REFERANS

REF_CB_1000 Single-phase / Three-phase, Controllable Single Position Watthour Meter Calibration Bench User Guide

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Contents

1) Safety Instructions: First Read !

REF-CB-1000 has been developed to analyze the performance of the meter by measuring current, voltage, power and energy values for active single-phase, active three-phase, active and reactive three-phase for direct connected and transformator connected energy meters.

Only persons over 18 years of age with the relevant electrical training and experience are authorized to use the equipment.

Each person using this device must read, understand and follow this guide, including safety instructions. Use of device parts or cables in a manner not specified in the instruction manual may damage the protection provided by the device.

At the same time, the general principles of local safety regulations, general principles for accident prevention and safe engineering regulations should be considered.

If the device functions or units are functioning abnormally or are damaged, the protection may be impaired. Do not operate the device in this state. Test operation must be stopped until damaged, unworked or damaged parts are repaired.

1.1 Warning

To avoid electrical shock, fire or damage to the device, the following information must be considered.

- Do not apply more voltage than the specified voltage. It is recommended to use ups or voltage regulator as source.
- The operator must not use the device without terminal block protection box,
- Do not insert metal objects into the connectors,
- Always, use the device parts as specified,
- Ensure that the recommended laboratory ambient conditions are met. Do not use the device under extremely humid, extremely hot, extremely cold conditions,
- Hands, shoes and floor must be dry and energy must be off when making input connections to the power line. Laboratory insulation should be provided as specified in the standards.
- Check the insulation of all cables for cracks and any problems. If problematic, change immediately.
- The user must wear appropriate personal protection equipment including safety goggles and insulated gloves.
- Ensure that all connections are properly made. Weak connections may cause sparking, overheating and short circuit, and may damage the device or insulation,
- Before starting the test, make the device connections and then connect the meter to the device,

- At the end of the test, turn off the device with emergency stop button, and disconnect the meter from the device , then remove the device connections.

1.2 Important User Information in the Guide

1.2.1 Warning Instructions

In this manual, the rectangles bordered with red lines are used to indicate that if the operator or the user does not consider the warning message in the box, it may be dangerous for him or the device and may cause serious damage.

The sample rectangle is seen below:

! If the warning message in this red box is ignored, the user or device may be seriously damaged.

1.2.2 User Information And Tips

In this manual, the rectangles bordered with blue lines are used to give information and tips to the operator or user.

The sample rectangle is seen below:

! The rectangle bordered with blue lines gives some information and tips to the user.

1.2.3 Abbreviations

The abbreviations and their definitions used in this manual are shown in the following list:

Abbreviation	Definition
AC	Alternative current
DC	Direct current
F	Frequency
UPS	Uninterruptible Power Supply
V	Volt
A	Ampere

1.3 Check before use

Please check before use:

The input fuse in Figure 1 must be switched off before energizing the device.

Figure 1

Before connecting to the input fuse, check whether the R, S, T, Notr lines are in sequence and correct, with phase sequence gauge and voltmeter. Ensure that the voltage between R - Notr, S - Notr, T - Notr is at 230V.If this connection is inaccurate, the device may be damaged as a phase to phase voltage at 400 Volt can be applied to the phase to neutral zone which should be 230V.
If the phase sequence is faulty, it will not be possible to apply the requested angle (angle between current and voltage) to the etalon and meter and the requested measurement will not be possible.

After all the above checks are done, while the emergency stop button shown in Figure 2 is closed, input connections are made in the order in Picture3 and then the fuse is activated.

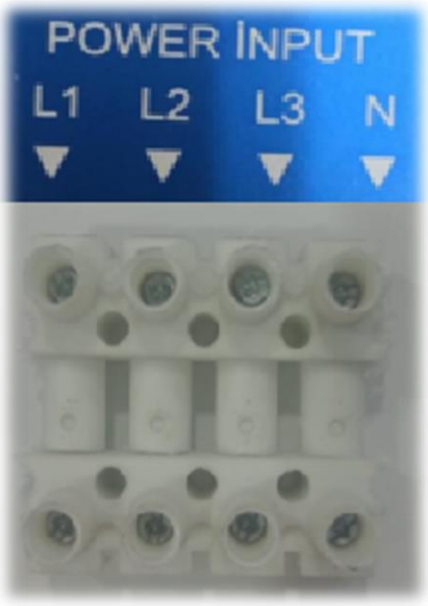


Figure 2

Measurements are repeated on the fuse. If there is no problem, the emergency stop button is opened.

Figure 3

The usb communication cable is connected to the computer where the test program is installed. The com port is automatically found by the program when the test program is opened.

After this stage, the terminals of the meter are connected to pins on the meter calibration panel via the quick connection set.

Figure 4

After connecting the meter to the meter calibration panel, Main Contactor, Voltage, Current, Phase Angle, Phase Current On-Off relays can be managed from the Power Source tab of the program. Thus the requested current, voltage and phase angle values can be applied to the meter to be tested. This process can be done with the test program or with a DLL file to be given to the user or 4x16 Lcd screen. Details on this topic are described in the Software Guide.

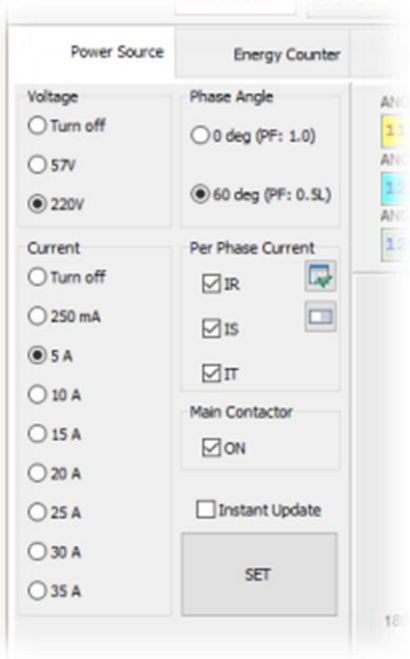


Figure 5

Depending on the current, voltage and phase angle applied to the test meter, the optical test output of the meter will start to produce signals. The pulse reader head is adjusted so that the leds on the pulse reader

flash at the same time as the test meter led. In this way, the pulse information produced by the meter is transferred to the etalon as feedback.

Figure 6

After this stage, Voltage, Current, Phase Angle between Current And Voltage, Power Factor, Active Power, Reactive Power, Angles between phases of R, S , T and Frequency information can be displayed separately for each phase applied to the meter.

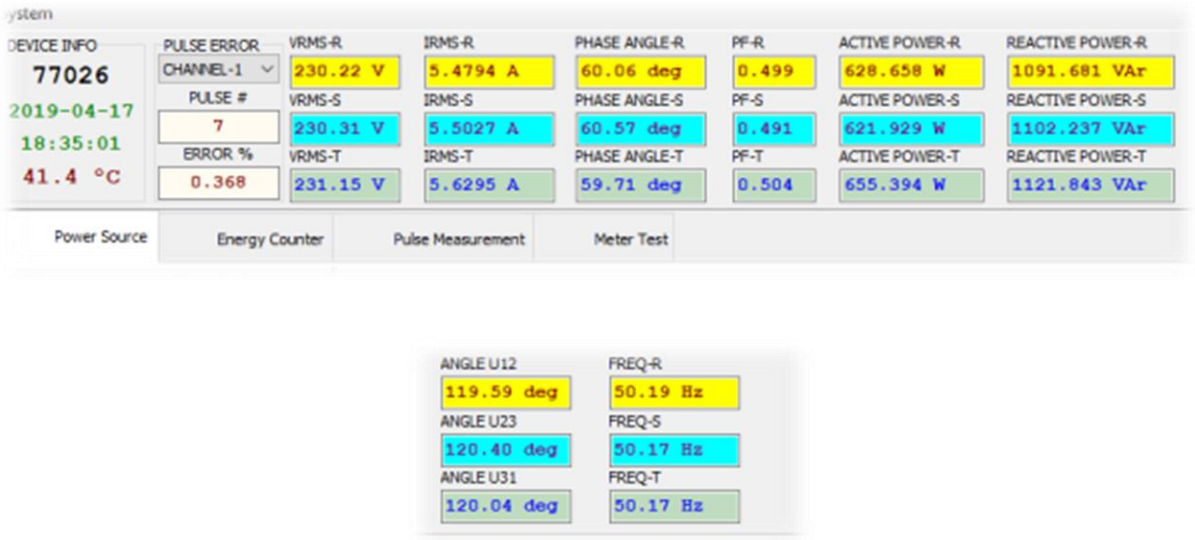


Figure 7

The power factor between current and voltage, the angles between voltages is also presented to the user graphically as follows.

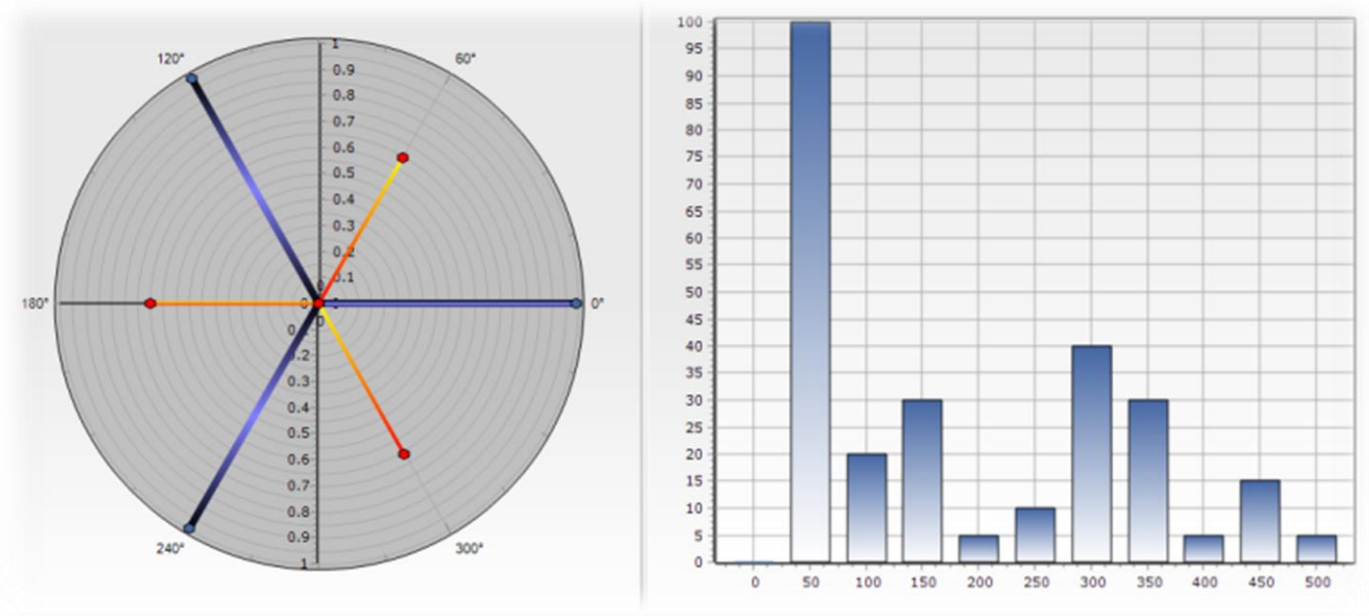


Figure 8

When the Energy Counter tab is clicked as shown in Figure 9, the active, reactive total energy information produced by each phase is recorded for certain time intervals to allow for dosing testing.

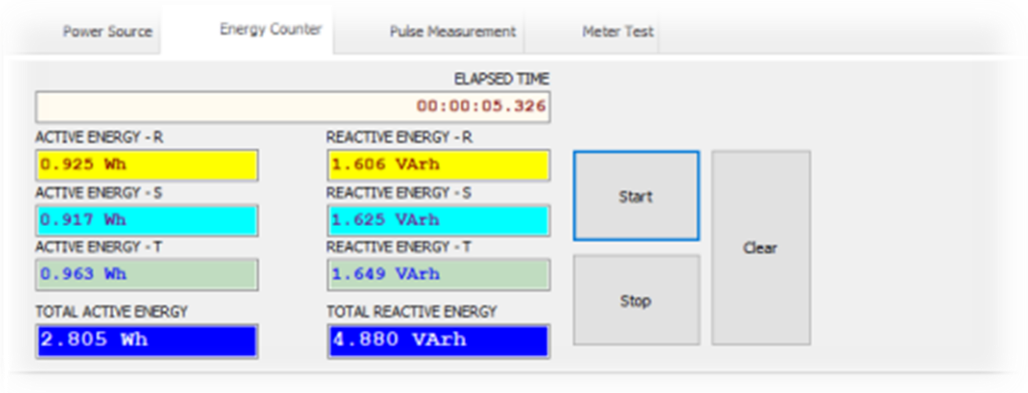


Figure 9

When “Pulse Measurement” tab is clicked, it is possible to enter the impulse / kwh value of the test meter as well as the N parameter as shown in Figure 10. The meter LED output generates signal according to

impulse / kwh value. For example, a watt hour meter with an Imp / Kwh value of 1000 will record a 1 kWh index when 1000 pulses are generated. In this case, 1 pulse is 1Wh.
The N number refers to the number of samples to be averaged. When N = 3 is selected, the calibration panel will produce results according to the average of 3 pulses.

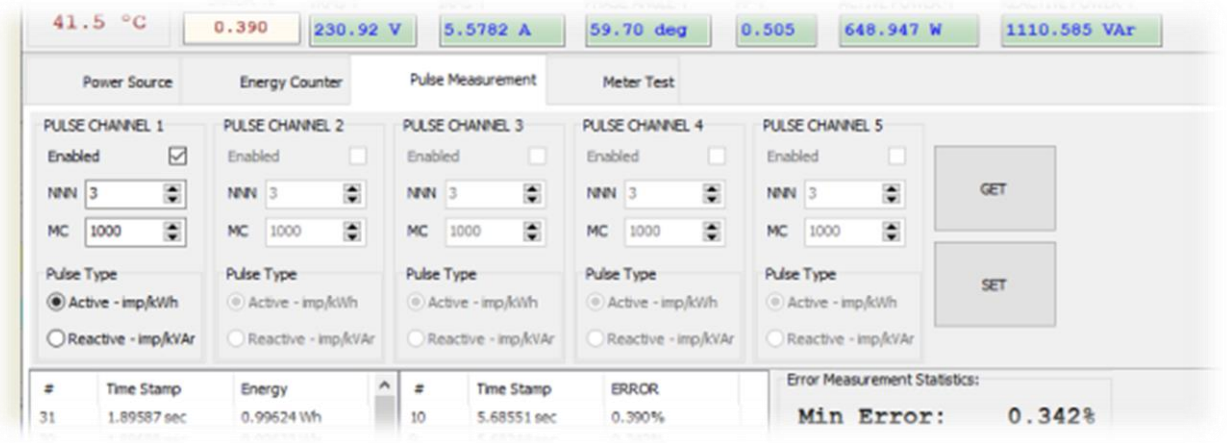


Figure 10

At the bottom of the same window, energy information together "Time-Stamp"s generated by the test meter and error values are displayed. These values can be recorded in the user database with the help of the dll file. The minimum and maximum error values, Range (the difference between the Max. and Min. error values), Average (the average of the error values), stDev (Standard deviation) are calculated separately.

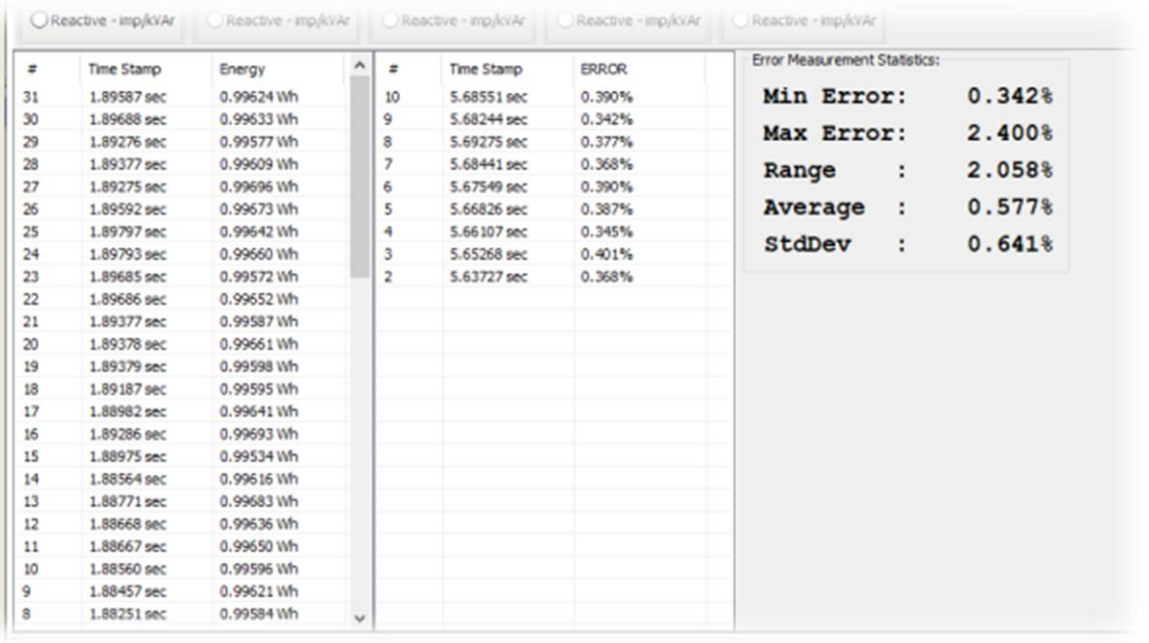
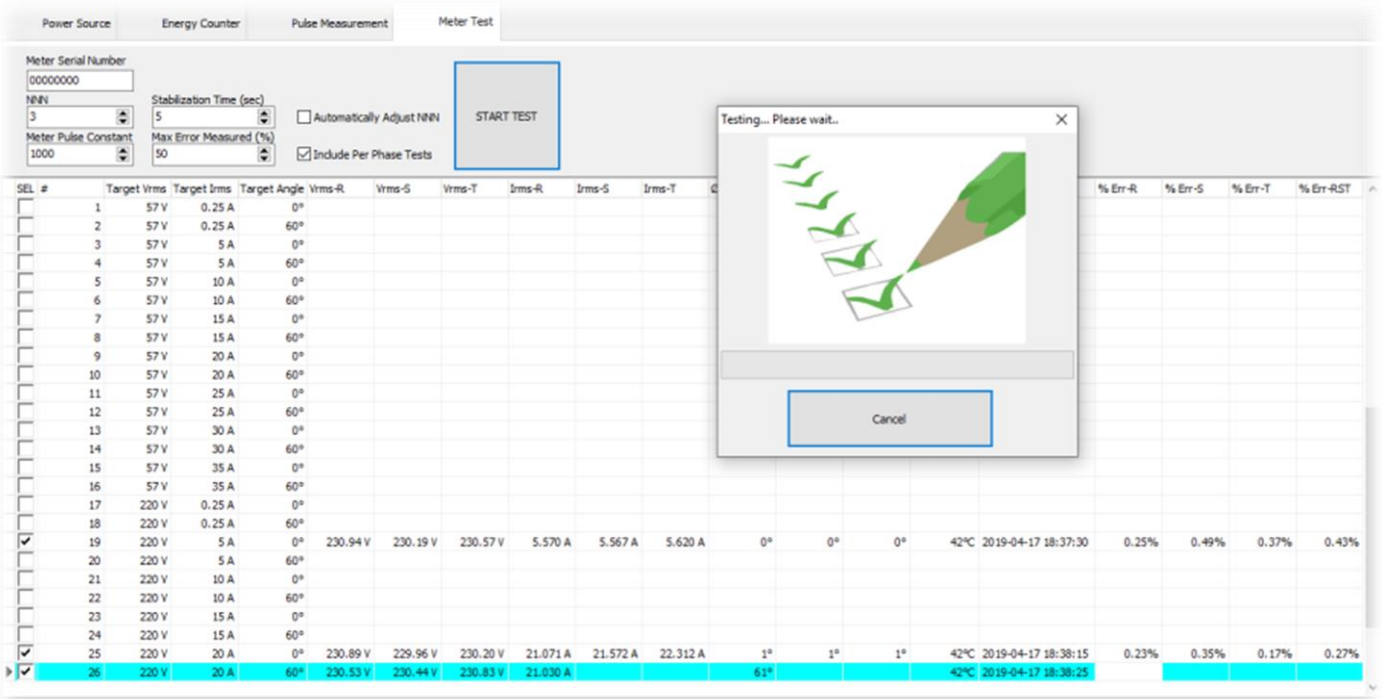


Figure 11

In the Meter Test tab, the previously defined test steps are applied in order and the voltage, current, angle information for each phase, laboratory temperature and accuracy values are automatically reported together with their date and time.



SEL	#	Target Vrms	Target Irms	Target Angle	Vrms-R	Vrms-S	Vrms-T	Irms-R	Irms-S	Irms-T						% Err-R	% Err-S	% Err-T	% Err-RST
☐	1	57 V	0.25 A	0°															
☐	2	57 V	0.25 A	60°															
☐	3	57 V	5 A	0°															
☐	4	57 V	5 A	60°															
☐	5	57 V	10 A	0°															
☐	6	57 V	10 A	60°															
☐	7	57 V	15 A	0°															
☐	8	57 V	15 A	60°															
☐	9	57 V	20 A	0°															
☐	10	57 V	20 A	60°															
☐	11	57 V	25 A	0°															
☐	12	57 V	25 A	60°															
☐	13	57 V	30 A	0°															
☐	14	57 V	30 A	60°															
☐	15	57 V	35 A	0°															
☐	16	57 V	35 A	60°															
☐	17	220 V	0.25 A	0°															
☐	18	220 V	0.25 A	60°															
☑	19	220 V	5 A	0°	230.94 V	230.19 V	230.57 V	5.570 A	5.567 A	5.620 A	0°	0°	0°	42°C	2019-04-17 18:37:30	0.25%	0.49%	0.37%	0.43%
☐	20	220 V	5 A	60°															
☐	21	220 V	10 A	0°															
☐	22	220 V	10 A	60°															
☐	23	220 V	15 A	0°															
☐	24	220 V	15 A	60°															
☑	25	220 V	20 A	0°	230.89 V	229.96 V	230.20 V	21.071 A	21.572 A	22.312 A	1°	1°	1°	42°C	2019-04-17 18:38:15	0.23%	0.35%	0.17%	0.27%
☑	26	220 V	20 A	60°	230.53 V	230.44 V	230.83 V	21.030 A			61°			42°C	2019-04-17 18:38:25				

Figure 12

2) Getting Started with the Device

2.1 General Description

REF-CB-1000 has been developed to analyze the measurement performance of the meter by measuring current, voltage, power and energy values for active single-phase, three-phase, direct-connected or X/5 (connected with transformer) active and reactive combi energy meters and works according to the following diagrams and steps.

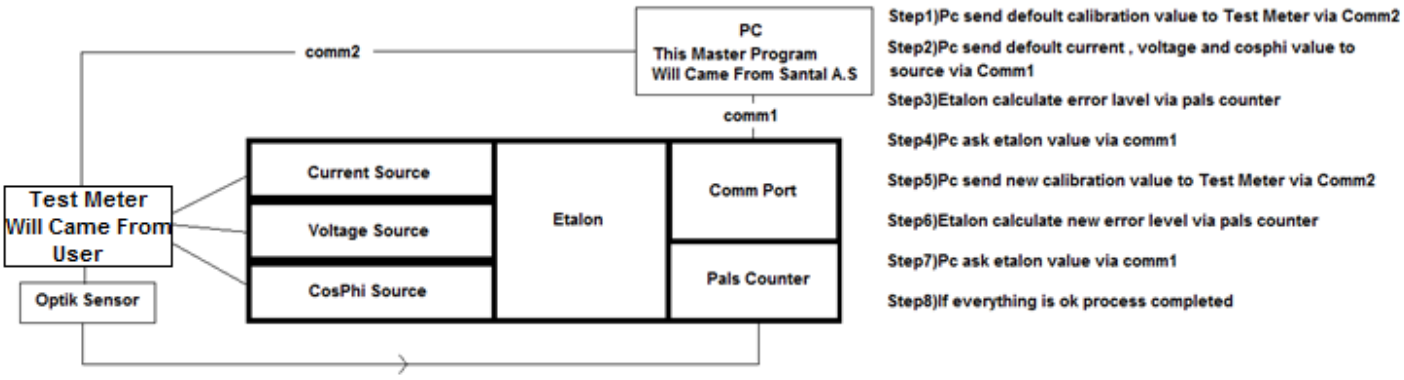


Figure 13

2.2 Features and Functions

The REF-CB-1000 is designed and developed with the following features and functions:

a. Rms voltage measurement for each phase,
b. Rms current measurement for each phase,
c. Power Factor (Angle between Current and Voltage) for each phase,
d. Phase to phase angle measurement (The angle between phase voltages),
e. Instantaneous active power measurement,
f. Instantaneous reactive power measurement,
g. Energy measurement up to the 40th harmonic with Bandwidth of 2kHz,
h. Operating temperature: -40°C / 70°C,
I. Frequency measurement for each phase,
j. Pulse reference output with led for active energy,

k. Pulse reference output with led for reactive energy,

l. 0.2 Class Active measurement accuracy,

m. 0.2 Class Reactive measurement accuracy,

n. Logging substructure of the error values measured with the last 64 pulses (From this substructure, in periods of 100ns sensitivity, the requested energy and test meter accuracy can be calculated),

o. Logs of error values measured with the last 64 pulses can be transferred to the system via communication channel,

p. Impulse/kWh value can be selected from 10 to 1.000.000,

q. N number can be selected from 1 to 63,

r. In periods of 100ns sensitivity, 16 logs for error measurement accuracy,

s. Statistical data of measurement logs (Min error, Max error, Delta error, Average error, Standard deviation),

t. Information of energy per each phase and total energy for certain time intervals to allow for dosing testing,

u. Automatically, measuring of error for energy per phase and total energy and reporting tool,

v. Atomic clock synchronization,

w. Temperature measurement with a precision of 0.5 ° C

x. Firmware update,

y. Ethernet, USB communication outputs,

z. Power supply control with 4x16 Lcd display,

aa. 57 / 230V voltage range selection,

bb. 250mA, 5A, 10A, 15A, 20A, 25A, 30A current range selection,

cc. 0°/60° angle range selection,

dd. Possibility of On-Off for each phase current,

ee. Switch of ranges: Max. 1 second

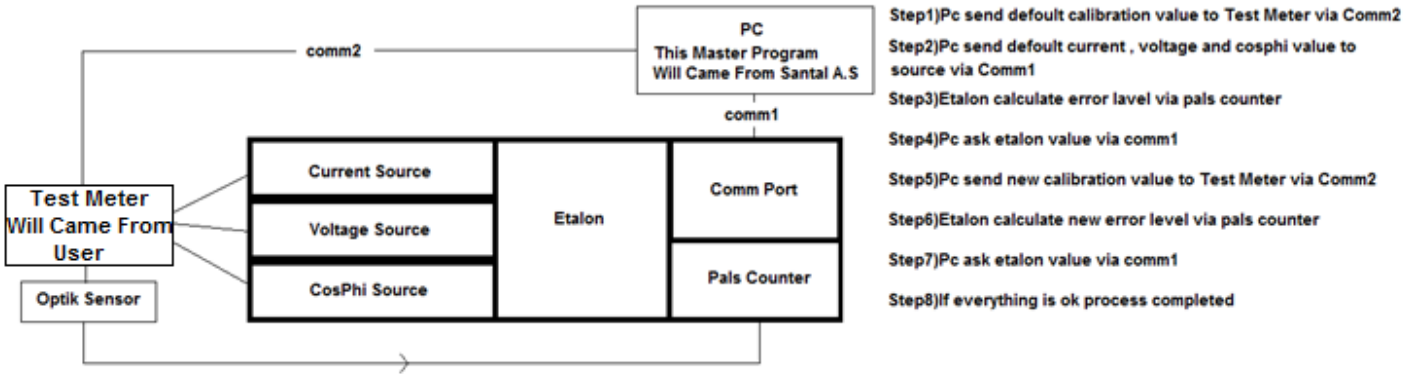
ff. Power consumption

2.3 Controls and Indicators

2.3.1 Socket Connections

1. The pulse reader,
2. Energy On-Off Indicator for each phase,
3. Emergency Stop Button,
4. Terminal block protection box,
5. Meter to be tested,
6. Pressing Arm for test meter,

2.3.2 Connection Diagram and Working Principle



Device Connection Diagram