



उत्पाद मैनुअल  
आई एस 1180 ( भाग 3 ) : 2021 के अनुसार  
बाह्य / आंतरिक - रंग तेल इमर्सेड वितरण ट्रांसफॉर्मर 2500 kVA, 33kV तक –  
भाग 1 प्राकृतिक / संश्लेषित कार्बनिक एस्टर निमज्जित के लिए

दस्तावेज संख्या – पीएम/आईएस 1180 (भाग 3 ) /2/ जनवरी 2023  
भारतीय मानक ब्यूरो की स्कीम-I (अनुरूपता मूल्यांकन) विनियम, 2018 के तहत यह उत्पाद मैनुअल प्रमाणीकरण के प्रचालन में रीति और पारिश्रिता की सुसंगतता सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों और लाइसेंसी द्वारा संदर्भ सामग्री के रूप में उपयोग किया जाएगा। बीआईएस प्रमाणीकरण लाइसेंस/प्रमाणपत्र प्राप्त करने के इच्छुक भावी आवेदकों द्वारा भी इस दस्तावेज का उपयोग किया जा सकता है।

**PRODUCT MANUAL FOR  
Outdoor/Indoor Type Oil Immersed Distribution Transformers up to  
and including 2 500 kVA, 33 kV - Natural/Synthetic Organic Ester  
Liquid Immersed  
ACCORDING to IS 1180 (Part 3) : 2021**

Document No.- PM/ IS 1180 (Part 3)/ 2/ January 2023

*This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of*

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**PRODUCT MANUAL FOR  
OUTDOOR/INDOOR TYPE LIQUID IMMERSED DISTRIBUTION  
TRANSFORMERS UPTO AND INCLUDING 2 500 KVA, 33KV –  
NATURAL/SYNTHETIC ORGANIC ESTER LIQUID IMMERSED  
ACCORDING TO IS 1180 (PART 3): 2021**

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|    |                                         |   |                                                                                                                                                             |
|----|-----------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <b>Product</b>                          | : | IS 1180 (Part 3) : 2021                                                                                                                                     |
|    | <b>Title</b>                            | : | Outdoor/Indoor Type Liquid Immersed Distribution Transformers upto and including 2 500 kVA, 33 kV - Natural/Synthetic Organic Ester Liquid Immersed         |
|    | <b>No. of Amendments</b>                | : | nil                                                                                                                                                         |
| 2. | <b>Sampling Guidelines:</b>             |   |                                                                                                                                                             |
| a) | <b>Raw material</b>                     | : | Standard Materials - Clause 9 of IS 1180 (Part 3): 2021<br>Bushings - Clause 10 of IS 1180 (Part 3): 2021<br>Gasket - Clause 15.4 of IS 1180 (Part 1): 2021 |
| b) | <b>Grouping guidelines</b>              | : | Please refer <a href="#">ANNEX – A</a><br>(for Grouping guidelines and General guidelines)                                                                  |
| c) | <b>Sample Size</b>                      | : | One Transformer                                                                                                                                             |
| 3. | <b>List of Test Equipment</b>           | : | Please refer <a href="#">ANNEX – B</a>                                                                                                                      |
| 4. | <b>Scheme of Inspection and Testing</b> | : | Please refer <a href="#">ANNEX – C</a>                                                                                                                      |
| 5. | <b>Possible tests in a day</b>          | : | Please refer <a href="#">ANNEX – D</a>                                                                                                                      |
| 6. | <b>Scope of the Licence</b>             | : | Please refer <a href="#">ANNEX – E</a>                                                                                                                      |

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**ANNEX A****Grouping Guidelines /General Guidelines****A. Grouping Guidelines**

1. For considering Grant of Licence (GoL) / Change in Scope of Licence (CSoL), grouping as given below shall be followed:

**(a) Three Phase Transformers:**

| <b>Group</b> | <b>Nominal System Voltage</b>         | <b>Standard Ratings</b>                     |                                                                |
|--------------|---------------------------------------|---------------------------------------------|----------------------------------------------------------------|
|              |                                       | <b>Up to and including 200 kVA, 3 phase</b> | <b>Above 200 kVA and up to and including 2500 kVA, 3 phase</b> |
| I            | Up to and including 11 kV             | One sample of the highest rating            | One sample of the highest rating                               |
| II           | Above 11 kV up to and including 22 kV | One sample of the highest rating            | One sample of the highest rating                               |
| III          | Above 22 kV up to and including 33 kV | One sample of the highest rating            | One sample of the highest rating                               |

**(b) Single Phase Transformers:**

| <b>Group</b> | <b>Nominal System Voltage</b>         | <b>Standard Ratings</b>          |
|--------------|---------------------------------------|----------------------------------|
| IV           | Up to and including 11 kV             | One sample of the highest rating |
| V            | Above 11 kV up to and including 22 kV | One sample of the highest rating |
| VI           | Above 22 kV up to and including 33 kV | One sample of the highest rating |

**Note:** As per IS 1180 (Part 3), there is no difference between indoor type and outdoor type distribution transformers w.r.t requirements, testing etc. and hence they may not be treated as separate varieties.

2. The Firm shall declare the ratings of transformers they intend to cover in the Licence. One sample of highest rating from each group mentioned above shall be drawn to cover the entire range of ratings in that particular group. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer. In case it is not possible to draw the highest rating within a

group, then the Scope of Licence shall be restricted up to the rating of the sample which is drawn for independent testing from that particular group.

3. For Sealed and non- Sealed construction, separate samples are not required to be drawn for Independent Testing. If sealed sample is already drawn, non-sealed variety can be included in the Scope of Licence after ascertaining the conformity to pressure test requirements as per IS 1180(Part 1):2021 and vice-versa. This testing may be done in the factory or at a third party laboratory.
4. Separate sample of transformer is required for change in the core material (CRGO/Amorphous) and winding material (Aluminium/Copper).
5. If transformers with higher energy efficiency level is drawn for testing and found passing, the Scope of Licence may also cover transformers with lower energy efficiency levels as specified in the ISS, within the group as given at 1(a) and 1(b).
6. Non-preferred ratings within the group as given at 1(a) and 1 (b) may be covered in the Scope of Licence based on the declaration submitted by the manufacturer w.r.t design calculations, maximum total losses and declared parameters as per Annex 1.
7. All tests shall be carried out at third party laboratory. As the Independent test reports issued by the laboratories cover only routine, type and special tests (if applicable) as specified in Cl. 21 of IS 1180 (Part 3) and does not cover the general requirements as specified in Cl. 6.9, 6.10, 7.9, 8.9, 10, 11, 12, 13, 14, 15.1, 15.2 15.3, 15.5, 16 and 20.1 of IS 1180 (Part 3), these requirements shall be verified in the factory during preliminary inspection for ensuring conformity. In case any of the general requirements could not be verified in the factory due to design aspects, an undertaking shall be obtained from the manufacturer to the effect that the product meets the said requirements as per the Indian Standard.
8. For the ratings/varieties that are not subjected to testing and are covered in the Scope of Licence by virtue of the grouping guidelines, an undertaking shall be obtained from the manufacturer to the effect that the product with such ratings will conform to the requirements of the ISS and that the firm, at the first instance of manufacturing these ratings and before applying the Standard Mark, shall get the transformer tested at third party laboratory for all parameters under Routine tests and Type tests. Such test reports, along with the undertaking regarding the general requirements as specified at sl. no. 7 above, shall be produced to BIS for records through Manakonline. The Grant of Licence letter shall clearly mention the details regarding submission of independent test reports by the licensee on the first instance of manufacturing of a variety as mentioned above.
9. The practice of offering a 'Lot' for sampling during Preliminary Inspection is not applicable for this product as these are costly and are manufactured on the basis of

orders received from buyers. Even though, offering of two samples (one FS and one CS) by the manufacturer during Preliminary Inspection is desirable, if the firm expresses difficulty in offering two samples and only one sample is offered during PI, the same may be accepted. In case only one transformer is offered, tests as mentioned under the Routine Tests as well as verification of the general requirements as per sl. no. 7 above shall be carried out on the sample during PI before sending the sample for independent testing.

10. The relevant drawings of the samples of transformers along with technical parameters as per Annex 1 shall be collected and sent to the laboratory along with the sample. The manufacturer shall ensure correctness of such drawings so that no variations are observed while testing the transformer vis-à-vis the drawing submitted. The drawings notwithstanding, the conformity of the product shall be determined vis-à-vis the requirements given in the Indian Standard.
11. During the operation of the Licence, BO shall ensure that all the Varieties covered in the Licence are tested in rotation to the extent possible.
12. **Change in Scope of Licence** - For change in Scope of Licence, licensee shall submit a complete independent test report of the new rating of the transformer indicating conformity of the product along with the certified drawings and design parameters. Such documents and drawings shall also be verified by BIS to ensure that the design parameters are in consonance with the requirements of the Indian Standard. However, verification of general requirements at factory may not be done for inclusion of varieties.

## **B. General**

13. **Operation of Licence** - For the purpose of timely planning for carrying out surveillance inspections, the licensee shall inform BIS about the production schedule in advance. During surveillance inspections, compliance to sl. no. 8 above shall be verified. Sample shall be tested in the factory for routine tests. Sample shall be drawn for independent testing for all routine tests. In case there is no stock during surveillance inspection licensee shall be advised to inform, at least two weeks in advance, the production schedule and the period during which inspection could be undertaken by BIS. As the product is heavy and difficult to transport apart from being costly, feedback from the organized buyers (State Electricity Boards, Utilities and DISCOMS etc.) may be obtained towards market surveillance. In case the buyer has tested the transformer in the factory of the manufacturer or at any third party laboratory, such test results may be obtained and treated as feedback.

14. **Guidelines for Special Tests** - Clause 21.4 of IS 1180 (Part 3) refers to Special tests to be carried out by mutual agreement between the user and the supplier. Such Special tests are normally not required to be conducted for GoL/CSoL. However, if any manufacturer insists for carrying out Special test(s), an undertaking as given below shall be obtained from the authorized signatory of the manufacturer before conducting such Special test(s):

*“I/We, ----- have submitted an application to BIS for Grant of Licence/Change in Scope of Licence for Distribution Transformers as per IS 1180 (Part 3): 2021. In connection with the sample(s) offered by us, I/We fully understand that Special tests, carried out by mutual agreement between the user and the supplier, as per clause 21.4 of IS 1180 (Part 3): 2021 are normally not required to be conducted for Grant of Licence/ Change in Scope of Licence. However, on my/our request, sample sealed by BIS would be subjected to Special tests as per clause 21.4 of IS 1180 (Part 3): 2021. I/We also fully agree that if any failure is observed in Special test(s) it would be considered as a failure of the sample and may lead to rejection of my/our application for Grant of Licence/Change in Scope of Licence. Any decision taken by BIS in this regard for Grant of Licence/ Change in Scope of Licence shall be acceptable to me/us.”*

In case any Test Report shows failure in Special test(s), including those submitted by the manufacturer for GoL/CSoL, such Test Reports shall not be considered for processing GoL/CSoL.

**Annex-1****TECHNICAL PARAMETERS FOR TESTING OF TRANSFORMER AS PER IS: 1180(Part 1)**

| <b>Sample Code</b> |                                                                       |    |  |
|--------------------|-----------------------------------------------------------------------|----|--|
| 1                  | Rated kVA                                                             |    |  |
| 2                  | Serial Number of Transformer                                          |    |  |
| 3                  | Energy Efficiency level                                               |    |  |
| 4                  | Rated Voltage at no load (Volts)                                      | HV |  |
|                    |                                                                       | LV |  |
| 5                  | Rated Currents (Amps)                                                 | HV |  |
|                    |                                                                       | LV |  |
| 6                  | No. of phases (HV/LV)                                                 |    |  |
| 7                  | Vector Group connection                                               |    |  |
| 8                  | Rated Frequency (Hz)                                                  |    |  |
| 9                  | Type: Sealed/Non-Sealed                                               |    |  |
| 10                 | Type of Cooling with Dielectric System type                           |    |  |
| 11                 | Basic Insulation Level                                                | HV |  |
|                    |                                                                       | LV |  |
| 12                 | Rated Temp. rise of Liquid/ winding (°C) as per IS 1180 (Part 3):2021 |    |  |
| 13                 | Guaranteed percentage Impedance                                       |    |  |
| 14                 | Type of Winding                                                       |    |  |
| 15                 | Winding Material (Al./Cu.)                                            |    |  |
| 16                 | Weight of Core & Winding                                              |    |  |
| 17                 | Total Weight                                                          |    |  |
| 18                 | Quantity of Liquid (in liters & Kg)                                   |    |  |
| 19                 | Total losses at 50% load                                              |    |  |
| 20                 | Total losses at 100% load                                             |    |  |
| 21                 | Specification for impulse test (with chopping/without chopping)       |    |  |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22 | <p>Drawings:</p> <p>I. Name plate drawing as per IS 1180 (Part 3):2021.</p> <p>II. GA drawing with following details (with Tolerance if any) and standard/optional fittings.</p> <p>a. Tank dimensions (inside &amp; overall)</p> <p>b. Size of fins:</p> <p>c. No. of radiator:</p> <p>d. No. of fins per radiator:</p> <p>e. Ph – Ph clearance, Ph – N clearance, Ph – E clearance</p> <p>III. Flux density design calculation sheet.</p> <p>IV. Core CLiquid Assembly drawing mention HV and LV conductor size with material (copper/Aluminium)</p> | <p>Drawing No.(s) – (Enclosed)</p> <p>Drawing No.(s) with the details as referred– (Enclosed)</p> <p>L = --- mm, W= --- mm, H= --- mm<br/>L= --- mm, W=--- mm</p> <p>Enclose Details</p> <p>Enclose Details</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 23 | <p>Details of tests required as per IS 1180(Part 1):2021<br/>(Please mark against test/category to be conducted)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p><b>21.2 Routine Tests</b></p> <p>a) Measurement of winding resistance IS 2026 (Part 1).</p> <p>b) Measurement of voltage ratio and check of phase displacement IS 2026 (Part 1).</p> <p>c) Measurement of short-circuit impedance (principal tapping, when applicable) and load loss at 50 percent and 100 percent load IS 2026 (Part 1).</p> <p>d) Measurement of no-load loss and current IS 2026 (Part 1).</p> <p>e) Measurement of insulation resistance IS 2026 (Part 1).</p> <p>f) Induced over-voltage withstand test IS 2026 (Part 3).</p> <p>g) Separate-source voltage withstand test IS 2026 (Part 3).</p> <p>h) Pressure test.</p> <p>i) Liquid leakage test.</p> <p><b>21.3 Type Tests</b></p> <p>a) Lightning impulse test IS 2026 (Part 3).</p> <p>b) Temperature-rise test IS 2026</p> |

|    |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                 | (Part 2).<br>c) Short-circuit withstand test IS 2026 (Part 5) (up to 200 kVA).<br>d) Pressure test<br><b>21.4 Special Tests</b><br>a) Determination of sound levels IS 2026 (Part 10)<br>b) Short-circuit withstand test IS 2026 (Part 5) (above 200 kVA)<br>c) No load current at 112.5 percent voltage.<br>d) Paint adhesion tests. The test is performed as per ASTM D3359<br>e) BDV and moisture content of Liquid in the transformer (IS 16081, IS 16099, IS 16899 or IS 16659, whichever is applicable)<br><input type="checkbox"/> <b>Test other than Type, Routine &amp; special test.</b><br>a) Cl.6.9.1 (maximum flux density)- Destructive test & transformer is not usable after this test.<br>b) Cl.11 (minimum clearances in air)<br>c) Cl.14 (mounting arrangement) |
| 24 | Tapping Details |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Tapping Range |                  |                 |                   |           |               |
|---------------|------------------|-----------------|-------------------|-----------|---------------|
| Tap position  | Primary. Voltage | Primary Current | Secondary Voltage | X/R Ratio | Impedance (%) |
|               |                  |                 |                   |           |               |
|               |                  |                 |                   |           |               |

Signature of Manufacturer's Representative:  
Officer:

Signature of BIS Inspecting

**ANNEX B****List of Test  
Equipment*****Major test equipment required to test as per the Indian Standard***

| <b>Sl. No</b> | <b>Test Equipment</b>                      | <b>Tests Used in with Clause reference</b> |
|---------------|--------------------------------------------|--------------------------------------------|
| 1             | Thermometer                                | Cl. 21.2 (a), Cl. 21.3(b), Cl. 21.2 (e)    |
| 2             | Micro ohm meter                            | Cl. 21.2 (a), Cl. 21.3(b)                  |
| 3             | Turns ratio meter                          | Cl. 21.2(b)                                |
| 4             | Multimeter                                 | Cl. 21.2(b)                                |
| 5             | Three phase Power analyzer                 | Cl. 21.2(c), Cl. 21.2(d), 21.3(b)          |
| 6             | Insulation resistance meter                | Cl. 21.2 (e)                               |
| 7             | Voltmeter (HV test bench), Frequency meter | Cl. 21.2 (f)                               |
| 8             | Voltmeter                                  | Cl. 21.2(g)                                |
| 9             | Pressure gauge                             | Cl. 21.2(h), Cl. 21.2(j), Cl. 21.3(d)      |
| 10            | Paint thickness gauge                      | Cl. 15.5                                   |
| 11            | Micrometer, Vernier Calipers, Steel scale  | Cl.11                                      |

***The above list is indicative only and may not be treated as exhaustive.***

## **ANNEX C**

### **Scheme Of Inspection And Testing**

**1. LABORATORY** - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

**1.1** The manufacturer shall prepare a calibration plan for the test equipment.

**2. TEST RECORDS** – The manufacturer shall maintain test records for the tests carried out to establish conformity.

**3. LABELLING AND MARKING** – As per the requirements of IS 1180 (Part 3):2021.

**4. LEVELS OF CONTROL** - The tests as indicated in column 1 of [Table 1](#) and the levels of control in column 3 of [Table 1](#), shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

**4.1 RAW MATERIAL** – Raw Material used in form of CRGO Electrical Steel/ Amorphous core material shall be ISI Marked with supplier test certificate. However, if the material so procured is sent to outside vendor for getting the jobwork done, it shall be done from a valid Certificate of Conformity (CoC) holder only. In case Stampings/ laminations/ cores of transformers (with winding/ without winding) are procured by the transformer manufacturer, these shall carry a valid Certificate of Conformity (CoC) from BIS. \*

**4.2 PURCHASE AND CONSUMPTION RECORDS** - Purchase and consumption records as per Annex F shall be maintained for the ISI marked material and the Stampings/ laminations/cores received from valid licensee/ CoC holders under CoC. These records are to be presented for verification by the licensee(s) to BIS during factory surveillance by BIS.

**5. REJECTIONS** – Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

\* Here jobwork means the practice of transformer manufacturers purchasing ISI marked steel from steel manufacturers and getting the further processing of stamping/ lamination/ cores done by a /amorphous material from other manufacturers and getting the complete lamination/ core assembly done by a third party outside vendor.

**TABLE 1**

| (1)           |                                           |                                                                                                              |           | (2)                                                                                | (3)                                                      |                                                                                                                                              |         |
|---------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Test Details  |                                           |                                                                                                              |           | Test equipment<br>requirement<br>R: required (or) S: Sub-<br>contracting permitted | Levels of Control                                        |                                                                                                                                              |         |
| Cl.           | Requirement                               | Test Methods                                                                                                 |           |                                                                                    | No. of<br>Sample                                         | Frequency                                                                                                                                    | Remarks |
|               |                                           | Clause                                                                                                       | Reference |                                                                                    |                                                          |                                                                                                                                              |         |
| Raw Materials |                                           |                                                                                                              |           |                                                                                    |                                                          |                                                                                                                                              |         |
| 9.1a)         | CRGO<br>Electrical Steel                  | IS 3024                                                                                                      |           | S                                                                                  | Each consignment of<br>a particular grade as<br>received | Please see Note 1.                                                                                                                           |         |
| 9.1 b)        | Amorphous<br>core material                | IS 16585                                                                                                     |           | S                                                                                  |                                                          |                                                                                                                                              |         |
| 9.1 c)        | Copper/Aluminium<br>conductor             | IS 191, IS 1897, IS 7404,<br>IS 12444, IS 13730/IS 6162<br>series as given in Annex A of<br>IS 1180 (Part 3) |           | S                                                                                  | Each consignment                                         | ISI Marked/ Test Certificate of Conformity<br>to the relevant ISS as per Annex A of<br>IS 1180 (Part 3) from Supplier/ BIS<br>recognised Lab |         |
| 9.1 d)        | Kraft Paper                               | IS 9335 series as given in<br>Annex A of IS 1180 (Part 3)                                                    |           | S                                                                                  |                                                          |                                                                                                                                              |         |
| 9.1 e)        | Press Board                               | IS 1576                                                                                                      |           | S                                                                                  |                                                          |                                                                                                                                              |         |
| 10.1.1        | Bushings                                  | IS/IEC 60137 and IS 7421                                                                                     |           | S                                                                                  |                                                          |                                                                                                                                              |         |
| 10.1.5        | Dimensions<br>of Bushings                 | IS 3347 series as given in Annex<br>A of IS 1180 (Part 3), IS 8603, IS<br>8603-4, IS/IEC 60137, IS 7421      |           | S                                                                                  |                                                          |                                                                                                                                              |         |
| 15.4          | Gasket                                    | Type III as per IS 11149/<br>Type C as per IS 4253 (Part 2)                                                  |           | S                                                                                  |                                                          |                                                                                                                                              |         |
| 9.1 f)        | Natural/Synthetic<br>Organic Ester Liquid | (IS 16081/ IS 16659, whichever is<br>applic <u>a</u> ble)                                                    |           | S                                                                                  | Each drum of Liquid<br>received                          |                                                                                                                                              |         |
| 15.1          | Transformer Tank                          | —                                                                                                            |           | S                                                                                  | Each consignment (if<br>tank is outsourced)              | Qualification Certificate of the welder to<br>be maintained                                                                                  |         |
| 15.3          | Bolts, Nuts, Washers                      |                                                                                                              |           | S                                                                                  | Each consignment                                         | Test Certificate from Supplier                                                                                                               |         |

| (1)                                                     |                                                                                                                                          |                  |           | (2)                                                                         | (3)                                                                                                                      |           |         |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------|---------|
| Test Details                                            |                                                                                                                                          |                  |           | Test equipment requirement<br>R: required (or) S: Sub-contracting permitted | Levels of Control                                                                                                        |           |         |
| Cl.                                                     | Requirement                                                                                                                              | Test Methods     |           |                                                                             | No. of Sample                                                                                                            | Frequency | Remarks |
|                                                         |                                                                                                                                          | Clause           | Reference |                                                                             |                                                                                                                          |           |         |
| General                                                 |                                                                                                                                          |                  |           |                                                                             |                                                                                                                          |           | —       |
| 6.9.1,<br>6.9.2,<br>7.9.1,<br>7.9.2,<br>8.9.1,<br>8.9.2 | Permissible Flux density,<br>Current and Voltage                                                                                         | IS 1180 (Part 3) |           | S                                                                           | One sample each of identical design/<br>construction and of same nominal<br>system voltage and rating once in 5<br>years |           |         |
| 11                                                      | Minimum clearances in<br>air                                                                                                             |                  |           | R                                                                           | Each Transformer                                                                                                         |           |         |
| 15.1                                                    | Construction of<br>Transformer Tank                                                                                                      |                  |           | R                                                                           |                                                                                                                          |           |         |
| 15.5                                                    | Painting of Transformer<br>Tank                                                                                                          |                  |           | R                                                                           |                                                                                                                          |           |         |
| 16                                                      | Conservator for non-<br>sealed type transformer                                                                                          |                  |           | R                                                                           |                                                                                                                          |           |         |
| Routine Tests (To be conducted on all units)            |                                                                                                                                          |                  |           |                                                                             |                                                                                                                          |           |         |
| 21.2a)                                                  | Measurement of Winding<br>Resistance                                                                                                     | IS 2026 (Part 1) |           | R                                                                           | Each Transformer                                                                                                         |           | —       |
| 21.2b)                                                  | Measurement of voltage<br>ratio and check of phase<br>displacement                                                                       |                  |           | R                                                                           |                                                                                                                          |           |         |
| 21.2c)6.8,<br>7.8, 8.8                                  | Measurement of short-<br>circuit impedance<br>(principal tapping, when<br>applicable) & load loss at<br>50 percent & 100 percent<br>load |                  |           | R                                                                           |                                                                                                                          |           |         |

| (1)                                                                                            |                                             |                  |                  | (2)                                                                         | (3)                                                                                          |           |              |
|------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------|--------------|
| Test Details                                                                                   |                                             |                  |                  | Test equipment requirement<br>R: required (or) S: Sub-contracting permitted | Levels of Control                                                                            |           |              |
| Cl.                                                                                            | Requirement                                 | Test Methods     |                  |                                                                             | No. of Sample                                                                                | Frequency | Remarks<br>— |
|                                                                                                |                                             | Clause           | Reference        |                                                                             |                                                                                              |           |              |
| 21.2d)                                                                                         | Measurement of no-load loss & current       | IS 2026 (Part 1) |                  | R                                                                           | Each Transformer                                                                             |           |              |
| 21.2e)                                                                                         | Measurement of insulation resistance        |                  |                  | R                                                                           |                                                                                              |           |              |
| 21.2f)                                                                                         | Induced Overvoltage withstand Test          | IS 2026 (Part 3) |                  | R                                                                           |                                                                                              |           |              |
| 21.2g)                                                                                         | Separate-source voltage withstand test      |                  |                  | R                                                                           |                                                                                              |           |              |
| 15.2 & 21.2h)                                                                                  | Pressure Test                               | 21.5             | IS 1180(Part 1)  | R                                                                           |                                                                                              |           |              |
| 15.2 & 21.2j)                                                                                  | Ester Liquid Leakage Test                   | 21.5             | IS 1180(Part 1)  | R                                                                           |                                                                                              |           |              |
| Type Tests: To be carried out at the first instance and whenever there is any change in design |                                             |                  |                  |                                                                             |                                                                                              |           |              |
| 21.3a)                                                                                         | Lightning Impulse Test                      | IS 2026 (Part 3) |                  | S                                                                           | One sample of identical design/construction & of same nominal voltage rating once in 5 years | —         |              |
| 21.3b)6.10, 7.10, 8.10                                                                         | Temperature Rise Test                       | IS 2026 (Part 2) |                  | S                                                                           | One sample of identical design/construction & of same nominal voltage rating once every year |           |              |
| 21.3c) 17                                                                                      | Short circuit withstand test (upto 200 kVA) | IS 2026 (Part 5) |                  | S                                                                           | One sample of identical design/construction & of same nominal voltage rating once in 5 years |           |              |
| 21.3d)                                                                                         | Pressure Test                               | 21.5             | IS 1180 (Part 3) | S                                                                           |                                                                                              |           |              |

| (1)                                                                                                        |                                              |                                                                   |                  | (2)                                                                         | (3)                                          |           |         |
|------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------|----------------------------------------------|-----------|---------|
| Test Details                                                                                               |                                              |                                                                   |                  | Test equipment requirement<br>R: required (or) S: Sub-contracting permitted | Levels of Control                            |           |         |
| Cl.                                                                                                        | Requirement                                  | Test Methods                                                      |                  |                                                                             | No. of Sample                                | Frequency | Remarks |
|                                                                                                            |                                              | Clause                                                            | Reference        |                                                                             |                                              |           |         |
| Special Tests: To be carried out on mutual agreement between manufacturer and purchaser (See Note 1 below) |                                              |                                                                   |                  |                                                                             |                                              |           |         |
| 21.4a)                                                                                                     | Determination of Sound Levels                | IS 2026 (Part 10)                                                 |                  |                                                                             | As agreed between purchaser and manufacturer |           |         |
| 21.4b)                                                                                                     | Short circuit withstand test (above 200 kVA) | IS 2026 (Part 5)                                                  |                  |                                                                             |                                              |           |         |
| 21.4c)                                                                                                     | No Load Current at 112.5% voltage            | 6.9.2, 7.9.2, 8.9.2                                               | IS 1180 (Part 3) |                                                                             |                                              |           |         |
| 21.4d)                                                                                                     | Paint adhesion test                          | ASTM D3359                                                        |                  |                                                                             |                                              |           |         |
| 21.4e)                                                                                                     | BDV & moisture content of transformer Liquid | IS 16081, IS 16099, IS 16899 or IS 16659, whichever is applicable |                  |                                                                             |                                              |           |         |

**Note 1:** Shall be ISI Marked with supplier test certificate. **However, if the material so procured is sent to outside vendor for getting the jobwork done, it shall be done from a valid Certificate of Conformity (CoC) holder only.** In case Stampings/ laminations/ cores of transformers (with winding/ without winding) are procured by the transformer manufacturer, these shall carry a valid Certificate of Conformity (CoC) from BIS. \*

**Note 2:** Purchase and consumption records as per Annex F shall be maintained for the ISI marked material and the Stampings/ laminations/cores received from valid licensee/ CoC holders under CoC. These records are to be presented for verification during factory surveillance by BIS.

Note 3: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

**Note 4:** Levels of control given in column 3 as decided by the Bureau are obligatory to which the licensee shall comply with.

\* Here jobwork means the practice of transformer manufacturers purchasing ISI marked steel from steel manufacturers and getting the further processing of stamping/ lamination/ cores done by a /amorphous material from other manufacturers and getting the complete lamination/ core assembly done by a third party outside vendor.

**ANNEX D****Possible Tests in a day**

| <b>Requirements</b>                                                      | <b>Clause of IS 1180 (Part 3): 2021</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General requirements                                                     | 6.9, 6.10, 7.9, 8.9, 10, 11, 12, 13, 14, 15.3, 15.5, 16, 20.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Routine tests                                                            | 21.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Records of use of ISI marked material and/ or stamping/ lamination/ core | <p><b>During factory surveillance the purchase and consumption records and certificates of following to be verified:</b></p> <ul style="list-style-type: none"> <li>i) <b>ISI marked steel material</b></li> <li>ii) <b>If ISI marked steel material is sent for jobwork, whether the job work is carried out by a third party vendor with valid CoC</b></li> <li>iii) <b>If stamping/ lamination/ core are procured directly, whether they are procured from valid CoC holder.</b></li> </ul> <p><b>NOTE: The Inspecting Officer shall verify the above records and shall report the availability and verification of the above records/ certificates in his/her surveillance report.</b></p> |

**ANNEX E****Scope of Licence**

|                                                                                                 |                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Licence is granted to use Standard Mark as per IS 1180 (Part 3): 2021 with the following scope: |                                                                                                                                                                                                                                                                                                                                                          |
| Name of the Product                                                                             | Outdoor/Indoor Type Natural/Synthetic Organic Ester Liquid Immersed Distribution Transformers                                                                                                                                                                                                                                                            |
| Type                                                                                            | <ul style="list-style-type: none"> <li>• Standard Rating in kVA</li> <li>• Nominal System Voltage in kV</li> <li>• Single/ Three phase</li> <li>• Sealed/ non-Sealed</li> <li>• Aluminium/ Copper winding</li> <li>• CRGO/ Amorphous core</li> <li>• Energy Efficiency Level</li> <li>• Maximum Total Loss (in-case of non-preferred ratings)</li> </ul> |

## **Annex F**

**Form I: Consolidated statement of record of purchase/ consumption of CRGO/ Amorphous material/ Lamination/ Stamping/ Core assembly**

(For all ratings and kinds of transformers including distribution / power transformers upto 2500 kVA)

|                                           | Opening Stock | Purchase | Consumption (total) | Closing Stock |
|-------------------------------------------|---------------|----------|---------------------|---------------|
| CRGO (ISI marked)                         |               |          |                     |               |
| Amorphous Material (ISI marked)           |               |          |                     |               |
| Lamination/ Stamping/ Core Assembly (CoC) |               |          |                     |               |

**Form II A: Record of material (CRGO/ Amorphous) purchased and consumed for making transformers**

[illegible]

**Form IIB: Record of material purchased (Lamination/Stamping/ core) and consumed for making transformers**

| Material purchased           | Supplier name and address | CoC number | Quantity purchased (MT) | TC number of Lamination/Stamping/ Core purchased | Quantity Consumed (MT) | Transformer supplied    |                       |                    |
|------------------------------|---------------------------|------------|-------------------------|--------------------------------------------------|------------------------|-------------------------|-----------------------|--------------------|
|                              |                           |            |                         |                                                  |                        | Transformer supplied to | Rating of transformer | No. of transformer |
| Lamination / Stamping / Core |                           |            |                         |                                                  |                        |                         |                       |                    |
|                              |                           |            |                         |                                                  |                        |                         |                       |                    |

**Note – 1: Traceability documents for all above purchase - CRGO Coil, Amorphous material, Lamination or Stamping, Core assembly, must be maintained.**

**Note – 2: Records to be maintained for each consignment and for each variety of Raw Material procured by the manufacturer.**

**Note – 3: Records as per above forms to be shared with BIS on quarterly basis.**