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TECHNICAL SPECIFICATION OF PORTABLE ELECTRONIC REFERENCE STANDARD ENERGY METER (ERS METER) FOR TESTING OF HT THREE PHASE ENERGY METERS:-

1.0 SCOPE:-

A lightweight electronic precision portable energy meter testing equipment which shall be capable of testing and calibration of all type of HT 3 phase x 3 wire/4 wire induction as well as electronic Active, Reactive and Apparent Energy Meters at lab & site. The specification covers the design, manufacturing, testing and supply of 0.1 accuracy class. The HT ERS meter shall be of 0.1 Class accuracy and shall have 4 wire potential leads and 2 x 3ph i.e. 6 wire current leads. HT ERS shall have auto mode selection for current ranges from 1 mA to 10 Amp in direct mode for testing of HT 1 Amp.& 5 Amp. CT & PT operated TVM. Also should have one nos. of external Set of Clamp type CT for 10mA to 100A and one nos. of external Set of flexible current probe for 1 A to 2000A for testing of meter at higher ampere.

2.0 SERVICE CONDITIONS: -

Equipment to be supplied against this order shall be suitable for satisfactory continuous operation under the following tropical conditions:

- | | |
|---|-------------------------------------|
| (a) Maxi. Amb. Temp. | 70° C (b) |
| (b) Maxi. Temp. in shade | 55° C (c) |
| (c) Mini. Temp. of air in shade | 3.5 ° C |
| (d) Relative Humidity | 10 to 95 RH (e) |
| (e) Maxi. Annual Rainfall | 1450 cm |
| (f) Maxi. Wind pressure | 150 Kg. Sq. Mtr. (g) |
| (g) Maxi. Altitude above sea level | 1000 meter |
| (h) Seismic level (Horizontal acceleration) | 0.39 |
| (i) Moderately hot & humid tropical Climate – | conductive to pest & fungus growth. |

3.0 APPLICABLE STANDARDS : IEC 60687/92, IS 11426 and IS 14697, IS 2705, IEC 60736, IEC 0801 -2/3/4, IS 12346, IS 15707 & CBIP Technical report publication No: 325.

Equipment meeting with the requirement of other authoritative standards, which ensure equal or better quality than this specification, shall also be considered. When the equipment offered by the tender confirm to other standard, salient point of difference between the standard adopted & this specification shall be clearly brought out. The copies of such standards, in English authentic translation shall be furnished along with the offer.

4.0 APPLICATION:

ERS meters are suitable for use with Phantom load at Meter testing lab & site testing of HT 3 ph. 3 wire or 4 wire trivector /electronic/electro-mechanical meters as mentioned in the scope.

5.0 SUPPLY & MEASURING SYSTEM: -

- (A) Auxiliary Supply Voltage 85V 265V at 50Hz \pm 10%
- (B) Measuring Voltage : 40V to 300 V (Phase - Neutral), 50Hz \pm 10%
- (C) Basic Current 1 mA, to 10 Amp. (Direct mode), 10mA to 100A (CT Mode) and 1A to 2000A (for flexible current probe Mode)
- (D) Max. Current: up to 120% of basic current in Direct, CT & current probe Mode

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- (E) PF range: 0-lag – UPF—0-lead PF (4 quadrant)
- (F) Temp. Co-efficient: 0.01% per degree centigrade or better.
- (G) Harmonic Measurement: Up to 20th Harmonics in Voltage circuit & Current Circuit.

6.0 DISPLAY: -

The meters shall have minimum 20 characters x minimum 10 Lines or bigger back lit LCD Display to display test parameters.

The parameters to be displayed should be selected through front panel switch. Following parameters are to be displayed.

- Instantaneous per phase voltage for 4 wires and line voltage for 3 wires.
- Instantaneous per phase line current
- Instantaneous per phase active current
- Instantaneous per phase reactive current
- Total Active (Fundamental +Harmonics) power /Reactive & Apparent Power phase wise & total three phase(i.e. derived from vectorial summation of total active power and lagging reactive power)
- Instantaneous per phase power factor in lag/lead derived from division of Total Active Power and Apparent power
- Instantaneous frequency
- Phase sequence of Voltage
- Phase sequence of Current
- Vectorial and waveform display for voltage and current.
- Harmonics up to 20th harmonics.
- Total Active (Fundamental +Harmonics) /Reactive (lag/lead) and apparent energies on display.
- Time
- Date
- The equipment shall have facility to display the logged energy in case of dial test after pressing stop button. The energy should not be reset and should be available on display after pressing the stop button.
- The Energy flow direction.
- Verification of parameters during test can be done without interrupting test.
- Polarity connection of test equipment can be shown by Indication of correct / wrong wiring.
- Indication of utilization of memory is to be provided

7.0 DISPLAY RESOLUTION:-

Minimum resolution for various parameters will be as follows.

Voltage -	0.01V
Current -	0.0001A in Direct, 0.001A in CT, 0.01A for probe mode.
Power Factor -	0.01
Energy -	00.0001 (kWh/kVArh/kVAh)
Inst. Load -	00.001 (kW/kVAr/kVA)

Energy parameters at least 4 digits after decimal & % error at least two digits after decimal shall be provided.

8) ACCURACY

The accuracy shall be sufficient in any condition for-testing Kwh, Kvarh, & Kvah of meter of accuracy class 0.2s, 0.5s or higher. And confirming to IS 13010, IS 13779, IS 14697, IS 15707 & CBIP publication 325. The accuracy class shall be 0.1s accuracy (10mA to 10A) in Direct Mode, 0.2s accuracy (10mA to 100A) in CT Mode and 1.0 accuracy (1A to 2000A) in flexible current probe mode for ERS meter.

9) STARTING CURRENT

Less than 0.1% of IB at UPF.

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10) POWER LOSS/POWER CONSUMPTION

Less than 10 VA per phase

11) CONSTRUCTIONAL FEATURES AND GENERAL REQUIREMENT:

- 11.1 Errors should be displayed directly with the help of bright LCD display.
- 11.2 All the display parameters indicated in point no 6 shall be obtained by pressing the push -button.
- 11.3 Alphanumeric keyboard shall be provided for entering meter Sr. No., Consumer identification number, meter constant, CT and PT Ratio of meter under test, test pulse/ revolution, Alphabets, Decimal & for other functions like result, enter, delete & shift etc.
- 11.4 The ERS shall have a facility to store minimum 500 test results along with following instantaneous parameters. The ERS shall have memory to store the test data. The error data up to at least 500 test shall be stored in ERS memory and these can be downloaded to computer using communication cord/port (RS232) so that print out can be taken out with help of software. The test data stored in the memory of ERS shall not be lost by roll over mode but after the memory is exhausted it should flash a message on LCD display or it has some other arrangement for such indication. The ERS Shall have capacity to store minimum 500 test results with following data.
1. Serial no of meter under test
 2. Consumer Identification
 3. Meter Constant of MUT
 4. No of revolution /pulses for which test is being carried out.
 5. Instantaneous voltage, line current, active current & reactive current of each phase, PF etc.
 6. Energy Logged/ Recorded by ERS during test.
 7. Test duration in hour, minute, & seconds.(With time of commencement & completion)& all parameters shown in clause no 6
- 11.5 The ERS meter shall be provided with optical sensor head for sensing mark of rotating disc or pulsing LED/LCD of static meter.
- 11.6 The meter shall be suitable for testing 3 phase 3 wire connection and 3 phase 4 wire connection solidly earthed & capable of testing meter supplying balanced, unbalanced loads of all PF ranging from zero lag. to UPF to zero lead PF.
- 11.7 Meter shall have facility to display the readings directly.
- 11.8 Auto measuring range shall be provided & switching between ranges should not affect the measurement. Probable variation of error in operating condition considering temperature coefficient, relative humidity & any other parameter which may affect uncertainty should be mentioned by the bidder.
- 11.9 Meter shall be provided with suitable insulated leads with crocodile clip for safe/quick current/voltage connection. The leads should be capable of being connected to the test terminal block (TTB) of the meter.
- 11.10 A selector switch/ suitable arrangement is to be provided for selecting single or three phase system.
- 11.11 ERS shall have capability to indicate display for the following conditions.
- Missing Potential in case of three phase mode if voltage is below 70% of reference voltage.
 - Missing current if current is less than 0.1% of the basic current
 - Reverse current if any current is reverse
 - Wrong/correct association of voltage & current
- 11.12 Self diagnose feature LCD/LED test is required to be provided on meter's display to indicate the healthiness of all segments of LCD display.
- 11.13 The ERS meter should derive its power from main voltage of meter under test only and shall not need any battery backup or other auxiliary supply for its operation or data storage. However the ERS shall be made functional on giving supply of 85 to 265 volts A.C between phase & neutral to down load data to PC etc.

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- 11.14 The meter shall measure and display a comprehensive analysis of three phase system showing instantaneous and integrated values of
- True RMS value for each phase voltage & current input.
 - Analysis of DC component and Harmonics contents.
- 11.15 It should be possible to input external CT & PT ratios, i.e measured parameters will be then shown as primary values.
- 11.16 The choice of following visual display to give a graphical analysis of the system under test shall be provided.
- Vectorial display of system parameters
 - Wave form display of voltage and current.
- 11.17 Auto range of current and voltage input should be provided.
- 11.18 The meter shall capable for accuracy test of KWH register of Energy Meter and display the % error as well as energy logged/ recorded by ERS automatically on ERS display.
- 11.19 The meter with its accessories shall be packed in an ergonomically and aesthetically designed single and handy instrument case which can withstand the usual handling of field personnel and normal transportation.
- 11.20 All the cords/ connectors/ accessories supplies along with ERS must confirm IEC -1010 and international standards of safety. Adequate built in features to protect the instrument itself from over voltage shall be provided.
- 11.21 The following Accessories shall be provided along with ERS.
- A Set of 3 Nos of Clamp CT for 10mA to 100A with suitable connection arrangement and minimum 2 Mtr length Cable. Clamping diameter of clamp CT should be minimum 12mm.
 - A Set of 3 Nos of flexible current probe for 1A to 2000A with suitable connection arrangement and minimum 2 Mtr length Cable for use ERS meter at LT side. Clamping diameter of current probe should be minimum 120mm.
 - A set of 3 pairs of current cables minimum 2mtr long with crocodile clip.
 - A voltage cables (4no) minimum 2 meters each with injection type jaw clips for added safety.
 - Snap switch with minimum 2 meters flexible cable. & also there is a facility to test the meter by push buttons in absence of snap switch.
 - Pulse scanner / optical sensor with 2 meters flexible cable.
 - Communication chord of 2 meters made of flexible cable.
 - Clamp for scanner
 - User Reference Manual for Electronics Reference Standard Meter and analysis software.
 - A separate 2 wire cable of 2 mtrs long to power up ERS for down loading data to PC etc.
- 11.22 The meter shall have ASCII file support – i.e Provision for converting data in ASCII format. This data can be integrated with the meter management system of utility for ensuring error test record and periodically meter testing.
- 11.23 It should be ensure
- Personal safety against electrical shock
 - Personal safety against effect of excessive temperature.
 - Protection against spreading of fire.
 - Protection against fraud etc.
 - Should be of light weight, compact & small size.
 - All parts vulnerable to corrosion should be given protective coating, which should not be liable to damage or lost due to normal handling.
- 11.24 Testing:
- The bidder shall provide to carry out the following tests facilities at his cost:
- Starting current test
 - A.C High voltage test
 - Insulation resistance measurement test
 - Limits of errors test (accuracy test)
 - No Load test
 - Repeatability & reproducibility of error test and standard deviation as per IS: 12346.

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- Test of influence quantities.
- Verification of functional test, data storage, & BCS features. BCS should be provided free of cost.
- Test of power consumption
- Vibration Test.

The ERS shall be verified for all the features stated in the specification during lot inspection as well as other acceptance tests and special tests in the relevant standard, if required by inspecting officer.

11.25 Name Plate Data & Marking:

The ERS shall exhibit the Name plate at the appropriate place. Words “Paschim Gujarat Vij Company Ltd.” Or PGVCL, sr. no of ERS along with date of manufacturing, Guarantee period as well as other technical details shall invariably mention on the equipment as well as on Hand bag.

11.26 The PCB of equipment shall be manufactured using surface mounting technology.

11.27 The meter shall have two outputs

- A test output in the form of blinking LED and Pulse output for its own calibration

11.28 Operation of the equipment should be user friendly for different type of testing, entry of details, saving and retrieving of test data etc.

12) ADDITIONAL INDICATIONS

Provision shall be made for the following additional indications.

- The energy flow direction.
- Warning for over load beyond the limits specified in the voltage & current circuits.

13) AUXILIARY POWER SOURCE:

The auxiliary power source shall be supplied to the device by the 50 Hz ± 5 Hz network at 110V/240 V or device shall have facility to power up with the help of long range power supply. ERS meter should have protected up to 500 volt in Auxiliary power. Auxiliary power consumption of the device should be such that it not overload metering CTPT unit during testing of meters at site.

14) ELECTROMAGNETIC COMPATIBILITY

The ERS will be required to work accurately in the field so that stray Electromagnetic disturbances or Electrostatic discharge may not influence the ERS . Similarly the field generated by ERS should not influence the MUT. The composition of the ERS should, therefore such that it's functioning is immune to these forces of external origin and it does not create electromagnetic field, which affects the working or the meteorological functioning of meter under test.

The equipment shall be fully protected against electromagnetic interferences, introduced through the connection cables, through capacitive or inductive coupling or by radiated electromagnetic interference. The meter shall comply all EMC condition and requirement within the limits specified in IEC60687 ,IS 14697 & CBIP publication 325. It should be immune to its confirming to IEC 801-2, IEC 801-3 IEC 801-4.

- Fast transient burst Test may be applied to ERS. It should not show any change in register of more than values shown in the relevant test specification IEC 801-4.
- The ERS should not produce any Electromagnetic field which may affect working of MUT confirming to the IEC & IS as per mentioned in Cl No 3 of Specification.
- It should not produce any conducted or radiated noise, which can interfere with other equipment & MUT.

15) Adequate protection fuses or otherwise should be provided in particulars for current circuit.

16) The equipment shall be immune to impact, vibration and bumping due to transport. It shall be within the limits specified in IEC 60687/92 or IS 11426 & IS-14697

17) DIELECTRIC STRENGTH

The equipment shall be capable to withstand between circuits and between circuits & case 4 KV AC 50 HZ for one minute.

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18) TEST CERTIFICATE

Complete calibration certificate of the offered equipment from NABL accredited laboratory, which cover complete range asked in direct mode and CT mode for active/reactive energy, voltage, current, power factor etc must be submitted with bid. Bid without the calibration certificate shall not accepted. It is required to conform accuracy of offered equipment throughout the required range.

Routine test report, calibration certificate of NABL accredited laboratory & operation manual is to be provided along with each meter. The routine test certificate of all equipment shall be provided along with each equipment and it will be in form of CD.

19) TYPE TEST REPORT

The bidder shall have to submit type-test report of offered equipment carried out as per relevant standard. The standard applicable shall be IS 14697, IEC 60687, IEC 60736, & CBIP publication 325 for different requirements. Also type test certificate shall be from Govt. approved / NABL Accredited Laboratory like NPL-Delhi, ERTL, ETDC or equivalent along with offer. No time limit will be given for submission. The offer without type test report shall be ignored. Also the type test certificates should not be the older than 5 years from the date of advertisement of the tender.

20) LIST OF ORDER EXECUTED

The tender shall have to submit list of order executed and list of machinery /equipment and testing facility available at their factory. The bidder shall have minimum five years of experience in the field of manufacturing of meter testing equipments.

21) INSPECTION:

The bidder has to offer ERS meters for inspection at their works before dispatch of a lot for calibration to any govt. approved lab. The offered lot shall be tested for acceptance test and any other test as per relevant standards.

The HT ERS meters shall also be verified for all the features stated in this specification i.e. Sr. No. 1 to 24 during lot inspection.

After inspection of the lot the H.T. ERS meters shall be sent for calibration to conform accuracy in full range for direct as well as CT modes at ERDA, Baroda or at any Govt. approved / NABL accredited laboratory viz: NPL, ETDC, ERTL or CPRI etc. After calibration of the meter and on submission of calibration certificate to C.E. (Mat.) the Dispatch Instruction shall be given. The charges for calibration of H.T. ERS meters shall be **borne by the bidders only.**

22) TRAINING

The successful tender shall be required to provide training at no extra cost to the purchaser's engineers and staff at different field offices of PGVCL.

The period and program of training shall be discussed and finalized by the purchaser with the supplier.

23) GUARANTEE

The H.T ERS meters shall be guaranteed for five years from the date of dispatch. Any defects observed during guarantee period shall be repaired / rectified / replaced by the bidders free of cost. The repaired / rectified / replaced meters must get calibrated from NABL accredited laboratory to confirm its accuracy by supplier at their own cost.

24) SALES SERVICE

The bidder has to indicate clearly what type sales service will be provided within guarantee period and outside guarantee period and address of Sales service central, details of Engineers shall be submitted with offer.

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Guaranteed Technical Particulars of Three Phase HT Electronic Reference Standard Meter

Sr. No.	Description	PGVCL Requirement	Supplier's Data
1.	Makers name and country	Please specify manufacturer name	
2.	Type and model no. of Meter	Specify by supplier (Manufacturer's specification and all details including photograph of offered meter must be attached with tender documents)	
3.	Accuracy Class	As per Technical Specification.	
4.	a. Basic Current <ol style="list-style-type: none"> 1. Direct Mode 2. CT mode for clamp CT 3. CT mode for current probe b. Max. Current <ol style="list-style-type: none"> 1. Direct Mode 2. CT mode for clamp CT 3. CT mode for current probe 	As per Technical Specification.	
5.	Parameters Displayed	a) Instantaneous per phase voltage for 4 wires and line voltage for 3 wires. b) Instantaneous per phase line current c) Instantaneous per phase active current d) Instantaneous per phase reactive current e) Total Active (Fundamental +Harmonics)power/Reactive & Apparent Power phase wise & total three phase(i.e. derived from vectorial summation of total active power and lagging reactive power) f) Instantaneous per phase power factor in lag/lead derived from division of Total Active Power and Apparent power g) Instantaneous frequency h) Phase sequence of Voltage i) Phase sequence of Current j) Total Active (Fundamental	

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		<p>+Harmonics) /Reactive (lag/lead) and apparent energies on display.</p> <p>k) Time</p> <p>l) Date</p> <p>m) The equipment shall have facility to display the logged energy in case of dial test after pressing stop button. The energy should not be reset and should be available on display after pressing the stop button.</p> <p>n) The Energy flow direction.</p> <p>o) Verification of parameters during test can be done without interrupting test.</p> <p>p) Polarity connection of test equipment can be shown by Indication of correct / error</p> <p>q) Indication of utilization of memory is to be provided</p> <p>r) Vectorial display for voltage and current.</p> <p>s) Harmonics up to 20th harmonics.</p>	
6.	Display Resolution	<p>a Voltage :</p> <p>b Current :</p> <p>c Power factor :</p> <p>d Energy :</p> <p>e % Error Resolution:</p> <p>As per Technical Specification.</p>	
7.	Connection check	<p>a Missing potential</p> <p>b Missing current</p> <p>c Reverse current if any current is reverse</p> <p>d Phase sequence Forward or Reverse</p> <p>e Over current</p> <p>f Over voltage</p>	
8.	Type of Display	Minimum 20 Character x Minimum 10 lines backlit LCD display	
9.	Interfaces	<p>a) RS232 connector for connecting to the PC.</p> <p>b) Scanning Head.</p> <p>c) Remote snap switch to count pulses</p>	
10.	Memory	Minimum 500 test results	
11.	Instantaneous Parameters to be	<p>a Serial number of MUT</p> <p>b Consumer identification</p>	

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	logged in memory during each test	<p>c Meter Constant of MUT</p> <p>d MUT CT & PT Ratio</p> <p>e No. of revolution/pulses for which test is being carried out</p> <p>f Instantaneous Voltage of each phase</p> <p>g Instantaneous Line Current of each phase</p> <p>h Instantaneous reactive current of each phase</p> <p>i Instantaneous frequency</p> <p>j Instantaneous Power Factor</p> <p>k Energy logged by equipment</p> <p>l Test duration</p> <p>m Test time</p>	
12.	Pulse scanner / optical sensor	Common for rotor mark & LED pulses to sense pulses	
13.	Snap Switch	Snap switch to operate equipment remotely	
14.	Dial test facility	Relay output for dial test	
15.	Key Board	Alphanumeric keyboard	
16.	Carrying Case	ergonomically and aesthetically designed instrument case which can with stand the usual handling of field personnel and normal transportation	
17.	Type Test	Type test certificate shall be from Govt. approved Laboratory like NPL-Delhi , ERTL, ETDC or equivalent along with offer. Without type test reports tender will be rejected.	

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