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**Applied  
Precision**

30 Years of Precise Innovations

# Applied Precision s.r.o.

## Products

30

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# Meter Test Equipment - ELMA



## ELMA

### AUTOMATED METER CALIBRATION AND TESTING

- Meter Production Automation
- High Production Efficiency
- Customized Design
- Pneumatic Quick Connection
- Smart Meter Compatible
- Complex Software Solutions
- Accuracy up to 0.01%

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## Fully Automated Meter Calibration and Testing

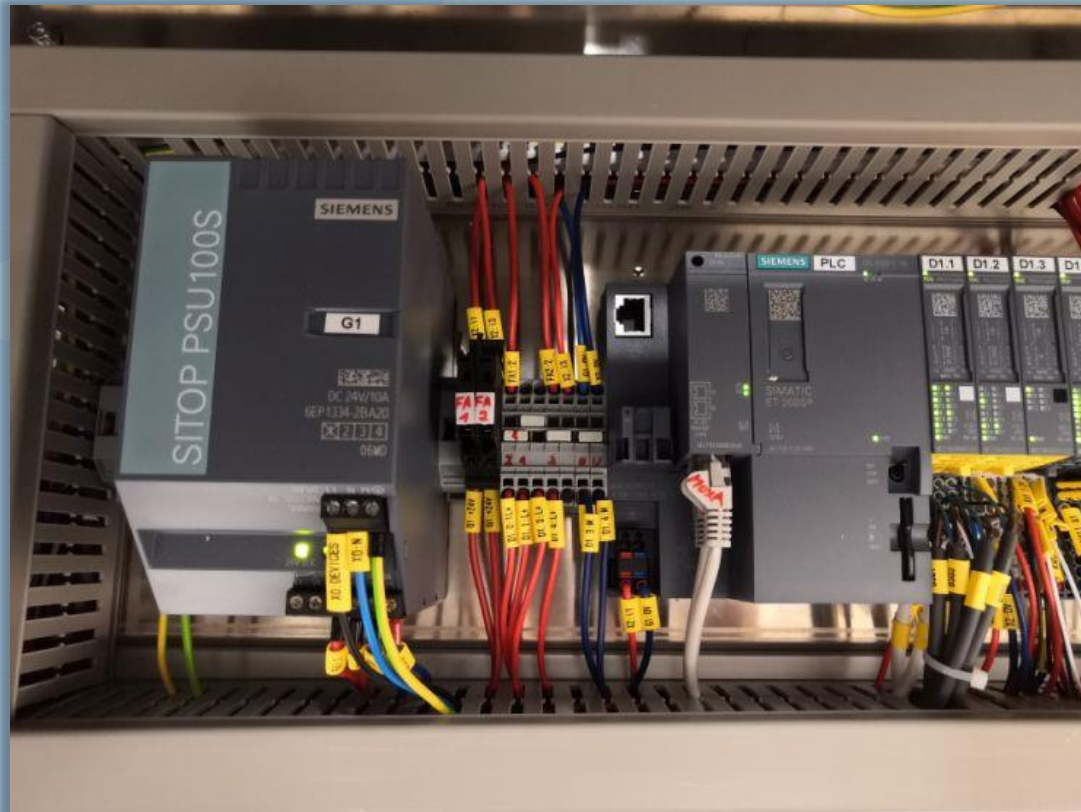
- Meter Producers
- Horizontal Meter Placement

## ELMA – Production Type



## Fully Automated Meter Calibration and Testing

- Safety and Control Integration (Siemens PLC)
- Supervising by SW “Manager”



# ELMA – Production Type

# ELMA – Production Type



20 positions – three-phase system

video: <http://www.appliedp.com/download/video/Elma20-Horizontal-Manual.mov>



**20 positions – three-phase system**  
video: <http://www.youtube.com/watch?v=RuRPNsgOyCI>



# ELMA – Production Type

**20 positions – single-phase system**



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# ELMA – Production Type

**24 positions – three-phase system – swap side**

video: <http://www.appliedp.com/download/video/elma24-horizontal-swapside.mp4>



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# ELMA – Standard Type – Fixed

5 positions



10 positions



# ELMA – Standard Type – Fixed

20 positions – double side



20 positions – single side



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# ELMA – Standard Type - Mobile

40 positions



## Power Source

- Generates and delivers precision high power voltage and current signals for high volume calibration and testing of electricity meters and measuring devices
- Modular design enables simple customization
- Signal generation based on digital synthesis of the signal waveform up to 100<sup>th</sup> harmonic
- Power Quality Signals
- Ripple Control
- High efficiency power output stages offer extremely high fidelity and noise-free output.
- Switch mode output stage efficiency better than 85%
- 19" Rack System
- RS 232 (IEEE 488 optional) with SCPI compatible programming protocol
- Output protection



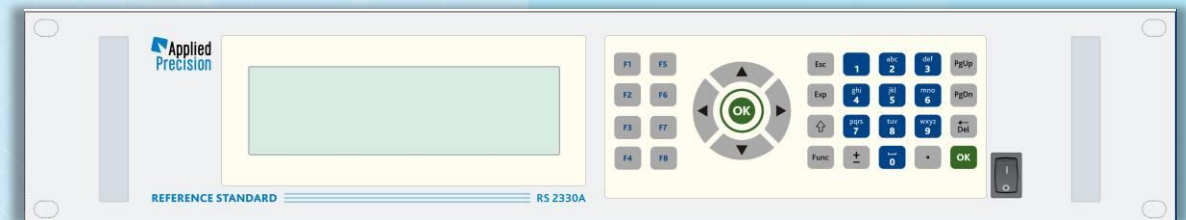
# Power Source - Specifications

- RMS Voltage: 30 V – 300 V (500 V - optional)
- RMS Current: 1mA – 120 A (240 A - optional)
- Output Power: 100, 300, 600, 1000, 1500, 2000, 2500 VA
- Phase Angle: 0° - 360°
- Frequency Range: 40 – 70 Hz
- Stability: 0.005 %
- Distortion Factor: <0.3 %
- Accuracy: 0.20 %  
0.05 %  
0.02 %  
0.01 %



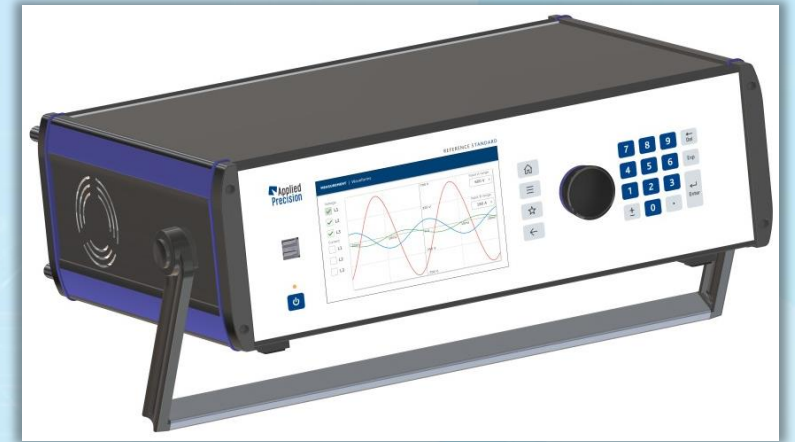
# Reference Standard RS 2x30

- Precision meter of electrical power and electrical energy
- Single-phase or three-phase, with display and keyboard
- Precision classes: 0.05, 0.02, 0.01
- 24-bit A/D precision conversion, FFT
- Programmable output impulses, 4 independent impulse outputs, 1 impulse input
- Remote control
- Measured quantities
  - Power, energy - active, reactive, apparent
  - Voltage, current, phase, frequency, distortion
  - harmonic content
- Meter Testing
- Energy Dosage Control

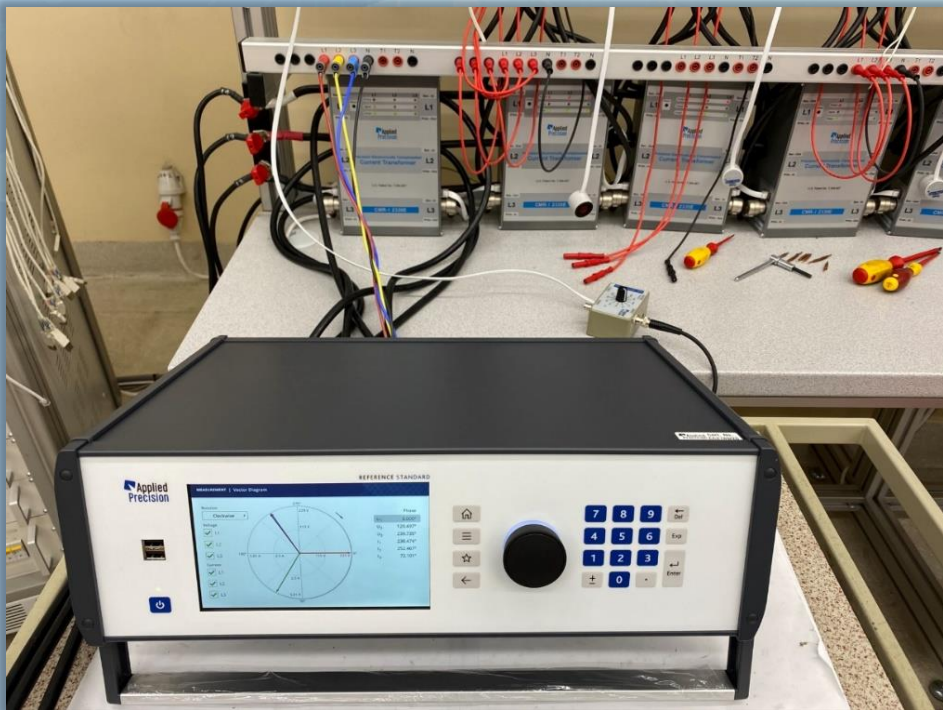


# Reference Standard RS 3330

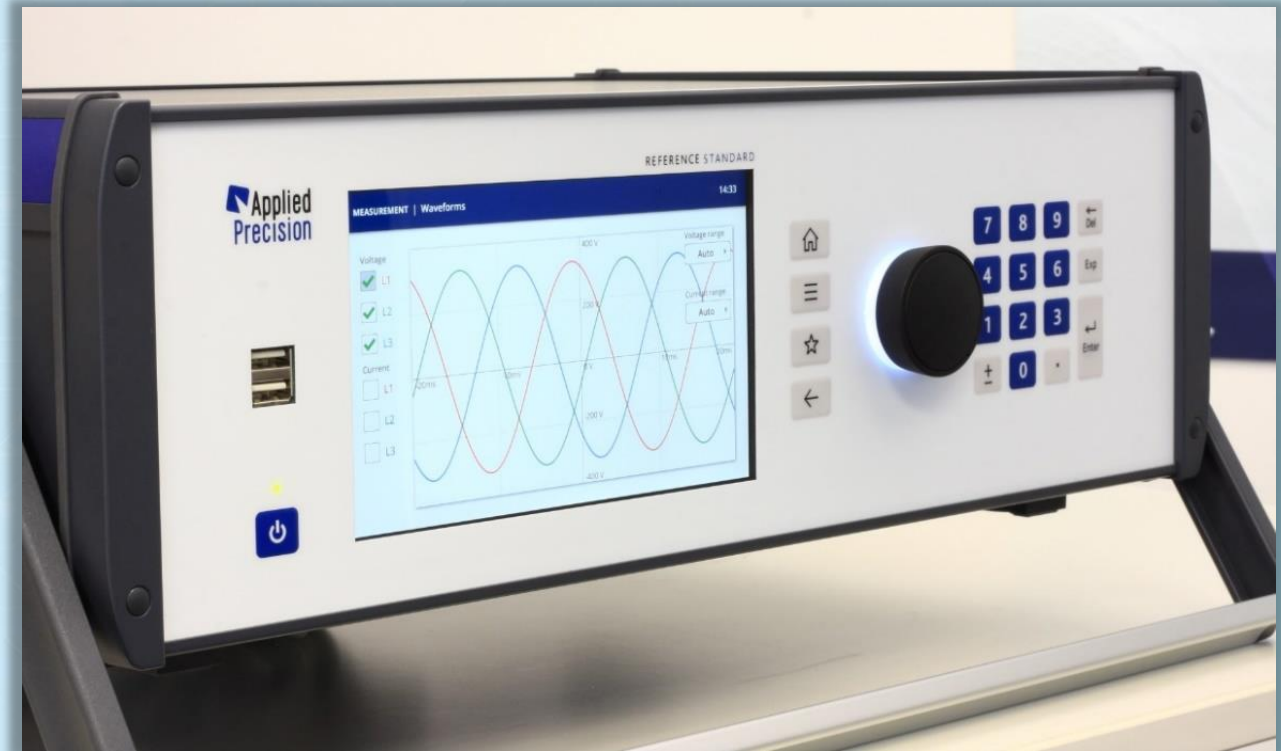
- 7" color touch display (with multi-touch function)
- Accuracy:
  - Model RS 3330S ... 0.01 %
  - Model RS 3330E ... 0.02 %
- Wide Measuring Range: 0.1 mA – 120 A, 0.1 V – 600 V
- Voltage and Current Inputs CAT IV 300 V / CAT III 600 V
- Bandwidth: 10 kHz
- Sampling rate: 24-bit 125000 samples/second
- Harmonics and interharmonics up to 200<sup>th</sup> harmonic
- Internal Processing up to 1024<sup>th</sup> harmonic
  
- 4 independent frequency inputs
- 4 independent frequency outputs (programmable), up to 4 MHz
- Ethernet connection, remote control, data exchange
- Power Quality Measurement According to IEC 61000-4-30



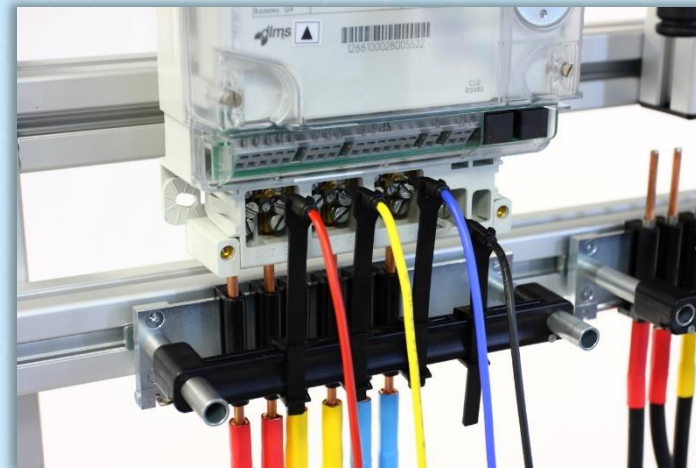
- Full Compatibility with ELMA Systems
- Standalone Version
- Use Case:
  - Primary Reference of Power and Energy
  - Meter Test Equipment Periodic Verification (“Weekly Maintenance”)
  - Power Quality Meters Verification



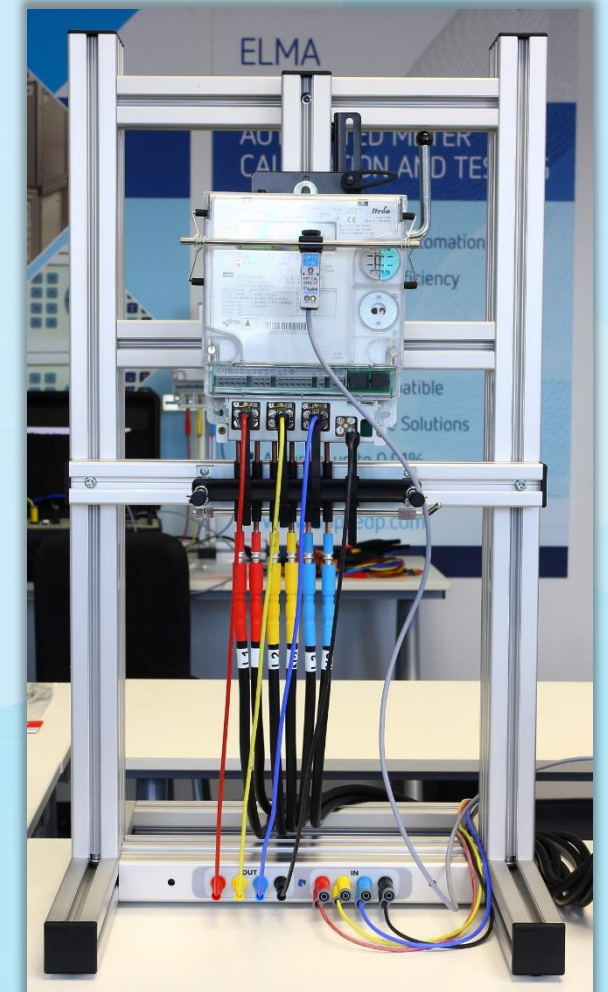
## Reference Standard RS 3330



- Fixed system – static stands
- Mobile system – fixed racks, mobile stands
- Modular design
- Quick connection for voltage, current and auxiliary contacts
- Single-phase or poly-phase quick connection mechanism
- Universal system – for any type of meter
- Customer specific design on demand
- Stands with Precision Electronically Compensated Transformers - simultaneous testing of meters with interconnected voltage and current circuits

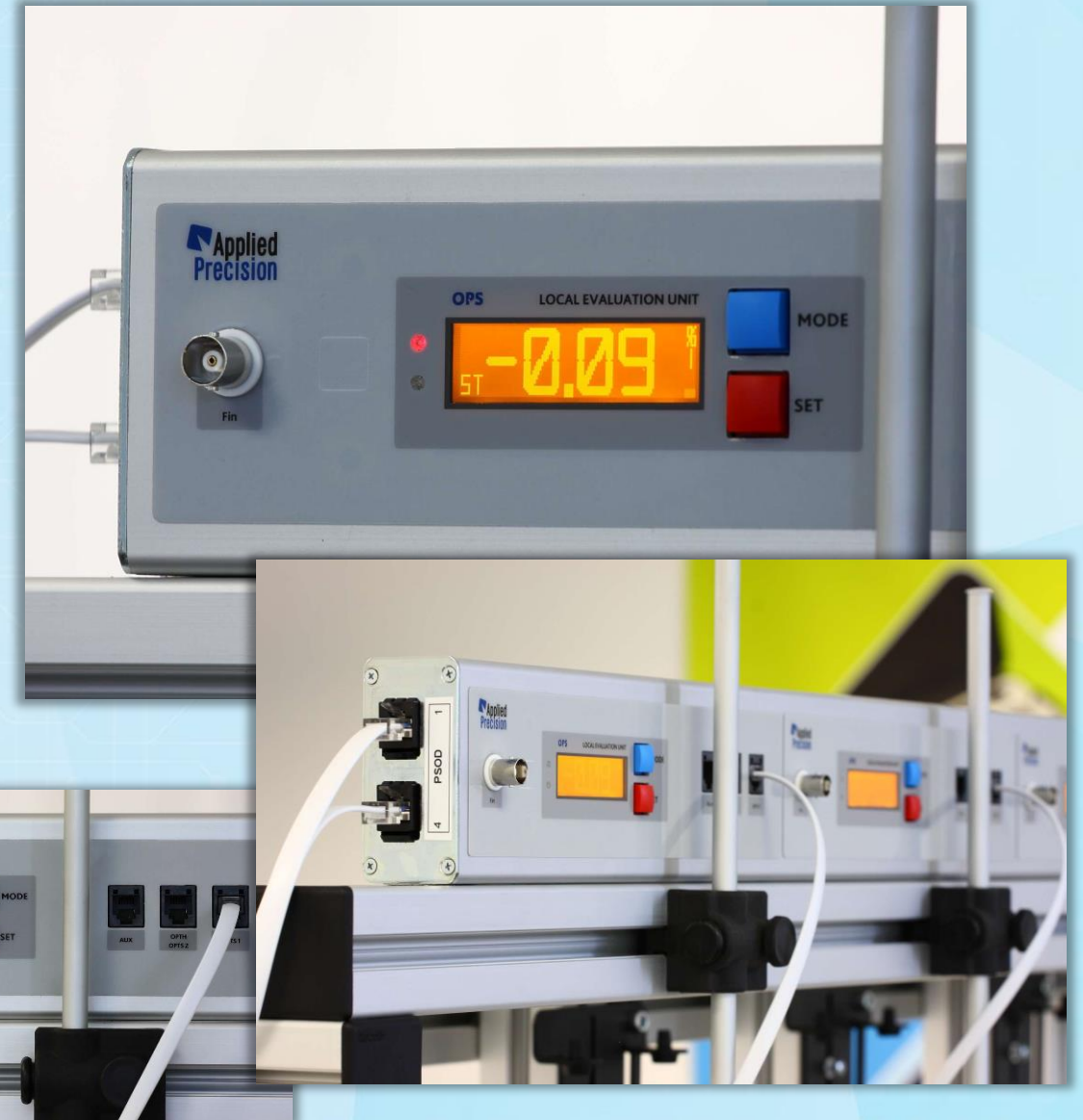


## Meter Handling System



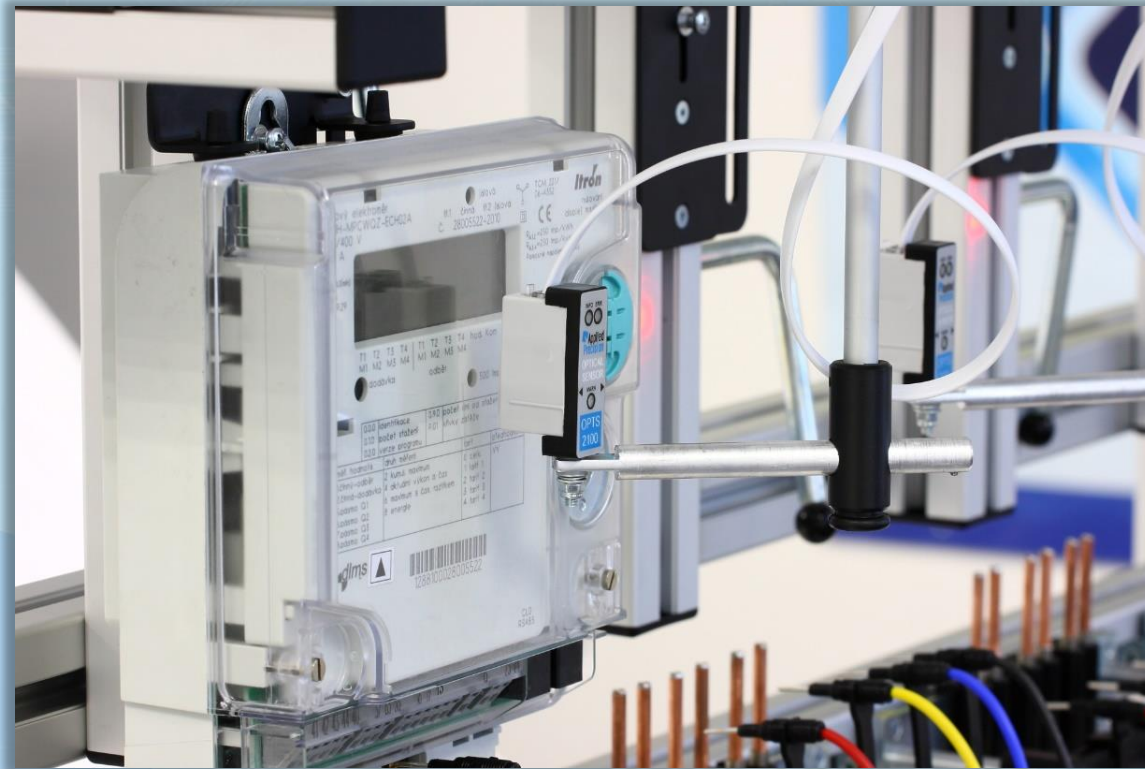
- Evaluation of meter error
  - static meters
  - inductive meters
- 4 inputs
  - LED/Disc sensing
  - LED/Disc sensing (reactive energy)
  - SO – meter impulse output sensing
  - BNC Input (20 kHz / 2 MHz)
- Local microcomputer
- Local control buttons
- Built-in dividers for evaluation of high constants meter up to 2.5kHz

## Local Evaluation Unit OPS



# Local Evaluation Unit OPS - Accessories

- Enhanced Optical Sensor OPTS 2100
- Optical Communication Head OPTH 1000 / OPTH 2000
  - Supports simultaneous meter data exchange
  - EDEX compatible
  - USB compatible



# Precision Electronically Compensated (PEC) Current Transformer

- Common Mode Rejecter for testing meters with interconnected current and voltage circuits (I-P links)
- Universal, small sized electronically controlled precision current transformer
- Serial remote control for Load Monitoring, Protection Circuits and Load Bypass
- Current ratio defined by primary and secondary coil via number of respective turns.
- Internal electronics assures exact primary and secondary ampere-turns equality
- Negligible additional power loss - no power increase is needed for closed link capability
- Universally applicable standalone unit with easy implementation to any existing test bench system
- Patented



# PEC Current Transformer - Specifications

- Max. Amplitude Error: 0.05 % , 0.02 % , 0.01 %
- Max. Phase Error: 0.03°, 0.01°, 0.005°
- Max. Output Power:
  - 1 x 50 VA (CMR-I 2130)
  - 2 x 50 VA (CMR-I 2230)
  - 3 x 50 VA (CMR-I 2330)
- Output / Input Voltage Ratio: user defined  
(1:1 for single wire circuit)
- Dynamics: > 100 000  
(240 A : 1 mA for single wire)
- Frequency Range: 45 – 65 Hz
- Power Supply: optional adapter PSCI 1220A
- Internal Power Consumption: < 2 VA
- Protection: Overload, Open Circuit



# Control Software ELMA

- Dedicated for electricity meter testing and calibration
- Controls all modules, data acquisition, evaluation, output documents generation, archiving, analysing
- User friendly programs for Microsoft Windows 10 / 11
- Network support in distributed systems, client/server architecture with central database
- Multilingual user interface with predefined and user definable dictionaries enables immediate national and regional implementation
- Simple switch of display from global characteristics of the process to detailed results on any meter
- Simple input of meter parameters, user defined tests, sequences, addresses and user friendly operations with respective databases
- User defined test limits with support of IEC standards and local regulations
- Graphic representation of measurement results, deviations and curves
- Output documents generation by usage of templates in Microsoft Word or Fast Report
- Support of mobile terminals for manual or barcode data acquisition
- Harmonic content definition in measuring power signals
- Simultaneous (parallel) data exchange with meters (EDEX)



## WORKING STANDARD

### ON SITE METER TESTING

- New Handy Design with 5.7" Display
- Integrated Voltage Input 600V CAT IV
- Electricity Meter Error Evaluation
- Dial Test, Maximum Demand Test
- Meter Data Readout
- Transformer Test
- Accuracy up to 0.02%

## PORTABLE TEST EQUIPMENT

### METER TESTING ANYWHERE

- Source and Reference in One Package
- Single Position Meter Test System
- Current Phantom Load
- Harmonics and Ripple Control
- Complex Software Compatibility
- Wireless Control from Android Device
- Accuracy up to 0.02%

[www.appliedp.com](http://www.appliedp.com)

- Handy and Lightweight Design with 5.7" Color Display
- Integrated Voltage Input 300 V CAT IV / 600 V CAT III
- Integrated Power Supply Function from Measured Circuit
- Two Universal Inputs for Voltage and Current Probes for Power or CT / VT Ratio, Phase and Burden measurement
- Accuracy Classes 0.2, 0.1, 0.05
- Color Graphic Display and Alphanumeric Keypad
- USB Connectivity with PC
- Enhanced Optical Scanning Head
- Optical Interface for Local Data Exchange with Smart Meters According to IEC 62056-21

## Working Standard



- High Capacity Memory for Configuration and Data Storage
- LED and TTL Impulse Outputs with Programmable Meter Constant or Frequency
- Vector Diagram and Signal Shape Display (Oscilloscope Mode)
- Harmonics Analysis in Tabular and Graphical Format
- Database System for Tested Meters and Measured Results with Search Capabilities
- Fast Synchronization of Measured Data and Configuration with PC
- PC Software for MS Windows
- Configurable User Interface (Regional and Functional Modifications)
- Transport Case with High Protection Degree

## Working Standard

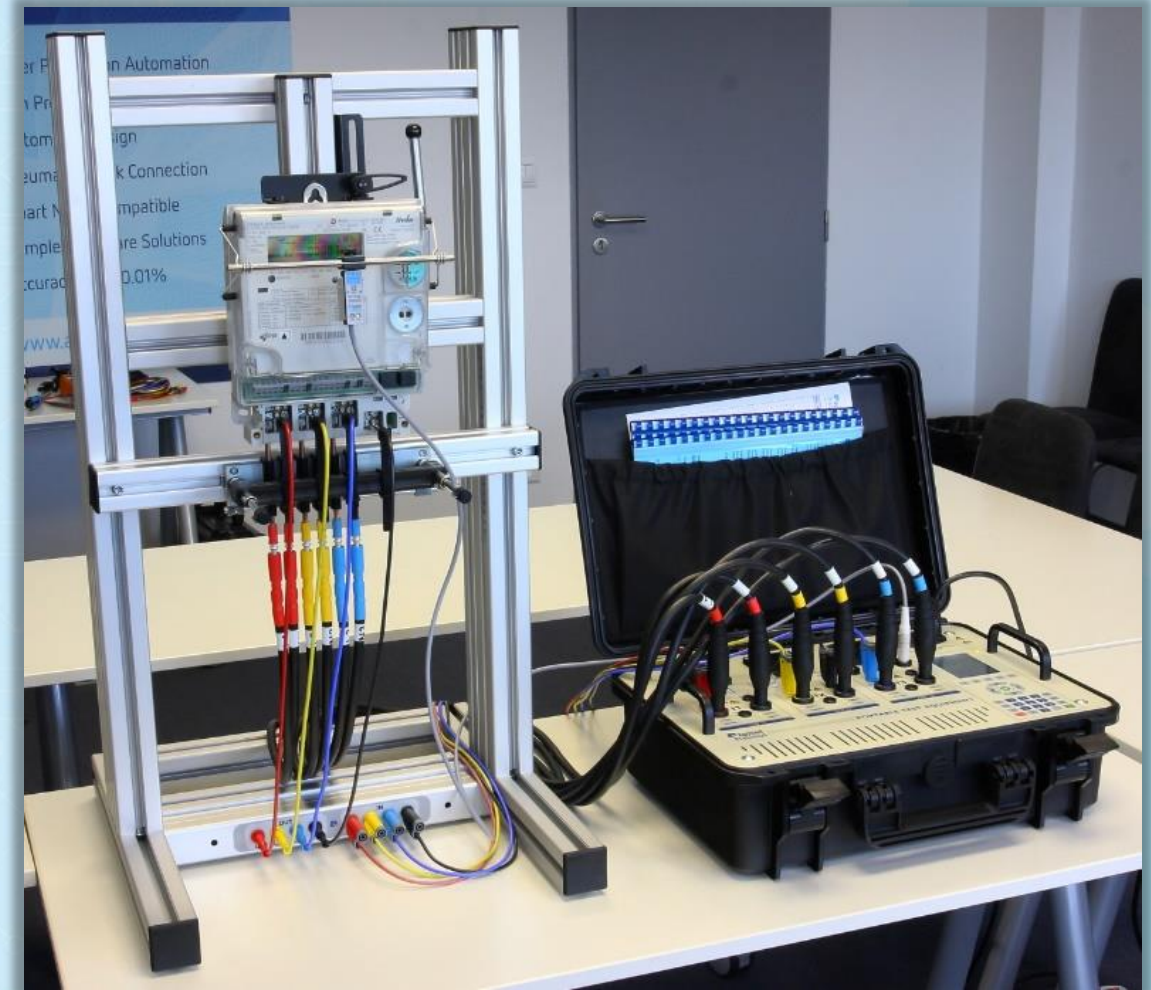


# Portable Test Equipment

- The Portable Test Equipment consists of an integrated three-phase current and voltage source and a three-phase electronic reference standard of accuracy class 0.05% or 0.02%
- Laboratory and on-site meter measurements
- Easy evaluation of meters under precise load conditions, using the built-in compact current and voltage source
- Testing of meters with closed I-P links
- Automatic operation with predefined load points without the need for an external computer
- Each source channel can be programmed with user defined harmonic content or standardized signal test shape
- Each source channel can be modulated with programmable Ripple control telegram
- Independent generation of single or three-phase loading conditions for testing, calibration and verification of meters
- Active, reactive and apparent energy measurement for three phase, 3 or 4-wire, systems with integrated error calculator and pulse output

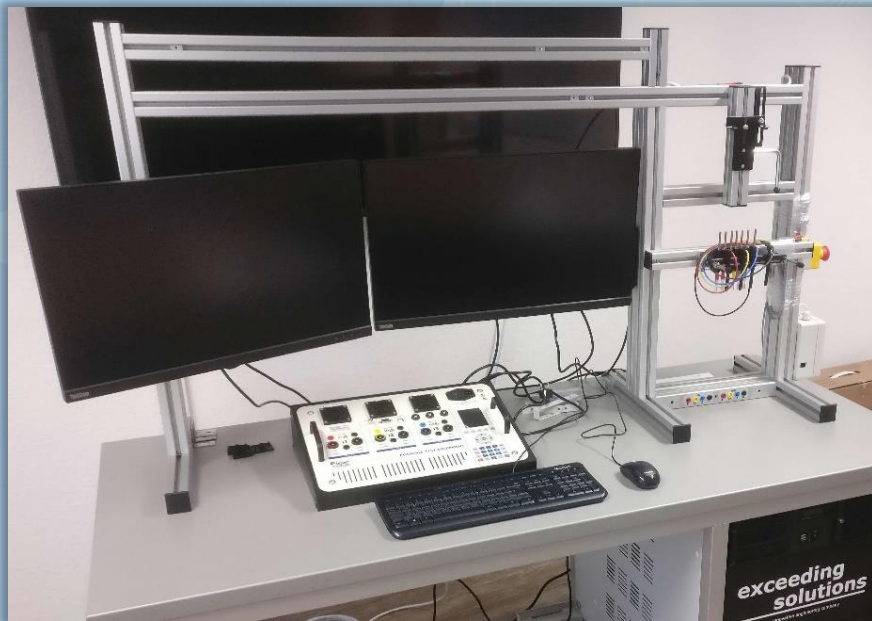
# Portable Test Equipment - Specifications

- Output Voltage: 3 V – 300 V / 30VA max.
- Current Output: 1mA – 120 A / 60VA max.
- Phase Angle : 0 .. 360 °
- Frequency Range: 40 – 70 Hz
- Optical scanner – sensing LED or disc
- Snap switch, impulse input
- Compatible with external voltage and current probes
- USB / RS-232 communication
- OS Windows based PC software for data transfer and presentation
- Supplied with transportable case

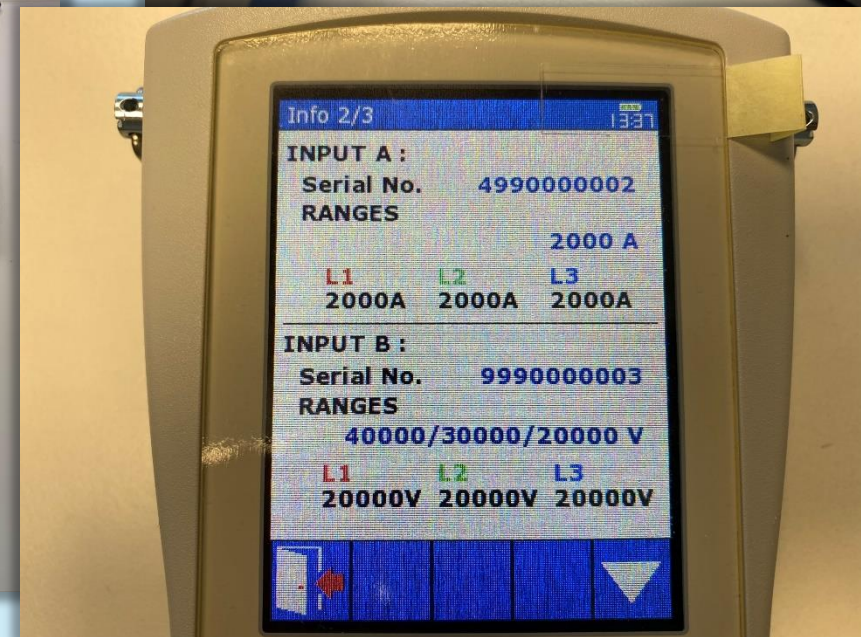
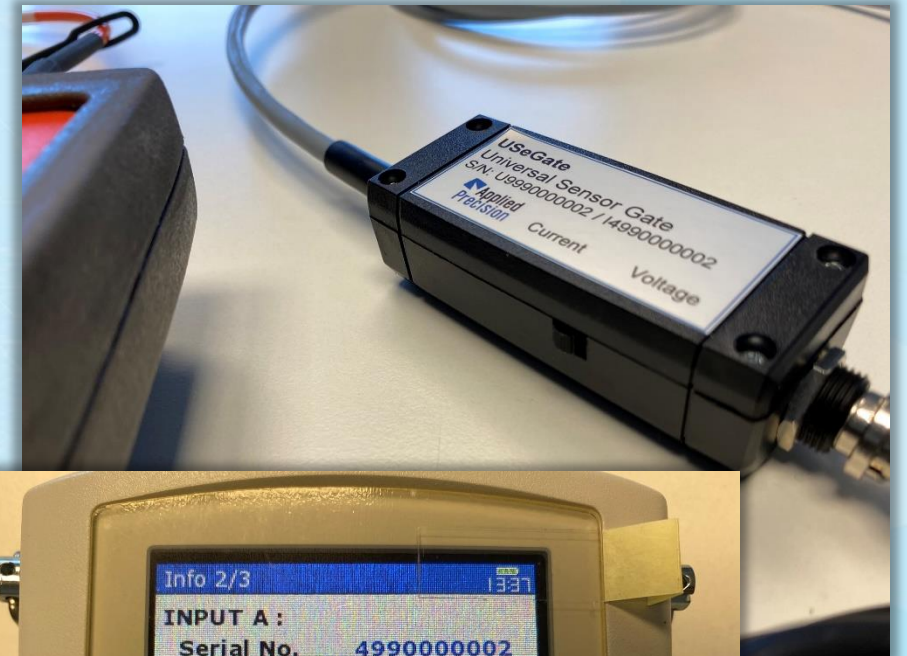


# PTE – Small Meter Test Systems

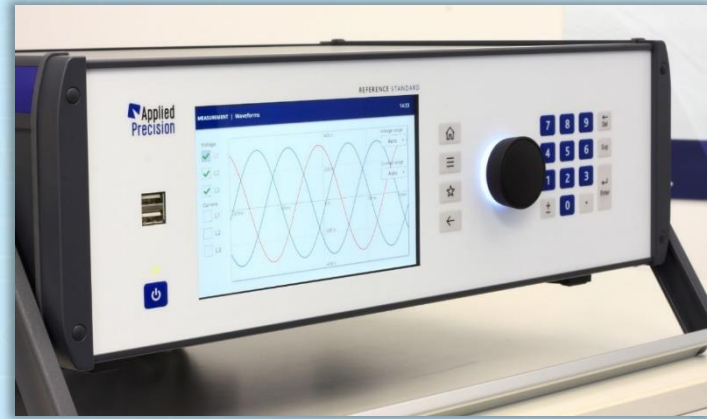
- Combined usage of internal current source and external voltage measurement – phantom load
- Small meter test systems from 1 to 4 positions
- Integration of PTE to table worktop



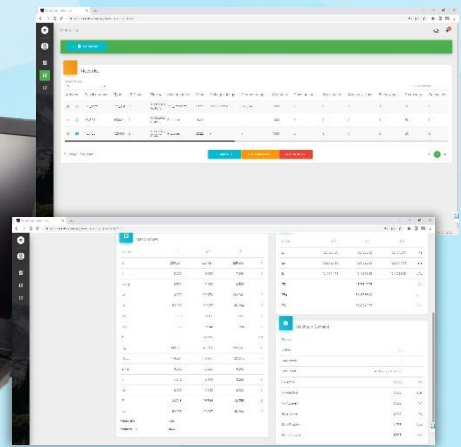
# USeGate – Universal Sensor Gate



# Ecosystem of Applied Precision



AP Cloud





# Applied Precision

30 Years of Precise Innovations

- New Version of Android app.
- New Graphical Tiles:
  - Vector Diagram
  - Harmonics
  - Signal Shapes
- Meter Database
- Communication with AP Cloud

# precis.io

The collage displays five screenshots of the precis.io Android application interface:

- Top Left Screenshot:** Shows a table of load values for three phases (L1, L2, L3).
 

	L1	L2	L3
U	230.03	230.02	230.02
I	5.00	5.00	5.00
$\Phi_U$	0.00	120.02	240.00
$\Phi_I$	60.02	60.00	60.00
$\cos \phi$	0.50	0.50	0.50
P	574.86	575.08	575.02
Q	996.29	996.15	996.11
S	1.15k	1.15k	1.15k
- Top Middle Screenshot:** Shows power and energy values.
 

S	1.15k	1.15k	1.15k
$E_p$	60.24k	60.26k	60.25k
$E_q$	104.03k	104.00k	104.02k
$E_s$	120.22k	120.21k	120.21k

Summary values:  
 $\Sigma P = 1.72k W$   
 $\Sigma Q = 2.99k var$   
 $\Sigma S = 3.45k VA$
- Top Right Screenshot:** Shows generator settings.
 

Generator settings:  
 f: 50 Hz  
 Conn. Type: 3P4W  
 Signal: Pure Sine  
 Buttons: Stop, Update
- Middle Left Screenshot:** Shows load values with a 'DISCONNECT' button.
 

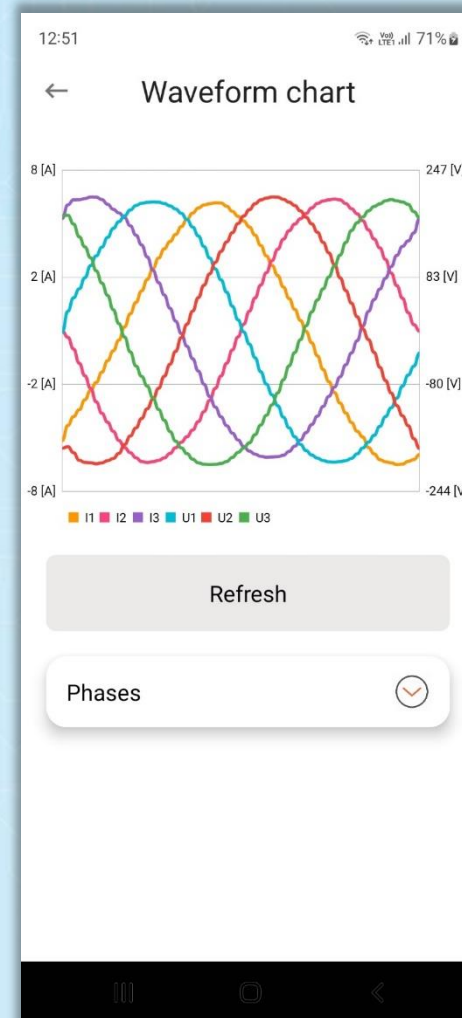
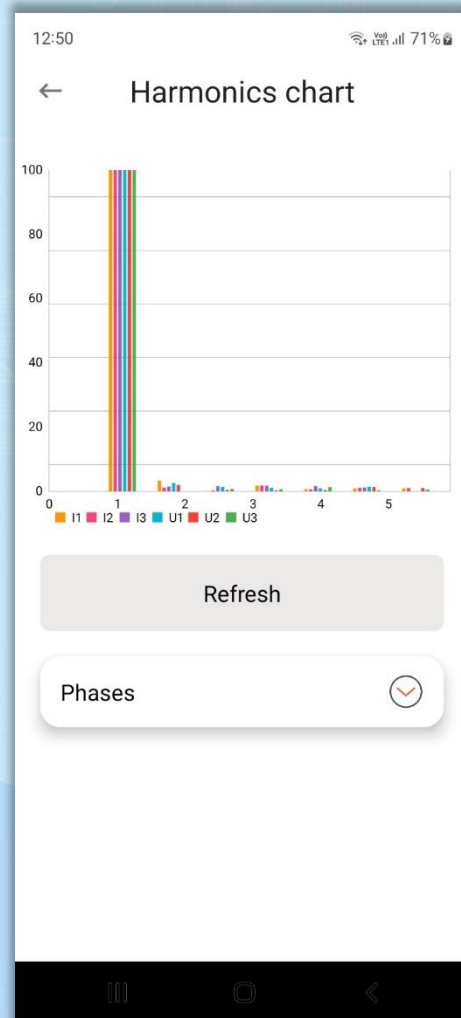
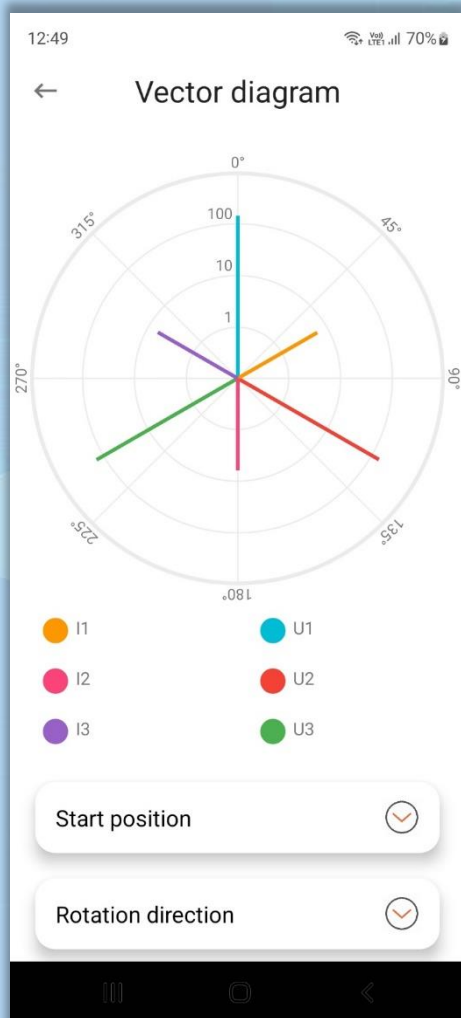
	L1	L2	L3
$DF_U$	0.20	0.21	0.20
$DF_I$	0.01	0.01	0.01
$U_{pp}$	398.46	398.36	398.41
$\Phi_{Upp}$	120.00	119.99	120.01
- Middle Right Screenshot:** Shows meter error test results.
 

Initial	Final	$\Delta E$
100.563	100.849	0.0

Summary:  
 -0.1388502 %  
 -0.496 %  
 60 sec.
- Bottom Screenshot:** Shows energy test results with a 'DISCONNECT' button.
 

Initial	Final	$\Delta E$
0.287426	01:00	17.245578



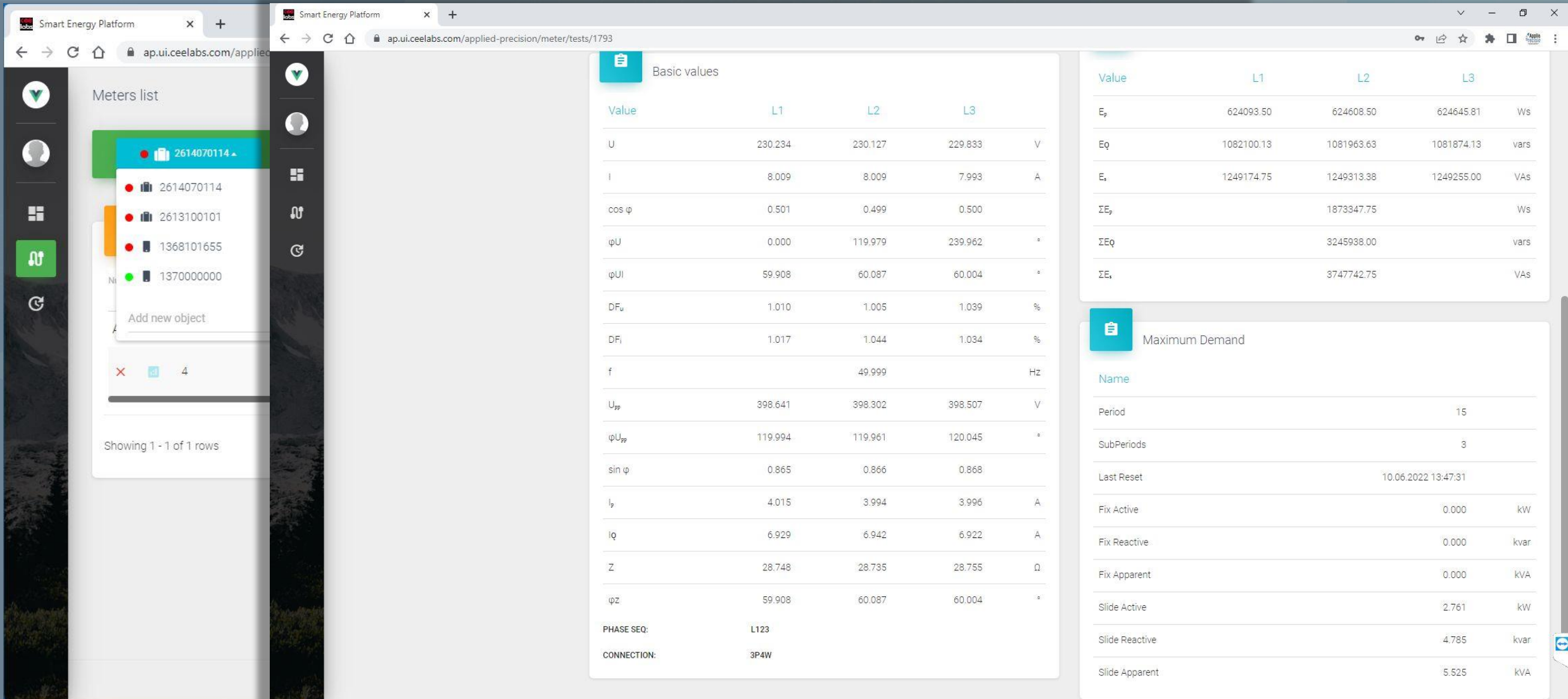


12:39 67%

### Meters

Download meters Upload meters

<b>Serial number</b>	123456
<b>Type</b>	123456
<b>CRC</b>	0
<b>IDN</b>	2
<b>LP Count</b>	0
<b>Time</b>	10.6.2022 12:38:12
<b>Manufacturer</b>	Producer
<b>Year</b>	2022
<b>Voltage ratings</b>	-
<b>Current ratings</b>	-
<b>Constant</b>	1000.0
<b>Constant unit</b>	0



The screenshot displays the AP Cloud Smart Energy Platform interface. On the left, a sidebar shows a 'Meters list' with a dropdown menu containing meter IDs: 2614070114, 2613100101, 1368101655, and 1370000000. The main content area is divided into three panels:

- Basic values:** A table showing electrical parameters for three phases (L1, L2, L3).
- Value:** A table showing specific values for various electrical parameters across three phases.
- Maximum Demand:** A table showing demand-related parameters and their values.

At the bottom of the 'Basic values' panel, the following information is displayed:

- PHASE SEQ: L123
- CONNECTION: 3P4W

Value	L1	L2	L3	
U	230.234	230.127	229.833	V
I	8.009	8.009	7.993	A
cos φ	0.501	0.499	0.500	
φU	0.000	119.979	239.962	*
φUI	59.908	60.087	60.004	*
DF <sub>U</sub>	1.010	1.005	1.039	%
DF <sub>I</sub>	1.017	1.044	1.034	%
f		49.999		Hz
U <sub>pp</sub>	398.641	398.302	398.507	V
φU <sub>pp</sub>	119.994	119.961	120.045	*
sin φ	0.865	0.866	0.868	
I <sub>p</sub>	4.015	3.994	3.996	A
I <sub>q</sub>	6.929	6.942	6.922	A
Z	28.748	28.735	28.755	Ω
φZ	59.908	60.087	60.004	*
PHASE SEQ:	L123			
CONNECTION:	3P4W			

Value	L1	L2	L3	
E <sub>p</sub>	624093.50	624608.50	624645.81	Ws
E <sub>q</sub>	1082100.13	1081963.63	1081874.13	vars
E <sub>r</sub>	1249174.75	1249313.38	1249255.00	VAs
ΣE <sub>p</sub>		1873347.75		Ws
ΣE <sub>q</sub>		3245938.00		vars
ΣE <sub>r</sub>		3747742.75		VAs

Name	Value	Unit
Period	15	
SubPeriods	3	
Last Reset	10.06.2022 13:47:31	
Fix Active	0.000	kW
Fix Reactive	0.000	kvar
Fix Apparent	0.000	kVA
Slide Active	2.761	kW
Slide Reactive	4.785	kvar
Slide Apparent	5.525	kVA

Smart Energy Platform

ap.ui.ceelabs.com/applied-precision/meter/tests/1793

### Meter test results

← BACK

10.06.2022 13:57:56  
METER ERROR  
1.50%

**Meter error**

Name

Error [%]

StDev [%]

Samples

Int. Period

Energy

OPS Input

Constant

**Basic values**

Value	L1	L2
U	230.234	230.127
I	8.009	8.009
cos φ	0.501	0.499
φU	0.000	119.979

Smart Energy Platform

ap.ui.ceelabs.com/applied-precision/meter/add

### Add meter

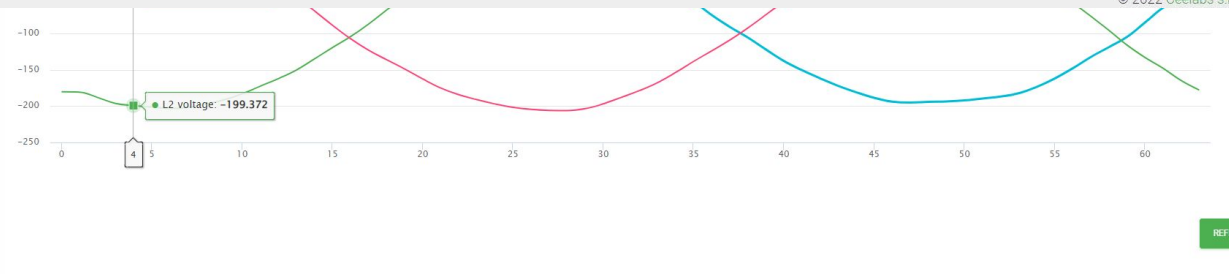
← BACK

Add meter

1/3      2/3      3/3

<p>Serial number 123_serial</p> <p>Connection 3P4W</p> <p>Energy Active</p> <p>Constant unit i/kWh</p> <p>Producer 123_Producer</p>	<p>Type 123_Typ</p> <p>Input type LED</p> <p>Constant 1000</p> <p>Constant type Secondary</p> <p>Class 1</p> <p>Year 2022</p>
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NEXT



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REFRESH