Specification of Single Phase Electric Digital Meter

1.0 APPLICABLE STANDARDS

The equipment and components supplied shall generally be in accordance with the latest editions/ amendments of the standards specified below following the relevant IEC Standard. However, the specific requirements mentioned below shall prevail.

2.0 REQUIREMENTS

The meters to be supplied against this specification shall meet the requirements specified below.

2.1 Electrical requirements

Meter supplied shall meet the following electrical requirements.

Sl. No	Description	Requirement
1	Connection	1-phase, 2-wire, direct connected
2	Number of element	2
3	Rated voltage	230V phase to neutral
4	Voltage Range	0.6 to 1.25 Un
5	Maximum withstand voltage	Should withstand 400 volts for one hour.
6	Base current, I_b	5 A
7	Maximum continuous current, I_{max}	60 A
8	Starting current	20 mA (0.4% I_b)
9	Rated frequency	50 Hz
10	Variation in frequency	± 5%
11	Power factor	Zero lag – unity – zero lead
12	Class index	1.0
13	Power supply unit	Preferably transformer less
14	Reference temperature	Reference temperature shall be 27^{o}C. Mean temperature co-efficient should not exceed 0.07%.
15	Display	LCD
16	Period of display	Continuous
17	Digits	Width : 5 - 7 mm Height : 7 - 10 mm
18	Maximum viewing angle	160 degrees
19	Number of display digits	SIX (without decimal digit)
20	Display parameters	Cumulative kWh
21	Power consumption at reference temperature, rated voltage and frequency	Shall not exceed 1 W and 8 VA in voltage circuit Shall not exceed 1 VA in current circuit at base current
22	Harmonic energy	Meter shall record total energy including harmonic energy

Sl. No	Description	Requirement
23	Memory	Non volatile memory that retain information up to 10 years in the absence of power
24	Security features	Should not be accessible for reprogramming at site
25	Display of Readings	Meter Reading shall be visible when Power is OFF or the Meter is disconnected by pressing a switch.
26	Battery	Reputable and well-known manufacturers from USA / Japan / Germany / France / China or other EU countries.

2.2 Mechanical requirements

Meter supplied shall meet the following mechanical requirements.

Sl. no.	Description	Requirement
1	Base & Cover	Unbreakable, high grade, fire resistant, reinforced, UV stabilized polycarbonate. The meter cover shall be transparent.
2	Terminal cover	Transparent, extended type; made of fire resistant, UV stabilized polycarbonate. The terminal cover shall have holes at the side for entry of the connecting wires.
3	Terminal block	Polycarbonate grade 500R or equivalent bakelite; brass or copper current terminals; two flat-head brass screws (5-6 mm dia) at each terminal
4	Number of terminal	4 (Four)
5	Minimum free space between bottom of terminal and terminal cover	60 mm
6	Minimum overall diameter of terminal hole inclusive of insulation thickness of service wire	7 mm
7	Connections diagrams and terminal marking	Every meter shall be indelibly marked with a diagram of connection Meter terminals shall be marked, this marking shall appear on the diagram .The line side terminal shall be located on the left & shall be labeled “Source” & load side terminal shall be located on the right & labeled “Load”.

Sl. no.	Description	Requirement
8	Name plate	Every meter shall have clearly visible, indelibly and distinctly marked name plate containing the following information: Manufacturer's name Meter type Number of phases and number of wire Serial number and year of manufacture Rated voltage of the system Basic current and maximum current Reference frequency in hertz Meter constant in imp/kWh Class index of the meter
9	Insulation level	Shall withstand a power frequency voltage of 4 kV and impulse withstand test of 6 kV
10	Protection against penetration of dust and water	Conform to the degree of protection of IP 52
11	Resistance to heat and fire	Terminal block and meter case shall have safety against spread of fire. Shall not be ignited by thermal overload of live parts in contact with them. Shall meet the tests stipulated in IEC 62053 or Equivalent.
12	Cover sealing	The meter main cover shall be ultrasonically welded so that once the meter is manufactured & tested at factory; it should not be possible to open.
13	Terminal cover sealing	Sealable independently
14	Thickness of material for meter body	2 mm minimum for polycarbonate material
15	Pulse output	Flashing LED visible from the front.
16	Maximum pulse frequency	Shall not exceed 2.5 kHz
17	Protection against magnetic field	Accuracy shall not be affected by AC/DC magnetic field of 0.2T on all the sides of meter. Meter working shall not be affected by permanent magnet of 0.5 T of minimum size 70x70x50 mm
18	Temperature range	Specified operating range: -10^0C to 45^0C Limit range of operation: -15^0C to 55^0C Limit range of storage and transport: -20^0C to 70^0C

2.3 Component specifications

Components of the meter shall meet the following requirements.

Sl. no.	Component	Requirement
1	Microcontroller	Should be from reputed manufacturer with proven design. **Origin:** Motorola, Xicor, Philips, Microchip, ST, Atmel, NEC, Oki, HOLTEC or equivalent reputable manufacturers with authentication of the proven standard quality.
2	Measurement or computing chip	Should be from reputed manufacturer with proven design. **Origin:** Analog Devices, Cyrus Logic, Atmel, Philips, SAMES, NEC , TERIDIAN, Texas Instrument or equivalent reputable manufacturers with authentication of the proven standard quality.
3	Memory IC	Should not be effected by external parameters like sparking, high voltage spikes or electrostatic discharges **Origin:** Atmel, NS, TI, ST, Phillips, Hitachi, Oki, or equivalent reputable manufacturers with authentication of the proven standard quality.
4	Display modules	i. Should be well protected from external UV radiations ii. Visibility should be sufficient to read the meter mounted at height of 0.5 to 2.0 m iii. Pin type iv. Trans-reflective HTN or STN type industrial grade v. Temperature range -20^0C to $+70^0$C. **Origin:** Genda, Bonafide tecnologies, Advantek, Fordata, , Success, Hitachi, Sony , Smart Good , China display or equivalent reputable manufacturers with authentication of the proven standard quality..
5	PCB	Glass epoxy, fire resistant grade FR4, minimum thickness 1.65 mm, finished copper thickness 1 oz/sft, lead free HAL surface treatment.

2.4 Tamper detection features

Meter accuracy shall not be affected in case of tamper condition. The meter shall detect and register correctly the energy only in forward direction under any or all tamper conditions. Visual indication shall be provided to show tamper condition.

Sl. no	Description	Requirement
1	Remote control device	Shall not get affected by any remote control device
2	Incoming and outgoing interchanged	Should record forward energy
3	Phase and neutral interchanged	Should record forward energy

Sl. no	Description	Requirement
4	Incoming neutral disconnected, outgoing neutral and load connected to earth	Should record forward energy
5	Incoming neutral disconnected, outgoing neutral connected to earth through resistor and load connected to earth	Should record forward energy
6	Incoming neutral connected, outgoing neutral connected to earth through resistor and load connected to earth	Should record forward energy
7	Phase and neutral interchanged and load connected to earth	Should record forward energy
8	Incoming and outgoing (phase and neutral) interchanged, load connected to earth	Should record forward energy
9	Incoming and outgoing (phase or neutral) interchanged, load connected to earth	Should record forward energy
10	Incoming and outgoing (phase or neutral) interchanged, load connected to earth through resistor	Should record forward energy

2.5 Electromagnetic compatibility

(a) Immunity to electromagnetic disturbance

The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not damage or substantially influence the meter. The disturbances to be considered are:

i. Electrostatic discharges

ii. Electromagnetic HF field

iii. Fast transient burst

(**b) Radio interference suppression**

The meters shall not generate conducted or radiated noise which could interfere with other equipment.

2.6 Accuracy requirements

(**a) Limits of error due to variation of the current**

The percentage errors shall not exceed the limits for relevant accuracy class stipulated in IEC 62053-21 or Equivalent

(b) Limits of error due to other influence quantities

The additional percentage error due to the change of influence quantities shall not exceed the limit for the reference accuracy class stipulated in IEC 62053-21 or Equivalent

(c) Limits of error due to ambient temperature variation

The limits of error shall not exceed the limits stipulated in IEC 62053-21 or Equivalent.

(d) Starting and running with no-load

Initial start-up of the meter: The meter shall be fully functional within 5 seconds after the voltage is applied to the meter terminals.

Running with no load: When the voltage is applied with no current flowing in the current circuit the test output of the meter shall not produce more than one pulse.

Starting: The meter shall start and continue to register at $0.4I_b$% at power factor of 1.

(e) Meter constant

The relation between the test output and the indication in the display shall comply with the marking on the name-plate.

(f**) Tamper Detection Features**

The meter shall record forward energy accurately under the tamper detection features as mentioned in clause 4.4

3.0 Acceptance Test

The following tests as per IEC 62053-21or Equivalent shall be witnessed by the representative(s) of the Purchaser.

a) Tests of insulation properties

i) AC Voltage Test

b) Tests of accuracy requirements

i) Test of meter constant

ii) Test of starting condition

iii) Test of no-load condition

iv) Test of ambient temperature influence

v) Test of influence quantities (only limits of error due to variation of the current)

c) Test of electrical requirements

i) Test of power consumption

d) Tamper Detection Requirements

Extra copies of the acceptance test report shall also be supplied with the meters.

4.0 Routine Test

Following routine tests as per IEC 62053-21 or Equivalent shall be carried out on all meters and each consignment of meters shall accompany one set of routine test results recorded in tabular form. If the test results are recorded in separate sheets all such sheets pertaining to each consignment shall be bound together as one volume.

a) Tests of insulation properties

i) AC Voltage Test

b) Tests of accuracy requirements

i) Test of meter constant

ii) Test of starting condition

iii) Test of no-load condition

iv) Test of ambient temperature influence

v) Test of influence quantities

c) Test of electrical requirements

i) Test of power consumption

ii) Test of influence of supply voltage

d) Test of mechanical requirements

i) Tests of protection against penetration of dust and water