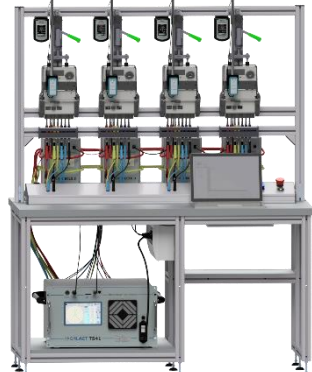
AC/DC Voltage, Current & Power Calibrators, Test Benches



3 phase U, I, ϕ , P, Q, S, E



1 phase U, I, ϕ , P, Q, S, E

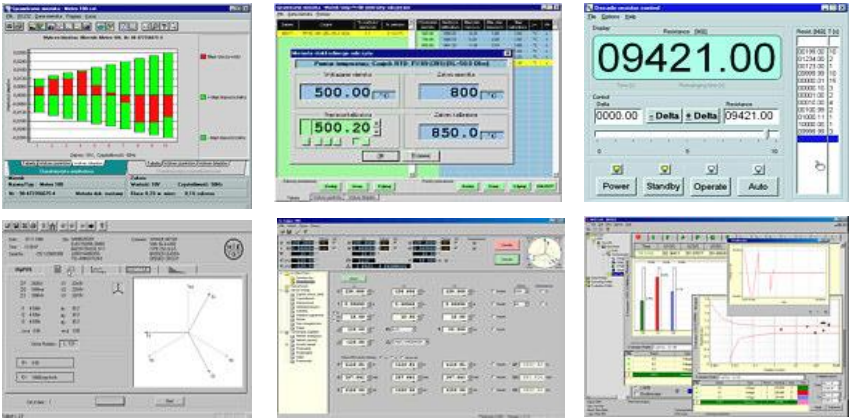


3 phase Test Bench



Multifunctions DC/AC

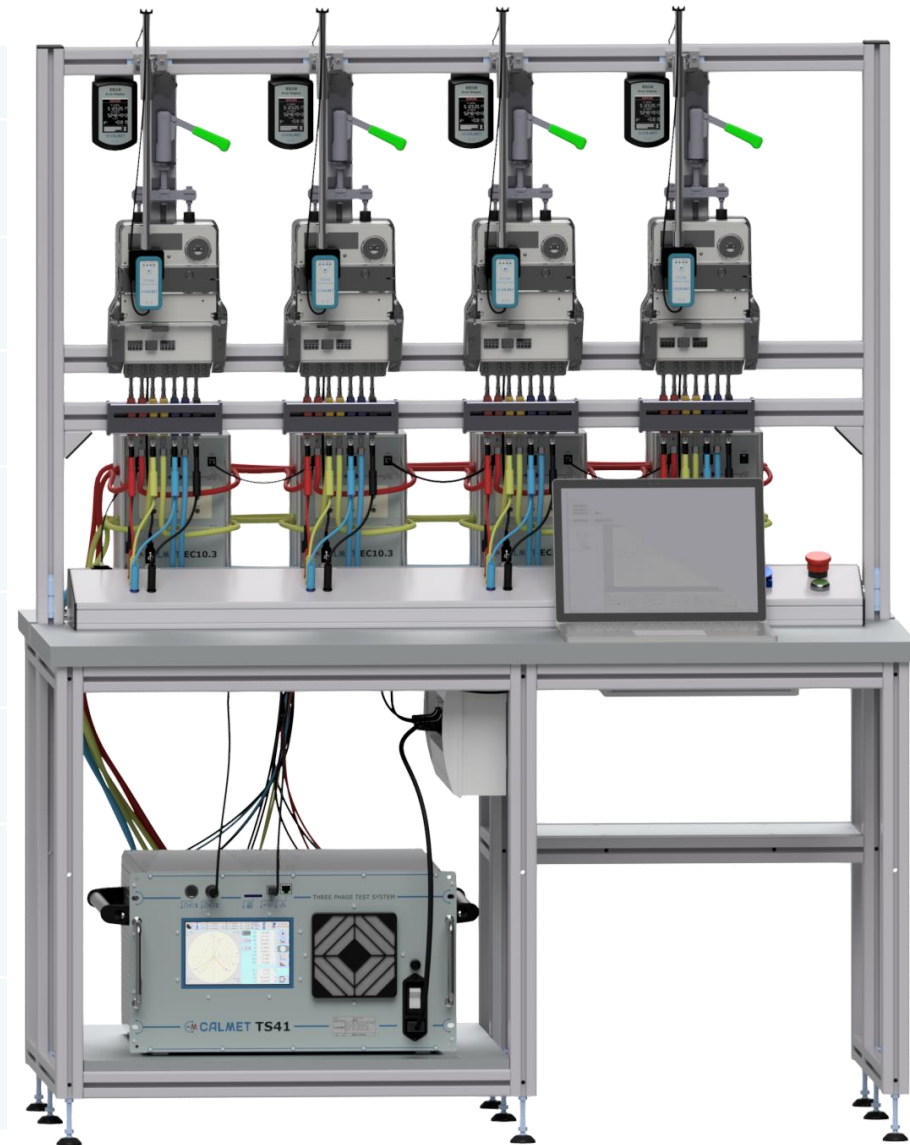
Control Software for measurement equipment



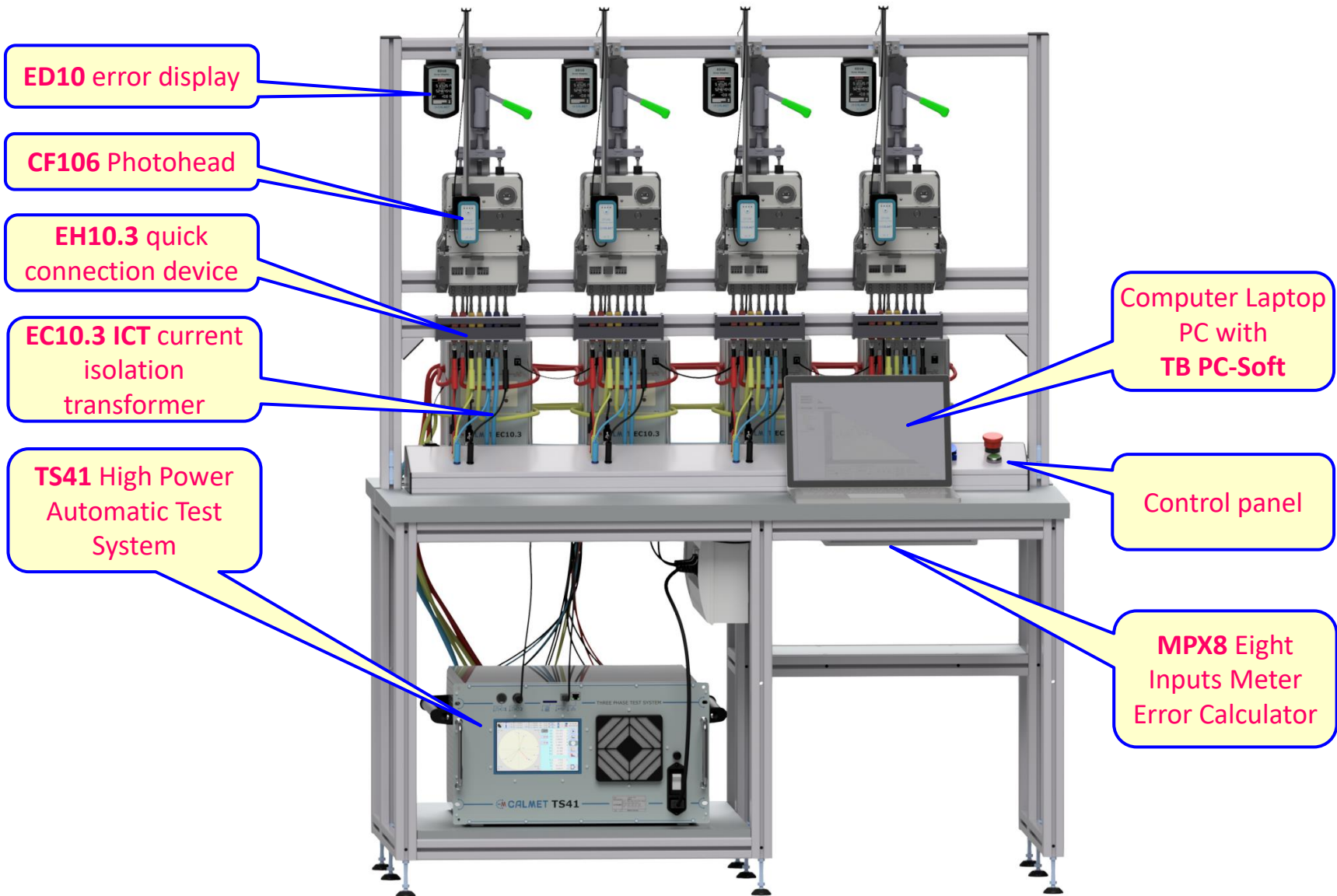
Current and Voltage Source with Integrated Reference Standard



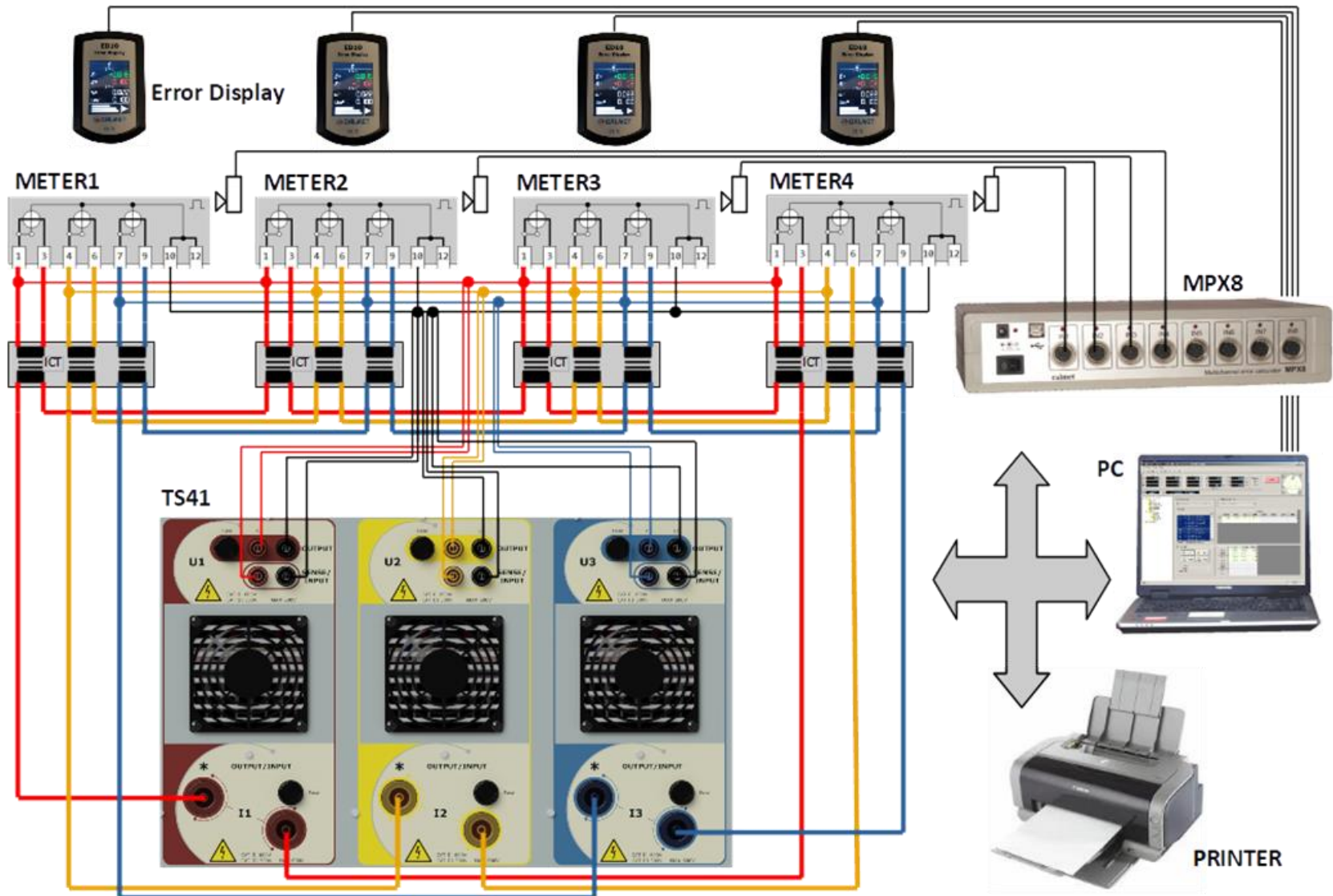
- ▶ Fully automatic procedures for meter testing
- ▶ Accuracy class **0.02%** or **0.04%** with internal reference standard
- ▶ Extremely high accuracy class with external reference standard
- ▶ Wide range of voltage **20...600V** at **150VA** and current **0.001...120A** at **300VA** per phase
- ▶ Harmonics up to 40th and special shapes generation capability
- ▶ Simultaneously testing up to 4 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



TB41 Front view:

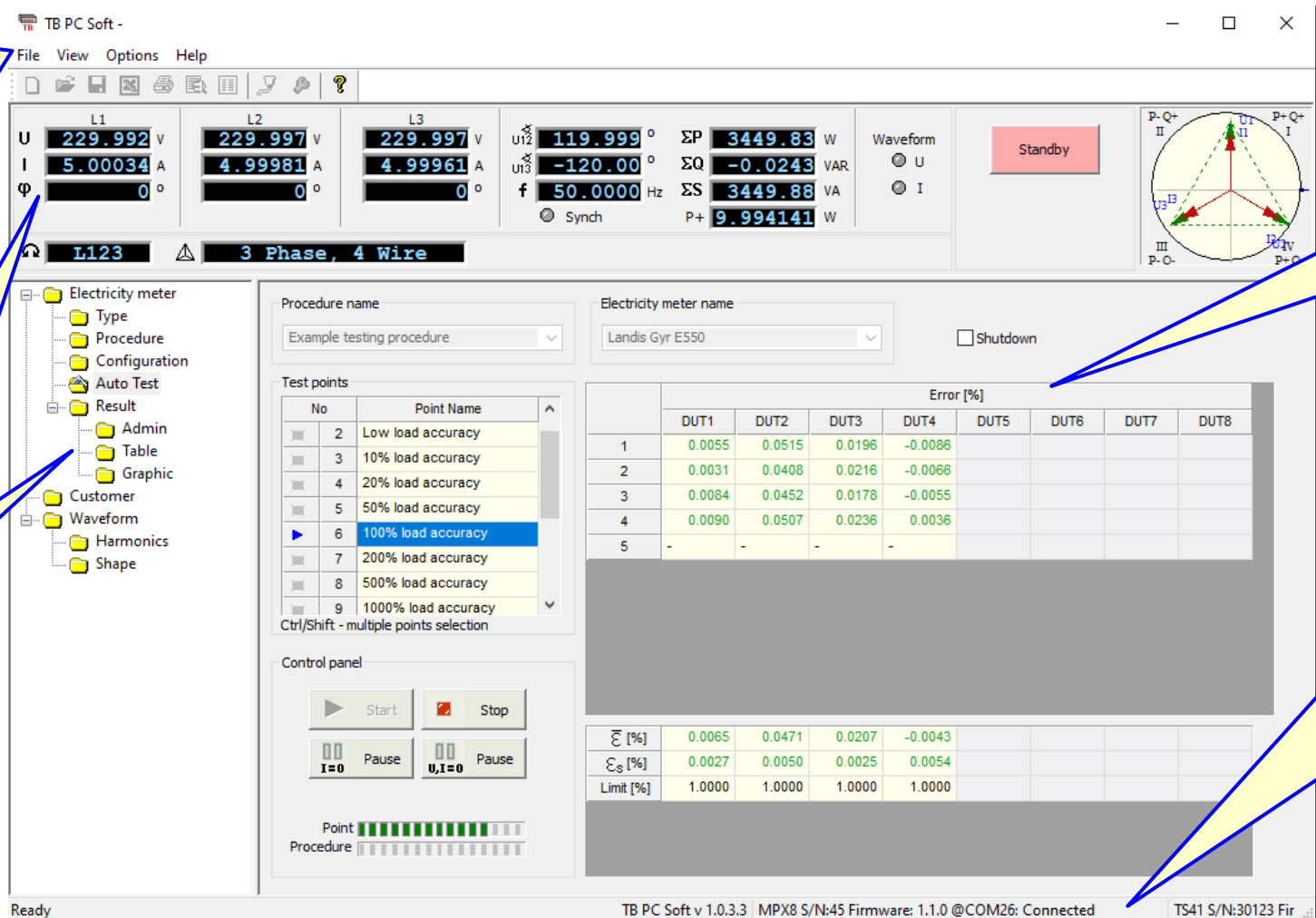


Typical configuration of Calmet TB41 Test Bench Station



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

Software Interface Data:

Phase	U [V]	I [A]	Φ [°]
L1	229.992	5.00034	0
L2	229.997	4.99981	0
L3	229.997	4.99961	0

Summary Data:

U ₁₂	119.999	ΣP	3449.83
U ₁₃	-120.00	ΣQ	-0.0243
f	50.0000	ΣS	3449.88
		P+	9.994141

Configuration: L123, 3 Phase, 4 Wire

Procedure name: Example testing procedure

Electricity meter name: Landis Gyr E550

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 [%] Table:

	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	-	-	-	-				

Summary Statistics:

Σ [%]	0.0065	0.0471	0.0207	-0.0043
Σ _S [%]	0.0027	0.0050	0.0025	0.0054
Limit [%]	1.0000	1.0000	1.0000	1.0000

Status Bar: TB PC Soft v 1.0.3.3 MPX8 S/N:45 Firmware: 1.1.0 @COM26: Connected TS41 S/N:30123 Fir

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

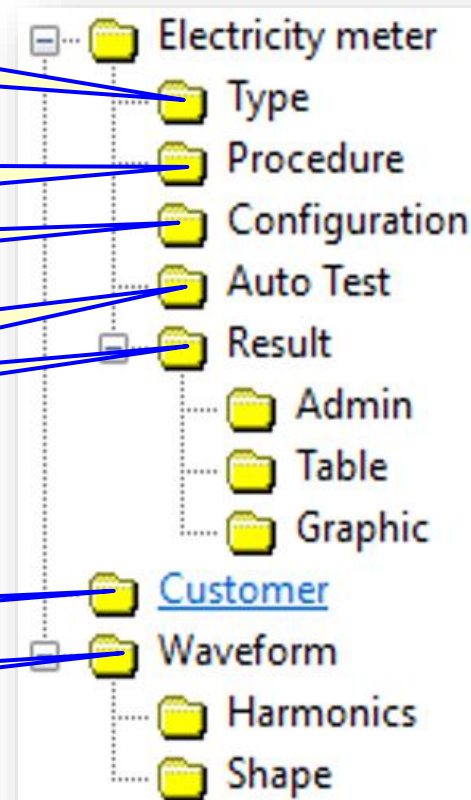
Result for visualization, edition and storing measurements results:

- **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

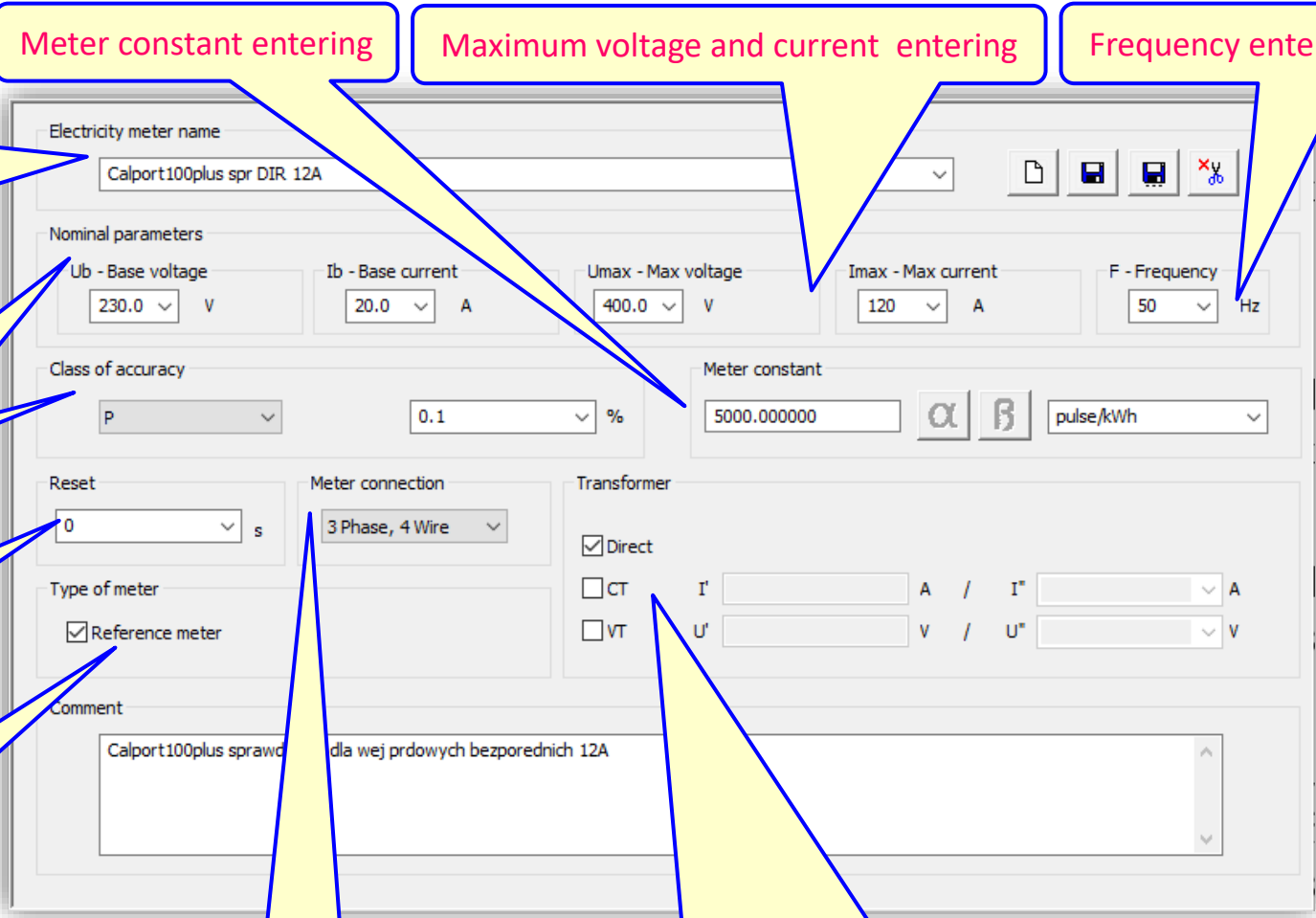
Customer function contains customer database

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



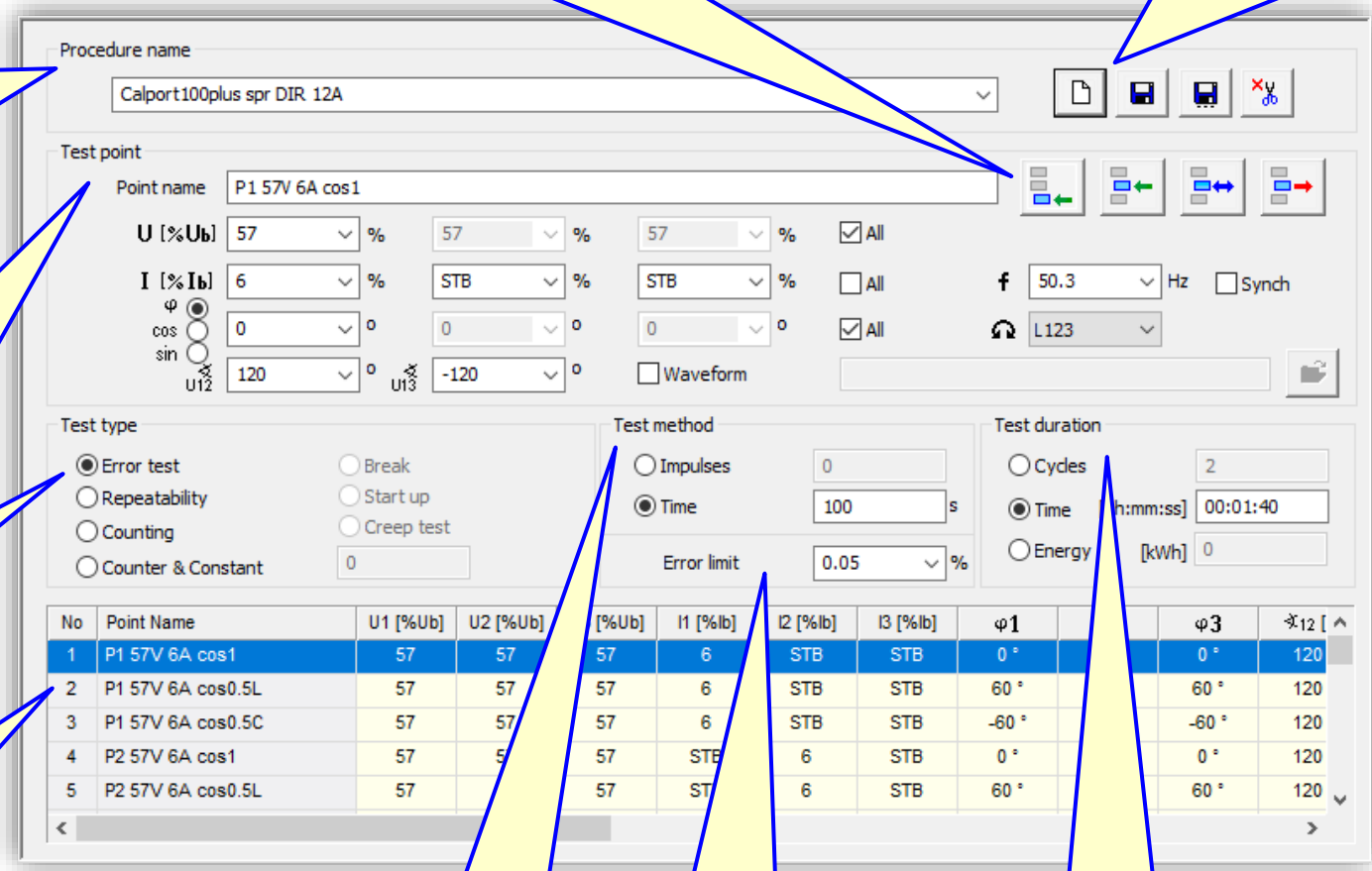
The screenshot shows the 'Electricity meter Type' configuration window. The interface includes the following fields and options:

- Electricity meter name:** Calport100plus spr DIR 12A
- Nominal parameters:**
 - Ub - Base voltage: 230.0 V
 - Ib - Base current: 20.0 A
 - Umax - Max voltage: 400.0 V
 - Imax - Max current: 120 A
 - F - Frequency: 50 Hz
- Class of accuracy:** P, 0.1 %
- Meter constant:** 5000.000000, pulse/kWh
- Reset:** 0 s
- Meter connection:** 3 Phase, 4 Wire
- Transformer:** Direct, CT, VT
- Type of meter:** Reference meter
- Comment:** Calport100plus sprawdz dla wej prdowych bezporednich 12A

Callouts point to the following elements:

- Electricity meter name entering/reading** (points to the name field)
- Nominal / Base voltage and current entering** (points to Ub and Ib fields)
- Class of accuracy entering** (points to accuracy dropdown)
- Reset time entering for prepaid energy meters** (points to Reset field)
- Reference meter check box** (points to Reference meter checkbox)
- Meter constant entering** (points to Meter constant field)
- Maximum voltage and current entering** (points to Umax and Imax fields)
- Frequency entering** (points to F - Frequency field)
- Meter connection selection** (points to Meter connection dropdown)
- Direct, CT, VT buttons for selection direct electricity meter or with current and/or voltage transformer** (points to transformer options)

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



Procedure table rows edition buttons

Measuring procedure file edition

Electricity meter name entering/reading

Test point parameters: Point name, Base voltage, Base current, Phase shift, Frequency

Test type selection

Measuring procedure table

Test method selection

Error limit entering

Test duration entering

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 ° -120 ° All

f: 50.3 Hz Synch

L123

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

Test method: Impulses 0 Time 100 s Error limit: 0.05 %

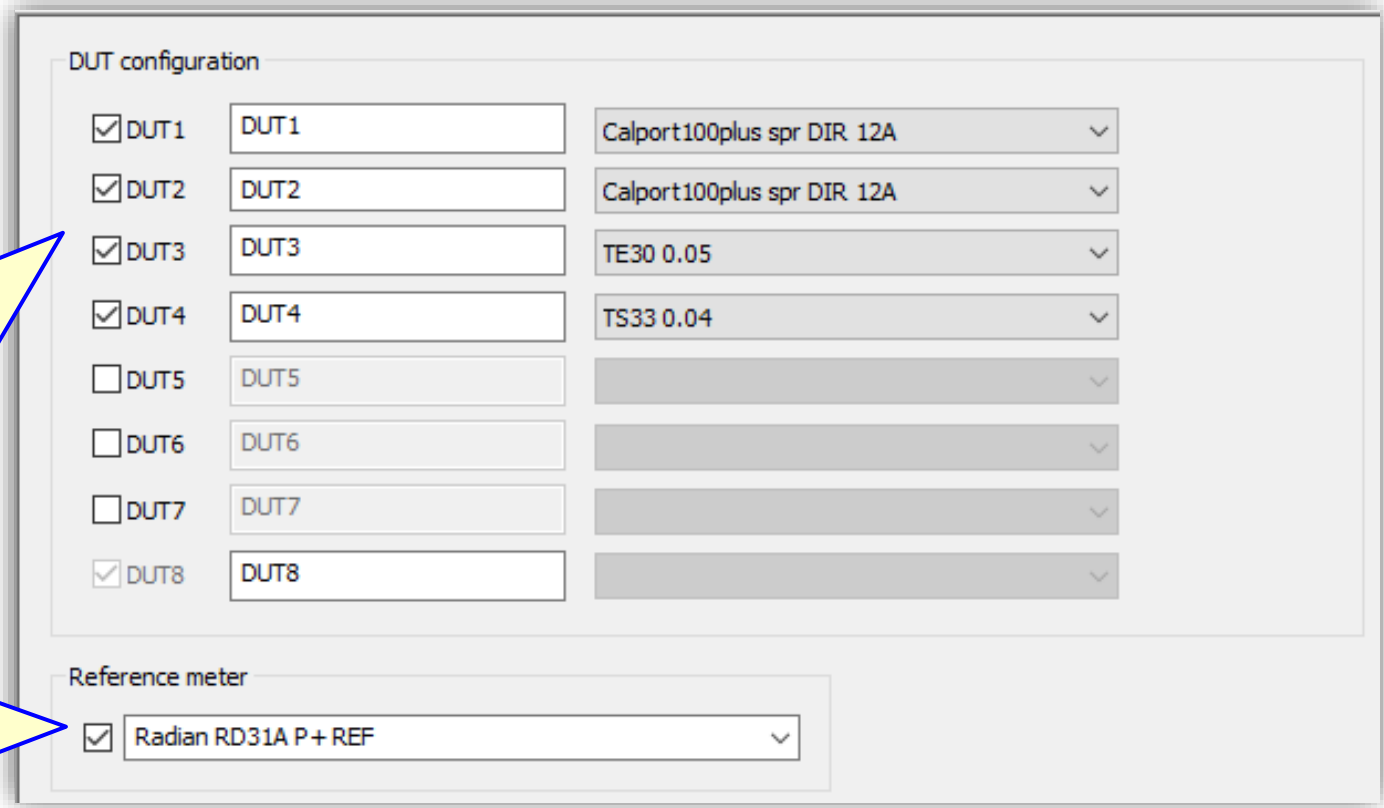
Test duration: Cycles 2 Time h:mm:ss 00:01:40 Energy [kWh] 0

No	Point Name	U1 [%Ub]	U2 [%Ub]	I1 [%Ib]	I2 [%Ib]	I3 [%Ib]	$\varphi 1$	$\varphi 3$	$\varphi 12$
1	P1 57V 6A cos1	57	57	6	STB	STB	0 °	0 °	120
2	P1 57V 6A cos0.5L	57	57	6	STB	STB	60 °	60 °	120
3	P1 57V 6A cos0.5C	57	57	6	STB	STB	-60 °	-60 °	120
4	P2 57V 6A cos1	57	57	6	STB	STB	0 °	0 °	120
5	P2 57V 6A cos0.5L	57	57	6	STB	STB	60 °	60 °	120

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

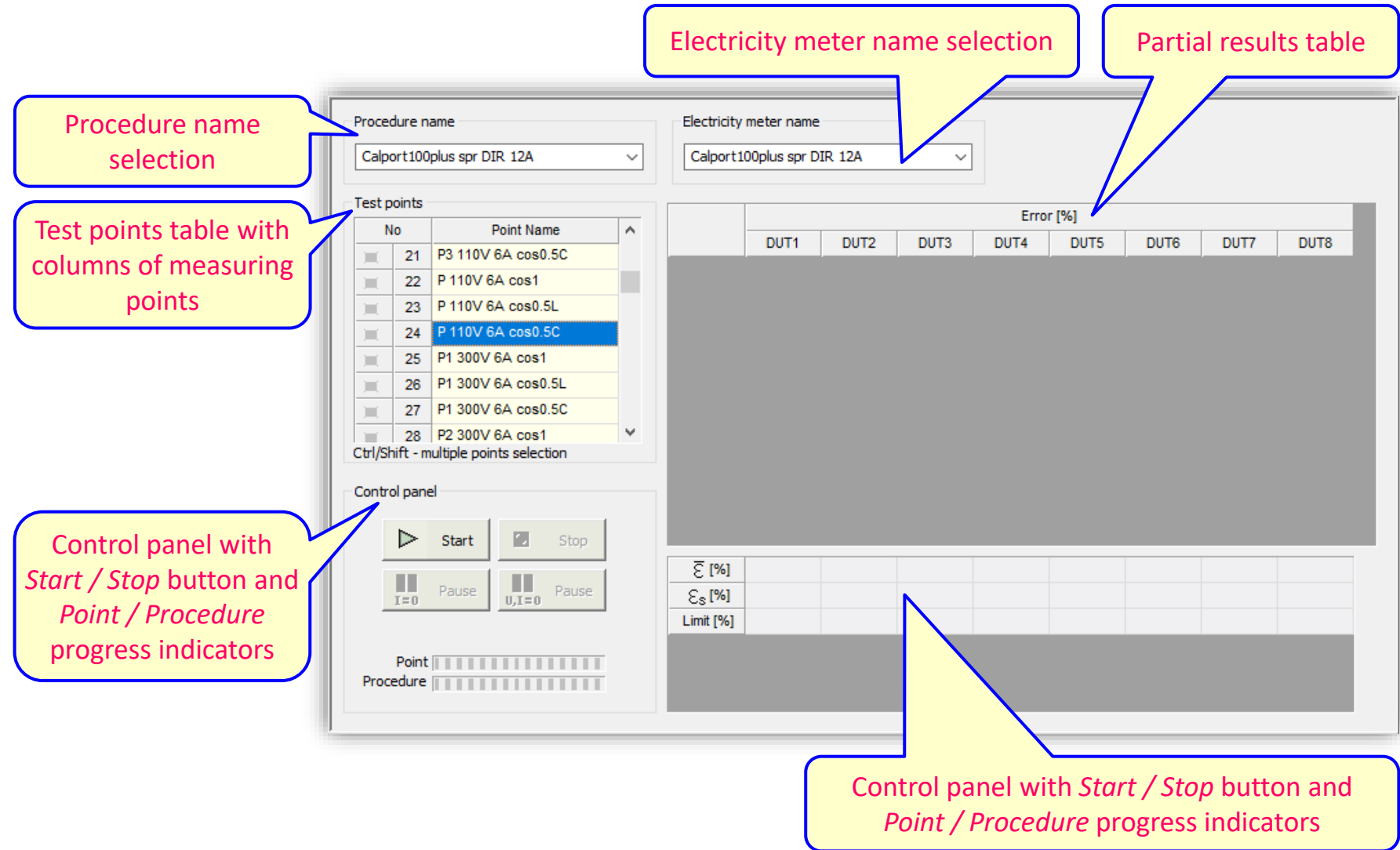


The screenshot shows a software configuration window titled "DUT configuration". It contains a list of eight DUT (Device Under Test) entries, each with a checkbox, a text field for the device name, and a dropdown menu for the device type. DUT1 through DUT4 are checked and have their respective device types set: DUT1 and DUT2 are "Calport100plus spr DIR 12A", DUT3 is "TE30 0.05", and DUT4 is "TS33 0.04". DUT5, DUT6, and DUT7 are unchecked and have empty dropdown menus. DUT8 is checked and has an empty dropdown menu. Below the DUT configuration is a "Reference meter" section with a checked checkbox and a dropdown menu set to "Radian RD31A P+ REF".

DUT	Device Name	Device Type
<input checked="" type="checkbox"/> DUT1	DUT1	Calport100plus spr DIR 12A
<input checked="" type="checkbox"/> DUT2	DUT2	Calport100plus spr DIR 12A
<input checked="" type="checkbox"/> DUT3	DUT3	TE30 0.05
<input checked="" type="checkbox"/> DUT4	DUT4	TS33 0.04
<input type="checkbox"/> DUT5	DUT5	
<input type="checkbox"/> DUT6	DUT6	
<input type="checkbox"/> DUT7	DUT7	
<input checked="" type="checkbox"/> 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



The screenshot shows the TB PC-Soft interface for electricity meter testing. It includes several key components:

- Procedure name selection:** A dropdown menu showing "Calport100plus spr DIR 12A".
- Electricity meter name selection:** A dropdown menu showing "Calport100plus spr DIR 12A".
- Test points table with columns of measuring points:** A table with columns for "No" and "Point Name". The selected point is "24 P 110V 6A cos0.5C".
- Control panel with Start / Stop button and Point / Procedure progress indicators:** A panel with "Start" and "Stop" buttons, "Pause" buttons for "I=0" and "U,I=0", and progress indicators for "Point" and "Procedure".
- Partial results table:** A table with columns for "Error [%]" and "DUT1" through "DUT8".

Additional callouts highlight the "Control panel with Start / Stop button and Point / Procedure progress indicators" and the "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

Number of device under test

Customer name entering

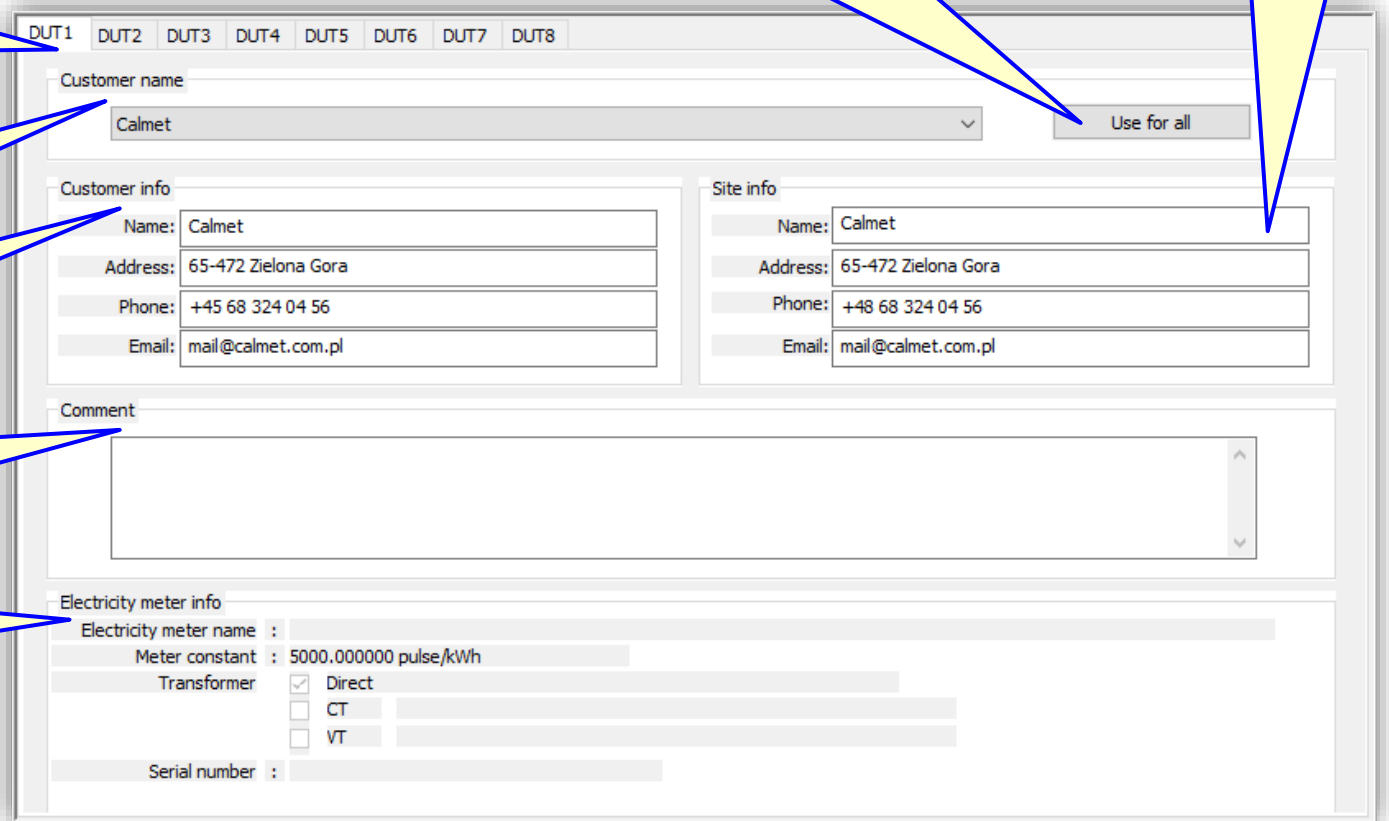
Customer info frame

Comment field for additional information

Electricity meter info

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

Site info frame



The screenshot shows a software interface for configuring test data. At the top, there are tabs for DUT1 through DUT8. Below the tabs, there are several input fields and sections:

- Customer name:** A dropdown menu with "Calmet" selected and a "Use for all" button to its right.
- Customer info:** A form with fields for Name (Calmet), Address (65-472 Zielona Gora), Phone (+45 68 324 04 56), and Email (mail@calmet.com.pl).
- Site info:** A form with fields for Name (Calmet), Address (65-472 Zielona Gora), Phone (+48 68 324 04 56), and Email (mail@calmet.com.pl).
- Comment:** A large text area for additional information.
- Electricity meter info:** A section with fields for Electricity meter name, Meter constant (5000.000000 pulse/kWh), Transformer type (Direct, CT, VT), and Serial number.

TB PC-Soft - Electricity meter testing Result / Table function – visualization and edition measured results in form of table

Buttons field makes possible switching between consecutive DUTs

Measurement results table

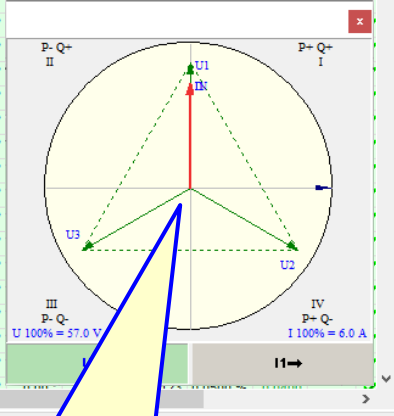
Button enables vector diagram window of selected measuring point

Button for deleting rows from the table

Advanced button for table edition

DUT1	DUT2	DUT3	DUT4	DUT5	DUT6	DUT7	DUT8	Σ											Advanced
No	Point name	Date	Time	U1 [V]	U2 [V]	U3 [V]	I1 [A]	I2 [A]	I3 [A]	F [Hz]	φ1	φ2	φ3	Limit	ε [%]	εg [%]	OK		
1	P1 57V 6A cos1	2012-03-12	09:02:11	57.0000	57.0000	57.0000	6.00000	0	0	50.300	0.00°	0.00°	0.00°	L123	0.0500 %	0.0336	✓		
2	P1 57V 6A cos0.5L	2012-03-12	09:05:52	57.0000	57.0000	57.0000	6.00000	0	0	50.300	60.00°	60.00°	60.00°	L123	0.1000 %	0.0462	✓		
3	P1 57V 6A cos0.5C	2012-03-12	09:09:32	57.0000	57.0000	57.0000	6.00000	0	0	50.300	-60.00°	-60.00°	-60.00°	L123	0.1000 %	0.0419	✓		
4	P2 57V 6A cos1	2012-03-12	09:13:09	57.0000	57.0000	57.0000	6.00000	0	0	50.300	0.00°	0.00°	0.00°	L123	0.0500 %	0.0081	✓		
5	P2 57V 6A cos0.5L	2012-03-12	09:16:48	57.0000	57.0000	57.0000	6.00000	0	0	50.300	60.00°	60.00°	60.00°	L123	0.1000 %	0.0107	✓		
6	P2 57V 6A cos0.5C	2012-03-12	09:20:30	57.0000	57.0000	57.0000	6.00000	0	0	50.300	-60.00°	-60.00°	-60.00°	L123	0.1000 %	0.0054	✓		
7	P3 57V 6A cos1	2012-03-12	09:24:07	57.0000	57.0000	57.0000	6.00000	0	0	50.300	0.00°	0.00°	0.00°	L123	0.0500 %	-0.0053	✓		
8	P3 57V 6A cos0.5L	2012-03-12	09:27:47	57.0000	57.0000	57.0000	6.00000	0	0	50.300	60.00°	60.00°	60.00°	L123	0.1000 %	-0.0262	✓		
9	P3 57V 6A cos0.5C	2012-03-12	09:31:29	57.0000	57.0000	57.0000	6.00000	0	0	50.300	-60.00°	-60.00°	-60.00°	L123	0.1000 %	0.0125	✓		
10	P 57V 6A cos1	2012-03-12	09:35:04	57.0000	57.0000	57.0000	6.00000	6.00000	6.00000	50.300	0.00°	0.00°	0.00°						
11	P 57V 6A cos0.5L	2012-03-12	09:38:42	57.0000	57.0000	57.0000	6.00000	6.00000	6.00000	50.300	60.00°	60.00°	60.00°						
12	P 57V 6A cos0.5C	2012-03-12	09:42:19	57.0000	57.0000	57.0000	6.00000	6.00000	6.00000	50.300	-60.00°	-60.00°	-60.00°						
13	P1 110V 6A cos1	2012-03-12	09:45:56	110.0000	110.0000	110.0000	6.00000	0	0	50.300	0.00°	0.00°	0.00°						
14	P1 110V 6A cos0.5L	2012-03-12	09:49:36	110.0000	110.0000	110.0000	6.00000	0	0	50.300	60.00°	60.00°	60.00°						
15	P1 110V 6A cos0.5C	2012-03-12	09:53:18	110.0000	110.0000	110.0000	6.00000	0	0	50.300	-60.00°	-60.00°	-60.00°						
16	P2 110V 6A cos1	2012-03-12	09:56:54	110.0000	110.0000	110.0000	6.00000	0	0	50.300	0.00°	0.00°	0.00°						
17	P2 110V 6A cos0.5L	2012-03-12	10:00:32	110.0000	110.0000	110.0000	6.00000	0	0	50.300	60.00°	60.00°	60.00°						
18	P2 110V 6A cos0.5C	2012-03-12	10:04:11	110.0000	110.0000	110.0000	6.00000	0	0	50.300	-60.00°	-60.00°	-60.00°						
19	P3 110V 6A cos1	2012-03-12	10:07:47	110.0000	110.0000	110.0000	6.00000	0	0	50.300	0.00°	0.00°	0.00°						
20	P3 110V 6A cos0.5L	2012-03-12	10:11:26	110.0000	110.0000	110.0000	6.00000	0	0	50.300	60.00°	60.00°	60.00°						
21	P3 110V 6A cos0.5C	2012-03-12	10:15:07	110.0000	110.0000	110.0000	6.00000	0	0	50.300	-60.00°	-60.00°	-60.00°						
22	P 110V 6A cos1	2012-03-12	10:18:41	110.0000	110.0000	110.0000	6.00000	6.00000	6.00000	50.300	0.00°	0.00°	0.00°						
23	P 110V 6A cos0.5L	2012-03-12	10:22:17	110.0000	110.0000	110.0000	6.00000	6.00000	6.00000	50.300	60.00°	60.00°	60.00°						
24	P 110V 6A cos0.5C	2012-03-12	10:25:53	110.0000	110.0000	110.0000	6.00000	6.00000	6.00000	50.300	-60.00°	-60.00°	-60.00°						
25	P1 300V 6A cos1	2012-03-12	10:29:27	300.0000	300.0000	300.0000	6.00000	0	0	50.300	0.00°	0.00°	0.00°						

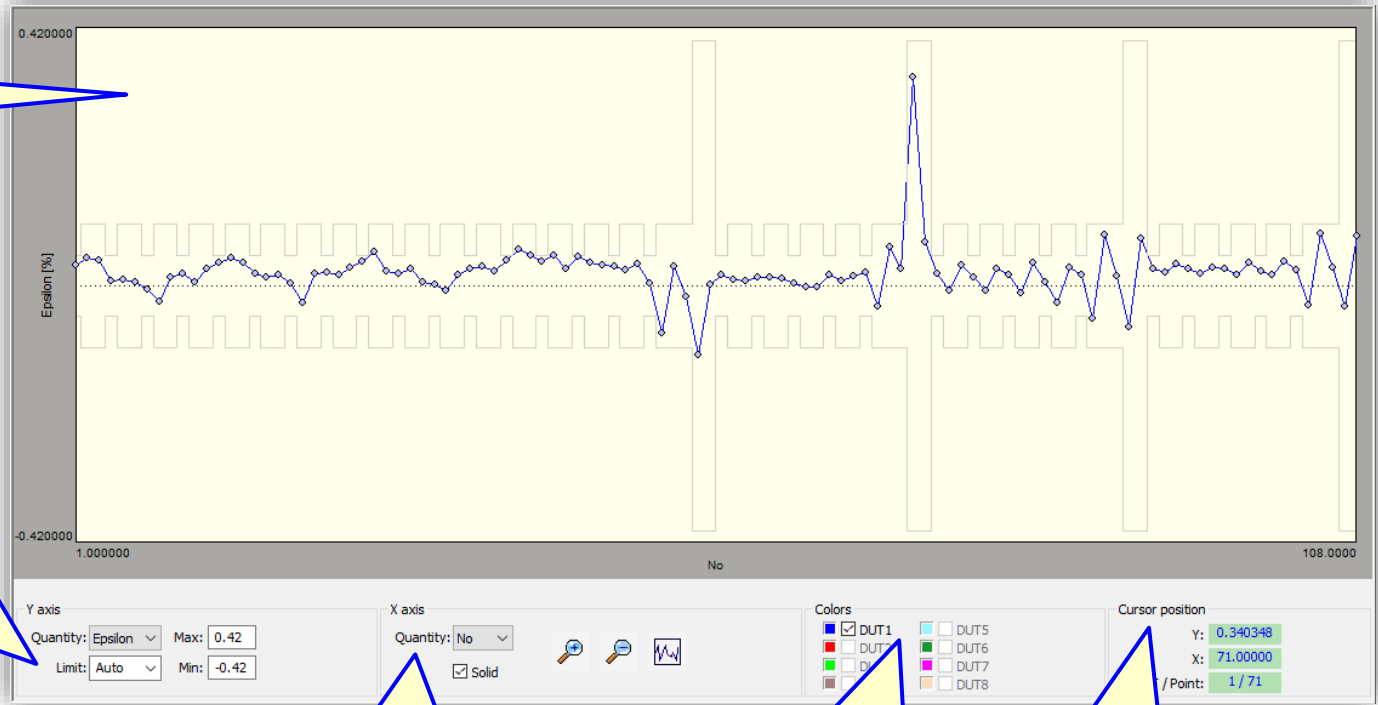
Vector diagram of selected measuring point



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

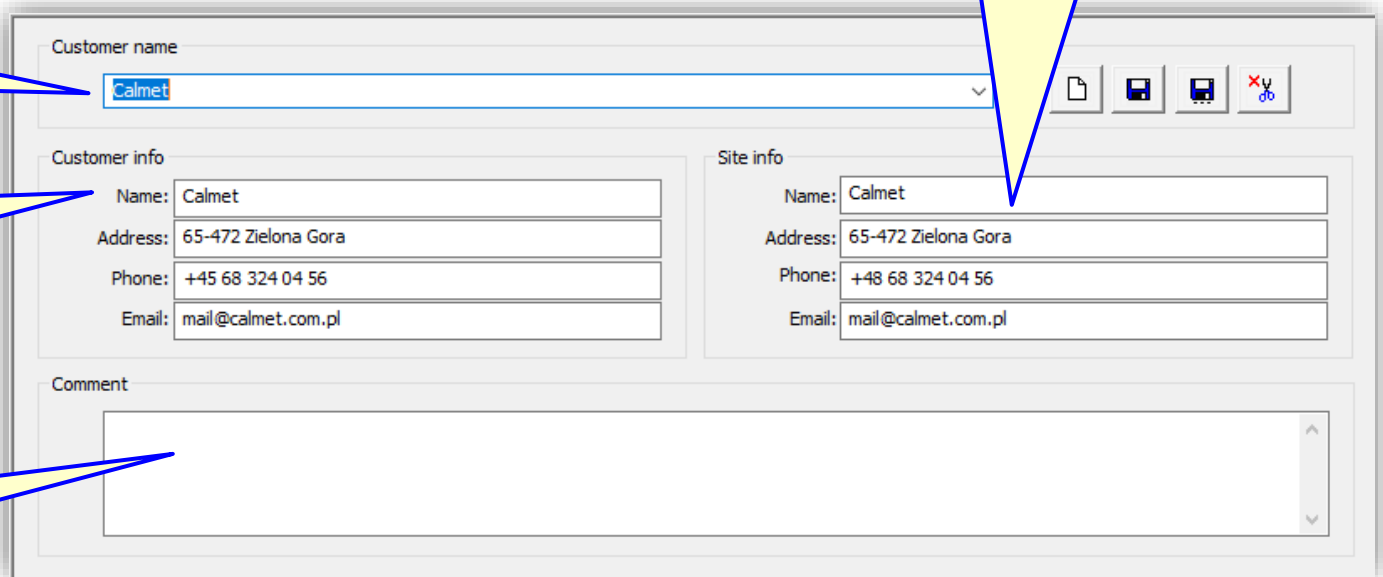
TB PC-Soft - Customer function – preparing predefined description data for measuring report

Customer name entering

Customer info frame with edition fields

Site info frame with edition fields

Comment field for additional information



The screenshot displays a software interface for entering customer and site information. At the top, there is a 'Customer name' field with a dropdown menu containing the text 'Calmet'. Below this are two columns of data entry fields. The left column is titled 'Customer info' and contains fields for Name (Calmet), Address (65-472 Zielona Gora), Phone (+45 68 324 04 56), and Email (mail@calmet.com.pl). The right column is titled 'Site info' and contains identical fields for Name (Calmet), Address (65-472 Zielona Gora), Phone (+48 68 324 04 56), and Email (mail@calmet.com.pl). At the bottom of the form is a large 'Comment' text area. To the right of the form, there are four small icons: a document, a save icon, a printer, and a close icon.

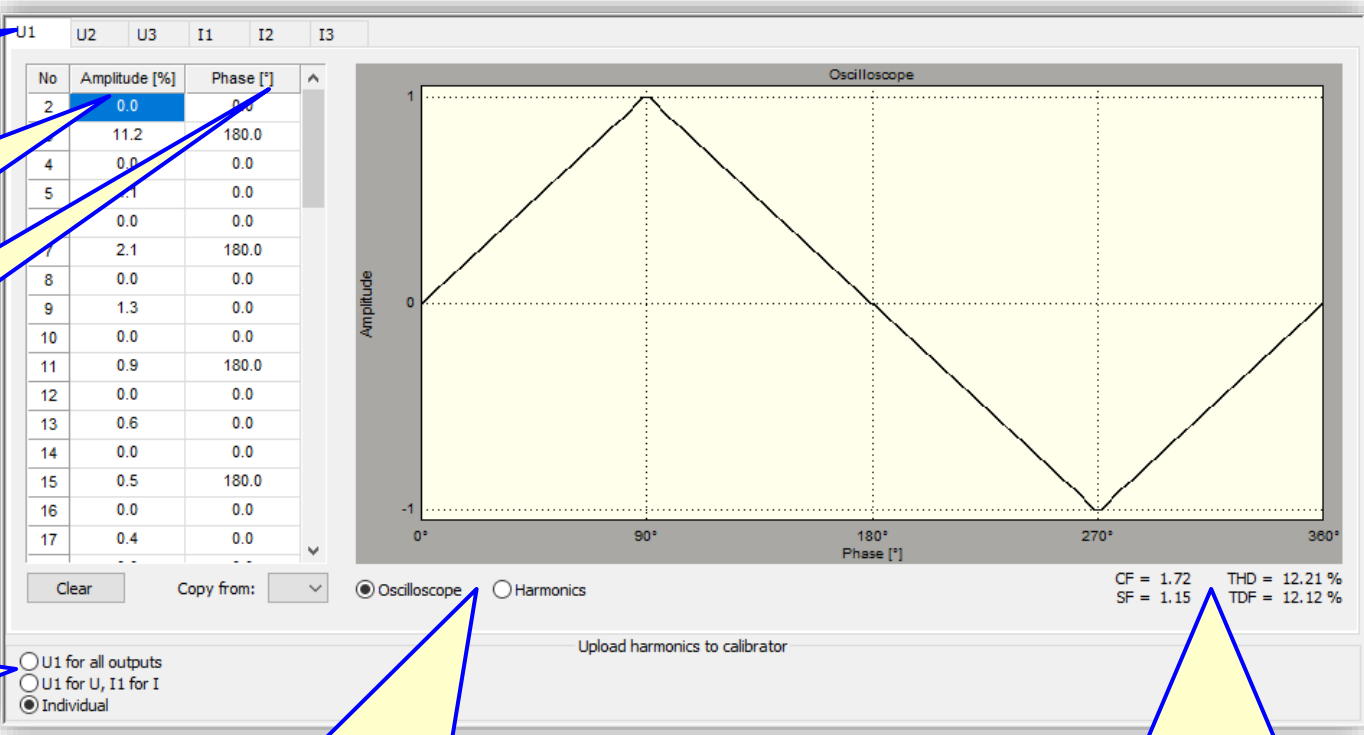
TB PC-Soft - Harmonics function – setting the magnitude and phase of harmonics

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



No	Amplitude [%]	Phase [°]
2	0.0	0.0
3	11.2	180.0
4	0.0	0.0
5	2.1	0.0
6	0.0	0.0
7	2.1	180.0
8	0.0	0.0
9	1.3	0.0
10	0.0	0.0
11	0.9	180.0
12	0.0	0.0
13	0.6	0.0
14	0.0	0.0
15	0.5	180.0
16	0.0	0.0
17	0.4	0.0

Oscilloscope Harmonics
 CF = 1.72 THD = 12.21 %
 SF = 1.15 TDF = 12.12 %

Selecting mode of visualization as graphic oscilloscope diagram

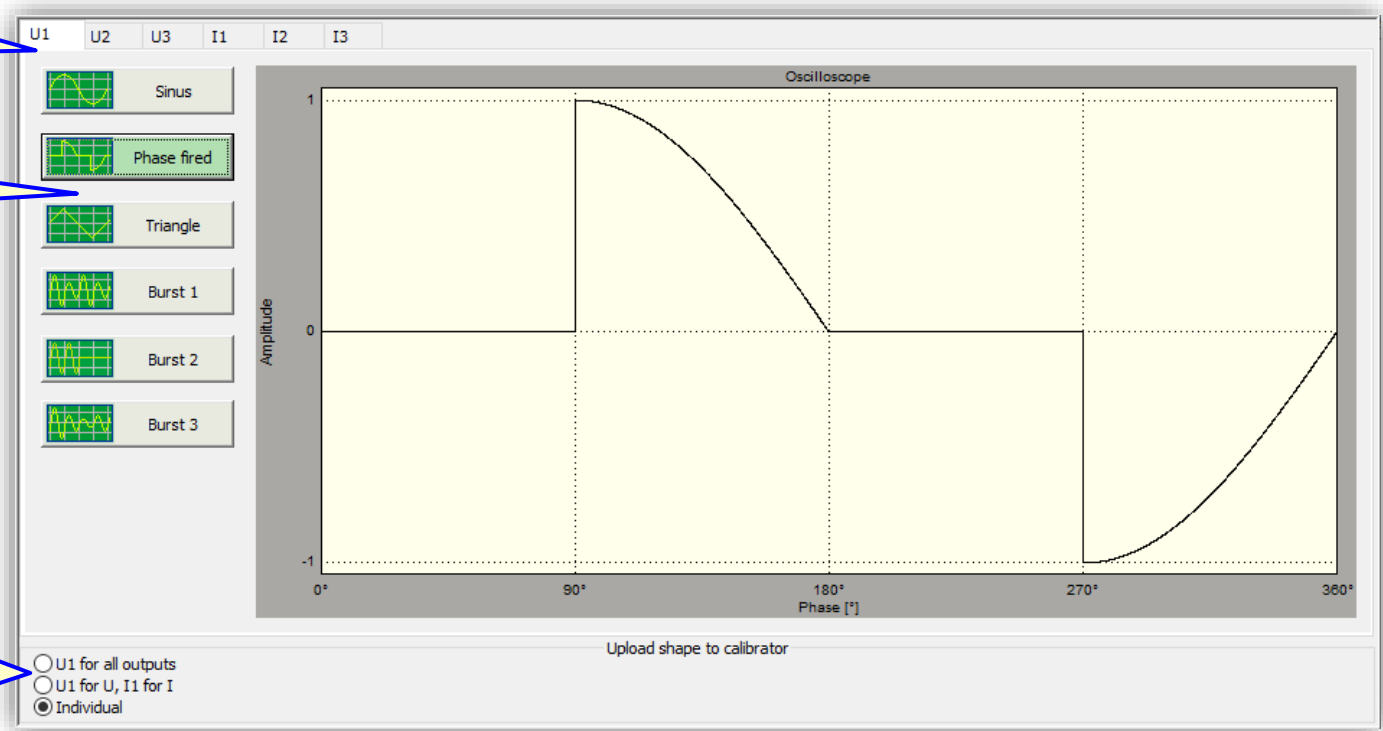
Coefficients field of programmed shape of signal

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

Selecting channel to set wave shape

Selecting wave shapes

Fields for selecting channels in which shape will be programmed



The screenshot shows the TB PC-Soft software interface. At the top, there are tabs for channels: U1, U2, U3, I1, I2, and I3. Below these are buttons for selecting wave shapes: Sinus, Phase fired (highlighted), Triangle, Burst 1, Burst 2, and Burst 3. To the right is an oscilloscope window titled "Oscilloscope" showing a graph of Amplitude (from -1 to 1) versus Phase [°] (from 0° to 360°). The graph displays a sine wave with a phase shift of 90°. At the bottom, there are radio buttons for channel selection: "U1 for all outputs", "U1 for U, I1 for I", and "Individual" (selected). A button labeled "Upload shape to calibrator" is also present.

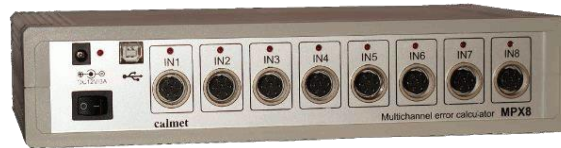
TB41: how to order – versions, options, accessories

TB41 versions: accuracy class 0.02% or 0.04%

Standard scope of delivery



TS41 Automatic Test System



MPX8 Eight Inputs Meter Error Calculator



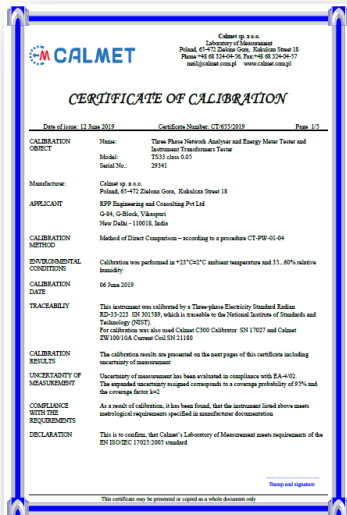
Computer Laptop PC with PC software



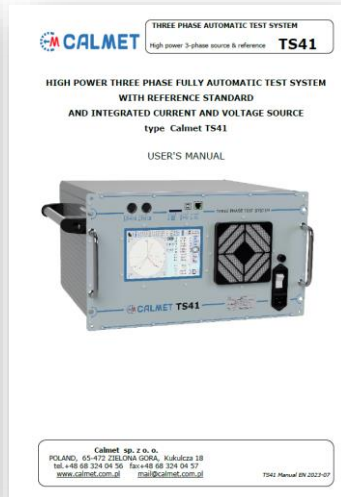
CF106 photo head (4 units)



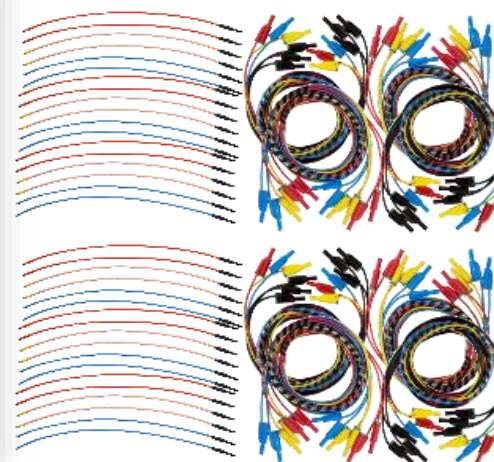
ER41H.3 four position testing stand for hanging 3-phase meters



Manufacturer Calibration Certificate



Operation manual



Set of voltage and current cables

TB41: how to order – versions, options, accessories

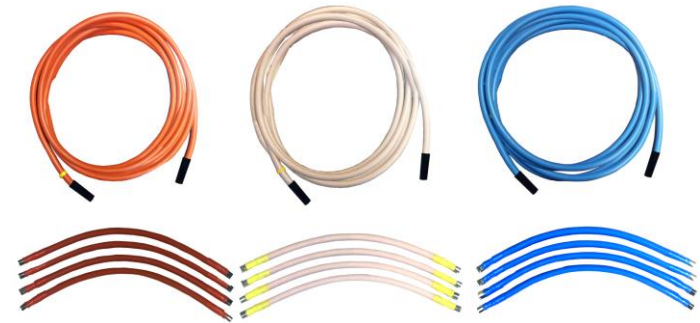
TB41 optional accessories:



EC10.3 Isolation Transformer (4 units)



ED10 Individual Error Display (4 units)



Optional scope of delivery 1

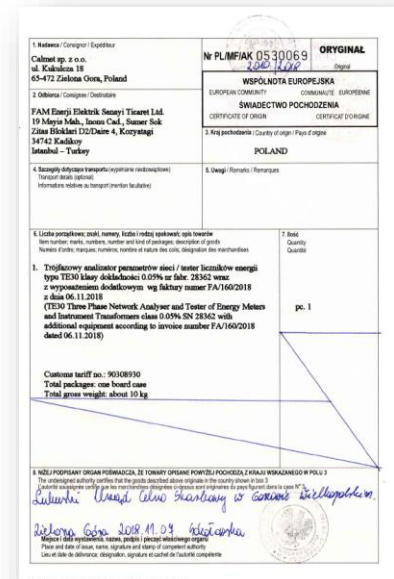
EA38 set of current cables up to 120A (15 units) for working with ICT



External high accuracy reference meter Radian Research



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
- TB41 - Four 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



TB41 - Four 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 4 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