# BUREAU OF INDIAN STANDARDS



*Draft Indian Standard*

## POLYOLEFIN ELASTOMER (POE) MATERIALS FOR MOULDING AND EXTRUSION — SPECIFICATION

(**ICS No**. 83.080.20)

| | |
|---|---|
| Plastics Sectional Committee, PCD 12 | Last date for receipt of comment is **18 May 2022** |

## FOREWORD

(Formal clause to be added later)

POE (polyolefin elastomer) is a relatively new type of thermoplastic elastomer (TPE). POE are families of homogeneous ethylene-based or propylene-based random copolymer produced from single-site catalysts to bridge the performance gap between conventional polyolefins.

Polyolefin elastomers are compatible with most olefinic materials, provide improved impact properties for plastics, and exhibit unique characteristics for compounded products.

Based on the recommendations of Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizer, the Committee has decided to formulate the Indian Standard on Polyolefin elastomer (POE) materials for moulding and extrusion.

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 or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (revised)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## 1 SCOPE

**1.1** This standard prescribes the designation system, requirements, methods of sampling and tests for Polyolefin Elastomers (POE). It applies to the material ready for normal use in the form of powder, granules, or pellets and to materials coated or uncoated with fillers, etc.

**1.2** This standard is applicable to all POE’s.

**1.3** This Standard is not intended to imply that materials having the same designation give necessarily the same performance. This standard does not provide engineering data, performance data or data on processing conditions which might be required to specify a

material for a particular application and/or method of processing.

**1.4** If such additional properties are required, they shall be determined in accordance with the test methods specified in **6.3.2**, if suitable.

**1.5** This standard does not cover master batches.

## 2 REFERENCES

The Indian standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of the 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 listed in Annex A.

## 3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2828 shall apply.

## 4 DESIGNATION

**4.1** The designation system is given in **4.2** into which the materials are classified according to method of processing, their designatory properties such as density, melt flow rate, Izod impact strength and melting point. The designation system is only intended to indicate a broad classification. In most circumstances specific values of the designatory properties and other characteristics as given in **7** shall be required.

**4.2** Designation shall consist of following information given in the order presented and shall be codified in different blocks as indicated below:

**4.2.1** *Designation Code for Polyolefin Elastomer Material and Compound*

| | |
|---|---|
| Data Block 1 | For Indian Standard |
| Data Block 2 | Identification of the POE by its symbol and information about the composition of the polymer (*see* **4.4**) |
| Data Block 3 | Intended application or method of processing (*see* **4.5**). |
| Data Block 4 | Designatory properties (*see* **4.6**) |
| Data Block 5 | Additional properties (for compounded materials) |

**4.2.2** There will be no space or hyphen between two alphabets/number within a block except block 1 (for Indian Standard), but each block will be separated by a space or hyphen. Each block is restricted with maximum number of letter/numbers as mentioned in **4.9.**

**4.3 Data Block 1** — For Indian Standard.

**4.4 Data Block 2**

In this data block, type of material represented by one numeric code as given in Table 1.

Additional information on the composition of the polymers are also given in Table 1.

**Table 1 Code for Identification of POE and Additional Information on the Composition in Data Block 2**
(*Clause* 4.4)

| Sl No. | Code | Type of Material | Additional Information on the Composition of Polymer |
|---|---|---|---|
| (1) | (2) | (3) | (4) |
| i) | B | Ethylene – Butene POE | C4 – Comonomer |
| ii) | O | Ethylene – Octene POE | C8 used as a comonomer |
| iii) | E | EPDM | Ethylene propylene Diene Comonomer |

### 4.5 Data Block 3

In this data block, information about intended application and/or method of processing is represented by code as given in Table 2.

**Table 2 Code for intended application and/or method of processing in Data Block 3**
(*Clause* 4.5)

| Sl No. | Code | Intended Application and/or Method of Processing |
|---|---|---|
| (1) | (2) | (3) |
| i) | A | Compounding |
| ii) | B | Blow moulding |
| iii) | C | General use/purpose |
| iv) | D | Extrusion coating/lamination |
| v) | E | Injection moulding |
| vi) | F | Others |

### 4.6 Data Block 4

In this data block, 4 alphabets shall be used to represent the designatory properties. First one for density, second one for MFR/MFI, third one for izod impact strength and fourth one for melting point.

For polyolefin elastomer materials and compounds, the density shall be designated as per Table 3, the MFR/MFI shall be designated as per Table 4, the izod impact strength shall be designated as per Table 5 and the melting point shall be designated as per Table 6. Other properties are to be mentioned as additional properties, as per agreement between purchaser and supplier, if required.

**4.6.1** *Density*

The density shall be determined in accordance with IS 13360 (Part 3/Sec 10)/ IS 13360 (Part 3/Sec 11). The possible values of density are divided into six ranges, each represented by a one-alphabet code as specified in Table 3.

**Table 3 Codes and Ranges for Density in Block 4**
(*Clause* 4.6.1)

| **Sl No.** | **Code** | **Range of Density,** g/cc |
|---|---|---|
| (1) | (2) | (3) |
| i) | A | >0.85 to ≤ 0.86 |
| ii) | B | > 0.86 to ≤ 0.87 |
| iii) | C | > 0.87 to ≤ 0.88 |
| iv) | D | > 0.88 to ≤ 0.89 |
| v) | E | > 0.89 to ≤ 0.90 |
| vi) | F | > 0.90 |

**4.6.2** *Melt Mass Flow rate (MFR) or Melt Flow Index (MFI)*

The melt mass flow rate shall be determined in accordance with IS 13360 (Part 4/Sec 1) at 190°C with a load of 2.16 kg. The possible values of melt flow rate are divided into six ranges, each represented by a one-alphabet code as specified in Table 4.

**Table 4 Codes and Ranges for Melt Mass Flow Rate (MFR) in Block 4**
(*Clause* 4.6.2)

| **Sl No.** | **Code** | **MFR at 190°C, 2.16 kg,** g/10 min |
|---|---|---|
| (1) | (2) | (3) |
| i) | A | 0.01o ≤ 0.5 |
| ii) | B | >0.5 to ≤ 1.0 |
| iii) | C | >1.0 to ≤ 5.0 |
| iv) | D | >5.0 to ≤ 15.0 |
| v) | E | > 15.0 to ≤ 50.0 |
| vi) | F | > 50.0 to ≤ 100.0 |

NOTES:

**1** MFR or MFI of POE compounds material resin will depend on the type and loading of its different ingredients. It can be determined based on the agreement between purchaser and supplier.

**2** The producer will use the code for the nominal MFI/MFR value (usually the mid-point of the range or Target value of the individual product specification) of respective grades while designating any grade.

**4.6.3** *Izod Impact Strength*

The notched izod impact strength shall be determined in accordance with IS 13360 (Part 5/Sec 4)/ISO 180. The possible values of notched izod impact strength are divided into three ranges, each represented by one alphabet code as specified in Table 5.

**Table 5 Codes and Ranges for Izod ImpactStrength in Block 4**
(*Clause* 4.6.3)

| **Sl No.** | **Code** | **Izod Impact Strength,** $kJ/m^2$ |
|---|---|---|
| (1) | (2) | (3) |
| i) | A | ≤ 30 |
| ii) | B | > 30 to ≤ 60 |
| iii) | C | No break (NB) |

### 4.6.4 Melting point

The melting point shall be determined in accordance with IS 13360 (Part 6/Sec 10). The possible values are divided in to three ranges, each represented by one alphabet code as specified in Table 6.

**Table 6 Code for Melting point**
(*Clause* 4.6.4)

| **Sl No.** | **Code** | **Melting point,** $^oC$ |
|---|---|---|
| (1) | (2) | (3) |
| i) | L | 10 – 50 |
| ii) | M | 50 – 80 |
| iii) | H | 80 – 120 |

### 4.7 Coding Examples

There will be no space or hyphen between two alphabets/number within a block except block 1 (for Indian Standard). But each block will be mentioned and separated by a space or hyphen. The designatory code shall be formed as per below table. Each block is restricted with maximum number of letter/ numbers as mentioned below.

| | |
|---|---|
| Data Block 1 | Maximum 8 character |
| Data Block 2 | Maximum one character(1 character for Type of POE) |
| Data Block 3 | Maximum one characters (1 character for method of processing/ application) |
| Data Block 4 | Maximum Four characters (1 character each for density, MFI, Izod impact strength and Melting point) |
| Data Block 5 | Additional properties (for compounded materials) |

### 4.7.1 Typical Example of Designatory Code:

| **Typical Example of Designatory Code** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Designation Code: IS XXXXX-B-A-CDBM-,,** | | | | | | | | |
| | IS XXXXX | B | A | C | D | B | M | ,, |
| **Data Block 1** | Indian Standard | Butene | Compounding | >1 to ≤5 g/10 min | > 0.88 to ≤ 0.89 g/cc | > 30 to ≤ 60 kJ/m$^2$ | > 50 to ≤ 80 °C | No additional property |
| **Data Block 2** | Material | | | | | | | |
| **Data Block 3** | Application or processing method | | | | | | | |
| **Data Block 4** | MFI at 190 °C at 2.16 kg load | | | | | | | |
| | Density | | | | | | | |
| | Izod impact | | | | | | | |
| | Melting point | | | | | | | |
| **Data Block 5** | Additional Property | | | | | | | |

## 5 PREPARATION OF TEST SPECIMEN FOR POLYOLEFIN ELASTOMER

It is essential that specimens are always prepared by the same procedure (injection moulding / compression sheet), using the same processing conditions as given in **5.2**. The procedure to be used for each test method is indicated in Table 7.

### 5.1 Treatment of the Material before Moulding

Before processing, no pretreatment of the material sample is normally necessary.

### 5.2 Injection Moulding

Injection moulded specimens shall be prepared in accordance with ASTM D4101 using the conditions specified in Table 7.

**Table 7 Conditions for Injection Moulding of Test Specimens**
(*Clause* 5.2)

| **Sl No.** | **MFR (g/10min)** | **Melting resin temperature (°C)[1)]** | **Mould temperature (°C)** | **Average melting resin speed (mm/min)** | **Pressure keeping time (s)** | **Injection Pressure and Speed** | **Total cycle time (s)[2)]** | **Back Pressure (MPa)** |
|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| i) | All | 10 – 50 | Use compression / Injection molding Process parameters recommended by Supplier. | | | | | |
| ii) | All | 50 – 80 | 40 ± 3 | 120± 100 | 20 | Note 3 | 75 | 0.7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| iii) | All | 80 - 120 | 40 ± 3 | 150 ± 100 | 20 | Note 3 | 75 | 0.7 |

NOTES:

**1** Melting resin temperature. It is to be measured at accuracy of ±3 °C.
**2** The total moulding cycle time shall be 80 (s) consisting of injection (20 s), cooling (50 s), mould open (5 s).
**3** Temperature should be used as per supplier recommendations or 120 °C of molten material temperature.
**4** Use the single stage pressure. Injection speed and pressure shall be set to produce equal part weights (including sprue and runners ± 2 percent) regardless of MFR.
**5** Injection and hold pressure shall be specified by manufacturer. In this range, injection and hold pressure may be set different pressures.

## 6 CONDITIONING

Test specimens shall be conditioned in standard atmospheric condition of temperature 23 ± 2 °C and percent relative humidity of 50 ± 10 percent before performing the required tests. The conditioning may change as per applicable standard for testing of the respective properties.

Test shall be conducted in the standard atmospheric condition as mentioned in the applicable test method.

## 7 REQUIREMENTS

### 7.1 Density

The density of the material shall be designated as per Table 3. It shall be determined by the method prescribed in IS 13360 (Part 3/Sec 10) or IS 13360 (Part 3/Sec 11). The value of density shall be within ± 20 percent of the specified density.

### 7.2 Melt mass-flow rate (MFR)

The melt mass flow rate of the material shall be designated as per Table 4. It shall be determined by the method prescribed in IS 13360 (Part 4/Sec 1). The value of melt flow rate shall be within ± 20 percent of the specified nominal melt flow rate, if this is 1 g/10 min or above and shall be within ± 30 percent of the specified nominal melt flow rate, if this is less than 1 g/10 min.

### 7.3 Izod impact strength

The izod impact strength of the material shall be designated as per Table 5. It shall be determined by the method prescribed in 13360 (Part 5/ Sec 4). The value of izod impact strength shall be within ± 20 percent of the specified izod impact if this is less than 300 kJ/m$^2$ and shall be within ± 30 percent of the specified izod impact strength if this is 30 kJ/m$^2$ or above.

### 7.4 Melting Point

The melting point of the material shall be designated as per Table 6. It shall be determined by the method prescribed in IS 13360 (Part 6/Sec 10). The value of melting point shall be within

± 20 percent of the specified value.

### 7.5 Additional Requirements for compounded materials

**7.5.1** Additional properties to be selected as per 7**.5.2** for compounds material shall be determined by the characteristics required for processing and product property requirements.

NOTE — The purchaser should establish his own correlation between the properties of the processed article and the material properties required for their achievement achieving the desired results.

### 7.5.2 Typical Additional Properties

The typical additional properties as given in Table 8 shall be as agreed between purchaser and supplier based upon the requirements of end product properties.

**Table 8 Typical Additional Properties and Recommended Test Methods**
(*Clause* 7.5.2)

| Sl No. | Property | Method of Test, Ref to |
|---|---|---|
| (1) | (2) | (3) |
| i) | Mechanical Properties | IS 13360 (Part 5/Sec 1) |
| | a) Tensile yield strength, MPa | and |
| | b) Elongation at yield, percent | IS 13360 (Part 5/Sec 2) |
| | c) Tensile strength at break, MPa | |
| | d) Elongation at break, percent | IS 13360 (Part 5/Sec 5) |
| | e) Charpy impact strength, $kJ/m^2$ | IS 13360 (Part 5/Sec 13) |
| | f) Hardness – Rockwell, R | IS 13360 (Part 5/Sec 11) |
| | – Shore, D | |
| ii) | Thermal Properties ºC | IS 13360 (Part 6/Sec 10) |
| | a) Melting temperature, | IS 13360 (Part 6/Sec 3) |
| | b) Temperature of deflection under load, ºC | IS 13360 (Part 6/Sec 17) |
| | c) Vicat softening temperature, ºC | IS 13360 (Part 6/Sec 1) |
| | d) Flammability, mm/min | IS/ IEC 60695-11-10 |
| | e) Ignitability (Oxygen index), percent | IS 13360 (Part 6/Sec 19) |
| iii) | Electrical Properties | |
| | a) Relative permittivity | IS 4486 |
| | b) Dissipation factor | IS 13360 (Part 7/Sec 1) |
| | c) Volume resistivity | |
| | d) Surface resistivity | IS 2071 (Part 1) |
| | e) Dielectric strength | IS 2584 |
| iv) | Other properties | |
| | a) Water absorption | IS 13360 (Part 8/Sec 1) |
| | b) Density | IS 13360 (Part 3/Sec 10)/ IS 13360 (Part 3/Sec 11) |

### 7.6 Special Requirements for Foodstuffs, Pharmaceuticals and Drinking Water Applications

**7.6.1** All additives used in the material, which is meant or usage in contact with foodstuffs, pharmaceuticals and drinking water are given in IS 16738 for guidance purpose only.

**7.6.2** When the products are used in contact with foodstuffs, pharmaceuticals and drinking water, its requirements with respect to the material shall also be met as per clause given below:

**7.6.2.1** *Pigments and Colourants* — In case the coloured material is used for food-packaging applications it shall comply with the list and limits of the pigments and colourants prescribed in IS 9833.

**7.6.2.2** *Overall Migration* — The material shall also comply with the overall migration limits as detailed below when tested by the method prescribed in IS 9845.

a) 60 mg/kg (*Max*) of the foodstuffs; in the case of the liquid foodstuffs or of simulants, the limit shall be 60 mg/l (*Max*). However, the value of the overall migration limit shall be equal to 10 mg/$dm^3$ of the surface of the material or article in the following cases:

   i) Containers or articles which are similar to containers or which in any case may be filled to a capacity less than 250 ml provided it is possible to calculate the surface area of contact with the foodstuff.

   ii) Sheets, foils and other non-fillable articles for which ratio between the surface areas of the material or article and the quantity of foodstuffs, in contact may not be calculated.

**7.6.3** The requirements mentioned in **7.6.2** will remain valid as long as the chemical composition and manufacturing process remains the same. In case of any change in chemical composition and/or manufacturing processes, the requirements mentioned in **7.6.2** shall be tested.

## 8 TESTS

**8.1** For product approval in the manufacturing of Polyolefin elastomer materials and the compound made thereof, the following shall be tested:

a) Density (*see* **7.1**);
b) Melt mass flow rate (*see* **7.2**);
c) lzod impact strength (*see* **7. 3**); and
d) Melting point (*see* **7. 4**).

### 8.2 Product Identification Tests for Compounded Materials

For the compounded materials to establish the end use application properties, the applicable requirement as listed in **7.5.2** shall be tested, by correlating the required properties of the compounded materials.

## 9 PACKING AND MARKING

### 9.1 Packing

The material shall be packed in suitable form of packing, as agreed to between the purchaser and the supplier.

### 9.2 Marking

Each bag and/or unit package whichever is smallest in size that is being delivered to the customer shall be clearly marked with the following:

a) Name and type of the material;
b) Designation code;
c) Net mass of the material;
d) Batch number/ Lot number;
e) Month and year of manufacture of the material;

NOTE — Batch number/lot number should reflect month and year of manufacture of the material. If not, it has to be printed separately as mentioned in e).

f) Name of the manufacturer and trademark, if any; and
g) Any other statutory requirements.

### 9.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

## 10 SAMPLING

### 10.1 General

In drawing, preparing, storing and handling samples, the precautions and directions given in **10.1.1** to **10.1.6** shall be observed.

**10.1.1** Samples shall be collected in a closed environment.

**10.1.2** The sampling instrument shall be of stainless steel or any other suitable material on which the material shall have no action. The instrument shall be clean and dry.

**10.1.3** Precautions shall be taken to protect the samples, the materials being sampled, the sampling instrument and the containers for samples from adventitious contamination.

**10.1.4** The samples shall be placed in a suitable clean, dry, airtight, plastic, metal or glass container on which the material has no action. The sample container shall be of such a size that it is almost completely filled by the sample.

**10.1.5** Each sample container shall be sealed air-tight with a stopper after filling and marked

with full details of sampling such as the date of sampling, the month and year of manufacture of the material, etc.

**10.1.6** Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

**10.2 Scale of Sampling**

**10.2.1** *Lot/Batch*

For continuous chemical processes like polymer production, the sampling shall be done from sealed bags/packages or other representative sampling points after proper homogenization of the material.

To get the representative samples from the entire lot/ batch, random sampling to be done from the entire lots/batches irrespective of the size of lot/batch. The number of samplings to be done as per Table 9 based on the quantity of the lot/batch.

**Table 9 Number of Containers to be Selected for Sampling**
(*Clause* 10.2.1)

| Sl No. | Lot Size (MT) | Number of the Sealed Bag / Package for Sampling |
|---|---|---|
| (1) | (2) | (3) |
| i) | Up to 600 | 3 |
| ii) | > 600 to 1000 | 4 |
| iii) | > 1000 | 5 |

Approximately 1 kg (or higher quantity required for testing) of sample is to be collected from each of the above sealed bag into a clean plastic bag to have approx. 3 kg composite sample. Proper mixing to be done for homogenization of composite sample before testing.

Based on the requirement of testing, the portion of the composite sample shall be stored properly in two containers as mentioned in **10.1.4**. Sample of the one container shall be used for testing in front of inspection authority at manufacturer site/laboratory. The other sample container shall be stored (6 months, *Max*) and properly labelled as reference sample for the testing in future, if it is required in case of any dispute or other requirement.

**10.3 Sampling Instrument**

**10.3.1** The sampling instrument made of stainless steel shall be as shown in Fig. 1. It shall be capable of taking samples from all points when inserted into the container / bag. In case of multilayer film sack (FFS bag) sampling may be done by opening the bag and collect the sample.

**10.3.2** From each of the containers/bags selected, portions of the material shall be drawn with the help of the sampling instrument. The total quantity of the material collected from each container/bag shall be sufficient to conduct tests for the determination of the various

characteristics as required.

**10.4 Number of Tests**

**10.4.1** Tests for the determination of density, melt mass-flow rate (MFR), izod impact strength and melting point shall be conducted individually from a portion of composite samples, kept in the bottle/container.

**10.4.2** Tests for the determination of the remaining characteristics shall be conducted on the remaining portion of composite samples if it is required as per agreement between purchaser and supplier.

**10.5 Criteria for Conformity**

Each of the test results for density, melt flow rate, izod impact and melting point shall satisfies the corresponding requirements given in **7.1, 7.2, 7.3** and **7.4.**

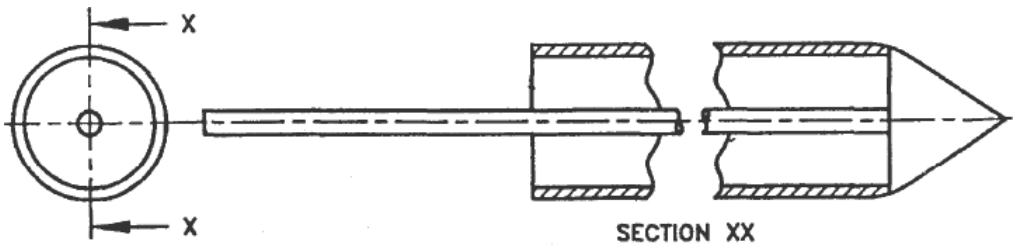


Fig. 1 SAMPLING INSTRUMENT

**ANNEX A**
(Clause 2)
**LIST OF REFERRED INDIAN STANDARDS/ OTHER PUBLICATIONS**

| *IS No./Other Publication* | *Title* |
|---|---|
| IS 2071 (Part 1) : 2016/ IEC 60060-1 : 2010 | High-voltage test techniques: Part 1 General definitions and test requirements (*third revision*) |
| IS 2584 : 1963 | Method of test for electric strength of solid insulating materials at power frequencies |
| IS 2828 : 2019/ISO 472 : 2013 | Plastics — Vocabulary (second *revision*) |
| IS 4486 : 1967 | Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths |
| IS 9833 : 2018 | List of colourants for use in plastics in contact with foodstuffs and pharmaceuticals (*second revision*) |
| IS 9845 : 1998 | Determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs — Method of analysis (*second revision*) |
| IS 13360 (Part 3/ Sec 10) : 2021/ ISO 1183-1 : 2019 | Plastics — Methods of testing: Part 3 Physical and dimensional properties, Section 10 Determination of density of noncellular plastics — Immersion method, liquid pyknometer method and titration method (*first revision*) |
| IS 13360 (Part 3/ Sec 11) : 2016 / ISO 1183-2 : 2019 | Plastics — Methods of testing: Part 3 Physical and dimensional properties, Section 11 Determination of density of non-cellular plastics — Density gradient column method (*first revision*) |
| IS 13360 (Part 4/ Sec 1) : 2000 / ISO 1133 : 1997 | Plastics — Methods of testing: Part 4 Rheological properties, Section 1 Determination of the Melt Mass-Flow Rate (MFR) and the Melt Volume-Flow Rate (MVR) of thermoplastics (*first revision*) |
| IS 13360 (Part 5/ Sec 1) : 2021 / ISO 527-1 : 2019 | Plastics — Methods of testing: Part 5 Mechanical properties, Section 1 Determination of tensile properties — General requirements (*second revision*) |
| IS 13360 (Part 5/ Sec 2) : 2017 / ISO 527-2 : 2012 | Plastics — Methods of testing: Part 5 Mechanical properties, Section 2 Determination of tensile properties — Test conditions for moulding and extrusion plastics (*first revision*) |
| IS 13360 (part 5/ Sec 4) : 2021 / ISO 180 : 2019 | Plastics — Methods of testing: Part 5 Mechanical properties, Section 4 Determination of izod impact strength (*second revision*) |
| IS 13360 (Part 5/ Sec 5) : 2017 / ISO 179-1 : 2010 | Plastics — Methods of testing: Part 5 Mechanical properties, Section 5 Determination of charpy impact properties — Non- |

| | |
|---|---|
| | instrumented impact test (*first revision*) |
| IS 13360 (Part 5/ Sec 11) : 2013 / ISO 868 : 2003 | Plastics — Methods of testing: Part 5 Mechanical properties, Section 11 Determination of indentation hardness by means of durometer (Shore Hardness) (*first revision*) |
| IS 13360 (Part 5/ Sec 13) : 1992 | Plastics — Methods of testing: Part 5 Mechanical properties, Section 13 Determination of rockwell hardness |
| IS 13360 (Part 6/ Sec 1) : 2018 / ISO 306 : 2013 | Plastics — Methods of testing: Part 6 Thermal properties, Section 1 Determination of vicat softening temperature of thermoplastic materials (*second revision*) |
| IS 13360 (Part 6/ Sec 3) : 2017 / ISO 75-1 : 2013 | Plastics — Methods of testing: Part 6 Thermal properties, Section 3 Determination of temperature of deflection under load — General test method (*second revision*) |
| IS 13360 (Part 6/ Sec 10) : 2013 / ISO 3146 : 2000 | Plastics — Methods of testing: Part 6 Thermal properties, Section 10 Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing — Microscope methods (*first revision*) |
| IS 13360 (Part 6/ Sec 17) : 2017 / ISO 75-2 : 2013 | Plastics — Methods of testing: Part 6 Thermal properties, Section 17 Determination of temperature of deflection under load — Plastics and ebonite (*second revision*) |
| IS 13360 (Part 6/ Sec 19) : 2019 / ISO 4589-2 : 2017 | Plastics — Methods of testing: Part 6 Thermal properties, Section 19 Flammability by oxygen index — Ambient temperature test (*first revision*) |
| IS 13360 (Part 7/ Sec 1) : 1996 / ISO 3915 : 1981 | Plastics — Methods of testing: Part 7 Electrical properties, Section 1 Measurement of resistivity of conductive plastics |
| IS 13360 (Part 8/ Sec 1) : 1997 / ISO 62 : 1980 | Plastics — Methods of testing: Part 8 Permanence/ chemical properties, Section 1 Determination of water absorption |
| IS 16738 : 2018 | Positive list of constituents for polypropylene, polyethylene and their copolymers for its safe use in contact with foodstuffs and pharmaceuticals |
| IS/IEC 60695-11- 10 : 2013 | Fire hazard testing: Part 11 Test flames, Sec 10 50 W horizontal and vertical flame test methods |
| ASTM D4101-17 | Standard classification system and basis for specification for polypropylene injection and extrusion materials |