

# JIS

**JAPANESE INDUSTRIAL STANDARD**

**Rubber Coated Fabrics**

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## JAPANESE INDUSTRIAL STANDARD

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## Rubber Coated Fabrics

K 6328-1981

1. Scope

This Japanese Industrial Standard specifies rubber coated fabrics to be used for apparel, sundry goods, covering and air tightening, hereinafter referred to as the "rubber coated fabrics".

- Remarks 1. By rubber coated fabrics are meant such fabrics composing of cloth coated with rubber on one side or both sides, of adhered thin rubber layers, or of two or more sheets similarly treated.
2. The units and numerical values given in { } in this standard are in accordance with the International System of Unit (SI), and are appended for reference.

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Applicable Standards:

- JIS K 6301-Physical Testing Methods for Vulcanized Rubber
- JIS P 8112-Testing Method for Bursting Strength of Paper and Paperboard by Müllen Low-Pressure Tester
- JIS P 8131-Testing Method for Bursting Strength of Paper and Paperboard by Müllen High-Pressure Tester
- JIS Z 8401-Rules for Rounding Off of Numerical Values
- JIS Z 8703-Standard Atmospheric Conditions for Testing

## Reference Standards:

- JIS B 7751-Glass-Enclosed Carbon-Arc Type Apparatus for Artificial Light Exposure Tests
- JIS B 7752-Light-and-Water-Exposure Apparatus (Enclosed Carbon-Arc Type)
- JIS B 7753-Light-and-Water-Exposure Apparatus (Open-Flame Sunshine Carbon-Arc Type)
- JIS K 7101-Testing Method for Colour Fastness of Plastics under Window Glass upon Exposure to Daylight
- JIS K 7204-Testing Method for Abrasion Resistance of Plastics by Abrasive Wheels
- JIS K 8125-Calcium Chloride (for U-tube)
- JIS L 0801-General Principles of Testing Methods for Colour Fastness
- JIS L 0803-Standard Adjacent Fabrics for Staining of Colour Fastness Test
- JIS L 0804-Grey Scale for Assessing Change in Colour
- JIS L 0805-Grey Scale for Assessing Staining
- JIS L 0841-Testing Method for Colour Fastness to Sunlight and Daylight
- JIS L 0842-Testing Method for Colour Fastness to Carbon Arc Lamp Light
- JIS L 0849-Testing Method for Colour Fastness to Rubbing
- JIS Z 2381-Recommended Practice for Weathering Test
- JIS Z 8203-SI Units and the Use of their Multiples and of Certain Other Units

## 2. Classification

The rubber coated fabrics shall be classified as given in Table 1 according to the uses, forms and performance.

Table 1

| Classification                           |        | Remark                                           |
|------------------------------------------|--------|--------------------------------------------------|
| Rubber coated fabrics for apparels       | Type 1 | Type in which rubbered side is used as surface   |
|                                          | Type 2 | Type in which cloth side is used as surface      |
|                                          | Type 3 | Type in which foaming rubber is used             |
| Rubber coated fabrics for sundry goods   | Type 1 | Laminated type                                   |
|                                          | Type 2 | One side type                                    |
| Rubber coated fabrics for covering       | Type 1 | Type which necessitates mechanical strength      |
|                                          | Type 2 | Type which needs not special mechanical strength |
| Rubber coated fabrics for air tightening |        | Type which is used for filling gas in bag form   |

## 3. Quality

**3.1 Appearance** Rubber coated fabrics shall be uniform both in colour tone and in thickness, and shall meet the requirements for the use, free from defects which may affect adversely the use.

Rubber coated fabrics shall be properly vulcanized, free from any specks, stains and other defects which remarkably impair the appearance.

**3.2 Performance** When rubber coated fabrics are tested by the methods specified in 5., the results shall meet the requirements specified in Table 2 for rubber coated fabrics for apparel, Table 3 for rubber coated fabrics for sundry goods, Table 4 for rubber coated fabrics for covering, and Table 5 for rubber coated fabrics for air tightening.

Table 2. Rubber Coated Fabrics for Apparel

| Test item                                                    |                                                         | Performance                                                         |                |                  | Clause referred to |
|--------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------|----------------|------------------|--------------------|
|                                                              |                                                         | Type 1                                                              | Type 2         | Type 3           |                    |
| Tension test<br>(strip method)                               | Tension load at breakage<br>kgf/cm {kN/m}               | L*                                                                  | 5 { 4.9 } min. |                  | 5.3.5              |
|                                                              |                                                         | T*                                                                  | 4 { 3.9 } min. |                  |                    |
|                                                              | Elongation<br>%                                         | L*                                                                  | 5 min.         |                  |                    |
|                                                              |                                                         | T*                                                                  | 5 min.         |                  |                    |
| Ageing test<br>(strip method)                                | Residual percentage of<br>tension load at breakage<br>% | L*                                                                  | 70 min.        | 80 min.          | 5.3.14             |
|                                                              |                                                         | T*                                                                  | 65 min.        | 70 min.          |                    |
|                                                              | Residual percentage of<br>elongation<br>%               | L*                                                                  | 70 min.        | 80 min.          |                    |
|                                                              |                                                         | T*                                                                  | 70 min.        | 80 min.          |                    |
| Tear resistance test (single tongue method)                  |                                                         | 0.6 { 5.9 } min.                                                    |                |                  | 5.3.6              |
| Peeling test (adhesion strength)                             |                                                         | 0.2 { 2.0 } min.                                                    |                | 0.3 { 2.9 } min. | 5.3.7              |
| Bursting strength test                                       |                                                         | 3.0 { 294 } min.                                                    |                | —                | 5.3.13             |
| Rumpling test                                                |                                                         | No abnormality to be found after 500 time<br>rumpling under no load |                |                  | 5.3.8              |
| Water resistance test                                        |                                                         | No abnormality to be found<br>at 2 kgf/cm <sup>2</sup> { 0.20 MPa } |                | —                | 5.3.9              |
| Water repellency test (using Rating Chart)                   |                                                         | —                                                                   | 70 min.        |                  | 5.3.10             |
| Water immersion test                                         |                                                         | No abnormality                                                      |                |                  | 5.3.11             |
| Low temperature test (embrittlement test at low temperature) |                                                         | No abnormality at - 30 °C                                           |                |                  | 5.3.15             |
| Heat resistance test                                         |                                                         | Equal to or superior to Rating 2                                    |                |                  | 5.3.16             |

L\* : Longitudinal, T\* : Transverse

Table 3. Rubber Coated Fabrics for Sundry Goods

| Test item                                                    | Performance                                                      |                  | Clause referred to |
|--------------------------------------------------------------|------------------------------------------------------------------|------------------|--------------------|
|                                                              | Type 1                                                           | Type 2           |                    |
| Bursting strength test                                       | 3.0 { 294 } min.                                                 | 2.5 { 245 } min. | 5.3.13             |
| Rumpling test                                                | No abnormality to be found after 200 time rumpling under no load |                  | 5.3.8              |
| Water resistance test                                        | No abnormality at 0.5 kgf/cm <sup>2</sup> { 49 kPa }             |                  | 5.3.9              |
| Heat resistance test                                         | Equal to or superior to Rating 2                                 |                  | 5.3.16             |
| Water immersion test                                         | No abnormality                                                   |                  | 5.3.11             |
| Low temperature test (embrittlement test at low temperature) | No abnormality at -15 °C                                         |                  | 5.3.15             |

Table 4. Rubber Coated Fabrics for Covering

| Test item                                                    |                                                   |    | Performance                                                    |                                                                  | Clause referred to |
|--------------------------------------------------------------|---------------------------------------------------|----|----------------------------------------------------------------|------------------------------------------------------------------|--------------------|
|                                                              |                                                   |    | Type 1                                                         | Type 2                                                           |                    |
| Tension test (strip method)                                  | Tension load at breakage kgf/cm {kN/m}            | L* | 10 { 9.81 } min.                                               | 4 { 3.9 } min.                                                   | 5.3.5              |
|                                                              | Elongation %                                      | T* | 10 min.                                                        | 5 min.                                                           |                    |
| Ageing test (strip method)                                   | Residual percentage of tension load at breakage % | L* | 80 min.                                                        | 65 min.                                                          | 5.3.14             |
|                                                              | Residual percentage of elongation %               | T* | 80 min.                                                        | 70 min.                                                          |                    |
| Tear resistance test (single tongue method)                  |                                                   |    | 5.0 { 49.0 } min.                                              | 0.6 { 5.9 } min.                                                 | 5.3.6              |
| Peeling test (adhesion strength)                             |                                                   |    | 1.0 { 9.81 } min.                                              | 0.2 { 2.0 } min.                                                 | 5.3.7              |
| Bursting strength test                                       |                                                   |    | 10.0 { 980.7 } min.                                            | 3.0 { 294 } min.                                                 | 5.3.13             |
| Rumpling test                                                |                                                   |    | No abnormality to be found after 1000 time rumpling under 1 kg | No abnormality to be found after 200 time rumpling under no load | 5.3.8              |
| Water resistance test                                        |                                                   |    | No abnormality at 3 kgf/cm <sup>2</sup> { 0.29 MPa }           |                                                                  | 5.3.9              |
| Water immersion test                                         |                                                   |    | No abnormality                                                 |                                                                  | 5.3.11             |
| Low temperature test (embrittlement test at low temperature) |                                                   |    | No abnormality at -30 °C                                       |                                                                  | 5.3.15             |
| Heat resistance test                                         |                                                   |    | Rating 1                                                       |                                                                  | 5.3.16             |

L\*: Longitudinal    T\*: Transverse

Table 5. Rubber Coated Fabrics for Air Tightening

| Test item                                   |                                                         | Performance                                                         | Clause referred to |
|---------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------|--------------------|
| Tension test<br>(strip method)              | Tension load at breakage<br>kgf/cm {kN/m}               | L*                                                                  | 5.3.5              |
|                                             |                                                         | T*                                                                  |                    |
|                                             | Elongation<br>%                                         | L*                                                                  |                    |
|                                             |                                                         | T*                                                                  |                    |
| Ageing test<br>(strip method)               | Residual percentage of tension load<br>at breakage<br>% | L*                                                                  | 5.3.14             |
|                                             |                                                         | T*                                                                  |                    |
|                                             | Residual percentage of elongation<br>%                  | L*                                                                  |                    |
|                                             |                                                         | T*                                                                  |                    |
| Tear resistance test (single tongue method) |                                                         | 0.6 { 5.9 } min.                                                    | 5.3.6              |
| Peeling test (Strength of adhesion)         |                                                         | 0.3 { 2.9 } min.                                                    | 5.3.7              |
| Rumpling test                               |                                                         | No abnormality to be found after 500<br>time rumpling under no load | 5.3.8              |
| Water immersion test                        |                                                         | No abnormality                                                      | 5.3.11             |
| Heat resistance test                        |                                                         | Equal to or superior to Rating 2                                    | 5.3.16             |
| Gas transmission test                       |                                                         | H <sub>2</sub> 5.0 max.                                             | 5.3.12             |

L\*: Longitudinal T\*: Transverse

#### 4. Materials

4.1 Rubber Rubber shall be blended to uniform composition so as to fit the purpose of use.

4.2 Cloth Cloth to be used for rubber coated fabrics shall be knitted or woven (or non-woven) cloth of natural or chemical fibre, and shall be of good quality suitable to the purpose of the use. It shall satisfy the quality requirements enumerated below.

- (1) Woven cloth shall be uniform in thickness and density, free from stain, warpage, flaws and the like. Yarn unevenness, yarn falling, yarn knots and dyeing specks shall not be found noticeably.

Non-woven cloth shall be uniform in thickness and density, and shall not have noticeable dirt and warpage.

- (2) Any dye stuff which may contaminate rubber and harmful substance which may deteriorate the rubber shall not be used.

#### 5. Test Methods

5.1 Test Items Test items specified in this standard shall be as enumerated in Table 6.

The rubber coated fabrics listed in the upper column of the table shall be subjected to the test pointed with round mark ○ in the table.

Table 6

|      | Test item                                               | Rubber coated fabrics |                  |              |                    |
|------|---------------------------------------------------------|-----------------------|------------------|--------------|--------------------|
|      |                                                         | for apparels          | for sundry goods | for covering | for air tightening |
| (1)  | Measurement of width                                    | ○                     | ○                | ○            | ○                  |
| (2)  | Measurement of length                                   | ○                     | ○                | ○            | ○                  |
| (3)  | Measurement of thickness                                | ○                     | ○                | ○            | ○                  |
| (4)  | Measurement of mass                                     | ○                     | ○                | ○            | ○                  |
| (5)  | Tension test                                            | ○                     | —                | ○            | ○                  |
| (6)  | Tear resistance test                                    | ○                     | —                | ○            | ○                  |
| (7)  | Peeling test                                            | ○                     | —                | ○            | ○                  |
| (8)  | Rumpling test                                           | ○                     | ○                | ○            | ○                  |
| (9)  | Water resistance test                                   | ○                     | ○                | ○            | —                  |
| (10) | Water repellency test                                   | ○                     | —                | —            | —                  |
| (11) | Water immersion test                                    | ○                     | ○                | ○            | ○                  |
| (12) | Gas transmission test                                   | —                     | —                | —            | ○                  |
| (13) | Bursting strength test                                  | ○                     | ○                | ○            | —                  |
| (14) | Ageing test                                             | ○                     | —                | ○            | ○                  |
| (15) | Low temperature test (embrittlement at low temperature) | ○                     | ○                | ○            | —                  |
| (16) | Heat resistance test                                    | ○                     | ○                | ○            | ○                  |

## 5.2 General Requirements for Tests

**5.2.1 Standard Condition of Test Room** In general, the standard condition of the test room shall be Grade 3 of standard temperature and humidity (i.e. temperature of  $20 \pm 2^\circ\text{C}$ , relative humidity of  $65 \pm 5\%$ ) specified in JIS Z 8703. If it is impossible to maintain the test room under the standard conditions abovementioned, the temperature and the humidity at the time of test shall be recorded in the test report.

**5.2.2 Standard Condition of Test Piece** In general, the test piece shall have passed 24 h after vulcanization, and shall have been left in the test room under the standard conditions for at least 1 h before the test.

**5.2.3 Rounding-off Test Result** Test results obtained by the tests shall be rounded off by the rule provided in JIS Z 8401, and expressed in the digit number of figures given in Table 7.

Table 7

| Test item                                      | Value to be measured | Test results to be rounded-off |
|------------------------------------------------|----------------------|--------------------------------|
| Width (cm)                                     | 1 place of decimals  | 1 place of decimals            |
| Length (m)                                     | 1 place of decimals  | 1 place of decimals            |
| Thickness (mm)                                 | 2 places of decimals | 2 places of decimals           |
| Mass (g/m <sup>2</sup> )                       | Integer              | Integer                        |
| Tensile strength (kgf/cm) {kN/m}               | 1 place of decimals  | Integer                        |
| Elongation (%)                                 | Integer              | Integer                        |
| Tearing strength (kgf) {N}                     | 1 place of decimals  | 1 place of decimals            |
| Adhesion strength (kgf/cm) {N/cm}              | 1 place of decimals  | 1 place of decimals            |
| Water resistance (mm)                          | Integer              | Integer                        |
| Permeability of moisture (g/m <sup>2</sup> )   | 3 places of decimals | 3 places of decimals           |
| Bursting strength (kgf/cm <sup>2</sup> ) {MPa} | 1 place of decimals  | 1 place of decimals            |
| Transmission of gas (l/m <sup>2</sup> /24 h)   | 1 place of decimals  | 1 place of decimals            |

Remark: This table does not give the digit number of the value based on the SI unit.

**5.2.4 Record** Test condition under which the test has been made shall be recorded in the test report.

### 5.3 Methods of Measurements and Tests

**5.3.1 Measurement of Width** Place the test piece on a flat table, smooth unnatural creases and remove tension, measure the whole width<sup>(1)</sup> at 5 points or more of one roll, obtain the average value, and express it in cm. The measuring points shall be nearly uniformly distributed in whole length.

Note (1) By whole width shall be meant the effective width excluding selvages consisting of only cloth or rubber layer.

**5.3.2 Measurement of Length** Place the test piece on a flat table, smooth unnatural creases and remove tension, measure the whole length by placing a scale on it, and express in m. The measurement may be made either by means of cloth measuring machine or by the use of measuring tape to be rolled into the cloth.

**5.3.3 Measurement of Thickness** The measurement shall be made by the method described below.

- (1) **Thickness Gauge** Use a gauge having a graduation of, in general, 1/100 mm, and smooth presser surface of 10 mm diameter. The presser load shall be 80 gf { 0.785 N }.

- (2) Measuring Method Measure with a thickness gauge at 5 points or more, excluding the portion 50 mm distant from the selvages, uniformly distributed as possible, obtain an average, and express in mm.

5.3.4 Measurement of Mass The measurement shall be made by the use of any one of two methods described below.

- (1) Method A In the case of a test piece with uniform width, weigh one whole roll, measure the width and length by the methods specified in 5.3.1 and 5.3.2, and obtain thereby the mass ( $\text{g/m}^2$ ) per unit area.
- (2) Method B Remove the portion 50 mm distant from the selvages of the test piece, take three test pieces measuring 100 x 100 mm from the positions distributed as uniformly as possible, weigh with balance, calculate an average of three measurements, and obtain thereby the mass ( $\text{g/m}^2$ ) per unit area.

5.3.5 Tension Test The test shall be made by the strip method described below.

- (1) Test Piece Take five rectangular test pieces measuring 250 mm length and 30 mm width, in which the length direction is parallel with warp yarns, put the bench marks of 100 mm distance in the middle part, and put clamping lines each 25 mm outside of the bench marks. Thus the test pieces for tension load at breakage for longitudinal direction have been prepared. Prepare five test piece for transverse test in the similar way.
- (2) Testing Machine Use a tensile testing machine which satisfies the requirements below.
- (a) The machine shall provide the indicating device of the breaking load, and clamping device which can hold firmly the both ends of test piece.
- (b) Breaking load at the test shall fall within the range of 15 to 85 % of the capacity.
- (c) Tolerance on load graduations shall be  $\pm 2\%$ .
- (3) Measurement Clamp a test piece first by the upper jaw and then by the lower jaw, and fix firmly so that the distance comes to 150 mm. Pull at the tensile rate of  $200 \pm 10$  mm/min, and continue till the test piece breaks. Read the maximum load till the breakage, and the distance between the bench marks at that time.
- (4) Calculation Calculate the tension load at breakage and the elongation by the use of the formula below. Express the results in an average obtained from five measurements each made for longitudinal and transverse directions.

$$T_B = \frac{F_B}{W}$$

where  $T_B$ : tension load at breakage (kgf/cm) {kN/m}  
 $W$ : width of test piece (cm)  
 $F_B$ : maximum load (kgf) {N}

$$E_B = \frac{l-100}{100} \times 100$$

where  $E_B$ : elongation (%)  
 $l$ : distance between bench marks at the maximum load (mm)

**5.3.6 Tear Resistance Test** The test shall follow the single tongue method described below.

- (1) **Test Piece** Prepare the test piece which has a cut at right angles to the warp direction for the transversal test and the test piece which has a cut parallel with the warp direction for the longitudinal test, as shown in Fig. 1. Take five test pieces each for the longitudinal and transverse tests.
- (2) **Testing Machine** Use a tensile testing machine specified in 5.3.5 (2).
- (3) **Measuring Method** Cut the incision of 75 mm length with a sharp blade at a middle point of the short side at right angle to the side, and clamp at the 75 mm interval, as shown in Fig. 2. Pull at the rate, in general, of  $200 \pm 10$  mm/min, measure the maximum load (kgf) {N} shown during the tearing. Express the result in an average obtained from five measurements each made for longitudinal and transverse directions.

Fig. 1

Unit: mm

Longitudinal Test Piece

Transverse Test Piece

