



भारतीय मानक ब्यूरो BUREAU OF INDIAN STANDARDS

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG, NEW DELHI 110002

व्यापक परिचालन मसौदा

22/09/2023

हमारा संदर्भ: ईटीडी 32/टी-1

तकनीकी समिति: विद्युत उपकरण अनुभागीय समिति, ईटीडी 32

प्राप्तकर्ता :

- विद्युत तकनीकी विभाग परिषद्, ईटीडीसी के सभी सदस्य
- ईटीडी 32 के सभी सदस्य
- रूचि रखने वाले अन्य निकाय

महोदय/महोदया,

निम्नलिखित भारतीय मानक का मसौदा संलग्न है:

प्रलेख संख्या	शीर्षक
ईटीडी 32 (23639) WC / Revision of IS 6365)	प्रयोगशाला इलेक्ट्रिक ओवन के लिए विशिष्टता (पहला पुनरीक्षण) ICS: 542.44.662.9

कृपया इस मानक के मसौदे का अवलोकन करें और अपनी समितियाँ यह बताते हुए भेजे कि यदि यह मानक के रूप में प्रकाशित हो तो इस पर अमल करने में आपके व्यवसाय अथवा कारोबार में क्या कठिनाइयाँ आ सकती हैं।

समितियाँ भेजने की अंतिम तिथि : **22/11/2023**

सम्मति यदि कोई हो तो कृपया अधोहस्ताक्षरी को उपरिलिखित पते पर संलग्न फॉर्मेट में भेजें या eetd@bis.gov.in पर ईमेल कर दें।

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यह प्रलेख भारतीय मानक ब्यूरो की वेबसाइट www.bis.gov.in पर भी उपलब्ध है।

धन्यवाद।

भवदीय,

(प्रीति भटनागर)
प्रमुख (विद्युत तकनीकी विभाग)

संलग्नक : उपरिलिखित

**भारतीय मानक ब्यूरो**
BUREAU OF INDIAN STANDARDS

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG, NEW DELHI 110002

DRAFT IN WIDE CIRCULATION

22/09/2023

Our Ref: ETD 32/T-1

TECHNICAL COMMITTEE: Electrical Appliances Sectional Committee, ETD 32

ADDRESSED TO:

- All Members of Electrotechnical Division Council, ETDC
- All Members of ETD 32
- All others interests.

Dear Sir/Madam,

Please find enclosed the following document:

Doc No.	Title
ETD 32 (23639) WC / Revision of IS 6365)	SPECIFICATION FOR LABORATORY ELECTRIC OVENS (First Revision) ICS: 542.44.662.9

Kindly examine the draft standard and forward your views stating any difficulties which you are likely to experience in your business or profession if this is finally adopted as National Standard.

Last Date for Comments: **22/11/2023**

Comments if any, may please be made in the attached format and mailed to the undersigned at the above address or preferably through e-mail to eetd@bis.gov.in.

In case no comments are received or comment received are of editorial nature, you may kindly permit us to presume your approval for the above document as finalized. However, in case of comments of technical in nature are received then it may be finalized either in consultation with the Chairman, Sectional Committee or referred to the Sectional Committee for further necessary action if so desired by the Chairman, Sectional Committee.

The document is also hosted on BIS website www.bis.gov.in.

Thanking you,

Yours faithfully,

(Priti Bhatnagar)
Head (Electrtechnical Dept.)

Encl: As above

FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS

(Please use A-4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/table/fig etc. be started on a fresh box. Information in column 3 should include reasons for the comments and suggestions for modified working of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat's work) {Please e-mail your comments to eetd@bis.gov.in

DOC. NO. & TITLE: ETD 32 (23639) WC / Revision of IS 6365)

SPECIFICATION FOR LABORATORY ELECTRIC OVENS (*First Revision*)

ICS: 542.44.662.9

LAST DATE OF COMMENT: **22/11/2023**

NAME OF THE COMMENTATOR/ORGANIZATION: _____

Sl. No.	Name of the Organization	Clause/ Sub-clause	Paragraph /Figure/Table	Type of Comment (Editorial/General/ Technical)	Comments	Proposed changes

BUREAU OF INDIAN STANDARDS

DRAFT INDIAN STANDARD

(Not to be reproduced without the permission of BIS or used as an Indian Standard)

भारतीय मानक ड्राफ्ट
प्रयोगशाला इलेक्ट्रिक ओवन के लिए विशिष्टता
(पहला पुनरीक्षण)

Draft Indian Standard

Specification for Laboratory Electric Ovens-

(First Revision)

(ICS 542.44.662.9)

Electrical Appliances
Sectional Committee, ETD 32

Last date of Comments – 21.11.2023

FOREWORD

This Indian Standard (*First Revision*) would be adopted by the Bureau of Indian Standards, on recommendation of the Electrical Appliances Sectional Committee and approval of the Electrotechnical Division Council.

This standard was originally published in 1971. The revision has been undertaken to align the safety requirements with the latest version of IS 302-1 and the current practice adopted by the manufacturers worldwide.

This standard covers the general, safety and performance requirements for electrically heated ovens intended mainly for laboratory use, with a view to ensuring personal safety against electric shock, safety against the effects of excessive temperature and fire, and reliable operation.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2:1960. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard***SPECIFICATION FOR LABORATORY ELECTRIC OVENS-***(First Revision)***1. SCOPE**

1.1 This standard applies to digitally controlled electrically heated ovens intended for laboratory use and designed for connections to supplies at voltages not exceeding 250V a.c. single phase or 440 V AC three phase, having an internal space in liters as declared by the manufacturer and ventilated by natural convection or forced convection to assist the circulation of air.

1.2 This standard does not apply to infra-red or radiant heat ovens, vacuum or pressure ovens, constant-humidity oven and forced—draught ovens.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this draft standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 302-1: 2008	Safety of household and similar electrical appliances: Part 1 general requirements (<i>Sixth Revision</i>)
IS 4984:1987	Polyethylene pipes for water supply - Specification (<i>Fifth Revision</i>)
IS 13871:2021	Powder Coating - Specification

3. TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Oven—A closed heating chamber in which heat from the source is transferred to the load predominantly by convection.

3.2 Low-Temperature Oven — An oven designed for heating materials at temperatures up to 110°C principally used for removal of moisture.

3.3 Medium Temperature Oven—An oven designed to heat materials up to 200°C.

3.4 High Temperature Oven—An oven designed to heat materials above 200°C.

3.5 Wide Range Oven—: An oven which incorporate the feature ovens described in **3.2** to **3.4**.

3.6 Convection Oven— An oven in which temperature uniformity is brought about by convection resulting solely by the difference in density hot air and cold air.

3.7 Forced convection oven— An oven in which motorized fan or blower is used to assist the convection and bring about uniformity of temperature.

3.8 Working Space — The space within the oven which is above the lowest shelf, if provided, and not less than 50 mm from any heating surface or 30 mm from any non-heating surface of a roof, wall, partition or cover.

3.9 Oven Temperature- The mean of the temperature of air at the Centre of the working space at a cut-in of the Digital Temperature controller and at the cut- out immediately following.

3.10 Temperature Variation — The difference in the temperature of the air the Centre of the working space and at any other point in the working space at any instant.

3.11 Temperature Differential — The cyclic change of temperature at any point in the working space regulated by the operation of the digital temperature controller.

3.12 Temperature Drift — The change in oven temperature which may take place in continuous operation over a long period.

3.13 Temperature Overshoot- The amount by which the maximum temperature attained by air at the centre of the working space during the initial heating up, exceeds the oven temperature when steady operating condition of the Digital Temperature controller is reached.

4. RATING

4.1 Voltage Rating- The voltage rating assigned to the appliance shall be 230 v, single phase a.c. Supply or 440 v, 3 phase, ac supply.

4.2 Rated Input – The rated power requirement shall be assigned by the manufacturer depending on the size of the oven and temperature requirements.

5. MATERIALS AND COMPONENTS

5.1 An electric motor with blower of suitable size and specification shall be used for forced convection oven.

If automatic controls are provided for temperature uniformity, suitable instruction manuals are to be provided by the manufacturer for the instrument installed.

6. CONSTRUCTION

6.1 The relevant provisions of 22 of IS: 302-1:2008 shall apply in addition to the requirements specified in 6.2 to 6.6

6.2 Cabinet

6.2.1 The inner surface of the cabinet and its fittings shall be smooth and impervious, and any point, rendering or coating used on the interior shall be capable of withstanding the maximum temperature for which the oven is designed.

6.2.2 Ventilation of the cabinet shall be provided by means of one or more ports near the bottom and the top of the cabinet. In large cabinets circulating fans may be provided to assist convection and ventilation so that temperature variation is kept within limits. The circulating fan shall not protrude into the working space. The ports at the top of the cabinet shall be adjustable to regulate ventilation.

6.2.3 Shelves, if provided, shall be adjustable along the height and made of stout wire mesh, expanded metal or perforated sheet metal, and shall be adequately protected from corrosion by heat and humidity. The design of lugs, brackets or runners for shelves shall be such that heavily laden shelves may not tilt during withdrawal. The area of all the opening or holes in the shelves shall not aggregate to less than 30 percent of the total area of the shelves.

6.2.4 The ovens shall be either of the totally-enclosed type or provided with a suitable viewing arrangement.

6.3 Heating Elements — The heating element shall be so designed and located that overheating in its vicinity is minimized. The heating element or that part of it which is fixed on the inside bottom of the oven shall be covered by suitable baffles or perforated covers so that fresh air entering through the bottom ports is uniformly distributed in the working space, and undue heating of materials at the bottom of the working space is avoided.

6.4 Wiring and Components - The wiring and components used in an oven shall be constructed or fixed in such a manner that they shall be able to withstand continuously the temperature to which they are likely to be exposed when the oven working space is maintained at its designed maximum temperature.

6.4.1 Switches — Suitable MCB to be used as per IS/IEC 60898-1 for protection of electrical system. Switches and controls shall be so located or protected that they are not subjected to mechanical injury and spillage.

6.5 TEMPERATURE CONTROL

Digital temperature controller with suitable thermocouple sensor /RTD sensor is recommended.

6.6 Air Circulation (Applicable to Forced Convection Ovens Only) — Suitable system should be designed by the manufacturer for air circulation to maintain the uniformity of the oven temperature as mentioned in **9.3.2**. Centrifugal fans as IS 4984 may be used for the purpose of air circulation.

7. GENERAL AND SAFETY REQUIREMENTS

7.1 Protection Against Electric Shock – The relevant provisions of Clause 8 of IS 302-1 shall apply.

7.2 Temperature Limit-The provision of **10.3.10** and Clause 11 of IS 302-1 shall apply.

7.2.1 The temperature rise of the external enclosure of the laboratory oven shall not exceed 40°C.

7.3 Electrical Insulation — The relevant provisions of Clause 13 of IS: 302-1 shall apply.

7.4 Stability — The relevant provisions of Clause 20 of IS: 302-1 shall apply.

7.4.1 The appliance shall not overturn. The test is repeated on appliances with heating elements with the angle of inclination increased to 15°. If the appliance overturns in one or more positions, it is subjected to the tests of 11 in each of these overturned positions.

7.5 Mechanical Strength — The relevant provisions of Clause 21 of IS 302-1 shall apply.

7.6 Supply Connections - The provisions of Clause 25 of IS 302-1 shall apply.

7.7 Terminals — The relevant provisions of Clause 26 of IS 302-1 shall apply.

7.8 Earthing — The provisions of Clause 27 of IS: 302-1 shall apply.

7.9 Screws and Connections— The relevant provisions of Clause 28 of IS 302-1 shall apply.

7.10 Resistance to Rusting — The provisions of Clause 31 of IS: 302-1 shall apply.

8. PERFORMANCE REQUIREMENTS

8.1 Input — The provisions of Clause 10 of IS 302-1 shall apply.

8.2 Thermal Performance — The oven shall satisfactorily pass the tests specified in 10.

9. MARKING AND INSTRUCTIONS FOR USE

9.1 Each oven shall be marked indelibly and clearly with the information prescribed in 7 of IS: 302-1 on its outer surface or on a label firmly attached thereto.

9.1.1 The ovens may also be marked with the BIS Certification Mark.

9.1.2 The use of the standard mark is governed by the provisions of Bureau of Indian Standards Act, 2016 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for use of the standard mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

9.2 Marking of Earth Terminal — The symbol shall be marked prominently on or adjacent to the earth terminal, if provided.

9.3 Instructions for Use — Each oven shall be provided with the necessary instructions including precautions to be taken for its proper use.

10. TESTS

10.1 Categories of Tests

10.1.1 Type Tests — The tests specified in Table 1 shall constitute type tests and shall be carried out on 2 samples of ovens of the same model rating (selected preferably at random from a regular production lot).

10.1.1.1 Criteria of acceptance—All samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If any sample should fail in any of the type tests, the testing authority at its discretion may call for fresh samples not exceeding twice the original number and subject them again to all the tests or to the tests in which failure occurred. No single failure shall be permitted in repeat test(s).

10.1.2 Acceptance Tests — The following shall constitute the acceptance tests:

- a) Visual examination and inspection (Clause 10.3.1),
- b) Protection against electric shock (Clause 8 of IS: 302-1),
- c) Leakage Current and Electric Strength at operating temperature (Clause 13 of IS: 302-1),
- d) Leakage Current and Electric Strength (Clause 16 of IS :302-1)
- e) Earthing connection (Clause 27 of IS: 302-1),
- f) Input (Clause 10 of IS: 302-1),
- h) Temperature limit (Clause 10.3.10),
- j) Temperature variation (Clause 10.3.2),
- k) Temperature differential (Clause 10.3.3)
- l) Temperature Drift (Clause 10.3.4)
- m) Test for Reproducibility of Temperature setting (Clause 10.3.5)
- n) Temperature overshoot (Clause 10.3.6)
- o) Ventilation Rate Test(Clause 10.3.7)
- p) Temperature Recovery Test (Clause 10.3.8)
- q) Test for Heating-Up time (Clause 10.3.9)
- r) Resistance to Fire (clause 30 of IS 302-1:2008)

10.1.3 Routine Tests — The following shall constitute routine tests:

- a) Visual examination and inspection (Clause 10.3.1),
- b) Protection against electric shock (Clause 8 of IS: 302-1),
- c) High voltage (Clause 13.3 of IS: 302-1),
- d) Leakage Current and Electric Strength (Clause 16 of IS :302-1)and
- e) Earthing connection (see Clause 27 of IS: 302-1-2008).

10.2 General Conditions for Tests

10.2.1 Test Voltage —The appliance shall be tested at rated voltage unless otherwise specified.

10.2.2 Ambient Temperature — The ambient temperature during the performance test may be kept at any value between 15 to 40°C and during the test the temperature shall not vary by more than $\pm 5^\circ\text{C}$.

10.2.3 Test Temperatures — The temperature variation test and temperature differential test shall be carried at $100 \pm 5^\circ\text{C}$ for low temperature ovens, and at a temperature within 10°C of the maximum temperature for medium and high temperature ovens. In the case of wide range ovens these tests shall be done at $100 \pm 5^\circ\text{C}$, as well as at a temperature within 10°C of its maximum temperature. The temperature drift test and the temperature overshoot test shall be made at the mid-point of the temperature range of the oven. The ventilation rate test (applicable only to low temperature ovens or wide-range ovens which are also intended for drying) shall be carried out at $105 \pm 2^\circ\text{C}$.

10.2.4 Measurement of Temperatures — The measurement of temperatures for the purpose of the temperature variation and temperature differential tests shall commence 2 hours after the oven has been switched on or one hour after the final adjustment of the digital temperature controller, whichever is later.

10.2.4.1 The oven temperature, temperature overshoot, temperature variation and temperature differential shall be measured with thermocouples, RTD or other compact sensing elements capable of measuring temperature differences of 0.1°C at the test temperature and having a response to temperature changes of at least 1 deg/min. For the purpose of measurements, one sensing element shall be placed as near as possible to the centre of the working space and the other successively at the following points:

- a) Each of the four upper corners of the working space,
- b) Each of the four centres of the four sides of the working space, and
- c) Each of the four points vertically above the four lower corners of the working space at a height of 20 mm above the bottom of the working space. In case of cylindrical ovens, the above twelve points shall be substituted by ten points equally distributed on the cylindrical periphery of the working space and two points on the 'axis of the cylinder one at each end of the working space.

10.2.5 Arrangement of the Oven — The oven shall be tested on a Table or stand 1 m above floor level and located so as to be protected from direct-heat source or draughts. When carrying out the performance tests, it should have all the shelves, if provided, in position but not loaded; the top ventilation ports should be adjusted according to the manufacturer's instruction accompanying each oven.

10.3 Schedule of Tests — The schedule of type tests to be carried out on the ovens for proving conformity with the requirements of this standard is given in Table 1 with reference to relevant clauses of IS: 302-1-2008 and this standard.

Sl. No (1)	Tests (2)	Clause Reference (3)
1	Visual examination and inspection	10.3.1
2	Mechanical Strength	7.5
3	Protection of Electric shock	7.1

4	Leakage Current and Electric Strength at operating temperature	13 of IS: 302-1
5	Leakage Current and Electric Strength	16 of IS: 302-1
7	Earthing connection	7.8
8	Input	11
9	Temperature Limit	9.3.10 11.1 and 11.2 of IS: 302-1
10	Temperature variable	10.3.2
11	Temperature differential	10.3.3
12	Temperature Drift	10.3.4
13	Reproducibility of temperature setting	10.3.5
14	Temperature overshoot	10.3.6
15	Ventilation Rate(For low temperature ovens and wide range ovens intended for drying and convection oven only)	10.3.7
16	Temperature recovery test	10.3.8
17	Heating of time	10.3.9
18	Resistance to Fire	30 of IS 302-1:2008

10.3.1 Visual Examination and Inspection — Each oven shall be examined and inspected for general construction and marking requirements specified in this standard.

10.3.1.1 The laboratory electric ovens shall be visually examined and Inspected for obvious visual defects in respect of components, parts and their assembly, construction, stability, marking, provision oi suitable terminals for supply earthing and the effectiveness of screws and connections.

10.3.1.2 The supply shall be of Size appropriate to the rating (see **25** of IS: 302-1-2008)

10.3.1.3 The external surface finish shall be even and free from finishing defects

10.3.2 Temperature Variation Test- With temperature sensing elements located as described in **10.2.4.1** the temperature differences shall be read with reference to the sensing element at the centre of the working space. The temperature variation at each point shall be determined by taking the mean of at least 3 readings of temperature difference at that point. The maximum temperature variation between any two points tested shall not exceed 2 percent of the test temperature of the oven for gravity convection ovens, and 1 percent for forced convection ovens.

10.3.3 Temperature Differential Test — With a temperature sensing element located successively at all the different points described in **10.2.4.1**, or a number of sensing elements located simultaneously at all the points described, the temperature at each point shall be recorded continuously or at intervals not exceeding 5 minutes during a .3-hour test period. The temperature differential measured at any point shall not exceed 2 percent of the oven temperature for gravity convection ovens and 1 percent for forced-convection ovens.

10.3.4 Temperature Drift Test — With the ovens adjusted as required by **10.2.3**, the oven temperature shall be recorded once every 6 hours with the thermocouple/RTD/thermistor, for a continuous period of 72 hours. The temperature drift measured above shall not exceed 1.5 percent of the temperature of the test.

10.3.5 Test for Reproducibility of Temperature Setting — At the end of the test described in **10.3.4**, when the last temperature reading has been taken, the oven shall be switched off, but left otherwise undisturbed for 24 hours. At the end of this period the oven shall be switched on again for at least 3 hours without altering its temperature setting. At the end of this period the original temperature before switching off shall be regained to within 0.5 percent.

10.3.6 Temperature Overshoot Test — In the above test during the initial heating up the temperature shall be recorded at least every 5 minutes when the temperature approaches the original temperature in the test according to **10.3.5** within 5°C, until a steady temperature is attained again. The maximum temperature recorded shall not exceed the steady oven temperature finally obtained by more than 1 percent.

10.3.7 Ventilation Rate Test — (Applicable to Low-Temperature Ovens and Wide Range Ovens Designed for Drying for Natural convection type oven only) — The ventilation measured with the oven in operation at $105 \pm 5^\circ\text{C}$, and with the room temperature maintained at $27 \pm 2^\circ\text{C}$ and pressure existing in the laboratory at the time of the test, by the method described in Appendix A or any method giving equally accurate results, shall be not less than 10 changes of air per hour.

NOTE—One change of air signifies the displacement of a volume of air equal to the volume of the total internal space of the heating chamber of the oven.

10.3.8 Temperature Recovery Test — The oven shall be operated at a steady cut-out temperature of 10°C below the declared maximum operating temperature. The oven door shall then be opened fully for one minute without switching off the supply. On closing the door, the original operating temperature shall be regained within 1°C in not more than 20 minutes.

10.3.9 Test for Heating-Up Time— The oven shall be connected to the supply with the Digital Temperature controller set at its maximum point and any other control such as heat switches, ventilators etc. adjusted according to the instructions of the manufacturer. The oven temperature shall reach the maximum operating value within 45 minutes of the connection of the supply.

10.3.10 Test for Temperature-Rise

10.3.10.1 The tests shall be performed as per Clause 11 of IS 302-1.

10.3.10.2 The temperature-rise of the external enclosure of the oven shall be measured after the oven has been adjusted to maximum operating temperature and is made to operate at this temperature for 3 hours. The temperature shall be measured at different points on the enclosure which, however, are not within 70 mm of any exhaust or vent from the oven. The maximum temperature observed at any point on the external enclosure shall be taken into account for calculating the temperature-rise. The temperature-rise so calculated shall not exceed 40°C.'

APPENDIX A*(Clause 10.3.7)***METHOD OF MEASUREMENT OF VENTILATION RATE BY MEASURING THE POWER CONSUMPTION**

A-1. The rate of ventilation is measured by the additional power required to maintain the oven at the test temperature with its ports open, over that required to maintain the oven at the same temperature with the ports closed. The average power consumption is measured by dividing the total energy consumption indicated by a watt-hour meter by the total time in hours. In either case the test is started with the initial reading at a cut-in of the Digital Temperature controller and ended with the final reading at another cut-in of the Digital Temperature controller, the interval being at least half an hour and as nearly equal as possible in both parts of the test.

A-2. The test is commenced after steady conditions have been reached with the temperature adjusted as required by 9.3.7 and the ventilation ports adjusted according to the instructions supplied with each oven. The average power (*x* watts) required to maintain the set temperature under these conditions is determined.

A-3. The ventilation ports at the bottom as well as top and the thermometer aperture, door joints, and any other openings are now effectively closed to prevent any leakage of air.

A-4. The oven is run for some time and if necessary adjusted so that the difference between the oven temperature and the room temperature; is within 0.2°C of that during the first part of the test, the room temperature being measured at a point 2 m from the oven approximately level with its base, and at least 1 m away from any solid object. The power consumption (*y* watts) is now, measured exactly as in the first part of the test, and for similar period.

A-4.1 The volume of air passing through the oven in the first part of the test is given by the expression: -

$$V = \frac{3.600}{1.003d} \times \frac{(X - Y)}{t_2 - t_1}$$

where

V = volume of air, in litres per hour;

x—y (see **A-2** and **A-4**) the difference in power consumption as determined above in watts;

d = density of air at the ambient temperature and pressure in grams per litre;

*t*₂ = the oven temperature during the test in deg Celsius; and

*t*₁ = the ambient temperature during the test in deg Celsius.