

**भारतीय मानक ब्यूरो**  
**(केंद्रीय मुहर विभाग III)**

हमारा संदर्भ : सी एम डी- III/16 : आई एस 14697

08 July 2021

विषय : आई एस 14697: 2021 के अनुपालन हेतु गाइडलाइन ।

सभी शाखा कार्यालय से आग्रह है कि गाइडलाइन का अनुपालन तत्काल प्रभाव से सुनिश्चित करें।

औरोस्मिता कबिराज  
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**BUREAU OF INDIAN STANDARDS**  
**(Central Marks Department-III)**

Our Ref: CMD-III/16 : IS 14697

08 July 2021

**Subject: Guidelines for implementation of Revised IS 14697: 2021 a.c. Static Transformer Operated Watthour Meters (Class 0.2S and 0.5S) and Var-Hour Meters (Class 0.2S, 0.5S and 1S)**

This has reference to the subject mentioned above.

BOs may kindly ensure implementation of the guidelines with immediate effect.

**Aurosmita Kabiraj**  
**Sc-C (CMD-III)**

**Head (CMD-III)**  
**Circulated to: All ROs/BOs**

## CENTRAL MARKS DEPARTMENT III

Our Ref: CMD III/16: IS 14697

08 July 2021

**Subject: Guidelines for implementation of Revised IS 14697: 2021 a.c. Static Transformer Operated Watthour Meters (Class 0.2S and 0.5S) and Var-Hour Meters (Class 0.2S, 0.5S and 1S)**

1. IS 14697: 1999 has been revised as IS 14697: 2021 and has been published. The last date for implementation of the revised Standard is 20 May 2022 after which the old Standard shall stand withdrawn.
2. All BOs shall inform the Applicants and Licensees under their jurisdiction about implementation of the revised Standard **within a week of issuance of these guidelines**.
3. The significant changes in the revised Standard as listed in the Table is given for the purpose of general guidance. BOs shall ensure that the product conforms to all the requirements, as applicable, as per the revised Standard.
  - i. Class 1s for Watt-hour meters has been removed the scope of the standard.
  - ii. Cl 6.10 Display of measured value- Retention time to be declared by manufacturer, additional principal units for measured values are permitted.
  - iii. Cl 6.11 Output Device- Additional high resolution register with minimum decimal of two digits shall also be available in the meter for testing purpose as mentioned in this standard
  - iv. Cl 7.1 Name plate- Country and place of manufacture to be displayed; requirement regarding connection of auxiliary devices added.
  - v. Cl 9.2.2 Voltage Dips and Interruptions – changes due to voltage dips and interruptions shall not be more than critical change value
  - vi. Cl 9.4 Influence of Heating – Visual inspection test added
  - vii. Cl 10.1 Immunity to Electromagnetic Disturbance- Surge immunity test added (also Cl 12.8.5)
  - viii. Cl 11.3 Limits of Error Due to Ambient Temperature Variation – Test modified
  - ix. Cl 12.2 Classification of Tests – requirements added
  - x. Cl 12.2.1 Number of Samples and Criteria for Conformity- number of samples changed
  - xi. Cl 12.5 Test of Protection Against Penetration of Dust and Water- Test method modified
  - xii. Cl 12.7.4 Test of Influence of Self- Heating- Maximum test duration specified, test method modified
  - xiii. Cl 12.7.6.1 General test conditions – Requirements modified.
  - xiv. Cl 12.7.6.2 Impulse voltage test – test method standard modified
  - xv. Cl 12.7.6.3 & Cl 12.7.6.4 – routine test requirements added

- xvi. Cl 12.8.2 Test for Immunity to Electrostatic Discharge (ESD)- Test method, including test method standard modified.
- xvii. Cl 12.8.3 Test for Immunity to Electromagnetic HF Fields- Test method, including test method standard modified.
- xviii. Cl 12.8.6 Radio Interference Measurement- Test method, including test method standard modified.
- xix. Cl 12.12 Test of No-Load Condition – Minimum test period defined
- xx. Cl 12.17 Repeatability of Error Test - test method modified
- xxi. Cl 12.18 Operation of auxiliary devices- New clause added
- xxii. Modification in certain Tables

4. The detailed comparison between the 1999 and 2021 versions are Annexed.
5. Consequent upon the issuance of the revised Standard, existing Product Manual has been revised as Doc: **PM/ IS 14697/ 2/ June 2021**
6. The guidelines for implementation of the revised Standard is given below:

**A. LICENSEES:**

- (i) All Licensees shall implement the revised Standard by 20 May 2022. Any difficulty in implementation shall be brought to the notice of CMD III at the earliest but in any case at least 30 days before the last date of implementation. BOs shall ensure that no Licences are under operation as per the old Standard after 20 May 2022. The status of implementation of the revised Standard shall be confirmed by Head (BO) to CMD-III within two weeks of the last date of concurrent running.
- (ii) Licences where scope includes only Accuracy Class 1 S of Watt-hour meters shall submit evidence of conformity to the Standard through **Independent Test Reports** after necessary changes in product design so as to establish conformity for Accuracy Class 0.2 S or 0.5 S.
- (iii) Other Licences, where scope of Licence includes at least one other Accuracy Class of Watt-hour meters, shall submit evidence of conformity to the other modified requirements through In-house/Independent Test Reports or Test Certificates, as applicable. Verification of implementation of the amendment, wherever required, may be done during the next visit **which may normally be completed within six months of the last date of concurrent running**.
- (iv) At the end of the concurrent running period, the scope of Licence shall be suitably modified so that Accuracy Class 1 S of Watt-hour meters is deleted from the scope.
- (v) If the Licensee fails to complete all actions by 20 May 2022 it shall be dealt with as per the prevailing guidelines.

**B. APPLICATIONS FOR GRANT OF LICENCE:**

- (i) Existing Applications where Sample has been submitted in the Laboratory/Test Report has been issued by the Laboratory May be processed as per the old Standard. However, if the Applicant is desirous of considering the Application as per the revised Standard, a declaration May be obtained from the Applicant to that effect and the Application May be processed accordingly. An undertaking shall also be obtained from such Applicants that if the sample fails in new test requirements, Licence will not be granted by BIS as per the old version.
- (ii) Applications which are recorded henceforth May be processed as per the old Standard or the revised Standard. Processing of Applications as per the old Standard shall be permitted only upto 20 May 2022 and for such cases Applicant shall give a declaration that they will implement the revised Standard by 20 May 2022.
- (iii) Beyond 20 May 2022 no Licence shall be granted as per the old Standard.

**C. CHANGE IN SCOPE OF LICENCE:**

- (i) For change in scope of licence, the relevant provisions as given above for Applicants shall apply.
  - (ii) However, processing of such applications for change in scope of licence as per the old Standard shall be permitted only upto the date of implementation of the revised Standard or upto 20 May 2022 whichever is earlier.
7. The above guidelines come into force with immediate effect.

**Aurosmita Kabiraj  
Sc C**

Head (CMD III)  
**DDG (Certification)**

	Removed/ replaced
	Added /replaced

Clause No.	IS 14697 : 1999 RE-affirmed 2009	IS 14697 : 2021
	<b>a.c. STATIC TRANSFORMER OPERATED WATTHOUR METERS AND VAR-HOUR METERS CLASS 0.2S AND 0.5 S – SPECIFICATION</b>	<b>a.c. STATIC TRANSFORMER OPERATED WATTHOUR METERS (CLASS 0.2S AND 0.5 S) AND VAR-HOUR METERS (CLASS 0.2 S, 0.5 S AND 1 S) – SPECIFICATION (First Revision)</b> <b>(Incorporating amendments 1, 2, 3 and 4)</b>
<b>FOREWORD</b>	This standard specifies the general requirements and tests applicable to transformer operated static watthour meters and Var-hour meters of class 0.2S, 0.5S keeping in view of performance levels attainable in such meters.	This standard specifies the general requirements and tests applicable to transformer operated <b>static watthour meters of 0.2S and 0.5S</b> ; and Var-hour meters of class 0.2S, 0.5S and <b>1S</b> keeping in view of performance levels attainable in such meters.
6.10 Display of Measured Values	<p>The information can be shown either with an electro- mechanical register or an electronic display. In case of an electronic display the corresponding non- volatile memory shall have a minimum retention time of 5 years.</p> <p>The principal unit for the measured values shall be kilowatthour (kWh), Megawatt-hour (MWh), kVarh, MVarh.</p> <p>The register shall be able to record and display starting from zero, for a minimum of 1500 h, the energy corresponding to rated maximum current at reference voltage and unity power-factor. Register should not rollover in between this duration.</p>	<p>Line is added</p> <p>The information can be shown either with an electro- mechanical register or an electronic display. In case of an electronic display the corresponding non- volatile memory shall have a minimum retention time of 5 years.</p> <p><b>Manufacturer shall declare the retention time.</b></p> <p>The principal unit for the measured values shall be <b>Watt-hour (Wh), kilowatthour (kWh), Megawatt-hour (MWh), Ggawatt-hour (GWh) or Var-hours (Varh), kiloVar- hours (kVarh), megaVar-hours (MVarh), GegaVar-hours (GVarh).</b></p> <p>The register shall be able to record and display starting from zero, for a minimum of 1500 h, the energy corresponding to rated maximum current at reference voltage and unity power-factor. Register should not rollover in between this duration.</p> <p><b>Number of digits of display shall be sufficient to display cumulative energy as per this requirement. Further this shall be supported by declaration of manufacturer (as the verification of rollover is not feasible in laboratory)</b></p> <p><b>For testing purposes only, it shall be possible to increase the resolution in order to enable the critical change</b></p>

		value to be seen.
<b>6.11 Output Device</b>	The resolution of the test output in the form of pulses or high resolution register, whether accessible on the meter through external display, shall be sufficient to conduct satisfactorily accuracy test at the lowest load in less than 5 min and starting current test in less than 10 min.	The resolution of the test output in the form of pulses or high resolution register, whether accessible on the meter through external display, shall be sufficient to conduct satisfactorily accuracy test at the lowest load in less than 5 min and starting current test in less than 10 min. Additional high resolution register with minimum decimal of two digits shall also be available in the meter for testing purpose as mentioned in this standard.
<b>7.1 Name Plate</b>	<p>a)Manufacturer's name and/or trademark and if required place of manufacture</p> <p>d)The serial number and year of manufacture. If the serial number is marked on a plate fixed to the cover, the number is to be marked also on the meter base</p> <p>Information under (a), (b), (c) may be marked on an external plate permanently attached to the meter cover.</p> <p>The information under (d) to (e) shall be marked on a name plate preferably placed within the meter.</p>	<p>a)Manufacturer's name and/or trademark</p> <p>d)The serial number and year of manufacture. If the serial number is marked on a plate fixed to the cover, the number is to be marked also on the meter base or displayed.</p> <p>p)Place and country of manufacturer.</p> <p>Information under (a), (b), (c) and (p) may be marked on an external plate permanently attached to the meter cover.</p> <p>The information under (d) to (k) shall be marked on a name plate preferably placed within the meter.</p> <p>It is preferable that the connection to the auxiliary device is/are marked to indicate the correct method of connection, if these connections are made by means of plugs and sockets, these connections should be irreversible.</p>

<p><b>9.2.2 Voltage Dips and Interruptions</b></p>	<p>Voltage dips and interruptions shall not produce a change in the register of more than 0.001 kWh and the test output shall not produce a signal equivalent to more than 0.001 kWh. These values are based on the rated current 5A and 100V of the meter. For other voltage and current ratings the value 0.001kWh has to be converted accordingly depending upon Transformation Ratio. When the voltage is restored, the meter shall not have suffered degradation of its metrological characteristics.</p>	<p>Voltage dips and interruptions shall not produce a change in the register of more than critical change value (refer 3.6.14) and the test output shall not produce a signal equivalent to more than critical change value (refer 3.6.14). When the voltage is restored, the meter shall not have suffered degradation of its metrological characteristics.</p>
<p><b>9.4 Influence of Heating</b></p>	<p>The temperature rise at any point of the external surface of the meter shall not exceed by more than 20K with an ambient temperature 45°C</p> <p>For testing, see 12.7.5.</p>	<p>The temperature rise at any point of the external surface of the meter shall not exceed by more than 20 °C with an ambient temperature between 25°C to 45°C. For testing, see 12.7.5. Visual inspection for deformation, if any of the meter including terminal blocks is to be carried out. There shall be no deformation. Connecting cables during the test shall be of ratings not less than the test current.</p>
<p><b>10.1 Immunity to Electromagnetic Disturbance</b></p>	<p>The meter shall be designed in such a way that conducted or radiated electromagnetic disturbance as well as electrostatic discharge do not damage nor substantially influence meter.</p> <p>NOTE — The disturbances to be considered are:</p> <ul style="list-style-type: none"> <li>a) Electrostatic discharge;</li> <li>b) Electromagnetic HF field; c</li> <li>c) Fast transient burst</li> </ul>	<p>The meter shall be designed in such a way that conducted or radiated electromagnetic disturbance as well as electrostatic discharge do not damage nor substantially influence meter.</p> <p>NOTE — The disturbances to be considered are:</p> <ul style="list-style-type: none"> <li>a) Electrostatic discharge;</li> <li>b) Electromagnetic HF field;</li> <li>c) Fast transient burst; and</li> <li>d) Surge immunity test.</li> </ul>
<p><b>11.3 Limits of Error Due to Ambient Temperature Variation</b></p>	<p>The mean temperature coefficient shall not exceed the limits given in Table 18.</p> <p>The determination of the mean temperature coefficient for a given temperature shall be made over a 30°C temperature range 15°C above and 15°C below that temperature, the temperature shall not exceed the specified operating temperature range</p>	<p>The determination of the mean temperature coefficient for operating temperature range shall be made, but in no case, the temperature shall exceed the specified operating temperature range. The whole operating temperature range shall be divided into two subranges: 0°C to reference temperature and reference temperature to 55 °C. The mean temperature coefficients of each subrange shall be measured</p>

		<p>individually by taking measurements at 0 °C, reference temperature and 55 °C.</p> <p>Each of the mean temperature coefficient shall not exceed the limits given in Table 14.</p>
<b>12.2 Classification of Tests</b>	The schedule and recommended sequence shall be as given in Table 16	<p>The schedule and recommended sequence shall be as given in Table 16.</p> <p>The accuracy of meter at reference conditions shall remain within accuracy class after completion of any type test, irrespective of the variation allowed during particular type test. For this verification, accuracy shall be verified at <math>I_b</math> and <math>I_{max}</math> at UPF and reference voltage.</p>
<b>12.2.1 Number of Samples and Criteria for Conformity</b>	Type tests shall be applied to three test specimens; in the event of one specimen failing to comply in any respect, further three specimens shall be taken all of which shall comply with the requirements of the standard.	All the Type test shall be made on minimum one or more samples (1st set) selected by the manufacturer and test sequence shall be as given in Table 16. In case of one test sample failing to comply in any respect, further same number(s) of sample(s) (equivalent to 1st set) shall be taken all of which shall comply with the requirements of standard.
<b>12.5 Test of Protection Against Penetration of Dust and Water</b>	<p>The test shall be carried out according to <b>IS 12063</b> under the following conditions:</p> <p>ii) The test should be conducted with sample lengths of cable (exposed and sealed) of the types specified by the manufacturer in place</p>	<p>The test shall be carried out according to <b>IS/IEC 60529: 2001</b> under the following conditions:</p> <p>2) The test should be conducted with sample lengths of cable (exposed and sealed) of the types specified by the manufacturer and terminal cover in place</p>



<b>12.6 Tests for Climatic Influences</b>	After each of the climatic tests, the meter shall show no damage or change of the information. These tests should not affect the functioning of the meters	After each of the climatic tests, the meter shall show no damage and no change in cumulative active and reactive energy registers. These tests should not affect the functioning of the meters.
<b>12.7.4 Test of Influence of Self-Heating</b>	The same test shall be carried out at 0.5 (lagging) power factor.	Maximum test duration shall not be more than 2 h. The same test shall be carried out at 0.5 (lagging) power factor after a break of at least 2 hours. During this break, meter shall be in off condition.
<b>12.7.5 Test of Influence of Heating</b>	With each current circuit of the meter carrying rated maximum current and with each voltage circuits (and with those auxiliary, voltage circuits which are energised for periods of longer duration than their thermal time constants) carrying 1.15 times the reference voltage, the temperature rise of the external surface shall not exceed by more than 20K, with the ambient temperature between 25°C to 45°C.	With each current circuit of the meter carrying rated maximum current and with each voltage circuits (and with those auxiliary, voltage circuits which are energised for periods of longer duration than their thermal time constants) carrying 1.15 times the reference voltage, the temperature rise of the external surface shall not exceed by more than 20°C, with the ambient temperature between 25°C to 45°C.
<b>12.7.6.1 General test conditions</b>	A flashover (capacitance discharge) is not necessarily a criterion of failure as this may occurs in a position that does not damage and the manufacturer shall decide, whether or not to eliminate the cause. provided other criteria of acceptance are met.	No puncture or partial breakdown of solid insulation shall occur; however A flashover (capacitance discharge) during impulse test is not necessarily a criterion of failure as this may occurs in a position that does not damage the meter
<b>12.7.6.2 Impulse voltage test</b>	The impulse of 6kV is applied ten times with one polarity and then repeated with the other polarity. The minimum time between the impulses shall be 3 s. The waveform and the generator characteristics shall be in accordance with IEC 61000-4-5 (1995-03) 'Elec- tromagnetic compatability (EMC) — Part 4: Testing and measurement techniques — Section 5 Surge im- munity test'.	The impulse of 6 kV is applied ten times with one polarity and then repeated with the other polarity. The minimum time between the impulses shall be 3 s. The waveform and the generator characteristics shall be in accordance with IEC 60060-12010 'High-voltage test techniques - Part 1: General definitions and test requirements' with source impedance 500 ohm ± 50 ohm and source energy 0.5J ± 0.05J
<b>12.7.6.3 AC voltage test</b>	The test voltage shall be substantially sinusoidal, having a frequency between 45 Hz and 55 Hz, and applied for one minute. The power source shall be capable of supplying at least 500 VA.	The test voltage shall be substantially sinusoidal, having a frequency between 45 Hz and 55 Hz, and applied for one minute for type test and acceptance test. The test duration for routine test shall be

		<p>minimum 5 s. The power source shall be capable of supplying at least 500 VA.</p>
<p><b>12.7.6.4</b> <i>Insulation resistance test</i></p>	<p>The insulation resistance test shall be carried out in accordance with Table 22. The voltage shall be applied for a minimum of one minute (or more for the pointer of the insulation tester to have come practically to rest.</p>	<p>The insulation resistance test shall be carried out in accordance with Table 22. The voltage shall be applied for a minimum of one minute (for type test and acceptance test) or more for the pointer of the insulation tester to have come practically to rest. The insulation resistance test duration for routine test shall be minimum 5 s.</p>
<p><b>12.8.2</b> <i>Test for Immunity to Electrostatic Discharge (ESD)</i></p>	<p>The test shall carried out according to IEC 61000-4-2 (1995-01) Electromagnetic Compatibility (EMC) Part 4 : Testing and measurement techniques — Section 2: Electrostatic discharge immunity test. Under the following conditions :</p> <p>Contact Discharge</p> <p>Test Voltage : 8kV</p> <p>Test severity level: 4</p> <p>Number of discharges ' 10</p> <p>Voltage and auxiliary circuits energized with reference voltage</p> <p>Without any current in the current circuits and the current terminal should be open circuit.</p>	<p>The test shall be carried out according to IS14700 (Part 4/Sec 2):2018, under the following conditions:</p> <p>Tested as table top equipment.</p> <p>The meter shall be in operating condition:</p> <p>a) Voltage circuits and auxiliary power supply circuits energized with reference voltages; and</p> <p>b) Without any current in the current circuits and the current terminals shall be open circuit.</p> <p><b>12.9.2.1 Contact discharge</b></p> <p>a) <i>Direct Discharge</i> — The test voltage of 8 kV shall be applied to metallic parts accessible in normal operation.</p> <p>Number of discharges = 10 (in both the polarity)</p> <p>b) <i>Indirect Discharge</i> — The test voltage of 8kV shall be applied to both vertical and horizontal coupling planes in contact mode. In both vertical and horizontal plane, all faces of meter shall be exposed to the discharge.</p> <p>Number of discharges = 10 ( in both the polarity)</p> <p><b>12.9.2.2 Air discharge</b></p> <p>a) <i>Direct Discharge</i> — The test voltage of 15kV shall be applied to non-metallic parts accessible in normal operation.</p> <p>Number of discharges = 10 (in both</p>

		<p>the polarity)</p> <p>The application of the electrostatic discharge shall not produce a change in the cumulative register of more than critical change value (refer 3.6.14) and the test output shall not produce a signal equivalent to more than critical change value (refer 3.6.14).</p>
<p><b>12.8.3 Test for Immunity to Electromagnetic HF Fields</b></p>	<p>The test shall be carried out according to IEC61000-4-3 (1995-03) 'Electromagnetic compatibility (EMC) — Part 4; Testing and measurement techniques — Section 3: Radiated, radio-frequency electromagnetic field immunity test' under the following conditions:</p>	<p>The test shall be carried out according to IS 14700 (Part 4/Sec 3: 2008) (Electromagnetic Compatibility (EMC) - Part 4 : Testing and Measurement Techniques, Section 3 :Radiated, Radio frequency, electromagnetic field immunity test) or IEC 61000-4-20 : 2010 : (Electromagnetic compatibility (EMC) - Part 4-20: Testing and measurement techniques - Emission and immunity testing in transverse electromagnetic (TEM) waveguides) under the following conditions:</p> <p>b) Frequency band: 80 MHz to 1000 MHz with sweep of frequency steps of 1 percent logarithm, dwell time at each frequency: minimum 3 sec.</p>
<p><b>12.8.3.1 Test without any current and the current circuit should be open.</b></p>	<p>The application of the HF field shall not produce a change in the register of more than 0.001 kWh and the test output shall not produce a signal equivalent to more than 0.001 kWh. These values are based on the rated current of 5A and 100 V of the meter. For other voltage and current ratings, the value 0.001 kWh has to be converted accordingly.</p>	<p>The application of the HF field shall not produce a change in the register of more than critical change value (refer 3.6.14) and the test output shall not produce a signal equivalent to more than critical change value (refer 3.6.14).</p>

<p><b>12.8.5 Surge Immunity Test</b></p>		<p>The test shall be carried out according to IS 14700 (Part 4/Sec 5)2012 under the following conditions with meter in operating condition:</p> <ul style="list-style-type: none"> <li>a) Voltage and auxiliary circuits energized with reference voltage;</li> <li>b) Without any current in the current circuits and the current terminals shall be open circuit;</li> <li>c) Cable length between surge generator and meter: 1 m</li> <li>d) Tested in differential mode (line to line);</li> <li>e) Phase angle: pulses to be applied at 60° and 240° relative to zero crossing of ac supply;</li> <li>f) Test voltage on the current and voltage circuits (main lines): 4 kV, generator source impedance: 2 Ohm</li> <li>g) Test voltages on auxiliary circuits with a reference voltage over 40V: 1kV; Generator source impedance: 42 ohm;</li> <li>h) Number of tests: 5 positive and 5 negative; and</li> <li>j) Repetition rate: maximum 1/min.</li> </ul> <p>The application of test shall not produce change in register of more than critical change value (refer 3.6.14) and the test output shall not produce a signal equivalent to more than critical change value (refer 3.6.14).</p> <p>During the test, a temporary degradation or loss of function or performance is acceptable.</p>
<p><b>12.8.6 Radio Interference Measurement</b></p>	<p>The test for radio interference shall be carried out for the frequencies from 0.15MHz to 30 MHz and for the frequencies from 30MHz to 300 MHz as per IS 6842.</p>	<p><b>A. For meters to be used without any remote communication feature</b></p> <p>The test for radio interference shall be carried out as per IS 6873 (Part 2/sec1): 2012 . The meter shall comply to the requirements of household appliance. The input to be applied to meter during test is reference voltage, load current between 0.1<sub>b</sub> to I<sub>b</sub> (any one value) at UPF. The limits specified in columns 2 and 3 of Table 1 of IS 6873 (Part 2/sec1): 2012 applies for 0.15MHz to 30MHz. The limits specified in</p>

		<p>columns 2 and 3 of Table2a of IS 6873 (Part 2/sec1): 2012 applies for 30MHz to 300MHz.</p> <p><b>B. For meters having or to be used with wireless communication feature</b></p> <p>The test for radio interference shall be carried out for the frequencies as per IS 6873 part 7 : 2012.</p> <p>The input to be applied to meter during test is reference voltage, load current between <math>0.1 I_b</math> to <math>I_b</math> (any one value) at UPF .The meter shall be tested as table top equipment and shall meet class B equipment requirements of IS 6873 Part 7.</p>
<p><b>12.12 Test of No-Load Condition</b></p>	<p>For this test the current circuit <b>must</b> be open circuit and a voltage of 115 percent of the reference voltage shall be applied to the voltage circuits</p>	<p>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.</p> <p>For this test, the current circuit <b>shall</b> be open-circuit and a voltage of 115 percent of the reference voltage shall be applied to the voltage circuits.</p> <p>The minimum test period <math>\Delta t</math> shall be:</p> <p><math>\Delta t = (900 \times 10^6) / (k m U_n I_{max})</math>  <b>[min] <math>\pm 1</math> min</b> for meters of class 0.2 S,</p> <p><math>\Delta t = (600 \times 10^6) / (k m U_n I_{max})</math>  <b>[min] <math>\pm 1</math> min</b> for meters of class 0.5 S and 1 S.</p> <p>Where</p> <p><math>k</math> = the number of pulses emitted by the output device of the meter per kilowatt hour(imp/kWh);</p> <p><math>m</math> = the number of measuring elements;</p> <p><math>U_n</math> = the reference voltage in volts; and</p> <p><math>I_{max}</math> = the maximum current in amperes.</p>

<p><b>12.17 Repeatability of Error Test</b></p>	<p>Test shall be carried out at 0.05 I<sub>b</sub>, I<sub>b</sub> at UPF load under reference test conditions. <b>Twenty error samples shall be taken at time-intervals of 30 min.</b> Identical test condition shall be maintained throughout the test.</p> <p>For acceptance test six error tests may be carried out at time interval of at least 5 min.</p>	<p>Test shall be carried out at 0.05 I<sub>b</sub>, I<sub>b</sub> at UPF load under reference test conditions. <b>Six error samples shall be taken by keeping a gap of time-intervals of 5 minutes between each sample.</b> Identical test condition shall be maintained throughout the test.</p> <p>For error test duration, refer 6.11.</p> <p>Requirement fixed under 11.7 shall be satisfied.</p>
<p><b>12.18, Operation of auxiliary devices</b></p>		<p>The installation and operation of any devices, or combination of devices, shall not influence the meter accuracy. This test shall be conducted with devices connected to create a test configuration representative of the typical meter configuration in service.</p> <p>Note: For example an auxiliary device for external communication (GSM, PLC, Zigbee®, etc.).</p> <p>All cables shall be connected according to the manufacturer's instructions (e.g. voltage and current measurement cables, communication cables, auxiliary power supply cables, I/O cables, accessory cables, etc.) The manufacturer shall provide the test equipment enabling the operation of auxiliary devices during this test.</p>

<p><b>ANNEX E</b> <b>RECOMMENDED SAMPLING PLAN</b> <b>E 3.2</b></p>	<p>Tests of insulation resistance, ac voltage tests, test of power consumption, test of meter constant/registration, limits of error and interpretation of test results and adjustment (if required).</p>	<p>E-3.2 Tests of Insulation Resistance, a.c. Voltage Tests, Test of Power Consumption, Test of Meter Constant/Registration and Limits of Error</p>
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# Comparison of Tables

Table 1 Standard Reference Voltages	Table 1 Standard Reference Voltages ( Clause 5.1 )																		
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**A new table 11B with a few new load points is added**

**Table 11B Percentage Error Limits (Single-Phase Meters and Polyphase Meters with Balanced Loads)**

*(Clause 11.1)*

Value of Current (1)	Power Factor (2)	Percentage Error Limits for Meters of Class 1 S (3)
$0.02 I_b \leq I < 0.05 I_b$	1	$\pm 2.0$
$0.05 I_b \leq I < 0.1 I_b$	0.5 lagging	$\pm 2.0$
	0.8 leading	$\pm 2.0$
$0.05 I_b \leq I \leq I_{max}$	1	$\pm 1.0$
$0.1 I_b \leq I \leq I_{max}$	0.5 lagging	$\pm 1.2$
	0.8 leading	$\pm 1.2$
When specially required by the user: from $0.2 I_b$ to $I_b$	0.25 lagging	$\pm 2.5$
	0.5 leading	$\pm 2.5$

Influence Quantities (1)	Value for current (Balanced Unless Otherwise Stated) (2)	Power Factor (3)	Limit of Variation in Percentage Error for Meters of Class	
			0.2S (4)	0.5S (5)
Voltage Variation (see Note 1) $\pm 10\%$	$0.05 I_b \leq I \leq I_{max}$	1	0.10	0.20
	$0.05 I_b \leq I \leq I_{max}$	0.5 lagging	0.20	0.40
Frequency Variation $\pm 5\%$	$0.05 I_b \leq I \leq I_{max}$	1	0.10	0.20
	$0.05 I_b \leq I \leq I_{max}$	0.5 lagging	0.10	0.20
Waveform 10% of 3 <sup>rd</sup> harmonic in the current (see Note 2)	$0.05 I_b \leq I \leq I_{max}$	1	0.10	0.10
Reversed phase sequence	$0.1 I_b$	1	0.05	0.10
Voltage Unbalance (see Note 3)	$I_b$	1	0.50	1.0
Auxiliary voltage $\pm 15\%$ (see Note 4)	$0.1 I_b$	1	0.05	0.10
Phase of Auxiliary supply voltage by 120 degree (see Note 4)	$0.1 I_b$	1	0.10	0.20
Continuous magnetic induction of external origin (see Note 5)	$I_b$	1	2.0	3.0

Influence Quantities (1)	Value for current (Balanced Unless Otherwise Stated) (2)	Power Factor (3)	Limit of Variation in Percentage Error for Meters of Class		
			0.2S (4)	0.5S (5)	1.0S (6)
Voltage Variation (see Note 1) $\pm 10\%$	$0.05 I_b \leq I \leq I_{max}$	1	0.10	0.20	0.40
	$0.1 I_b \leq I \leq I_{max}$	0.5 lagging	0.20	0.40	0.80
Frequency Variation $\pm 5\%$	$0.05 I_b \leq I \leq I_{max}$	1	0.10	0.20	0.40
	$0.1 I_b \leq I \leq I_{max}$	0.5 lagging	0.10	0.20	0.40
Waveform 10% of 3 <sup>rd</sup> harmonic in the current (see Note 2)	$0.05 I_b \leq I \leq I_{max}$	1	0.10	0.10	0.20
Reversed phase sequence	$0.1 I_b$	1	0.05	0.10	0.20
Voltage Unbalance (see note 3)	$I_b$	1	0.50	1.0	2.0
Auxiliary voltage $\pm 15\%$ (see Note 4)	$0.05 I_b$	1	0.05	0.10	0.20
Phase of Auxiliary supply voltage by 120 degree (see Note 4)	$0.05 I_b$	1	0.10	0.20	0.40
Continuous magnetic induction of external origin (see Note 5)	$I_b$	1	2.0	3.0	3.0

Magnetic induction of external origin 0.5mT (see Note 6)	I <sub>b</sub>	1	0.50	1.0
Electromagnetic HF fields (see Note 7)	I <sub>b</sub>	1	1.0	2.0
Operation of auxiliary devices(see Note 8)	0.05 I <sub>b</sub>	1	0.05	0.10
Continuous abnormal magnetic induction of external origin (see Note 9 )	I <sub>b</sub>	1	4.0	4.0

Magnetic induction of external origin 0.5mT (see Note 6)	I <sub>b</sub>	1	0.50	1.0	2.0
Electromagnetic HF fields (see Note 7)	I <sub>b</sub>	1	1.0	2.0	2.0
Operation of auxiliary devices(see Note 8)	0.05 I <sub>b</sub>	1	0.05	0.10	0.20
Continuous abnormal magnetic induction of external origin (see Note 9 )	I <sub>b</sub>	1	4.0	4.0	4.0

**Table 16 Schedule of Type Tests**  
( Clauses 12.2, 12.2.2 and 12.2.3 )

4.1	Radio interference measurement	12.8.5
4.2	Fast transient burst test	12.8.4
4.3	Test of immunity to electrostatic discharges	12.8.2
4.4	Test of immunity to electromagnetic HF field	12.8.3

**Table 16 Schedule of Type Tests**  
( Clauses 12.2, 12.2.2 and 12.2.3 )

4.1	Radio interference measurement	12.8.6
4.2	Fast transient burst test	12.8.4
4.3	Test of immunity to electrostatic discharges	12.8.2
4.4	Test of immunity to electromagnetic HF field	12.8.3
4.5	Surge immunity test	12.8.5

**Table 17 a. c. Voltage Tests**  
( Clause 12.7.6.3 )

Test Voltage (r.m.s.)	Points of Application of the Test Voltage
(1)	(2)
2 kV	Test to be carried out with the case closed, cover and terminal cover in place a) Between, on the one hand, all the current and voltage circuits as well as the auxiliary circuits whose reference voltage is over 40 V, connected together, and, on the other hand, earth b) Between circuits not intended to be connected together in service
4 kV	additional tests for insulating encased meters a) Between, on the one hand, all the current and voltage circuits as well as the auxiliary circuits whose reference voltage is over 40 V, connected together, and, on the other hand, earth b) Between circuits not intended to be connected together in service
-	A c) visual inspection for compliance with the conditions of 6.7
40 V (for test item d), if applicable	d) between on the one hand, all conductive parts inside the meter, connected together and, on the other hand, all conductive parts outside the meter case that are accessible with the test finger connected together

**Table 17 a. c. Voltage Tests**  
( Clause 12.7.6.3 )

Test Voltage (r.m.s.)	Points of Application of the Test Voltage
(1)	(2)
2 kV	<b>Test of meter with single insulation.</b> Test to be carried out with the case closed, cover and terminal cover in place a) Between, on the one hand, all the current and voltage circuits as well as the auxiliary circuits whose reference voltage is over 40 V, connected together, and, on the other hand, earth b) Between circuits not intended to be connected together in service
4 kV	<b>Test of meter with double insulation (for insulating encased meters).</b> Test to be carried out with the case closed, cover and terminal cover in place a) Between, on the one hand, all the current and voltage circuits as well as the auxiliary circuits whose reference voltage is over 40 V, connected together, and, on the other hand, earth b) Between circuits not intended to be connected together in service
2 kV	b) Between circuits not intended to be connected together in service
-	A c) visual inspection for compliance with the conditions of 6.7
40 V (for test item d), if applicable	d) between on the one hand, all conductive parts inside the meter, connected together and, on the other hand, all conductive parts outside the meter case that are accessible with the test finger connected together

Note

(note is removed)

**Table 20 Reference Conditions**

( Clause 12.9.1 and 12.10 )

Influence Quantity	Reference Value	Permissible tolerance
		<b>0.2S and 0.5S</b>
Magnetic induction of external origin at the reference frequency	Magnetic induction equal to zero (see Note 4)	Induction value which causes a variation of error not greater than 0.2%(class 1) and 0.3 % (class 2) but in any case should not be greater than 0.05 mT(see note 2)

**Notes:**

- 1) If the tests are made at a temperature other than the reference temperature, including permissible tolerances, the results shall be corrected by applying the appropriate temperature coefficient of the meter..
- 2) The test consists of
  - a) For a single-phase meter, determining the errors at first with the meter normally connected to the mains and then after invert- ing the connections to current circuits as well as to the voltage circuits. Half of the difference between the two errors is the value of the variation of error. Because of the unknown phase of the external field, the test has to be made at 0.1 i at unity power factor and 0.2 f, at 0.5 lag power factor.
  - b) For a three-phase meter, making three measurements at 0.1 i, at unity power factor, after each of which the connections to the current circuits and to voltage circuits ate changed ovet 120° while the phase sequences is not altered. The greatest difference between each of the errors so determined and their average value is the value of the variation of error.
- 3) The reference conditions for voltage and frequency apply to both the measuring circuit and the auxiliary supply(ice).
- 4) This magnetic induction is that at the place of test without the presence of the meter and its connections.

**Table 20 Reference Conditions**

( Clause 12.9.1 and 12.10 )

Influence Quantity	Reference Value	Permissible Tolerances
		<b>0.2S, 0.5S, 1.0S</b>
(1) Ambient temperature (see Note 1)	(2) Reference temperature or in its absence 27° C	(3) ± 2° C
Voltage	Reference Voltage (see Note 2)	± 1 percent
Frequency	Reference frequency (see Note 2)	± 0.3 percent
Waveform	Sinusoidal voltage and current	Distortion factor less than 2 percent
Magnetic induction of external origin at the reference frequency	Magnetic induction equal to zero (see Note 3)	± 0.05 mT

**NOTES:**

- 1 If the tests are made at a temperature other than the reference temperature, including permissible tolerances, the results shall be corrected by applying the appropriate temperature coefficient of the meter.
- 2 The reference conditions for voltage and frequency apply to both the measuring circuit and the auxiliary supply (ies).
- 3 This magnetic induction is that at the place of test without the presence of the meter and its connections.