Power Calibration System

PCS ME 1.0

I + II

EnergoEtalon

I

Features

PCS ME 1.0 and EnergoEtalon™ software form a state-of-the-art reference setup that provides:

• **Extremely high accuracy of measurements;**
• **Versatility required for testing/calibration of high-end measuring instruments for AC and DC determinations;**
• **Extended frequency range for power quality measurements (16...3000Hz frequency bandwidth).**

Can be applied as

• **Standard of Active and Reactive Electrical Power for both sine and distorted signals;**
Active and reactive power measurements:

Power factor	Expanded uncertainty of measurements
PF = 1	0.004%
PF = 0.5	0.006%

• **AC Voltage and AC current Standards for sine and distorted signals with the following characteristics;**
Voltage and current measurements:

Parameter	Range	Expanded uncertainty of measurements
Voltage	0.01...530V	0.004%
Current	0.01...40A	0.004...0.006%
Phase angle U^I	0...360°	0.0015° at 50Hz

• **Analyzer of harmonic and interharmonic parameters;**
• **System for ratio measurements (scalar and vectorized quantities).**

Who needs PCS ME 1.0?

• National Measurement Institutes and standard laboratories may use it as a multifunctional calibration system for electrical energy and power quality applications;
• Metrological service departments of power industry enterprises;
• Research and design departments and laboratories that conduct products testing.
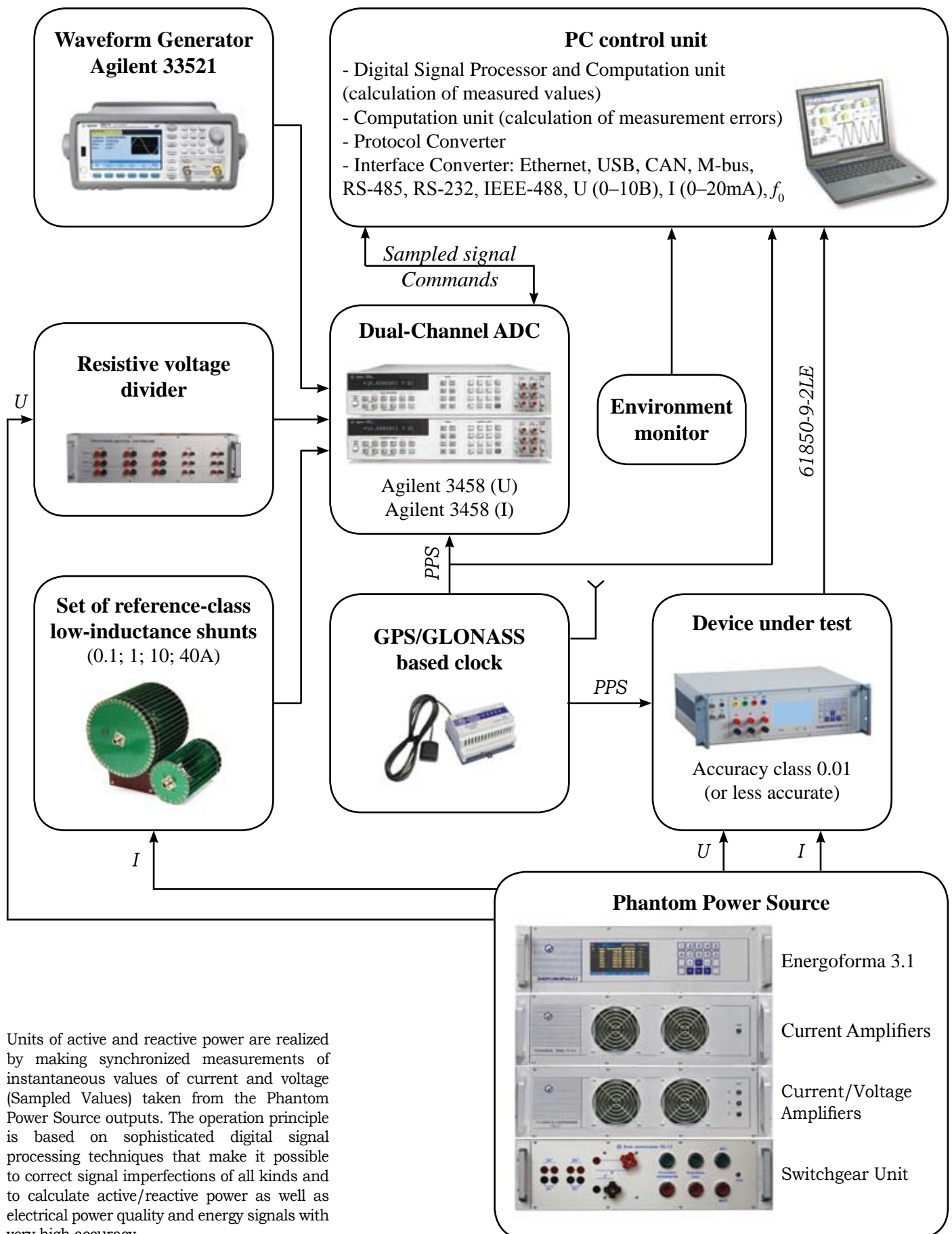
Extra functionality

• Traceable calibration of instruments making up Digital Substation infrastructure: non-conventional digital (electronic) current and voltage transformers, merging units with analogue input/output (IEC 61850-9-2LE).

• *With EnergoEtalon™-61850 software*
Operates with devices supporting digital communication interface (IEC 61850-9-2 LE), e.g. non-conventional instrument current/voltage transformers or power quality analyzers.

• *With EnergoEtalon™-PMU software*
Provides for calibration of the most precision Phasor Measurement Units.

Great opportunity

We offer an outstanding opportunity to get either the entire calibration setup or any part of it (that can be easily integrated in the equipment already installed in your lab). Considering that most of its blocks are typical "on-the-shelf" equipment you may purchase just EnegoEtalon software as a key component of the system.

		minimum (I)	maximum (I+II)
EnergoEtalon™ software		✔	✓
Three-phase AC Voltage/Current Phantom power source	Energoforma		✓
Dual-Channel ADC	Agilent 3458A multimeters		✓
Resistive voltage divider	480; 240; 120; 60 B		✓
Arbitrary waveform generator	Agilent 33521		✓
Set of reference-class low-inductive shunts	0.1; 1; 10 (5); 40 A		✓
Workstation			✓
GPS/GLONASS based clock			✓
Environment monitor (pressure, humidity, temperature)			✓

Block diagram and operation principle

Waveform Generator Agilent 33521

PC control unit
- Digital Signal Processor and Computation unit (calculation of measured values)
- Computation unit (calculation of measurement errors)
- Protocol Converter
- Interface Converter: Ethernet, USB, CAN, M-bus, RS-485, RS-232, IEEE-488, U (0–10B), I (0–20mA), f_0

Sampled signal
Commands

Resistive voltage divider

U

Dual-Channel ADC

Agilent 3458 (U)
Agilent 3458 (I)

Environment monitor

61850-9-2LE

Set of reference-class low-inductance shunts
(0.1; 1; 10; 40A)

GPS/GLONASS based clock

PPS

Device under test

Accuracy class 0.01
(or less accurate)

PPS

I

U I

Phantom Power Source

Energoforma 3.1

Current Amplifiers

Current/Voltage Amplifiers

Switchgear Unit

Units of active and reactive power are realized by making synchronized measurements of instantaneous values of current and voltage (Sampled Values) taken from the Phantom Power Source outputs. The operation principle is based on sophisticated digital signal processing techniques that make it possible to correct signal imperfections of all kinds and to calculate active/reactive power as well as electrical power quality and energy signals with very high accuracy.

EnergoEtalon™ software

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EnergoEtalon™ software

Estimation of signal parameters & tuning of ADC parameters

Synthesis of equalizer, special weighting window, phase correction filers

U_U → ADC$_I$

U_I → ADC$_U$

Control & Data Acquisition

Phase-shift compensation

Equalization of analog filters and sin(x/x) effect

× × ×

Signals weighting and calculation in time domain: P, Q, S, Urms, Irms

GPS/ GLONASS

FFT with specialized windows and optional: equalization of analog filters & sin(x/x) effects, phase-shift compensation

Calculation of signals parameters and PQP: U_1, I_1, P_1, Q_1, φ, THD, K_{harm}, etc.

Ratio measurements:
- phase displacement (Δφ)
- magnitude error

Voltage vector, Current vector, Time stamp

Traceability to digital substation equipment: calculation of Merging unit and non-conventional transformers parameters

U
I → **Merging unit or non-conventional transformer**

61850-9-2LE

Signal processing in time- and frequency domains

Signal processing flow chart