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JAPANESE INDUSTRIAL STANDARD

**Testing Method of Tissue Paper
for Nitrocellulose**

JIS P 9002—1976

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JAPANESE INDUSTRIAL STANDARD

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Testing Method of Tissue Paper for Nitrocellulose P 9002-1976
(Reaffirmed: 1984)1. Scope

This Japanese Industrial Standard specifies the testing method of the tissue paper which is the raw material of nitrocellulose.

Remark: The units and numerical values given in { } in this standard are in accordance with the International System of Units (SI), and are appended for reference.

2. Kinds of Testing Method

The items which are specified in this standard shall be as follows:

2.1 General Test Weight of bales, moisture contents of bales

2.2 Physical Test Dirt, shives and specks, weight, bulk density, tensile strength, thickness, brightness, rate of water absorption

2.3 Chemical Test Ratio of absolute dry weight, ash content, solvent extract, α -cellulose, β -cellulose, copper number, viscosity

3. Sampling and Preparation3.1 Sampling of Test Specimen

3.1.1 The test specimen shall be cut in the size of 300 mm x 300 mm or larger.

Remarks 1. The test specimen shall be free from the fold and shall not be subjected to direct sunlight, liquids, and other deleterious influences.

2. Since the test specimen may be affected by the moisture of the hands of handling persons, it shall be treated with care in case of measuring its optical properties, surface condition, acidity, or other physical or chemical characteristics.

3.1.2 If the test for moisture contents is also required, the piece of paper for testing shall be put in the sealed vessel with stopper to be stored immediately after sampling.

3.1.3 The test specimen shall be chosen at random as follows so that it represents the whole paper.

Applicable Standards: See page 26.

Number of bales	Test papers to be sampled
50 and under	5
51 to 200	10
201 to 300	15
301 to 500	20

If the number of bales is 501 or more, five test papers shall be further sampled for increasing of every 200 bales or its fraction.

3.1.4 The same number of a pair of test papers shall be sampled from each bale.

3.1.5 If the bale is wound, the test specimen shall be sampled from the bale whose first four layers are taken off at least.

3.1.6 In measuring the moisture contents, the test specimen shall be sampled from the inner layer 10 mm or more inside from the outer layer of the wind. It shall be cut off from the several layers of overall width which are free from fractures.

3.1.7 The test specimen shall be cut off exactly parallel to each of vertical and horizontal directions excluding the width of 50 mm from both ends of the deckle edge.

3.2 Preparation of Test Specimen The test specimen in 3.1 shall be made in a state of equilibrium with respect to its moisture contents by preserving in the desiccator containing 40.0 ± 0.5 % nitric acid for 24 h or more at room temperature.

4. General Test

4.1 Weight of Bale By weighing the total weight (kg) and tare (kg) of a bale, obtain the weight of the bale G (kg) by the following formula:

$$G = A \times \frac{100 - C}{100 - B}$$

A : total weight (kg) - tare (kg)

B : agreed moisture contents (%)

C : moisture contents of bale (%)

4.2 Moisture Contents of Bale

4.2.1 Test Specimen Put quickly in the moisture-proof sack the test specimens sampled by the number in 3.1.3 according to 3.1.6.

4.2.2 Instruments

- (1) Thermostatic desiccator capable of keeping temperature at 105 ± 2 °C
- (2) Chemical balance (capable of weighing up to 100 to 200 g and with reciprocal sensibility of 1 mg)

- (3) Desiccator containing calcium chloride
- (4) 60 mm cylindrical weighing bottle (refer to JIS R 3503)

4.2.3 Measuring Method

- (1) Quickly cut uniformly a piece of paper of approximately 10 g from the sample of 4.2.1 in about 60 mm strip, slightly wind it in a roll, make the deckle edge upright to the above and below directions and put it in the weighing bottle whose weight is weighed accurately.
- (2) Accurately weigh the weighing bottle containing the test specimen by means of the chemical balance.
- (3) Desiccate it in the thermostatic desiccator kept at 105 ± 2 °C for 3 h.
- (4) Weigh it after cooling for about 30 min in the desiccator.
- (5) Dry it again for 1 h and weigh it after it has been similarly cooled.
- (6) If the loss is 10 mg or less in comparison with the prior weight, it shall be taken as constant weight.
- (7) If the loss is over 10 mg, further repeat the similar procedure until the constant weight is obtained.

4.2.4 Report Calculate the moisture content of a bale C (%) by the following formula and report the result to two places to decimals.

$$C = \frac{A - B}{A} \times 100$$

where A : weight of original tissue paper (g)
 B : weight of absolute dry tissue paper (g)

5. Physical Test

5.1 Dirt, Shives and Specks

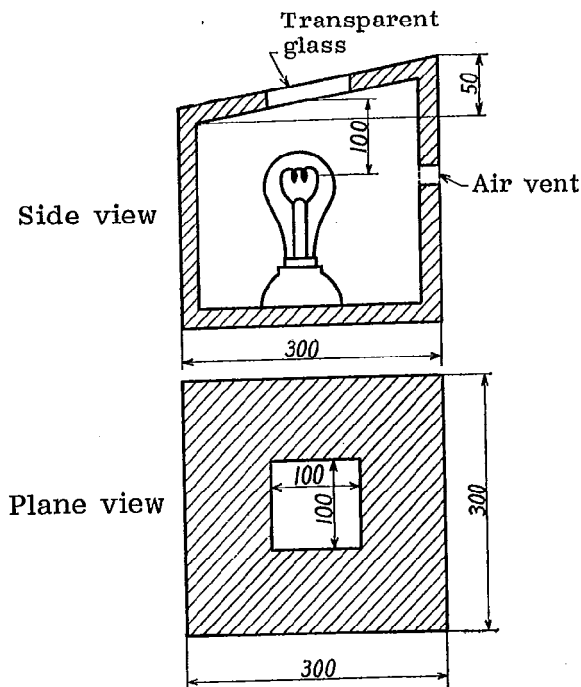
5.1.2 Test Specimen Use the test specimen in 3.2.

5.1.3 Instruments

- (1) Measurement diagram of dirt, shives and specks
- (2) Measuring apparatus of dirt, shives and specks (Refer to Fig. 1)

Fig. 1. Measuring Apparatus of Dirt, Shives and Specks

Unit: mm



The interior of the box shall be painted in white. The box shall be shielded leaving the square of 100 mm x 100 mm at the center of the transparent glass of 300 mm x 300 mm.

5.1.4 Measuring Method Place a 250 mm x 250 mm test specimen on the glass plate and measure the number of dirt, shives and specks which can be seen through and have the actual area larger than the size equivalent to 0.05 mm² by means of the measuring diagram for dirt, shives and specks, according to the sizes while irradiating from the rear with the delustered 100 W lamp.

Remark: In measuring the midium-sized dirt, shives and specks shall be treated according to JIS Z 8401.

5.1.5 Report The number of dirt, shives and specks H (mm²/m²) shall be calculated by the following formula and reported as a value to an integer.

$$H = \frac{\sum(a_i \times m_i)}{n} \times 100$$

where

- a_i : indicating area of measuring diagram (mm²)
- m_i : number of dirt, shives and specks of all test specimens according to the indicating areas
- n : number of sheets of test specimen

5.2 Weighing

5.2.1 Test Specimen At least 10 sheets or more of the test specimen in 3.1 shall be sampled and treated in advance conforming to 3.2.

5.2.2 Instruments

- (1) Chemical balance (capable of weighing up to 100 to 200 g with the reciprocal sensibility of 1 mg)
- (2) 60 mm cylindrical weighing bottle (refer to JIS R 3503)

5.2.3 Measuring Method

- (1) Cut the test specimen in a size of 50 mm x 300 mm with a knife or cutter to the accuracy of 1 mm or below.
- (2) Leave the cut test specimen in the desiccator containing 40.0 ± 0.5 % nitric acid for two hours or more.
- (3) Put the test specimen the moisture of which has attained the balance in the weighing bottle whose weight has accurately been measured.
- (4) The weight shall be indicated with the unit of g and measured to the accuracy of 0.25 % of the total weight.

5.2.4 Report

- (1) The weight D (g/m²) shall be calculated to three significant figures and the mean value of two test specimens obtained from the same sample shall be reported up to the first integer.

$$D = \frac{W_t}{5 \times 30} \times 10000$$

where W_t : measured weight (g)

- (2) Weight variations S shall be calculated by the following formula and reported to one place to decimals (10 times or more of measurement).

$$S = \frac{\sigma}{M} \times 100$$

where σ : standard deviation (g)

M : average weight (g)

Provided the standard deviation σ (g) shall be calculated by the following formula:

$$\sigma = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (x_i - \bar{x})^2}$$

where $\bar{x}$: mean value of measured values (g)

N : total number of test specimens measured

x_i : average measured value of each test specimen (g)

5.3 Thickness

- 5.3.1 Test Specimen The test specimen in 3.2 shall be used.

5.3.2 Instrument Micrometer (refer to JIS B 7502)5.3.3 Measuring Method

- (1) Pinch the test paper between the micrometer and measure the thickness (mm) by gently turning the screw.
- (2) Test each of test pieces at least at two places. It may be allowed that several lapped sheets of paper are measured and the result is divided by the number of sheets used.

5.3.4 Report

- (1) Report the result to three places to decimals together with the maximum and minimum readings, the number and size of the test paper.
- (2) Thickness variations S (%) shall be calculated by the following formula:

$$S = \frac{\sigma}{T} \times 100$$

where σ : standard deviation (mm)
 T : average thickness (mm),

Provided the standard deviation σ (mm) shall be calculated by the following formula:

$$\sigma = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (x_i - \bar{x})^2}$$

where $\bar{x}$: mean value of thicknesses of total sheets (mm)
 N : total number of sheets measured
 x_i : average measured value of each sheet (mm)

5.4 Bulk Density The bulk density shall be calculated by the following formula on the basis of the weight in 5.2 and the thickness in 5.3:

$$E = \frac{D}{T} \times 1000$$

where E : bulk density (g/cm³)
 D : weight (g/m²)
 T : thickness (mm)

5.5 Tensile Strength

5.5.1 Test Specimen The test specimen of 15 mm x 120 mm in 3.2 shall be used.

5.5.2 Instrument Schopper tensile strength tester

5.5.3 Measuring Method

- (1) Apply load until the test paper is broken by the method stated below.
- (2) Chuck the test specimen with 100 mm interval and adjust the rate of the machine so as to cut it in 5 to 15 sec. If the test specimen is weak, it may be lapped in several sheets and measured.
- (3) In order to fit the test piece (15 mm x 120 mm) to the chuck, first arrange it in a line by gently pinching it between the lower chuck, fasten its top edge tightly to the upper chuck, next clamp down the lower chuck and apply load. The reading in the case where the test piece slides or breaks between the chuck shall be discarded.
- (4) The reading for tension load F (kgf) {N} shall be recorded to three significant figures.
- (5) The number of test piece shall be at least 10 pieces, and if possible, 20 pieces in each of vertical and horizontal directions. If the test result does not allow a rational mean value to be obtained because it is too far higher or lower than the mean value, discard this abnormal value.

5.5.4 Report Report the mean value, maximum value and minimum value in reference to each of vertical and horizontal directions. In the case where the test piece is measured in a state of lapping, report the numerical value obtained by dividing the result by the lapping number. The following items shall be noted in addition for completing the report:

- (1) Maximum and minimum values in each test and testing number of times
- (2) The measurement of test specimen in a state of lapping shall be noted.
- (3) Accounts of load applying ratio used
- (4) Width of test piece
- (5) Length of test piece, i.e., the chucking interval for starting the test.
- (6) If necessary, the breaking length L (km) shall be calculated by the following formula and reported:

$$L = \frac{F(\text{kgf})}{15 \times D} \times 1000 \quad \left\{ L = \frac{F(\text{N})}{9.81 \times 15 \times D} \times 1000 \right\}$$

where D : weight of test paper (g/m^2)

F : reading for tension load (kgf) {N}

5.6 Brightness

5.6.A Brightness by Hunter The brightness by Hunter means specific reflection factor of the sample when it is irradiated by the light of blue violet part of spectrum by means of Hunter multi-purpose reflect meter.

5.6.A1 Test Specimen The test specimen in 3.2 shall be used.

5.6.A2 Instruments