



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS K 7390 : 2003

**Testing methods for reclaimed
poly(ethylene terephthalate) (PET)
moulding materials from PET bottle**

ICS 83.080.20

Reference number : JIS K 7390 : 2003 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

Date of Establishment: 2003-03-20

Date of Public Notice in Official Gazette: 2003-03-20

Investigated by: Japanese Industrial Standards Committee

Standards Board

Technical Committee on Chemical Products

JIS K 7390 : 2003, First English edition published in 2003-12

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
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Printed in Japan

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Testing methods for reclaimed poly(ethylene terephthalate) (PET) moulding materials from PET bottle

Introduction This Japanese Industrial Standard has been established in order to specify the test methods of reclaimed polyethylene terephthalate and to promote the efficiency of application, consumer's convenience and the like, for the purpose of manufacturing the reclaimed polyethylene terephthalate moulding materials by carrying out of processing such as sorting, grinding, fractionating, cleaning, drying, refining, etc. to the bottles of polyethylene terephthalate (PET bottles) collected separately for the purpose of recycling the used PET bottles and of utilizing them effectively as textile product, moulded product, sheet product and the like.

1 Scope This Standard specifies the test method of the flake-shaped reclaimed polyethylene terephthalate moulding materials (hereafter referred to as "reclaimed PET") by processing of reclaiming the used polyethylene terephthalate bottles (hereafter referred to as "PET bottle").

Remarks : The reclaimed PET aimed at in this Standard is the flake-shaped reclaimed resin manufactured by processing of sorting, grinding, fractionating, cleaning, drying, refining, etc. and not include the pellet-shaped one.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS K 6900 *Plastics—Vocabulary*

JIS K 7100 *Plastics—Standard atmospheres for conditioning and testing*

JIS K 7367-5 *Plastics—Determination of the viscosity of polymers in dilute solution using capillary viscometers—Part 5 : Thermoplastic polyester (TP) homopolymers and copolymers*

JIS K 8034 *Acetone*

JIS K 8322 *Chloroform*

JIS K 8798 *Phenol*

JIS K 9520 *1,1,2,2-Tetrachloroethane*

JIS R 3503 *Glass apparatus for chemical analysis*

JIS R 3505 *Volumetric glassware*

JIS Z 8401 *Guide to the rounding of numbers*

JIS Z 8722 *Methods of colour measurement—Reflecting and transmitting objects*

JIS Z 8729 *Colour specification—CIE LAB and CIE LUV colour spaces*

JIS Z 8801-1 *Test sieves—Part 1 : Test sieves of metal wire cloth*

JIS Z 9031 *Procedure for random number generation and randomization*

3 Definitions For the main terms used in this Standard the definitions in **JIS K 6900** apply, and the rest of the terms shall be as follows:

- a) **residue on sieve** The ratio, expressed by percentage, of the mass of sample on sieve after sieving to the whole mass of sample.
- b) **particle size distribution** The respective ratios, expressed by percentage, of the mass of sample on each sieve and under the lowest sieve to the whole mass of sample when using two or more sieves with different opening. It is also called as the size distribution.
- c) **bulk density** The apparent density of flake.
- d) **colour difference** The difference of colour expressed quantitatively.

4 Test items The test items specified in this Standard are given in Table 1.

Table 1 Test items

Test item	Outline of test method	Applicable subclause
Cut size	Method by using a sieve	5.2
Bulk density	Method by using a specified container	5.3
Colour difference	Measurement of $L^*a^*b^*$ by colour-difference meter	5.4
Moisture content	Method of heating loss	5.5
Intrinsic viscosity (IV value)	Method by solution viscosity method	5.6
Foreign matters rate	Visually fractionating method	5.7

Information : The viscosity measuring method by melt flow rate is shown in Annex 2 as an informative test.

5 Test methods

5.1 General condition of test

5.1.1 Sampling method The required amount of sample for each test in 5.2 to 5.7 shall be taken from the lot regarded as being same in quality so as to represent the whole lot in quality by the random sampling specified in **JIS Z 9031** or by other reasonable sampling method agreed between the parties concerned with delivery.

5.1.2 Conditioning of sample The samples to be used for each test shall be conditioned at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ in temperature and $(50^{+20}_{-10})\%$ in relative humidity specified in **JIS K 7100** for 8 h or longer prior to test or be in accordance with the agreement between the parties concerned with delivery.

5.1.3 Standard conditions of test place The standard conditions of test place shall be in a room of $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ in temperature and $(50^{+20}_{-10})\%$ in relative humidity specified in **JIS K 7100** or be in accordance with the agreement between the parties concerned with delivery.

5.2 Cut size

5.2.1 Apparatus and instruments The apparatus and instruments to be used shall be conformed to the following.

- a) **Balance** The balance capable of measuring to the nearest 0.1 g.
- b) **Sieve** The sieves having 9.5 mm, 8 mm, 5.6 mm, 4 mm, 2 mm and 1 mm of nominal openings specified in **JIS Z 8801-1**.
- c) **Brush** The brush capable of removing the clogging sample from the opening of sieve.

5.2.2 Sample The required amount of sample for thrice-repeated measurement shall be taken.

5.2.3 Operation The operation shall be as follows:

- a) Weigh out 1 000 g of the sample to the nearest 0.1 g, and make it the initial mass, M_0 .
- b) Take the proper quantity of the sample in a) to put into a sieve having 9.5 mm nominal opening, hold it by both hands and sift it by vibrating back and forth on the horizontal plane with approximately 70 mm amplitude at the rate of approximately 60 reciprocations per minute, then weigh the remaining sample on the sieve to the nearest 0.1 g.

When a large quantity of sample is sifted at once, the accurate measurement of residue on sieve is difficult, and therefore it is recommended to measure by dividing the sample several times. It is also recommended to settle the time of sifting out by carrying out the preparatory test previously.

- c) Carry out sifting by the similar procedure using the sieves of 8 mm, 5.6 mm, 4 mm, 2 mm and 1 mm in nominal opening in this order. At the time of the last sieve having the 1 mm opening, measure the mass of the sample under the sieve as well as the remaining sample on the sieve.
- d) Repeat twice the measurement of a) to c) by using new samples.

5.2.4 Calculation The residue on sieve, A_i (%), particle size distribution, δ_i (%), and sample loss factor, M_{loss} (%) shall be calculated according to the following formulae, respectively.

- a) **Residue on sieve, A_i (%)**

$$A_i = \frac{B_i}{\sum_{i=1}^7 B_i} \times 100 \quad (i = 1, 2, \dots, 7)$$

where, A_i : residue on sieve (%)

B_i : mass of sample on sieve (g) (however, B_7 is the sample under sieve)

$\sum_{i=1}^7 B_i$: total mass of sample on sieve and under sieve (g)