MES

RESTRICTED

Mazda Engineering Standard

MES Classification:	**Material Standard**
MES Description:	**Test Methods for Fabrics, Carpets, Nonwoven Fabrics, Vinyl, and Leathr for Automobiles**
MES No.:	**MES MN 405E**

Distribution

General

Limited

Mazda Motor Corporation

3-1, Shinchi, Fuchu-cho, Aki-gun

Hiroshima, Japan

Date Established:	Nov. 25, 1994
Date Revised:	Nov. 10, 2005
Date Effective:	Nov. 15, 2005

SI

1. The MES Number is stated on this cover sheet. The Number on the top right-hand side of each page of the text does not include any revision code (alphabetical suffix).

2. The effective date on this cover sheet shows the desired date of implementation. Implement these standards after coordinating any changes with related departments.

3. If there is any discrepancy between a standard and a drawing, follow the drawing.

Issued by

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Notices

1. Purpose of Establishment

This MES has been revised to extract test methods from Material Standards **MES MN 400**, **MES MN 401**, and **MES MN 402** and then organize, integrate, or revise the contents.

2. Main Revised Point

Addition of **7.9.3 Thread breakage**

3. Explanation of SI Indications

Mark	Transition Phase	Description
SI	Third Phase	Only SI units are used in this standard without use of any previous unit. Example: 10 N

4. Pagination

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Contents

1. Scope

This MES specifies test methods for fabrics, carpets, unwoven fabrics, vinyl, and leather for automobiles.

2. Standard Conditions for Testing

Standard temperature shall be 20 °C, class 2 (20± 2°C) and standard humidity shall be 65 %, class 5 (65±5 %), as specified in **JIS Z 8703**. Hereinafter these conditions are referred to as "the standard conditions".

Test date, temperature, and humidity shall be recorded in the test report.

3. Appearance Evaluation Conditions

When the appearance is evaluated visually, the following conditions shall be satisfied:

(1) Light source shall be natural light avoiding direct sunlight (during the period of time from 3 hours after sunrise until 3 hours before sunset) or xenon daylight and equivalent beam lamp for color evaluation.

(2) Illumination shall be 1000 lx or more for the surface which requires color comparison, including sample surface and the standard surface. The illumination of the xenon daylight shall be at an electric current of 7.5 A (approximately 1150 lx) or more, and shall not be dazzling.

(3) For glossy samples, surrounding wall shall be covered with black mat paint or black curtains to avoid regular reflection of the light from the surrounding wall.

(4) The sample surface and the standard surface shall, in principle, be illuminated from vertical direction and observed from 45-degree direction, or illuminated from 45-degree direction and observed from vertical direction. Illumination from all directions and observation from vertical direction or from 45-degree direction are also acceptable.

(5) Masks which have a proper opening (rectangle or round) shall be used so that the comparison areas of sample surface and the standard surface are the same. The mask shall be achromatic color and the lightness shall approximate to that of the sample surface but darker than the sample color.

4. Rules for Rounding Off Numerical Values of Test Results

Test result shall be taken down to one place lower than the specified numerical value and rounded off according to **JIS Z 8401**.

5. Sampling and Conditioning of Samples

Samples shall be taken from a lot which is considered to have the same quality. As a rule, the samples shall be kept under the standard conditions for at least 24 hours.

6. Sampling of Test Pieces

(1) Test pieces shall be taken at random ([1]) from the sample, avoiding the area within 50mm from each end of the sample.

Note ([1]) When multiple test pieces are required from the same fabric which has warps and wefts, different warps and wefts shall be taken for each test piece.

(2) Longitudinal and lateral directions of the sample shall conform to the following:

1) Fabrics, etc. Direction parallel to the longitudinal direction of roll is "longitudinal direction" and direction parallel to the cross direction of roll is "lateral direction".

2) Vinyl, etc. Direction parallel to the longitudinal direction of roll is "longitudinal direction" and direction parallel to the cross direction of roll is "lateral direction".

3) Leather Direction parallel to the dorsal line is "longitudinal direction" and direction perpendicular to it is "lateral direction".

7. Test Methods

7.1 Density The scope is as shown in **Table 1**.

Table 1

		MES MN 400 (Hereinafter referred to as "400")	MES MN 401 (Hereinafter referred to as "401")	MES MN 402 (Hereinafter referred to as "402")
Scope	Method A	Woven fabric, Moquette		
	Method B	Knit fabric		
	Method C	Pile carpet		

7.1.1 Method A

(1) Preparation of test pieces Prepare 3 test pieces, each min. 100 mm wide and min. 100 mm long.

(2) Operation Count the number of threads of warps and wefts in 100 mm square as shown in **Fig. 1**.

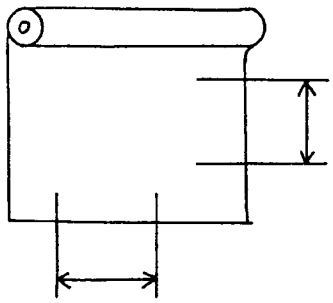


Fig. 1

(3) Expression of test results Obtain the integer to express the average of the three test pieces for warp and weft.

7.1.2 Method B

(1) Preparation of test piece Prepare material to be tested. It is unnecessary to cut it to make test pieces.

(2) Operation Count the number of knitted stitches in longitudinal and lateral directions in the range of 25.4 mm as shown in **Fig. 2**. Be sure to count at 3 different areas.

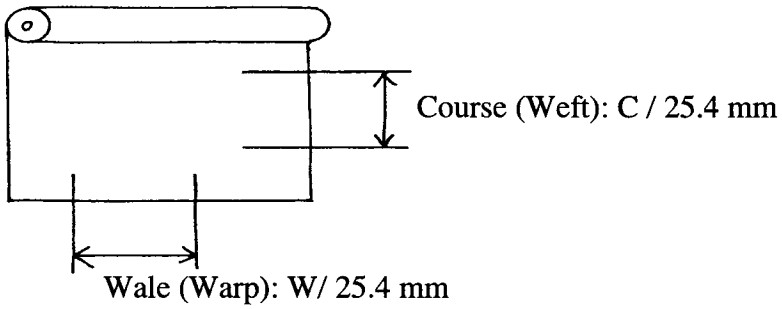


Fig. 2

(3) Expression of test results Obtain the integer to express the average of the three test pieces from longitudinal and lateral directions.

7.1.3 Method C

(1) Preparation of test piece Prepare material to be tested. It is unnecessary to cut it to make test pieces.

(2) Operation Measure the number of stitches within 100mm in warp direction and the number of gauges within 127mm in weft direction as shown in **Fig. 3**. Be sure to count at 3 different areas.

(3) Expression of test results Obtain the integer to express the average of the three test pieces from longitudinal and lateral directions.

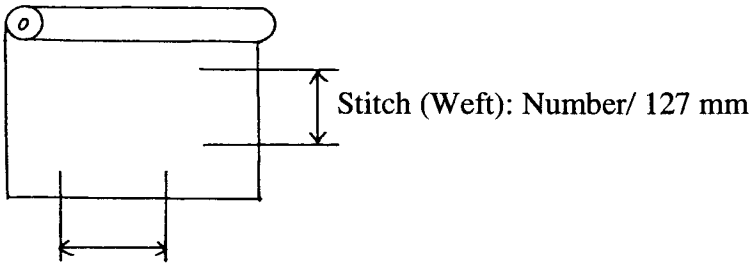


Fig. 3

7.2 Mass This scope is as shown in **Table 2.**

Table 2

	400	401	402
Scope	O	O	O

O: Applicable

(1) Preparation of test pieces Prepare 3 test pieces, each min. 100 mm wide and min. 100 mm long.

(2) Operation Measure the mass of each test piece to the nearest 1 mg, and convert it into g/m^2.

(3) Expression of test results Obtain the integer to express the average of the three test pieces.

7.3 Thickness The scope is as shown in **Table 3.**

Table 3

	400	401	402
Scope	O	O	O

(1) Preparation of test piece Prepare material to be tested. It is unnecessary to cut it to make test pieces.

(2) Measurement Measure thickness of three different areas of the testing material using a dial thickness gauge ([2]) which has a dial gauge specified in **JIS B 7503.**
For vinyl, coating thickness means the thickness of compound sheet before coating on the ground fabric, and overall thickness means the thickness including the ground fabric and grain.

(3) Expression of test results Express the average of the three measurements to the first decimal place.

7.4 Pile length The scope is as shown in **Table 4**.

Table 4

	400	401	402
Scope	Carpet		

(1) Preparation of test piece Prepare material for testing. It is unnecessary to cut it to make test pieces.

(2) Operation

1) Cut-pile carpet: Insert a scale between piles and hold it so that the piles and scale are perpendicular to the ground fabric. Measure the pile length from the ground fabric surface to the tip of the pile to the nearest 0.1 mm. Perform this measurement at 3 different areas.

2) Loop pile carpet: Straighten up the center of a loop by using a hook. Measure the pile length between the ground fabric surface and the tip of the pile to the nearest 0.1 mm. Perform this measurement at 3 different areas.

(3) Expression of test results Express the average of the three measurements to the first decimal place.

7.5 Tensile strength and elongation percentage The scope is as shown in **Table 5**.

Table 5

		400	401	402
Scope	Method A-a	○		○
	Method A-b		With ground fabric	
	Method B		Without ground fabric	

7.5.1 Method A (strip method)

(1) Preparation of test pieces Prepare 3 test pieces for the method A-a or A-b from the warp and weft directions respectively. Draw 100mm reference lines on the center of each test piece.

Table 6

	Size of Test Piece		Unit for Maximum Load
	Width mm	Length mm	
Method A-a	50	250	N/ 50 mm
Method A-b	30	250	N/ 30 mm

(2) Operation

1) Pull the test piece every 150 mm at a speed of 200 mm/min. Measure the maximum load ([3]) and the distance between the reference lines ([4]).

Notes ([3]) Vinyl with ground fabric: When either vinyl or ground fabric is damaged.
Leather: When the leather surface is damaged.

([4]) If breakage occurs in an area other than the area within the reference lines, be sure to indicate to that effect in the test report.

2) Express the tensile strength in the maximum load and calculate the elongation percentage using the formula [1] shown below.

$$\text{Elongation percentage}\ (\%) = \frac{\ell_1 - \ell_0}{\ell_0} \times 100 \cdots\cdots [1]$$

ℓ_0 : Distance between reference lines before test (mm)

ℓ_1 : Distance between reference lines when the maximum load is obtained (mm)

(3) Expression of test results Obtain the integer to express the average of the three test pieces from longitudinal and lateral directions.

7.5.2 Method B (dumbbell method)

(1) Preparation of test pieces Prepare 3 test pieces from longitudinal and lateral directions respectively as shown in **Fig. 4**. Draw 40 mm-distant reference lines at the center of the test piece.

Unit: mm

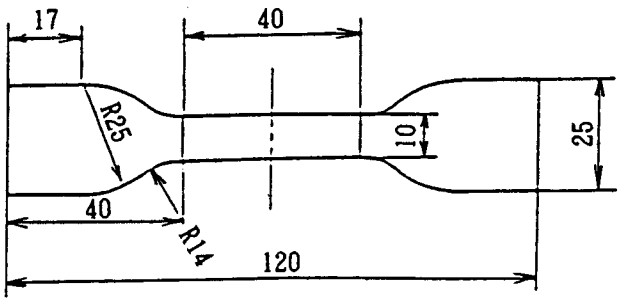


Fig. 4

(2) Operation

1) Pull the test piece every 90 mm ([5]) at a speed of 200 mm/min. Measure the maximum load ([3]) and the distance between the reference lines ([4]) at that time.

Note ([5]) Do not pull test piece in the R areas.

2) Express the tensile strength in N/10mm and calculate the elongation percentage using the formula [1].

(3) Expression of test results Obtain the integer to express the average of the three test pieces for warp and weft respectively.

7.6 Tearing strength The scope is as shown in **Table 7**.

Table 7

		400	401	402
Scope	Method A	O	With ground fabric	O
	Method B		Without ground fabric	

7.6.1 Method A (trapezoid method)

(1) Preparation of test pieces Prepare 3 test pieces 50 mm wide and 250 mm long from the longitudinal and lateral directions respectively. Draw a trapezoidal mark on each test piece as shown in **Fig. 5**,and make a 10mm cut at a right angle in the middle of the short side of the mark. ([6])

Note ([6]) For test on knit fabric, give a cut from the end of the knitting.

Unit: mm

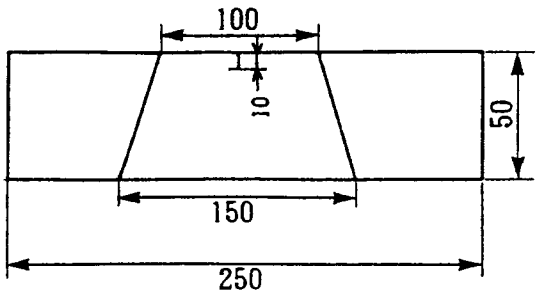


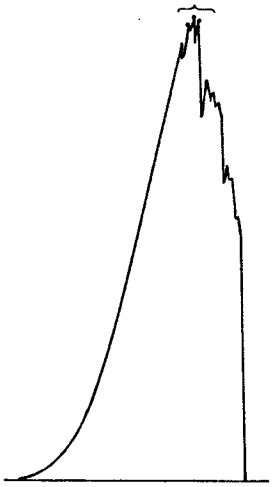
Fig. 5

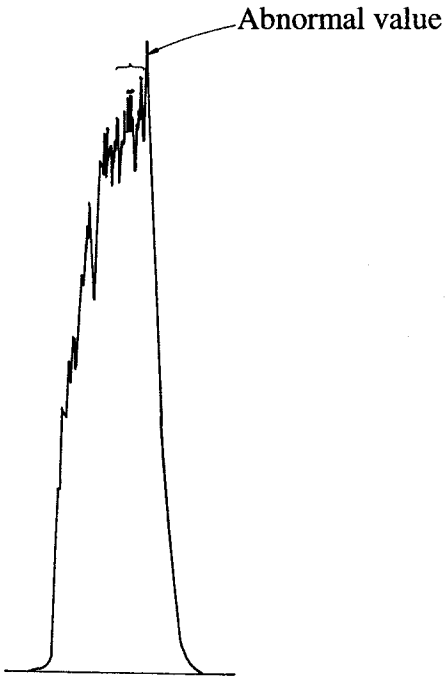
(2) Operation Using a tension tester, pull the test every 100 mm so as to stretch the short side of the trapezoid slackening the long side. Keep the tension speed at 200 mm/min and measure the maximum load (N) when the test piece is torn. Express the average of the three maximum values of the tearing strength.

See **Fig. 6** for the method to take the maximum values.

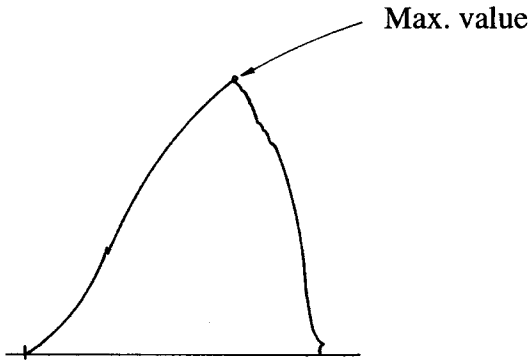
1) Average of the 3 maximum values

2) Average of the 3 maximum values





3) Average of the 3 maximum values excluding the abnormal value



4) If it is hard to take 3 maximum values, it is allowed to take only 1 max. value.

Fig. 6

(3) Expression of test results Obtain the integer which shows the average of the three test pieces from longitudinal and lateral directions.

7.6.2 Method B (90° method)

(1) Preparation of test pieces Prepare 3 test pieces from longitudinal and lateral directions respectively as shown in **Fig. 7**.

Unit: mm

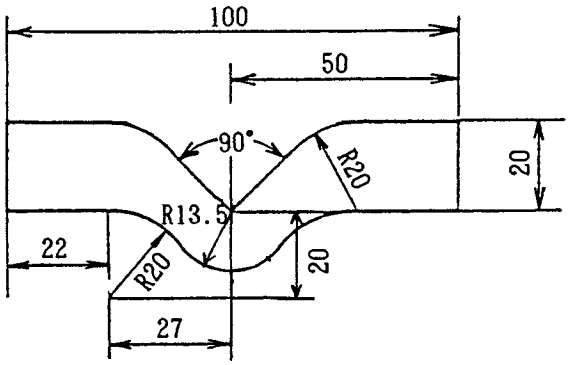


Fig. 7

(2) Operation Set the test piece on a tension tester so that the axial direction of the test piece are aligned with the pulling direction, and pull the test piece every 60 mm ([5]) at a speed of 200 mm/min. Obtain the maximum load (N) when the test piece is torn.

(3) Expression of test results Obtain the integer to express the average of the three test pieces for longitudinal and lateral directions respectively.

7.7 Strain percentage

7.7.1 Constant-load elongation percentage and residual strain percentage The scope is as shown in **Table 8**.

Table 8

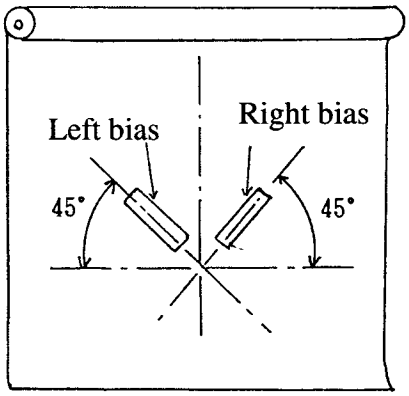
		400	401	402
Scope	Method A	Fabric (Non-molded)	With ground fabric	O
	Method B	Fabric (Molded)	Without ground fabric	

(1) Preparation of test pieces Prepare 3 test pieces for either Method A or B from longitudinal and lateral directions ([7]) respectively as shown in **Table 9**. Draw 100 mm-distant reference lines at the center of the test piece.

Table 9

	Size of Test Piece		Tension Condition		Exposure period (min.)
	Width (mm)	Length (mm)	Load (N)	Period (min.)	
Method A	50	250	100	5	10
Method B	30	250	50	1	5

Note (7) Add sample fabric in bias direction as shown in **Fig. 8**.



(Face up)

Fig. 8

(2) Operation

1) Set the test piece on a Martens' fatigue tester with 150 mm grip distance. Pull the test piece by either Method A or B and measure the distance between the reference lines to the nearest 0.1 mm [ℓ_1].

2) Release the load and leave the test piece on a flat table by either Method A or B, and measure the distance between the reference lines to the nearest 0.1 mm [ℓ_2].

3) Calculate the constant load elongation percentage and residual distortion percentage using the formula [2] below.

Constant load elongation percentage (%) = $\ell_1 - 100$
Residual distortion percentage (%) = $\ell_2 - 100$ } [2]

ℓ_1 : Distance between reference lines after applying load (mm)

ℓ_2 : Distance between reference lines after releasing load (mm)

(3) Expression of test results Express the average of the three test pieces to the first decimal place for longitudinal and lateral directions separately.

7.7.2 Durability residual strain The scope is as shown in **Table 9.1**.

Table 9.1

	400	401	402
Scope	Fabric for seat (main area)		

(1) Preparation of test pieces Prepare a test piece with 80mm width and 250mm length taken from longitudinal and lateral, right and left bias directions respectively. Draw 100 mm-distant reference lines at the center of the test piece.

(2) Operation

1) Set the test piece on Martens' fatigue tester with 150 mm grip distance. Pull the test piece under the conditions of the measuring timing 1 shown in **Table 9.2**.
2) Release the load and leave the test piece on the tester for 1 minute. Then measure the distance between the reference lines to the nearest 0.1 mm [ℓ_1].
3) Pull the test piece under the measuring timing 2 and measure the distance between the reference lines [ℓ_2].
4) Measure the distance between the reference lines in the same procedure with measuring timing 3, 4, and 5 sequentially [$\ell_3 \cdot \ell_4 \cdot \ell_5$].
5) After testing at the measuring timing 5, release the load and leave the test piece on a flat table for an hour, and measure the distance between the reference lines [ℓ_6].
6) Calculate the durability residual strain percentage using the formula [3] shown below.
Durability residual strain (%) = ℓ_5 – 100 [3]

Table 9.2

Measuring timing	Strain condition		
	Load (N)	Loading time (h)	Exposure time (min.)
1	49	1	1
2		1	1
3		2	1
4		4	1
5		24	1
6		–	60

(3) Expression of test results Express the measured value to the first decimal place at every measuring timing for longitudinal and lateral, right and left bias directions respectively.

7.8 Stiffness The scope is as shown in **Table 10**.

Table 10

	400	401	402
Scope	O	O	O

(1) Preparation of test pieces Prepare 3 test pieces, 25 mm in width and 200 mm in length, separately in longitudinal and lateral directions.

(2) Operations

1) Place the test piece on a horizontal table which has a 45° slope on one side as well as smooth surface as shown in **Fig. 9** so that the short end of the test piece is aligned with the base line of the scale (A).
2) Press the test piece with a presser plate whose size is the same as the test piece. Slide them slowly towards the slope at a speed of approximately 10 mm/s, and read the position of the opposite end of the scale (B) when the end of the test piece contacts the slope.
3) If the end does not contact the slope, prepare 350 mm-long test pieces, and conduct the test again.
4) The average of 4 measurements; the right side on the surface, the left side on the surface, the right side on the back and the left side on the back, shall be used as the measured value for each test piece.

Unit: mm

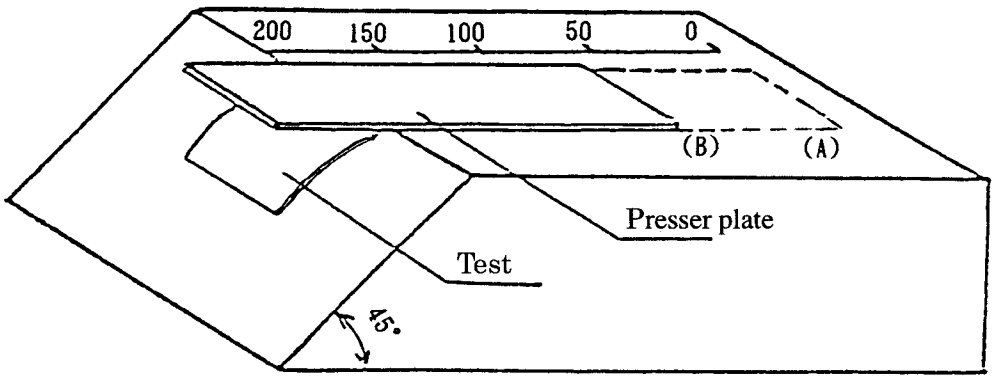


Fig. 9

(3) Expression of test results Express the average of the three test pieces to the digit of integer for longitudinal and lateral directions respectively.

7.9 Seam strength

7.9.1 Seam strength The scope is as shown in **Table 11.1**.

Table 11.1

	400	401	402
Scope	Fabric	O	O

(1) Preparation of test pieces Prepare 3 pairs of fabrics, which measure 100 mm in width and 100 mm in length, from both longitudinal and lateral directions. Put two pieces together with their surfaces facing each other, and sew ([8]) them with a sewing machine at 10 mm inside from one end to prepare test pieces for longitudinal and lateral directions ([9]) respectively.

Note (8) Machine-sewing thread: Polyester sewing thread #8 specified in **JIS L 2511**
Needle: #23 specified in **JIS B 9076** as a rule
Seam pitch: 5 mm

(9) Test piece for longitudinal direction means the one sewed perpendicularly to the longitudinal direction, and test piece for lateral direction means the one sewed perpendicularly to the lateral direction. As for test pieces for longitudinal-direction of knit fabric, sew the knitting ends of the test pieces together.

(2) Operation Set the test piece on the tension tester as shown in **Fig. 10.1**. Pull the test piece at a speed of 200 mm/min. and measure the maximum load (N).

Unit: mm

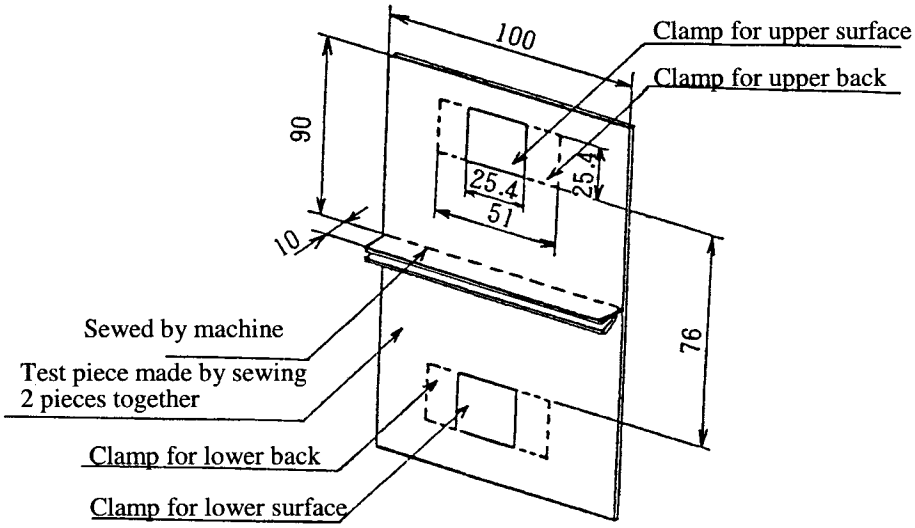


Fig. 10.1

(3) Expression of test results Express the average of the three pairs to the digit of integer for both longitudinal and lateral directions.

7.9.2 Seam opening The scope is as shown in **Table 11.2**.

Table 11.2

	400	401	402
Scope	Fabric		

(1) Preparation of test pieces

1) Prepare 3 pairs of fabrics, each measuring 100 mm in width and 200 mm in length, from both longitudinal and lateral directions. Put two pieces together with their surfaces facing each other, and sew them with a sewing machine (53) at 10 mm inside from one edge to prepare test pieces for longitudinal and lateral directions (54) respectively.

Note ([53]) Machine-sewing thread: Polyester sewing thread #8 specified in **JIS L 2511**
Sewing needle: #23 specified in **JIS B 9076** as a rule
Seam pitch: 5mm

Note ([54]) Test piece for longitudinal direction means the one sewed perpendicularly to the longitudinal direction, and test piece for lateral direction means the one sewed perpendicularly to the lateral direction. As for test pieces for longitudinal-direction of knit fabric, sew the knitting ends of the test pieces together.

(2) Operation

1) Set the test piece on the tension tester conforming to **section 7.9** (Seam strength) of **MES MN 405**.

2) Pull the test piece at a speed of 10mm/min. The tension tester shall bet set to stop when the load reaches 294N. After waiting for 10 seconds, reduce the load to 0.

3) Again pull the test piece at a speed of 10mm/min., and set the tension tester to stop when the load reaches 50N. When the load reaches 50N, hold the status for 10 seconds. Then measure the maximum length of the hole "a" and "b" caused by the dislocation of the seam to the nearest 0.1 mm as shown in **Fig. 10.2**, and the value of either "a" or "b", whichever is larger. ([55])

Note ([55]) For example, if the maximum value of "a" is 1.8mm while "b" is 1.9mm, the measure value shall be recorded as 1.9mm.

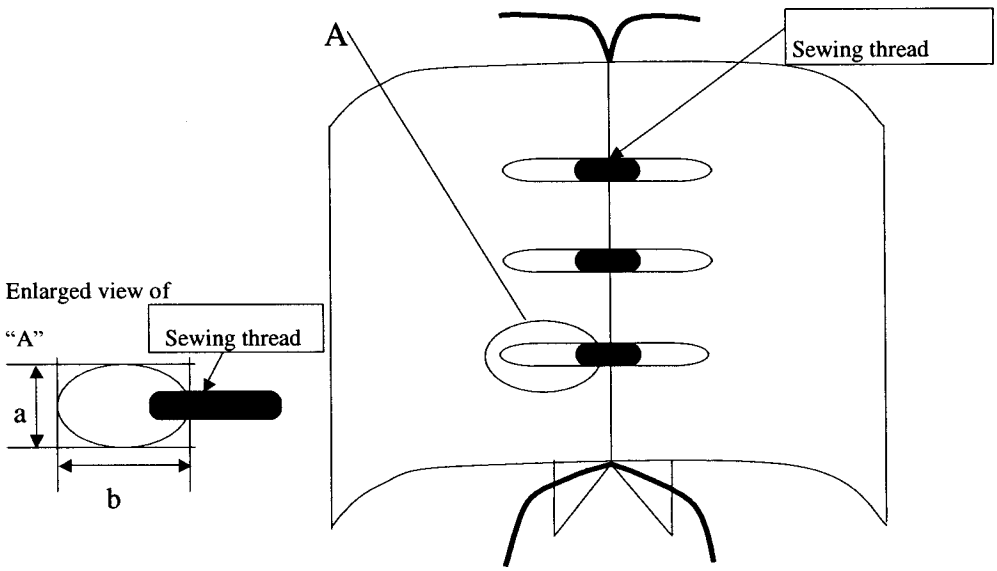


Fig. 10.2

(3) Expression of test results (Test piece shall be submitted.) Show the greater value of the 3 pairs up to the first decimal place for longitudinal and lateral directions respectively.

7.9.3 Thread breakage The scope is as shown in **Table 11.3**.

Table 11.3

	400	401	402
Scope	Fabric		

(1) Preparation of test pieces

1) Prepare 3 pairs of fabrics, each measuring 100 × 300 mm, in longitudinal, lateral, bias in right (45 degrees in right direction), and bias in left (45 degrees in left direction) respectively. Put two pieces from the same direction together with their surfaces facing each other, and sew them with a sewing machine ([56]) at 10 mm inside from one edge of the fabric.

Note ([56]) Machine-sewing thread: Polyester sewing thread #8 specified in **JIS L 2511**
Sewing needle: #22 specified in **JIS B 9076** as a rule
If it is impossible to thread #22, #21 shall be used.
If #21 cannot be threaded, #21 Ball Point shall be used.
Seam allowance: 10±2mm
Seam pitch: 5±1mm
Machine-sewing speed: 1800 to 2000 rpm
Ends of sewing: Tie the tread at the both ends of the sewn area so that the seam does not come apart.

(2) Operation

1) Place the test piece on a flat table. Attach a cotton-canvas cloth #10 specified in **JIS L3102** ([57]) to the bottom of an OIML standard weight (cylinder shape) with 20N covering the entire bottom face of the weight (O/D: approx. 60mm). Then apply friction with min. 20N load to-and-fro 5 times between A to B (300mm) as shown in **Fig. 10.4** at a speed of 1 to-and-fro motion per second. Be sure to apply friction load to the 250mm area avoiding 25mm from each end of the test piece.

Note ([57]) Use new cotton canvas for each test and do not reuse it.

2) Set the test piece on the Martens' fatigue tester, and pull the test piece with 90N load in the direction shown in **Fig. 10.5** ([58]), and hold for 5 seconds.

Note ([58]) If the clamping width of the machine is smaller than the width of the test piece, it is allowed to divide the load depending on the clamping width of the tester. Make sure to divide the load so that the clamping width is equal. Do not clamp the same area of the test piece more than once.

3) Stop applying the load, then visually check for thread breakage and count the number of the breakages (if any) in the area of 250mm excluding the area of 25mm from the both ends of the test piece.

4) Conduct the operation **1)** to **3)** for 3 pairs of the test pieces for each direction (longitudinal, lateral, bias in right, and bias in left).

(3) Expression of test results (Test piece shall be submitted.)

1) Show the results of the thread-breakage check for the 3 pairs for each direction. If any thread breakage is found, record the number of the breakages.

2) Report the sewing-machine needle used for the test.

3) If the load is divided for the test, report the number of the divisions.

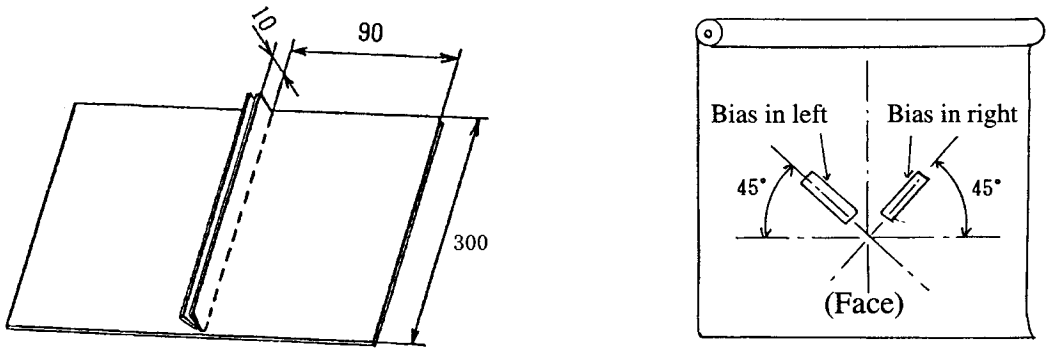


Fig. 10.3

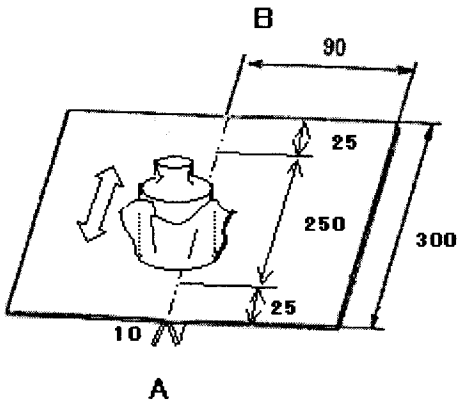


Fig. 10.4

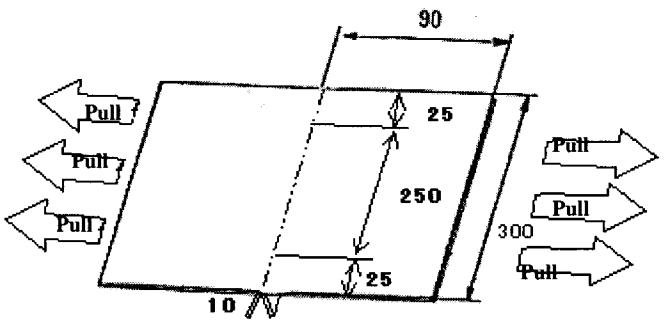


Fig. 10.5

7.10 Seam fatigue The scope is as shown in **Table 12**.

Table 12

	400	401	402
Scope	Fabric	For seating surface	

(1) Preparation of test pieces

1) Prepare 3 pairs of fabrics, which measure 100 mm in width and 100 mm in length, from both longitudinal and lateral directions. Put two pieces together with their surfaces facing each other, and sew (8) them with a sewing machine at 10 mm inside from one edge to prepare test pieces for longitudinal and lateral directions (9) respectively.

2) Cut the test piece at four places as shown in **Fig. 11**.

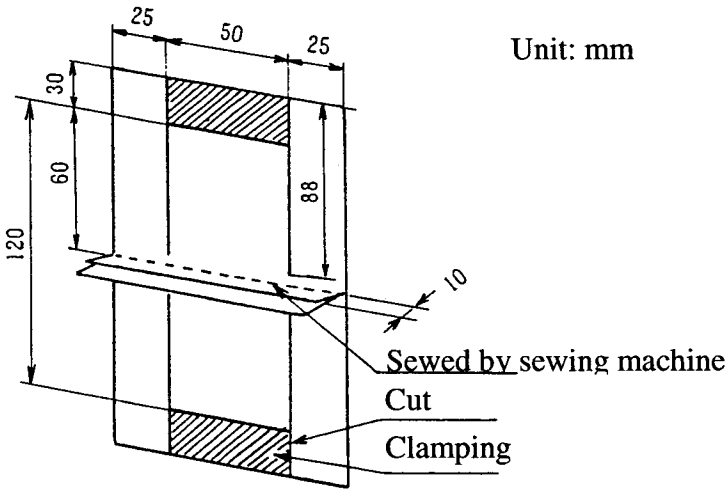


Fig. 11

(2) Operation

1) Using an Amsler type fabric abrasion tester shown in **Fig. 12**, clamp the parts marked with oblique lines as shown in **Fig. 11** with the grip distance of 120 mm, and suspend 30 N weights from the clamps on both sides.

2) Apply reciprocating motion 2,500 times at 150 mm stroke and the speed of 30 times of reciprocation/minute.

3) With the test piece loaded, measure the maximum length of the hole (a mm) caused by the dislocation of the seam to the nearest 0.1 mm as shown in **Fig. 13**.

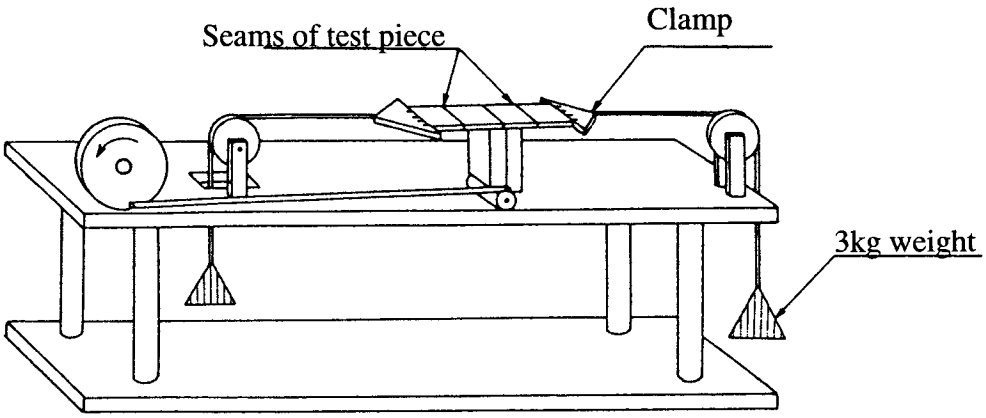


Fig. 12

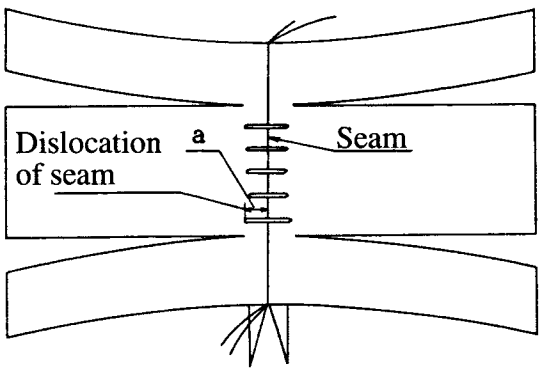


Fig. 13

(3) Expression of test results (Test piece shall be submitted) Show the greater value of the 2 pairs up to the first decimal place for longitudinal and lateral directions respectively.

7.11 Peeling resistance The scope is as shown in **Table 13**.

Table 13

	400	401	402
Scope	Fabric (laminate)	Laminate	

(1) Preparation of test pieces

(1.1) Test pieces at initial setting Take 3 test pieces, which measure 25 mm in width and 120 mm in length for longitudinal and lateral directions respectively.

(1.2) Test pieces for heat aging test Apply heat treatment to the sample at 100±2 °C for 240 hours in a Geer air oven ([10]). Remove the edge of the sample and take 3 test pieces from the sample, which measure 25 mm in width and 120 mm in length for longitudinal and lateral directions respectively.

Note ([10]) Use the Geer air oven specified in **section 5** in **JIS K 7212** which satisfies the followings:
Circulating air: 10L/ minute or more
Revolving speed: 5 to 10 rpm

(2) Operation

1) Peel the test piece approximately 50 mm in parallel to the short side of the test piece to secure clamping allowance ([11]).

Note ([11]) If it is difficult to peel the test piece, apply methyl ethyl ketone specified in **JIS K 1524** on the ground fabric, and peel the test piece. Then keep the test piece at room temperature for at least 6 hours.

2) Set the peeled surface and the ground fabric on the tension tester, and peel off at a speed of 200 mm/min.

3) Obtain absolute value of peeling resistance (N/ 25 mm) from the average of the maximum values in accordance with **Table 6**.

4) Using the formula [4] below, calculate the rate of change of peeling resistance after heat aging.

$$\text{Peeling strengh change}(\%) = \frac{|P_1 - P_0|}{P_0} \times 100 \cdots\cdots [4]$$

P_0 = peeling resistance before heat aging (N/ 25 mm)
P_1 = peeling resistance after heat aging (N/ 25 mm)

(3) Expression of test results Express the absolute value and the rate of change with the average of the 3 test pieces, obtained to the first decimal place for longitudinal and lateral directions. If test piece can not be exfoliated due to breakage, it shall be indicated as "Material broken".

7.12 Pile drawing out strength The scope is as shown in **Table 14**.

Table 14

	400	401	402
Scope	O		

(1) Preparation of test pieces Prepare 5 test pieces, which measure 55 mm in width and 90 mm in length.

(2) Operation Set the test piece on a tension tester using a jig as shown in **Fig. 14**. Pull the test piece at 300 mm/min. and measure the maximum load (N) when pile is drawn out.

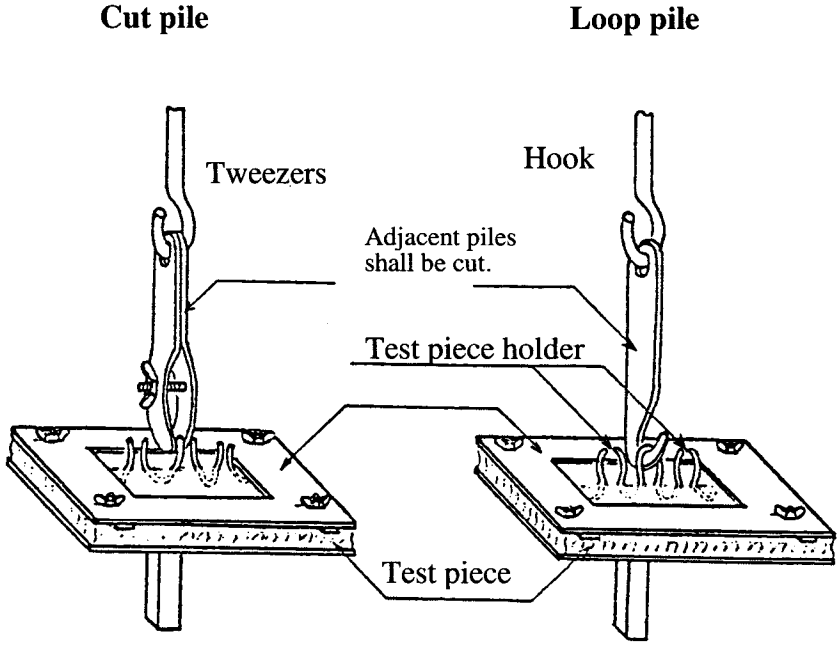


Fig. 14

(3) Expression of test results Express the average of the three measurements (excluding the maximum and minimum values of the five measurements) to the first decimal place.

7.13 Bursting strength The scope is as shown in **Table 15**.

Table 15

	400	401	402
Scope			

(1) Preparation of test pieces Prepare 3 test pieces, which measure 150 mm in width and 150 mm in length.

(2) Operation Using a Mülen-type bursting-strength tester which has the functions shown in **Fig. 15**, hold the test piece with the ring clamp applying a uniform initial tension so that the surface of the test piece faces downward. Apply hydraulic pressure at 93.3 mL/min to burst the test piece.

Express the bursting strength by pressure (kPa) of the rubber diaphragm.

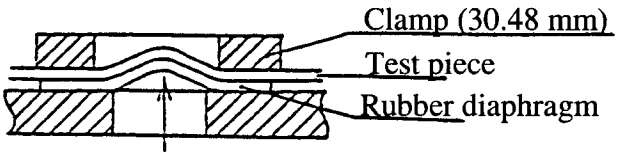


Fig. 15

(3) Expression of test results Obtain the integer which shows the average of the three test pieces.

7.14 Abrasion resistance The scope is as shown in **Table 16**.

Table 16

		400	401	402
Scope	Method A-a	Fabric	Other than seating surface and mat	
	Method A-b			○
	Method B-a	Floor mat		
	Method B-b	Trunk mat Rear package		
	Method B-c		Seating surface	○
	Method C		Mat	

7.14.1 Method A (JSPS method)

(1) Preparation of test pieces Prepare 1 test piece, which measures 30 mm in width and 250 mm in length from the longitudinal direction.

(2) Operation

1) Using friction testing equipment type II specified in **JIS L 0849** (hereinafter referred to as "friction testing equipment type II"), set cotton canvas ([12]) No. 10 specified in **JIS L 3102** on the friction device.

Note ([12]) Use new cotton canvas for each test and do not reuse it.

2) Set the test piece on the testing stand as shown in **Table 17**. Applying the specified load, rub 100 mm of the test piece surface at a speed of 30 reciprocations/minute for the specified cycles of rubbing.

3) Visually compare the test piece surface with that of the standard material, which is agreed between the supplier and Mazda Motor Corporation (hereinafter referred to as "Mazda"), and judge the abrasion status in accordance with **Table 18**.

Table 17

	Method "a"	Method "b"
Test piece setting method	Set test piece directly on the testing stand.	Place a cushion material ([13]) on the testing stand and place a silicone rubber bar with 2 mm in section and 250 mm in length on the center of the cushion material. Place the test piece on that.
Load (N) (including friction device)	5	10
Number of rubbing (reciprocations)	3,000	10,000 or 20,000

Note ([13]) Use urethane foam with 10±1 mm thickness and 8 to 11 kPa of compressive stress.

Table 18

Grade	Criterion
5	No changes are found.
4	Slight changes are found.
3	Changes are clearly noticeable.
2	Rather significant changes.
1	Significant changes.

(3) Expression of test results (Test piece shall be submitted.) Express the abrasion resistance with grades (grade may be indicated in 0.5 → e.g., Grade 4.5).

7.14.2 Method B (Taber method)

(1) Preparation of test piece

(1.1) Initial stage Prepare 1 circular test piece with ϕ130 mm.

(1.2) Heat aging Apply heat treatment to a test piece with ϕ 130 mm at 100±2 °C for 240 hours in a Geer air oven ([9]).

(2) Operation

1) Set the test piece to a Taber type rotary abrader shown in **Figs. 16** and **17** with the surface of the test piece facing up. Give rotational abrasion at a speed of 70 rpm under the conditions specified in **Table 19** ([14]).

Note ([14]) If a new abrasion roller is used, polish it 50 times applying 4.90 N load with a S-11 (AA-330) paper. Then change the papers and polish it another 50 times. When test piece is replaced, polish the new test piece 50 times under the same conditions before starting the test.

2) Visually compare the test piece to the standard material agreed between the supplier and Mazda, and judge the status in accordance with **Table 18**.

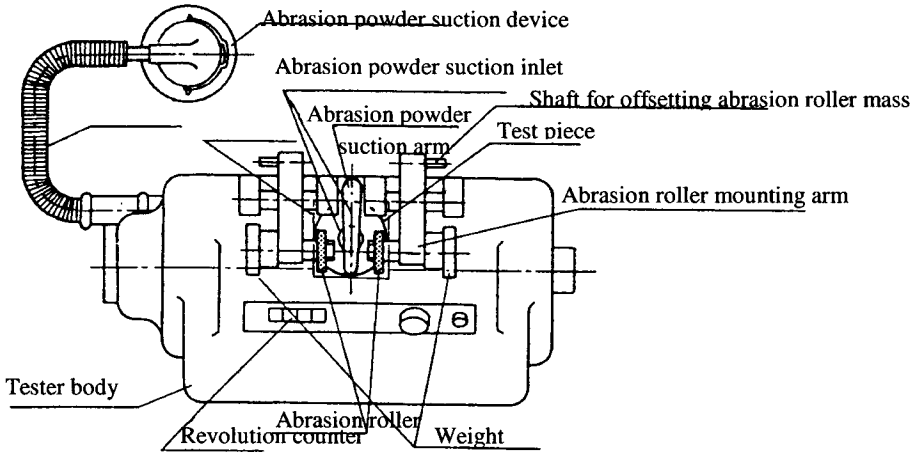


Fig. 16

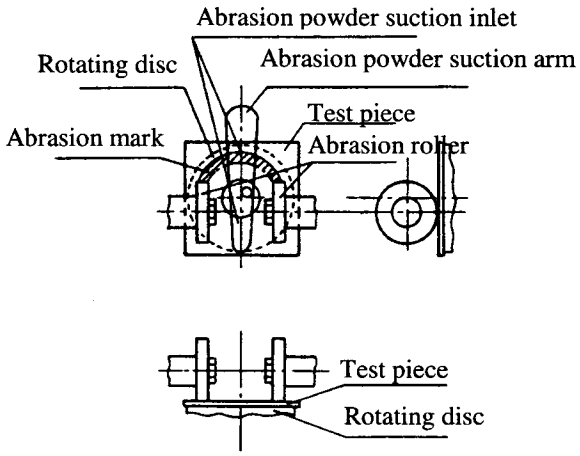


Fig. 17

Table 19

	Abrasion Roller	Pressing Load N	Number of Rubbing
Method B-a	H-38		1000
Method B-b	H-38	10 ([15])	300
Method B-c	CS-10		At initial stage: 4000 After aging: 3000

Note ([15]) 5 for one roller.

(3) Expression of test results (Test piece shall be submitted) Express the results with grades. (Grade may be indicated in 0.5 points. e.g., Grade 4.5)

7.14.3 Method C (Abrasion loss method)

(1) Preparation of test piece Prepare 1 test piece with ϕ 130 mm, and keep it in a desiccator for 24 hours.

(2) Operation

1) Measure the test piece mass to the nearest 0.1 mg [M_0].

2) Set the test piece on a Taber type rotary abrader with its surface facing up as shown in **Figs. 16** and **17**. Give abrasion under the condition specified in **Table 20**.

3) Remove the abrasion powder on the test piece surface and leave the test piece in the desiccator for 24 hours. Measure the test piece mass to the nearest 0.1 mg [M_1].

4) Calculate the abrasion loss (mg) using the formula [5] shown below.

Abrasion loss (mg) = $M_0 - M_1$.....[5]

M_0 = Test piece mass before testing (mg)

M_1 = Test piece mass after testing (mg)

Table 20

Abrasion roller	H-22
Speed (rpm)	70
Pressing load (N)	10 ([15])
Number of rubbing (times)	1000

(3) Expression of test results Express the abrasion loss in integer.

7.15 Pill and fuzz The scope is as shown in **Table 21**.

Table 21

	400	401	402
Scope	Fabric	For seating surface	

(1) Preparation of test pieces

1) Take 2 test pieces, which measure 100 mm in width and 120 mm in length from longitudinal and lateral directions respectively.

2) Wrap the test piece around a special rubber tube ([16]) shown in **Fig. 18** without applying any tension to the short side of the test piece. Cut off the surplus part of the test piece to avoid overlap, sew it with cotton threads, and apply 18 mm-wide film-type adhesive tape on both ends of the test piece without concealing the ends of the rubber tube, as shown in **Fig. 19**.

Note ([16]) Special rubber tube shall be chamfered at both ends as shown in **Fig. 18** and shall conform to the followings:

Mass: 50±2 g

Hardness: 42±5 degrees (Asker C type)

When using the tube for the first time, place 4 special rubber tubes as a set in the rotating box of ICI type tester and idle it for 10 hours before use.

Unit: mm

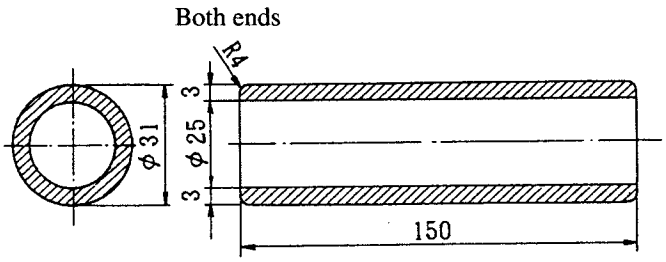


Fig. 18

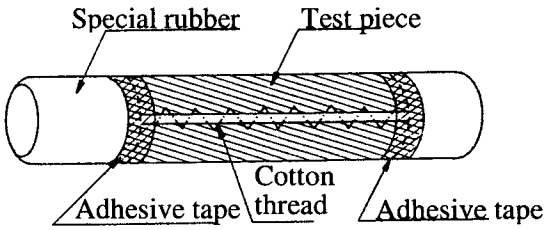


Fig. 19

(2) Operation

1) Place 4 test pieces (= 1 set), each wrapped around the special rubber tube, in the rotating box which is lined with cork ([17]) of ICI tester.

Note ([17]) The rotating box shall be a cube of 230 mm on a inner side, and the lining cork shall conform to the followings:

Thickness: Approximately 3 mm

Density: 0.21 ± 0.03 g/cm^3

Tensile strength: 0.7 MPa

Hardness: 62 ± 2 degrees (Asker F type)

Grading: 10 to 60μm

As a rule, the service life of the lining cork shall be 1500 hours. If it is broken or abraded, it shall be replaced.

2) Rotation speed and operating duration shall be as specified in **Table 22**.

3) Judge the test results for the following 2 items:

a) **Appearance of lint and fuzz** Compare the test piece to the criterion photographs in accordance with **Table 23**, and judge the results in accordance with **Table 24**.

b) **Removability of lint and fuzz** Judge whether the lint or fuzz on the fiber comes off by picking and pulling.

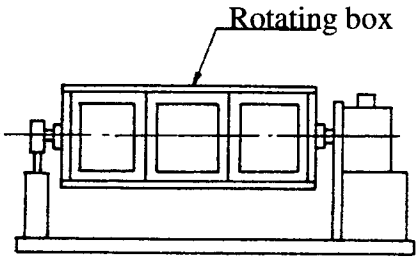


Fig. 20

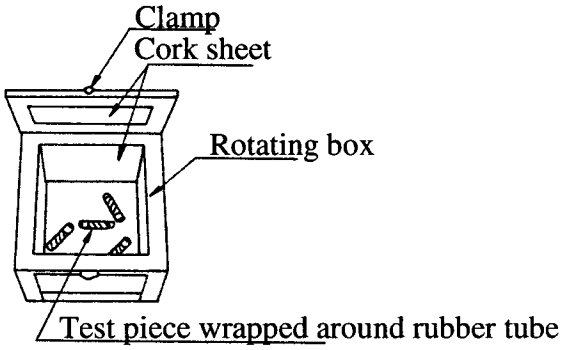


Fig. 21 Inside of rotating box lined with cork

Table 22

Fabric	Rotation speed rpm	Operating time h
Woven fabric	60	10
Knit fabric		10

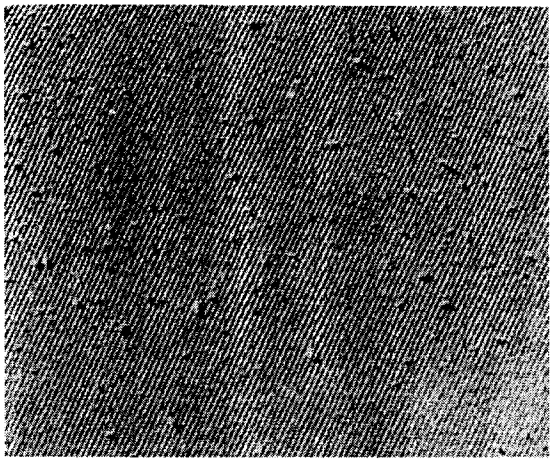
Table 23

Criterion photograph of lint and fuzz	
Woven fabric	Knit fabric
Fig. 22	**Fig. 23**

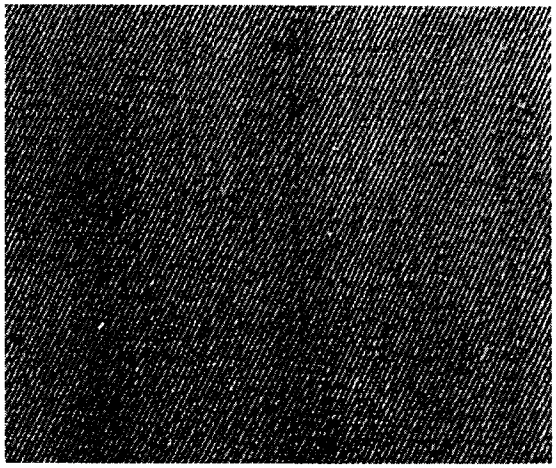
Table 24

Grade	Criterion
5	Lint and fuzz equivalent to or less than that of the criterion photo No. 5
4	Lint and fuzz equivalent to or less than that of the criterion photo No. 4
3	Lint and fuzz equivalent to or less than that of the criterion photo No. 3
2	Lint and fuzz equivalent to or less than that of the criterion photo No. 2
1	Lint and fuzz more than that of criterion photo No. 2

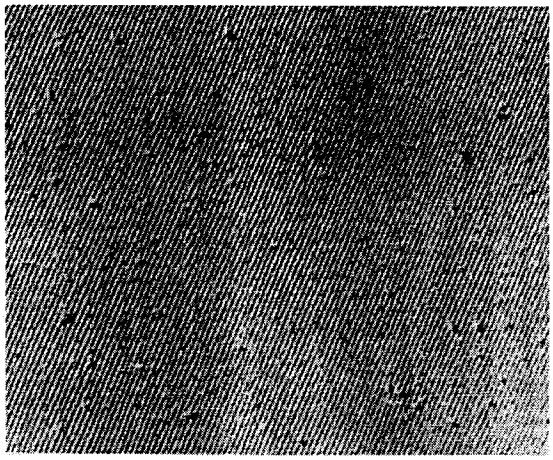
No. 1



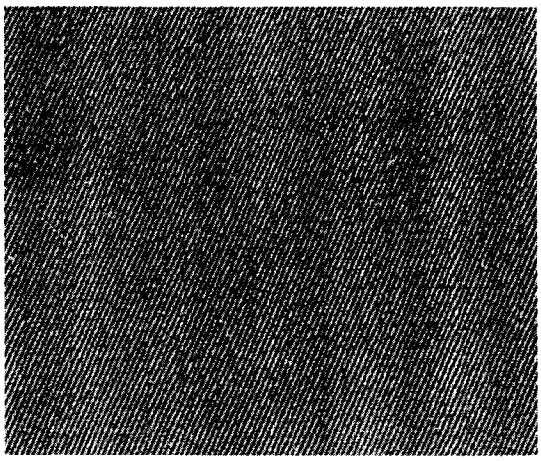
No. 4



No. 2



No. 5



No. 3

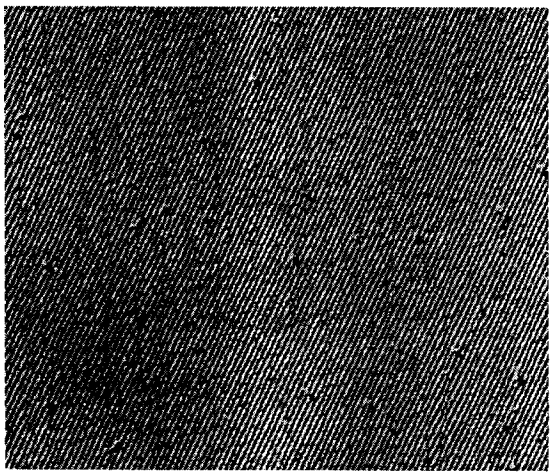
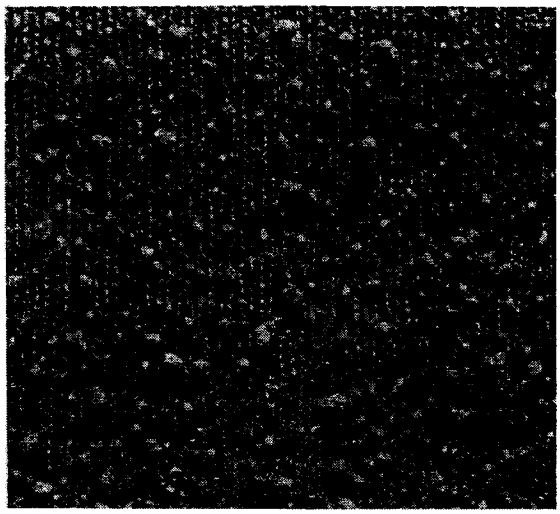
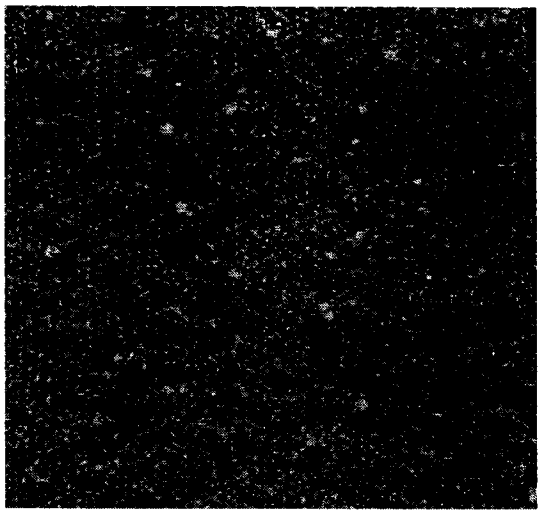


Fig. 22

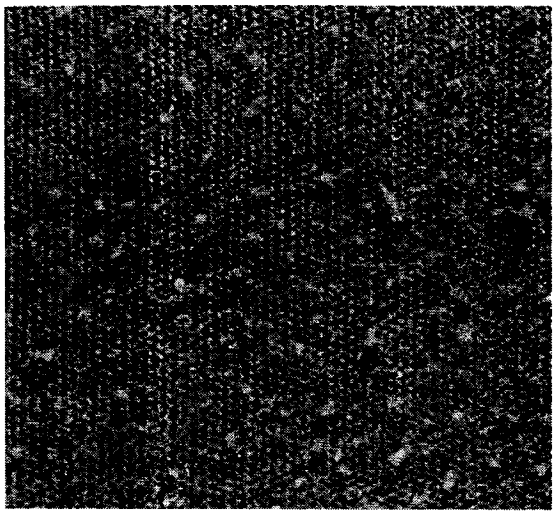
No. 1



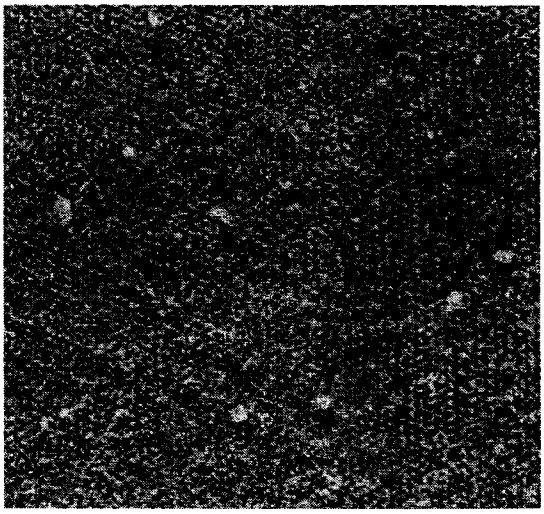
No. 3



No. 2



No. 4



No. 5

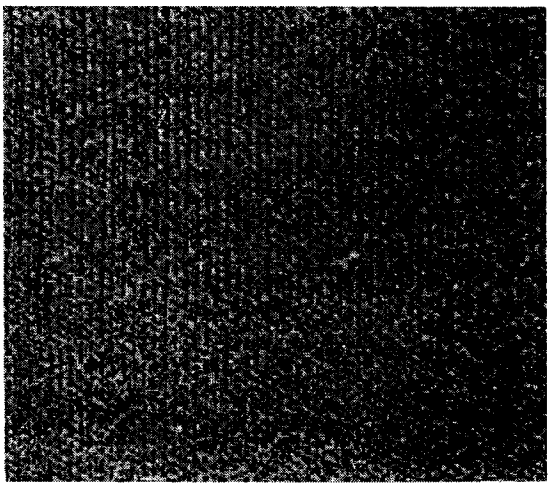


Fig. 23

(3) Expression of test results (Test piece shall be submitted.)

a) Appearance of lint and fuzz Express the lower grade of the two test pieces for longitudinal and lateral directions respectively.
(Grade may be indicated in 0.5 points. e.g. Grade 4.5).

b) Removability of lint and fuzz Show either "Removable" or "Not removable". If the grade of the appearance is 4 or higher, however, this evaluation is not required.

7.16 Anti-snag

7.16.1 Snagging The scope is as shown in **Table 25**.

Table 25

	400	401	402
Scope	Fabric (excluding 100 % cut-pile fabrics)	For seating surface	

(1) Preparation of test pieces Prepare 2 samples, which measure 200 mm in width and 330 mm in length from the longitudinal and lateral directions respectively. Roll the sample with the surface inside and apply lock stitch with cotton threads in accordance with **Table 26**. Then turn the sample inside out with the surface outside.

Remark The test piece for longitudinal direction shall be attached so that the warp or wale is parallel to the axial direction of the rotating drum, and the test piece for lateral direction shall be attached so that the weft or course is parallel to the axial direction of the rotating drum.

Table 26 Unit: mm

Classification	Test Piece Size (Outlet seam on both sides)	Width of Rolled Test Piece × Circular Cylinder
Woven fabric	200 × 330 (25)	200 × 280
Knit fabric	200 × 330 (30)	200 × 270

(2) Operation

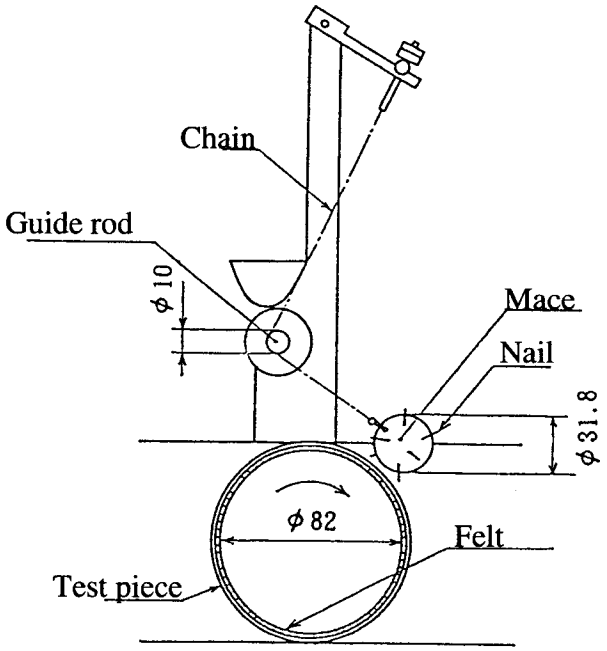
1) Use an ICI type mace tester specified in **JIS L 1058 section 5** as shown in **Fig. 24**.

2) Open the seam allowance to the both sides to make the fabric flat, and set the test piece with the surface facing outside to the cylinder as shown in **Fig. 25**. Smooth wrinkles so that the test piece fits the cylinder and fix the both ends with rubber ring ([18]). When setting the test pieces for the wale direction of knit fabric to the cylinder, the loop head of one test piece shall face the right side of the tester, while the loop head of another test piece shall face the left side of the tester as shown in **Fig. 26**.

Note ([18]) Rubber ring shall be 7 mm in thickness and 74 mm in inner diameter.

3) Carefully place the mace on the test piece. Confirm that the distance between the mace and guide rod is 46 mm and rotate it 100 times at a speed of 60 rpm.
4) Compare the test piece surface to the criterion photographs shown in **Fig. 27**, and judge it in accordance with **Table 27**.

Unit: mm



Mace:	Diameter = 31.8 mm
	Mass = approximately 135 g
	Radius of the nail tip = 0.127 mm
	Length of the projecting part = 10 mm
Cylinder:	82 in outer diameter × 210 mm in width.
	It shall be covered with 3 mm-thick rubber.
Felt:	3.2 in thickness × approximately 160 mm in width
Guide rod:	10 in outer diameter × 122 mm in width
Chain:	42 links

If the nail of the mace is damaged or the felt is abraded, they shall be replaced.

Fig. 24

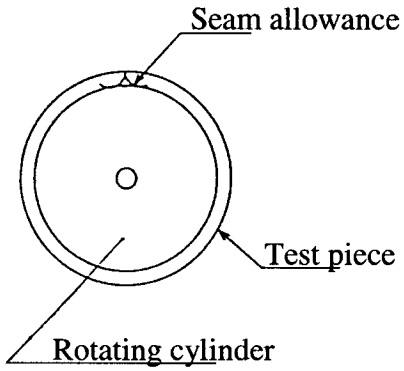
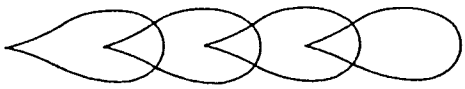


Fig. 25

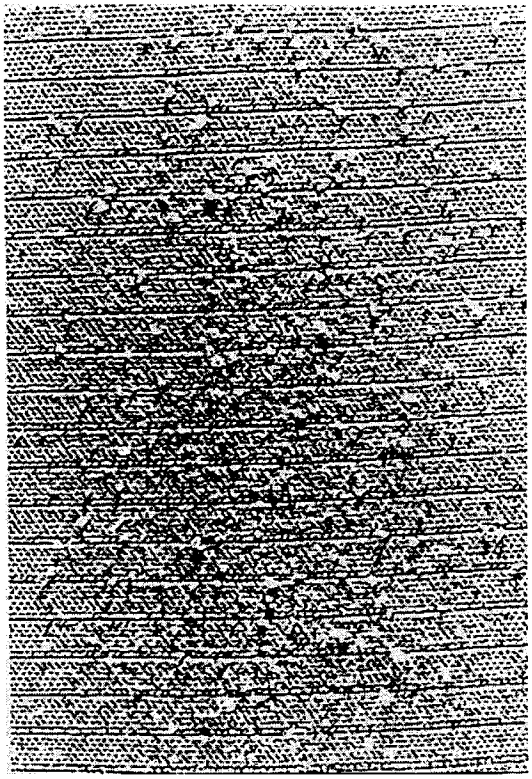
Loop head faces rightward



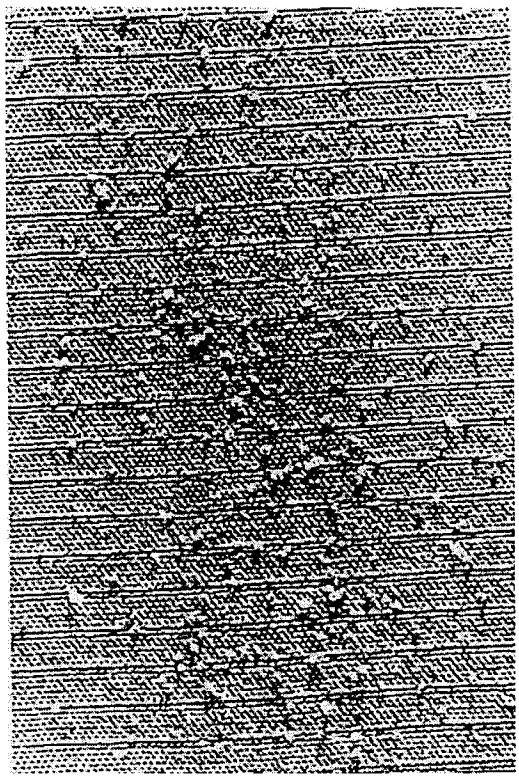
Loop head faces leftward

Fig. 26

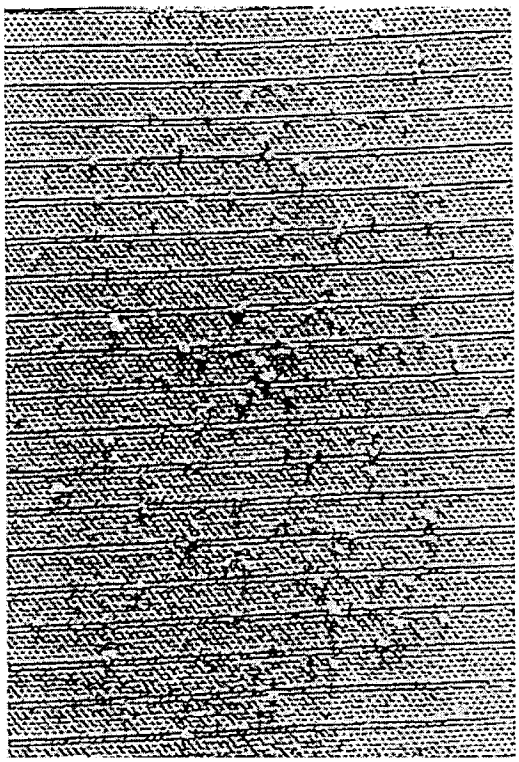
No. 1



No. 1–2



No. 2



No. 2–3

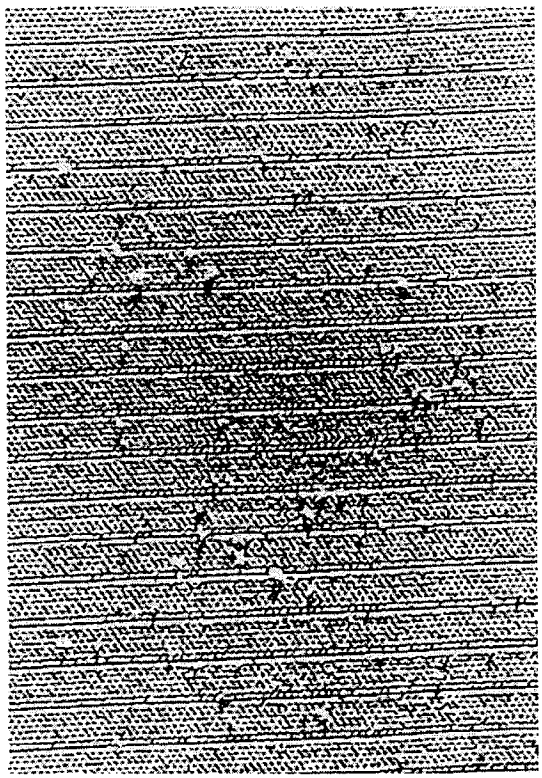
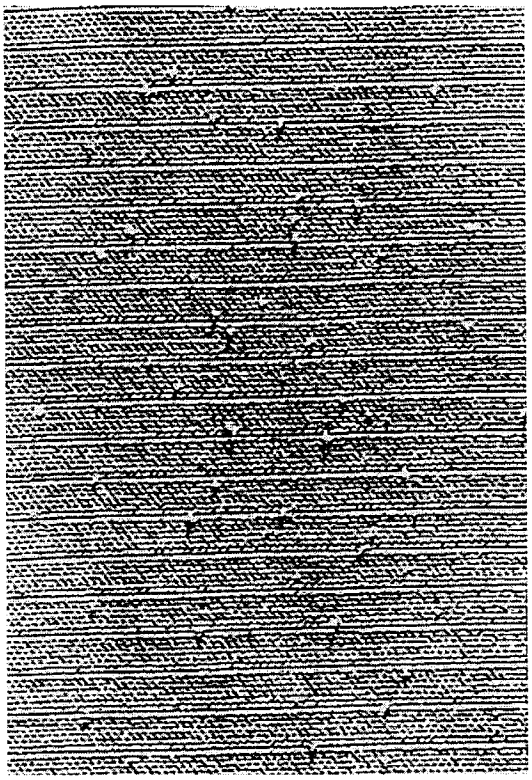
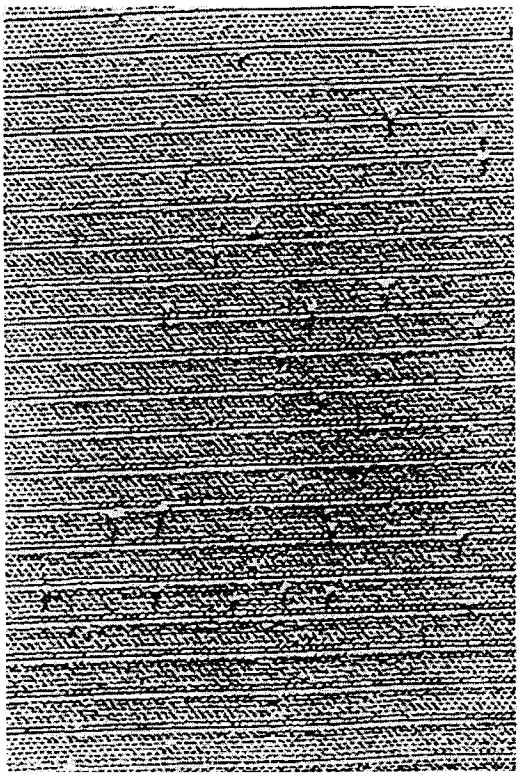


Fig. 27

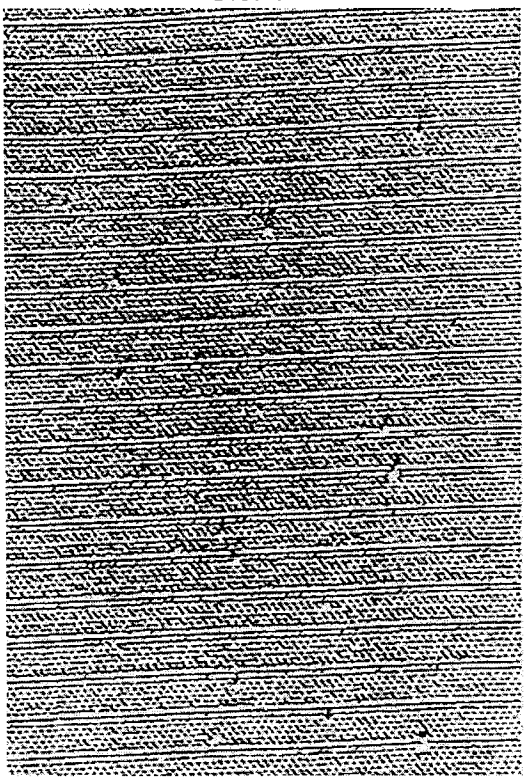
No. 3



No. 3–4



No. 4



No. 4–5

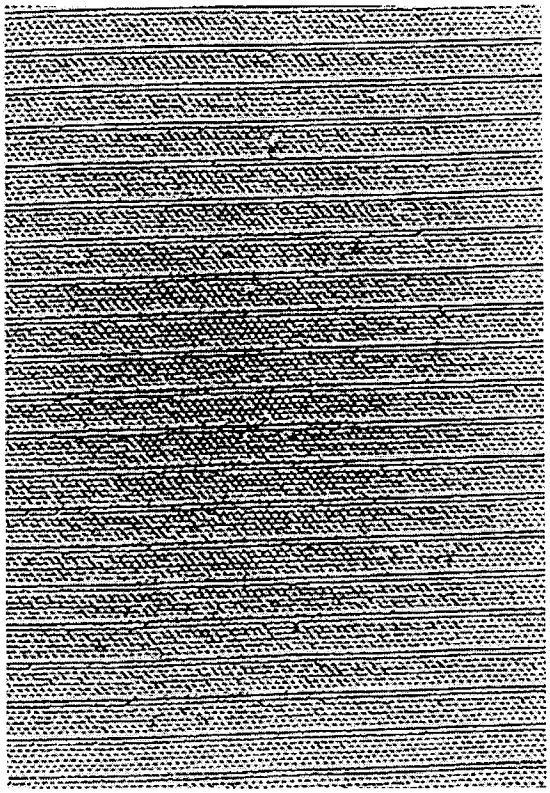


Fig. 27 (continued)

No. 5

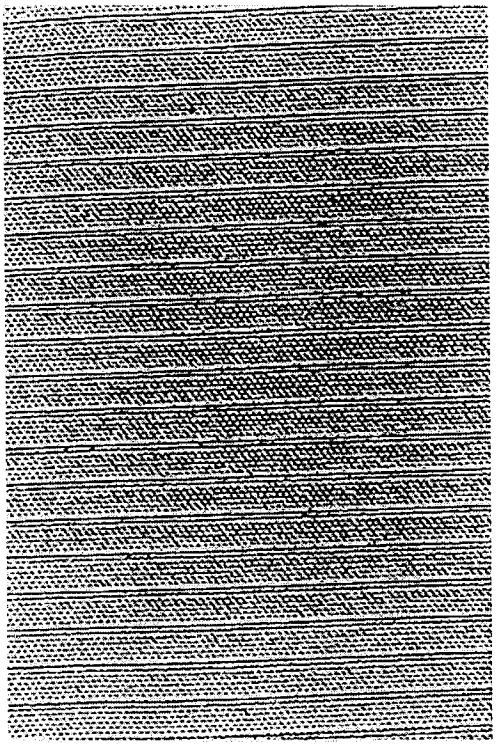


Fig. 27 (continued)

Table 27

Grade	Criterion
5.0	No snag found.
4.5	Snag equivalent to or less than criterion photo No. 4-5
4.0	Snag equivalent to or less than criterion photo No. 4
3.5	Snag equivalent to or less than criterion photo No. 3-4
3.0	Snag equivalent to or less than criterion photo No. 3
2.5	Snag equivalent to or less than criterion photo No. 2-3
2.0	Snag equivalent to or less than criterion photo No. 2
1.5	Snag equivalent to or less than criterion photo No. 1-2
1.0	Snag more than criterion photo No. 1-2

(3) Expression of test results (Test piece shall be submitted.) Show the lower grade of the two test pieces for longitudinal and lateral directions respectively.

7.16.2 Scratch The scope is as shown in **Table 27.1**.

Table 27.1

	400	401	402
Scope	Fabric (excluding 100 % cut-pile fabrics)		

(1) Preparation of test pieces Prepare one ϕ 130mm-circular test piece.

(2) Operation

1) Use "No. 499 Scratch Tester" manufactured by Toyoseiki or "Taber type Scratch Tester" by Tester Sangyo Co., Ltd. or any other equivalent tester. (It is required to report which tester to be used.)

2) Fix the test piece on the turntable with the surface facing up.

3) Attach the scraper (needle) to the testing machine as shown in **Fig. 27.1**.

4) Pull the scraper down carefully, apply 200g load, then rotate it twice at 1 rpm.

5) Observe visually the damage on the surface of the test piece, and judge the level according to **Table 27.2**.

(3) Expression of test results (Test piece shall be submitted) Show the results with grades.

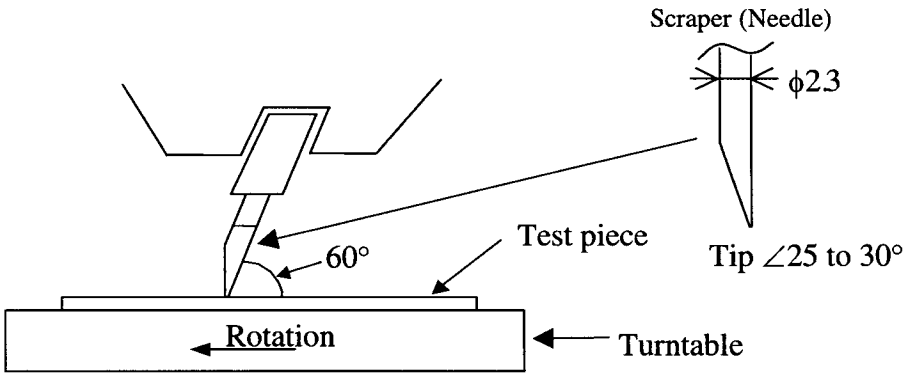


Fig. 27.1

Table 27.2

Grade	Criterion
5	No damage
4	Scuffing can be seen, but neither fray or tear in threads is found.
3	Threads are frayed, but it is inconspicuous. Fabric is torn, but it is inconspicuous.
2	Threads are frayed, and it is conspicuous. Fabric is torn, and it is conspicuous.
1	Threads are frayed, and it is very conspicuous. Fabric is torn, and it is very conspicuous.

7.16.3 Velcro-strap resistance The scope is as shown in **Table 27.3**.

Table 27.3

	400	401	402
Scope	Fabric		

(1) Prepare 1 sample, which measures 80 mm in width and 270 mm in length from the longitudinal and lateral directions respectively.

(2) Operation

1) Using friction testing equipment type I specified in **JIS L 0849** (hereinafter referred to as "friction testing equipment type I"), Wrap Velcro strap ([52]) around the test piece so that surface R of the friction device is completely covered as shown in **Fig. 27.2**.

Note ([52]) Use Velcro strap which is equivalent to 25mm-wide strap by CRARAY CO., LTD (Product No.: A03800-00).
Use new Velcro strap for each test and do not reuse it.

2) Set the test piece on the test stand firmly so that the test piece does not move. Applying 9.8N load, rub 150mm of the test piece surface 10 times (5 reciprocating movements) at a speed of 60 reciprocations/minute.

3) Observe the fuzz status of the test-piece surface visually, and judge in accordance with **Table 27.4**.

(3) Expression of test results (Test piece shall be submitted) Compare the status of the test piece to the criterion photographs shown in **Fig. 27.3**, and show the results with grades. (Grade may be indicated in 0.5 points e.g. Grade 4.5).
Regard the longitudinal direction of E024B (by Suminoe Textile Co., Ltd.) as grade 3, and the fabric whose fuzz is larger in amount or longer in length shall be considered as less than grade 3.

Table 27.4

Grade	Criterion
5	Fuzz equivalent to or more than criterion photo "Grade 5"
4	Fuzz equivalent to or more than criterion photo "Grade 4"
3	Fuzz equivalent to or more than criterion photo "Grade 3"
2	Fuzz equivalent to or more than criterion photo "Grade 2"
1	Fuzz less than criterion photo "Grade 1"

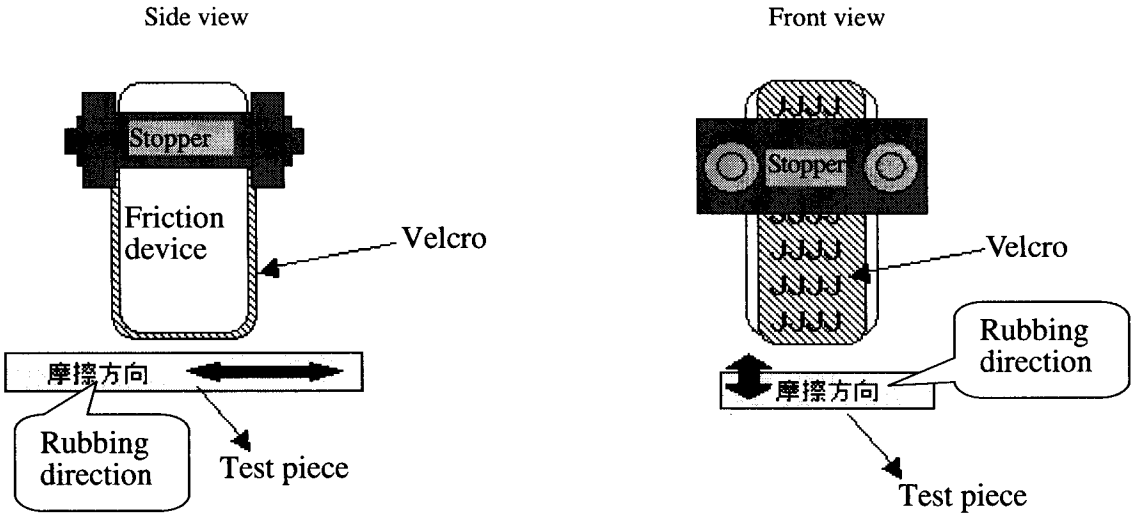
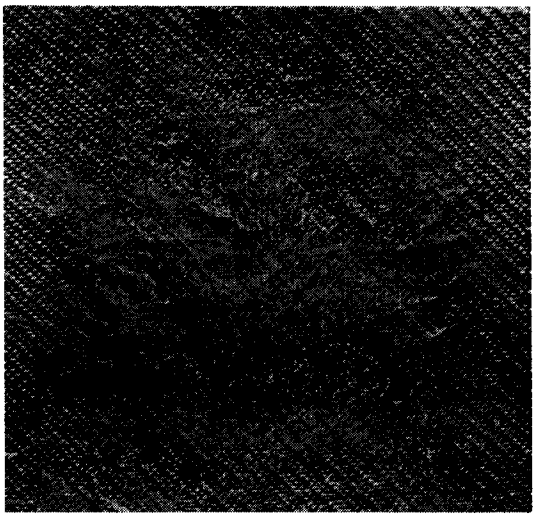
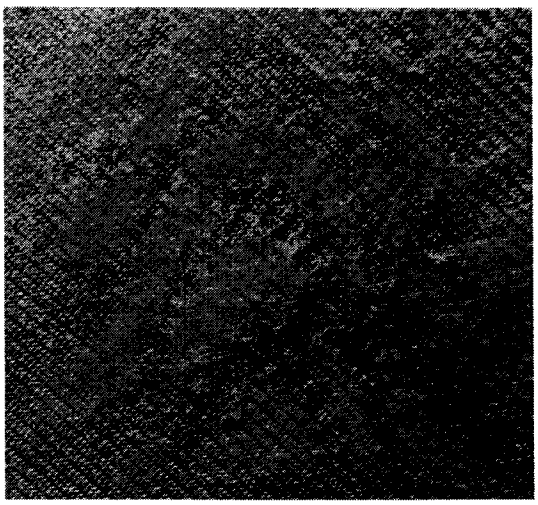

Side view
Front view
Stopper
Friction device
Velcro
摩擦方向
Rubbing direction
Test piece
Stopper
Velcro
Rubbing direction
摩擦方向
Test piece

Fig. 27.2

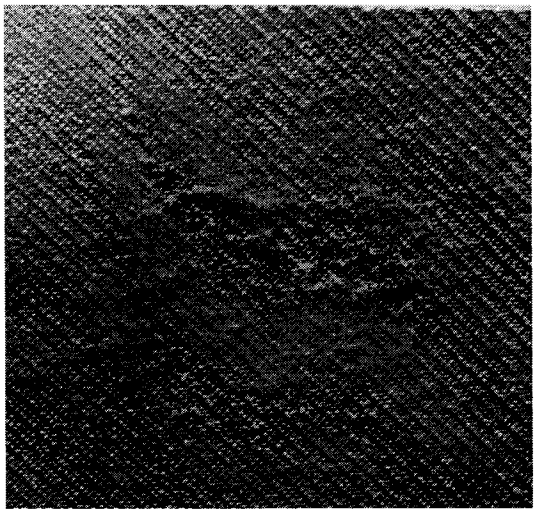
Grade 1



Grade 2



Grade 3



Grade 4

Grade 5

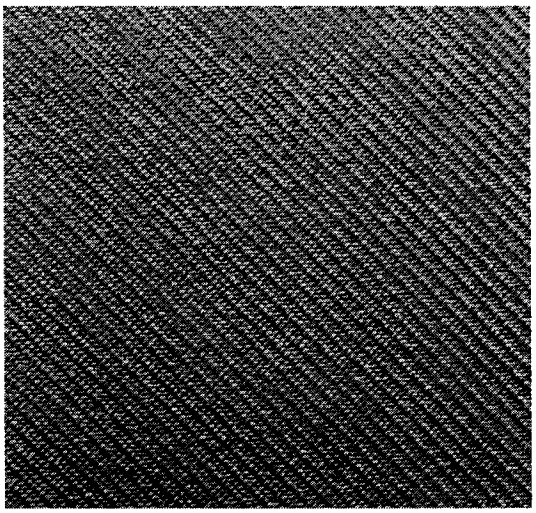


Fig. 27.3

7.17 Pile lying down The scope is as shown in **Table 28**.

Table 28

	400	401	402
Scope	Fabric (pile product)		

(1) Preparation of test piece Prepare 1 test piece, measuring 70 mm in width and 70 mm in length.

(2) Operation

1) Carefully place a cylindrical 1 kg weigh with 40 mm diameter on the test piece surface, and leave it in a thermo-hygrostat at 50±2 °C and 65±2 % in humidity for 24 hours.
2) Take the test piece out of the thermo-hygrostat and remove the weight. Leave the test piece at room temperature for 24 hours. Then apply a hair spray or the like to the surface of the test piece to keep the pile-lying-down condition.
3) Visually compare the pile-lying-down condition with the standard material agreed by the supplier and Mazda, and judge in accordance with **Table 18**.

(3) Expression of test results (Test piece shall be submitted.) Express the pile lying down with grades. (Grade may be indicated in 0.5 → e.g. Grade 4.5.)

7.18 Dust adhesion and removability The scope is as shown in **Table 29**.

Table 29

	400	401	402
Scope	Fabric (Solid color)		

(1) Preparation of test pieces Prepare 2 test pieces, which measure 150 mm in width and 150 mm in length ([19]).

Note ([19]) Select test pieces whose color makes the dust most conspicuous of all.

(2) Operation

(2.1) Dust adhesion

1) Fix the test piece on a flat table with its surface facing up. Using white cotton flannel of 200 mm wide and 200 mm long ([20]) designated by Mazda, rub the test piece 5 times forcefully in one direction which is the most advantageous in conditions.

Note ([20]) Use new white cotton flannel for each test and do not reuse it.

2) Observe dust adhesion on the test piece surface and judge it in accordance with **Table 18**.

(2.2) Dust removability

1) Fix the test piece ([21]) on a flat table with its surface facing up. Rub the test piece lightly 5 times with palm of a hand, and observe the dust removability. If the dust has not been removed, perform **2)** below.

Note ([21]) Use the other test pieces, not the one used in the dust adhesion test.

2) Rub the test piece once slightly with an etiquette brush ([22]) and observe dust removability. If dust has not been removed, perform **3)** below.

Note ([22]) Use an etiquette brush whose brush area is 80 mm wide and 200 mm long.

3) Furthermore, rub the test piece 5 times with the etiquette brush, and observe dust removability. If dust has not been removed, perform **4)** below.

4) Furthermore, rub the test piece 5 times with the etiquette brush, and observe dust removability.

Judge the dust removability in accordance with **Table 30**.

Table 30

Grade	Criterion
5	Dust can be removed by operation **1)**
4	Dust can be removed by operation **2)**
3	Dust can be removed by operation **3)**
2	Dust can be removed by operation **4)**
1	Dust can not be removed by operation **4)**

(3) Expression of test results (Test piece shall be submitted.)

(3.1) Dust adhesion Express with grades (Grade may be indicated in 0.5 points e.g. Grade 4.5).

(3.2) Dust removability Express with grades (Grade may be indicated in 0.5 points e.g. Grade 4.5).

When the grade of dust adhesion is 4 or higher, however, this evaluation is not required.

7.19 Coating film strength The scope is as shown in **Table 31**.

Table 31

	400	401	402
Scope			O

(1) Preparation of test piece Take 2 samples, each 20 mm wide and 50 mm long, in the longitudinal direction. Sew them using a sewing machine of industrial use so that the surfaces of the 2 samples face inside as shown in **Fig. 28**. Use polyester sewing thread #8 specified in **JIS L 2511** and needle #23 specified in **JIS B 9076**. The seam pitch shall be 5 mm.

Unit: mm

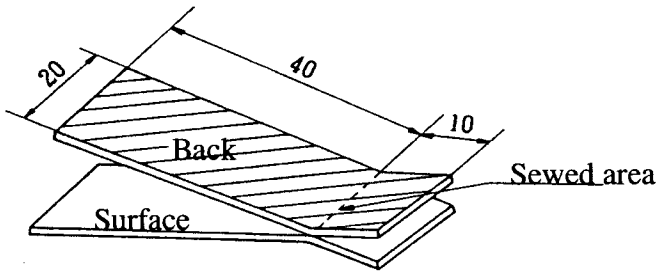


Fig. 28

(2) Operation

1) Open the test piece so that the surface can be abraded. Lay the seam allowance down to one side and put a cushion ([23]) on the back of the test piece.

Note ([23]) Cushion material shall be 5 mm-thick urethane foam with 0.20 to 0.32g/cm³ in density.

2) Set the test piece to the friction device of friction testing equipment - type II specified in **section 7.14.1** - Method A so that the seam of the test piece is at the center of the friction device as shown in **Fig.29**. Attach cotton canvas No. 10 which is specified in **JIS L 3102** on the test piece stand as shown in **Fig. 30**. The cotton canvas shall be:

Method A (Dry coating film strength): Dry cotton canvas

Method B (Wet coating film strength): Cotton canvas immersed in distilled water for 10 minutes and wrung slightly up to approx. 100 % moist condition.

3) Apply reciprocating motion 50 times with pressing load of 4.9N.

4) Visually compare peeling-off of coating film with the status of the standard material agreed between the supplier and Mazda, and judge in accordance with **Table 18.**

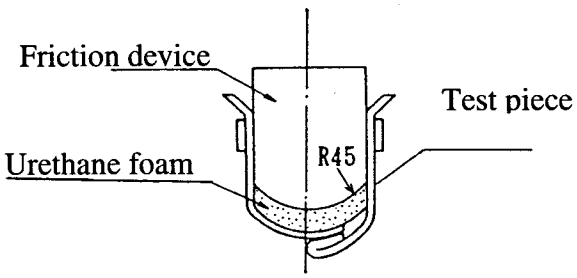


Fig. 29

Unit: mm

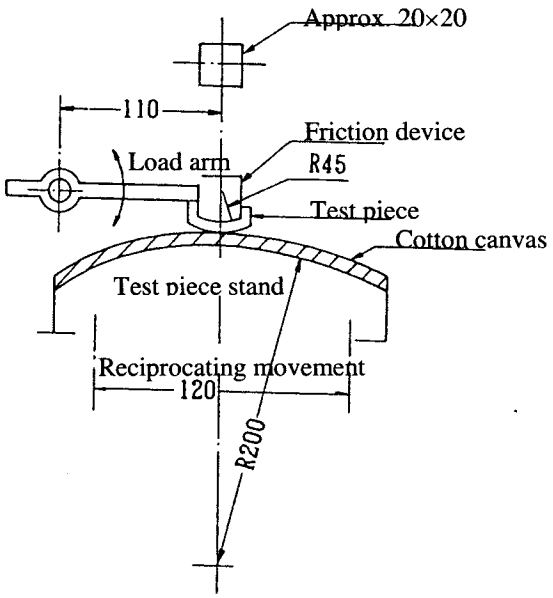


Fig. 30

(3) Expression of test results (Test piece shall be submitted.) Express the coating film thickness with grades

(Trade may be indicated in 0.5 points. e.g. Grade 4.5)

7.20 Water repellent The scope is as shown in **Table 32**.

Table 32

		400	401	402
Scope	Method A	Fabric		
	Method B		○	

7.20.1 Method A (Shower method)

(1) Preparation of test pieces Prepare 3 test pieces from longitudinal direction, which measure 200 mm wide and 200 mm in long.

(2) Operation

1) Set the test pieces on the holding frame of the water repellent tester as shown in **Fig. 31** ([24]).

Note ([24]) If test piece is a pile product whose fiber pattern has a fixed direction, set the test piece so that water is sprayed in the fiber-fixed direction.

2) Adjust the center of the spray nozzle to the center of the holding frame. Pour 250 mL distilled water into a glass funnel and spray it over the test piece within 25 to 30 seconds.

3) Take the holding frame off the tester and remove water drops. Compare the wet condition of the test piece with that of the reference samples shown in **Fig. 32**.

Unit: mm

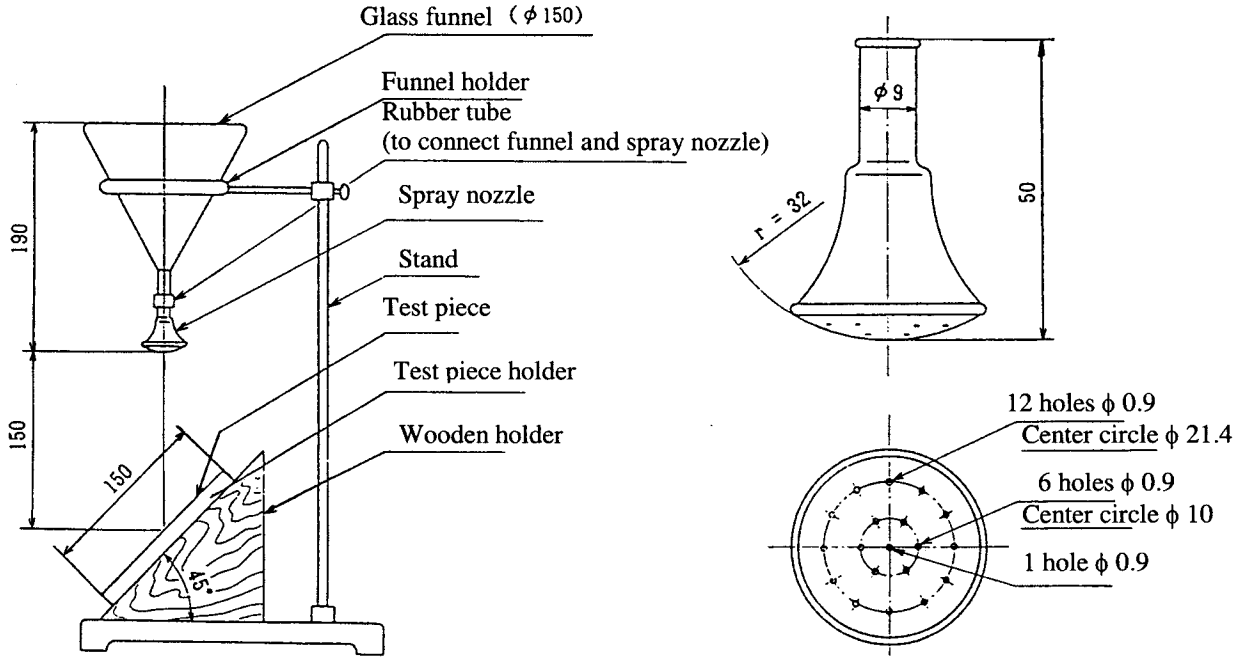
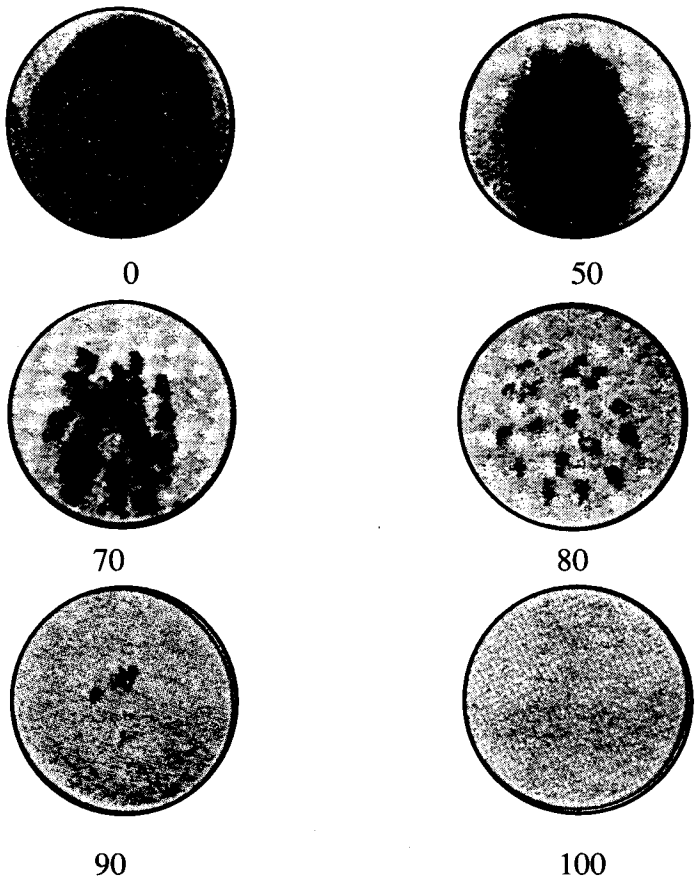


Fig. 31



0: Surface and back are entirely wet.
50: Surface is entirely wet.
70: A half of the surface is wet, and small spots of moisture have penetrated through the fabric.
80: Surface is wet with small water drops.
90: Surface is not wet, but small water drops are seen.
100: Neither moisture nor water drops on the surface.

Fig. 32

(3) Expression of test results Express the average of the three test pieces obtained to the digit of integer.

7.20.2 Method B (Immersion method)

(1) Preparation of test pieces Prepare 3 test pieces, which measure 20 mm wide and 100 mm long from longitudinal and lateral directions respectively.

(2) Operation

1) Put 300 mL red-dyed water in a one-liter beaker.

2) Immerse the test piece by 20 mm for 24 hours.

3) Measure the water suck-up height.

(3) Expression of test results Show the average of the three test pieces, obtained to digit of integer for longitudinal and lateral directions respectively.

7.21 Color fastness to rubbing The scope is as shown in **Table 33**.

Table 33

		400	401	402
Scope	Method A	Fabric	O	O
	Method B	Fabric	O	O

(1) Preparation of test piece Prepare 1 test piece of 30 mm wide and 250 mm long from longitudinal direction.

(2) Operation

1) Set the test piece on the testing stand of the friction testing equipment - type II specified in **section 7.14.1** - Method A.

2) Cover the friction device of the testing equipment with a white cotton cloth ([25]) under the conditions specified in **Table 34**.

Note ([25]) Use the white cotton cloth (No. 3) specified in **JIS L 0803**.

Table 34

Classification	Condition of White Cotton Cloth
Method A (color fastness to rubbing - dry)	Dry condition
Method B (color fastness to rubbing - perspiration)	After immersing white cotton cloth in artificial perspiration ([26]) for 10 minutes, wring the cloth lightly to make wet condition.

Note ([26]) One-liter artificial perspiration shall be prepared by dissolving following reagents in distilled water.

JIS K 8150 [Sodium Chloride] Class 1 or higher, 8 g

JIS K 8355 [Acetic Acid] Class 1 or higher, 5 g

JIS K 9019 [Disodium Hydrogenphosphate 12-water] Class 1 or higher, 8 g

3) Rub the 100 mm of the test piece to-and-fro 100 times with 1.96 N load and at a speed of 30 reciprocating movements per minute.

4) Measure stains on the white cotton cloth using a grey scale specified in **JIS L 0805** and assess staining in accordance with **Table 35**.

Table 35

Grade	Criterion
5.0	Staining is equivalent to or less than that of staining-assessing grey scale No. 5.
4.5	Staining is equivalent to or less than that of staining-assessing grey scale No. 4-5.
4.0	Staining is equivalent to or less than that of staining-assessing grey scale No. 4.
3.5	Staining is equivalent to or less than that of staining-assessing grey scale No. 3-4.
3.0	Staining is equivalent to or less than that of staining-assessing grey scale No. 3.
2.5	Staining is equivalent to or less than that of staining-assessing grey scale No. 2-3.
2.0	Staining is equivalent to or less than that of staining-assessing grey scale No. 2.
1.5	Staining is equivalent to or less than that of staining-assessing grey scale No. 1-2.
1.0	Staining is exceeding that of staining-assessing grey scale No. 1-2.

(3) Expression of test results (Test piece shall be submitted.) Show the color fastness to rubbing with grades.

7.22 Color fastness to wash

7.22.1 Color fastness to immersion The scope is as shown in **Table 36**.

Table 36

	400	401	402
Scope	Carpet Unwoven fabric		

(1) Preparation of test piece Prepare 1 test piece, 40 mm wide and 100 mm long from longitudinal direction.

(2) Operation

1) Affix the test-piece-sized cotton cloth ([27]) on the test piece, and roll them. Place them in a beaker. Pour distilled water of 6 times liquor ratio into the beaker.

Note ([27]) Cotton cloth shall be made of the same material as the test piece and finished by boiling-off and bleaching without starch.

2) After leaving for 16 hours, take the test piece and white cloth out of the beaker and remove water from them using a hydroextractor. Dry them in a thermostatic chamber at 70 to 75 °C and keep them at room temperature for at least 1 hour.

3) Measure the discoloration/fading of the test piece by using a grey scale for color-change assessment specified in **JIS L 0804** and judge in accordance with **Table 37**.

4) Measure the staining of the cotton cloth using a grey scale for staining assessment specified in **JIS L 0805** and judge in accordance with **Table 35**.

Table 37

Grade	Criterion
5.0	Discoloration/fading is equivalent to or less than that of grey scale for color-change assessment No. 5.
4.5	Discoloration/fading is equivalent to or less than that of grey scale for color-change assessment No. 4-5.
4.0	Discoloration/fading is equivalent to or less than that of grey scale for color-change assessment No. 4.
3.5	Discoloration/fading is equivalent to or less than that of grey scale for color-change assessment No. 3-4.
3.0	Discoloration/fading is equivalent to or less than that of grey scale for color-change assessment No. 3.
2.5	Discoloration/fading is equivalent to or less than that of grey scale for color-change assessment No. 2-3.
2.0	Discoloration/fading is equivalent to or less than that of grey scale for color-change assessment No. 2.
1.5	Discoloration/fading is equivalent to or less than that of grey scale for color-change assessment No. 1-2.
1.0	Discoloration/fading is exceeding that of grey scale for color-change assessment No. 1-2.

(3) Expression of test results (Test piece shall be submitted.) Show the color fastness to wash with grades.

7.22.2 Color fastness The scope is as shown in **Table 37.1**.

Table 37.1

	400	401	402
Scope	O		

(1) Preparation of test pieces Prepare 2 test pieces, which measure 400 mm in width and 400 mm in length. ([51])

Note ([51]) Conduct the test for all the colors specified.

(2) Operation

1) Drop 4cm^3 tap water in the center of the surface of one of the test pieces. Drop the same amount of tap water on the back of the other test piece.

2) Dry the test pieces, keeping them in standing position.

3) After drying, check for stains visually.

4) After leaving the test pieces for one day, check again for stains visually.

(3) Expression of test results (Test piece shall be submitted.) Show "With stain" or "No stain" for each color.

7.23 Color fastness to light The scope is as shown in **Table 38**.

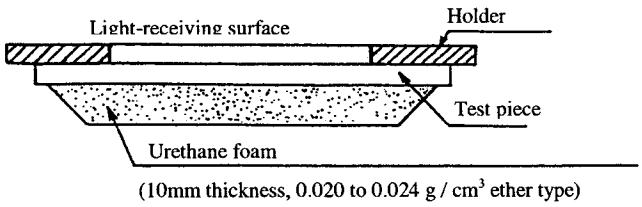
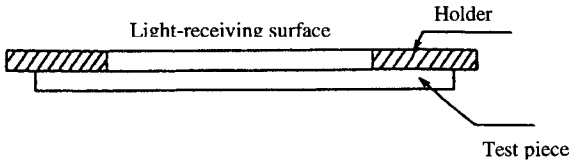
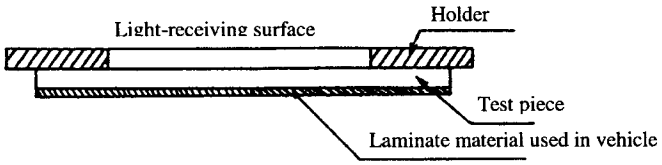
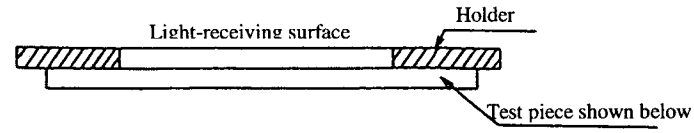
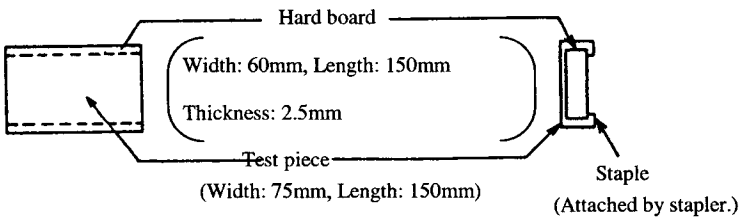
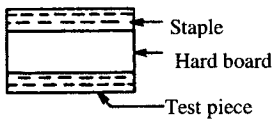
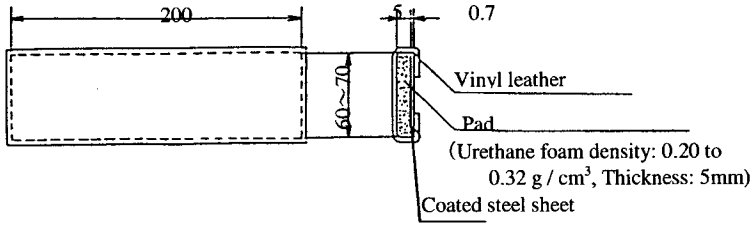
Table 38

		400	401	402
Scope	Method A	O	O	O
	Method B	O	O	O
	Method C		O	

7.23.1 Method A (Xenon arc lamp method)

(1) Preparation of test pieces Prepare test pieces from longitudinal direction, securing enough dimensions for min. 30 mm wide in irradiation area and min. 30 mm in length. The test pieces shall also be large enough to be set to holder as specified in Methods "a" to "d" shown in **Table 39**.

Table 39

	Test Piece Setting Condition to Test Piece Holder	
Method "a"	Lined with urethane foam Note: Stick the back side fast to the urethane foam.	 (10mm thickness, 0.020 to 0.024 g / cm^3 ether type)
Method "b"	Without lining Note: If it is laminate, exfoliate them for testing. Note: White cardboard may be attached to the back side to improve workability.	
Method "c"	Laminated as in vehicle:	
Method "d"	Lined with hard board: Note: Securely stick the hard board to the back side.	 (a) Surface Detail (b) Section  (c) Backside 
Method "e"	Lined with pad Note: Stick the test piece fully to the pad. Adhesive is specified separately.	

(2) Operation

1) Use xenon-arc-lamp type light-resistance tester ([28]) which satisfies the test conditions specified in **Table 40**.

Note ([28]) It shall have arc lamp emitting light by xenon-arc discharge, and be equivalent to the one specified in **JIS B 7754**.

Table 40

Item	Condition
Temperature setting	BPT. ([29]) 89 ± 3 °C
Humidity setting	50 ± 5 % RH
Irradiance	48 to 162 W/m² ([30]) (Within the range of 300 to 400 nm)
Irradiance ratio	320 nm or less irradiance shall be less than 1.5 % in the range of 300 to 400 nm.
Irradiation method	Continuous irradiation ([31])
Test duration control	Depending on radiant exposure ([32])

Notes ([29]) Abbreviation of "black panel temperature". This is the temperature indicated by a black panel thermometer is attached to the rack or disk. This is the temperature which represents the surface temperature.

([30]) ± 10 % of the set irradiance shall be maintained.

([31]) If continuous irradiation deteriorates test efficiency remarkably, it is allowed to apply light and dark cycle (after 3.8 hours irradiation, light turned off for 1 hour). When the light and dark cycle is adopted, the temperature and humidity for the dark cycle shall be 38 ± 3 °C and 95 ± 5 %RH respectively, and the effective exposure time shall be the total duration of the light cycle. For leather, it is now allowed to apply the light and dark cycle.

([32]) Radiant exposure shall be calculated using the formula [6] below.

$E = I \times t \times C$ .....[6]

E = Radiant exposure (kJ/m²/nm)

I = Irradiance (W/m²/nm)

t = Exposure time (h)

C = Constant 3600 (s/h)

2) Carefully set the test piece to the test piece holder under one of the methods "a" to "d" described in **Table 39** so that the test piece does not come off ([33]).

Notes ([33])-1 When the test piece is a pile product whose fiber pattern has a fixed direction, set the test piece so that the fibers face downward.

([33])-2 The test piece shall be free from wrinkles and slackness.

([33])-3 It is desirable that the test piece surface matches the holder surface as shown in **Fig. 33**.

Fig. 33

3) Set the test piece holder to the rack or disk. ([34])

Notes ([34])-1 Set the test piece holder on the rack or disk so that no clearance is left between them. If there is any test piece holder without test piece, attach a white cardboard, aluminum sheet, stainless sheet, etc. to all the holders in order to keep a thermal equilibrium state in the test chamber.

([34])-2 Change the test piece position at the specified interval to improve the test accuracy.

4) Irradiate the test piece as specified in "Color fastness to light (xenon arc lamp method)" in **Table 2** of **MES MN 400**, **Table 3** of **MES MN 401**, and **Table 2** of **MES MN 402**. Then keep the test piece at room temperature for at least 1 hour.

5) Visually compare the discoloration and fading of the test piece with non-irradiated product and judge it in accordance with **Table 37** using a grey scale for color-change assessment specified in **JIS L 0804**.

(3) Expression of test results (Test piece shall be submitted.) Show the color fastness to light with grades.

7.23.2 Method B (Carbon arc lamp method)

(1) Preparation of test pieces Prepare test pieces for longitudinal direction, having irradiation area of 30 mm or more in width and 30 mm more in length securing enough dimensions to be set to holder following Methods "a" to "d" shown in **Table 39**.

(2) Operation

1) Use glass-enclosed carbon-arc-lamp-type light resistance tester which is specified in **JIS L 0842**.

2) Set the test piece to the test piece holder under one of the conditions for Methods "a" to "d" so that the test piece does not come off. ([33])

3) Set the test piece holder to the rack or disk. ([34])

4) Irradiate the test piece as specified in "Color fastness to light (carbon arc lamp method)" in **Table 2** of **MES MN 400**, **Table 3** of **MES MN 401**, or **Table 2** of **MES MN 402**. Then keep the test piece at room temperature for at least 1 hour.

5) Visually compare the discoloration and fading of the test piece with non-irradiated product and judge it in accordance with **Table 37** using a grey scale for color-change assessment specified in **JIS L 0804**.

(3) Expression of test results (Test piece shall be submitted.) Show the color fastness to light with grades.

7.23.3 Method C (Weathermeter method)

(1) Preparation of test pieces Prepare 2 test pieces from longitudinal direction which have irradiation area of 30 mm or more in width and 30 mm more in length, securing enough dimensions to be set to holder following Method "e" shown in **Table 39** ([35]).

Note ([35]) Test piece shall be big enough to be tested on color fastness to rubbing after irradiation.

(2) Operation

1) Use sunshine carbon arc lamp system weatherability tester specified in **section 5.4** of **JIS D 0205**.

2) Set the test piece to the test piece holder under the condition of Method "e" shown in **Table 39** so that the test piece does not come off. ([33])

3) Set the test piece holder to the rack or disk. ([34])

4) Subject the test piece to irradiation for 1000 hours. Then keep the test piece at room temperature for at least 1 hour.

5) Visually compare the discoloration and fading of the test piece with non-irradiated product and judge it in accordance with **Table 37** using a grey scale for color-change assessment specified in **JIS L 0804**.

Check for blooming and adhesion on the surface after assessing change in color. Then, cut the test piece (which has been peeled off from the pad), perform the color fastness to rubbing - dry following **section 7. 21** - Method A, and judge staining in accordance with **Table 35**.

(3) Expression of test results (Test piece shall be submitted.) Show the color fastness to light with grades.

7.24 Light aging resistance The scope is as shown in **Table 41**.

Table 41

		400	401	402
Scope	Method A	Fabric, unwoven fabric	O	O
	Method B	Rear package		
	Method C		O	O

7.24.1 Method A (Tearing strength method)

(1) Preparation of test pieces Concerning materials specified in Method A of **Table 41**, prepare 1 test piece from longitudinal and lateral directions respectively, conforming to the scope and setting conditions specified in the test item "Color fastness to light (xenon arc lamp method, carbon arc lamp method, weathermeter method)" shown in **Table 2** of **MES MN 400**, **Table 3** of **MES MN 401**, or **Table 2** of **MES MN 402**.

(2) Operation

1) Irradiate each test piece under the same conditions (tester, temperature, radiant exposure, and duration) as those for the color fastness to light. Then leave the test pieces at room temperature for at least 1 hour.

2) For test pieces other than that for vinyl without ground fabric, cut them to have dimensions for tearing strength test piece ([36]) specified in **section 7.6.1** - Method A (Trapezoid method). For test piece for vinyl without ground fabric, cut it to have dimensions for tearing strength test piece ([36]) specified in **section 7.6.2** - Method B (90° method). Perform tearing strength test and obtain an average of the maximum values that led up to the damage of the test piece.

Note ([36]) Part to be torn shall have been irradiated.

3) Tearing strength change rate shall be calculated by using the formula [7] below.

$$\text{Tearing strength change rate}\,(\%) = \frac{|T_0 - T_1|}{T_0} \times 100 \cdots\cdots [7]$$

T_0 = Tearing strength before exposure to light aging (N)

T_1 = Tearing strength after exposure to light aging (N)

(3) Expression of test results Express the absolute value in N and the change rate in %, for longitudinal and lateral directions respectively. They shall be obtained to digit of integer.

7.24.2 Method B (Tape peeling method)

(1) Preparation of test pieces Concerning fabric, carpet, and unwoven fabric used for rear package specified in Method B of **Table 41**, prepare 1 test piece conforming to the scope and setting condition specified in the test item "Color fastness to light (Xenon arc lamp method, carbon arc lamp method) in **Table 2** of **MES MN 400**.

(2) Operation

1) Irradiate each test piece under the same conditions as those for the color fastness to light (Tester, temperature, radiant exposure and duration). Then leave the test pieces at room temperature for at least 1 hour.

2) Affix clear adhesive tape (3M scotch 810 Mending tape®) on the surfaces of test pieces in longitudinal direction before and after exposure to light aging, respectively. Rapidly peel off the tape.

3) Compare the test pieces before and after the light aging exposure on deteriorated fibers adhering on the tape, and judge in accordance with **Table 18**.

(3) Expression of test results Express the light aging resistance with grades (grade may be indicated in 0.5 → e.g. Grade 4.5).

7.24.3 Method C (Bending method)

(1) Preparation of test piece From the materials specified in Method C of **Table 41**, prepare 1 test piece conforming to the scope and setting condition specified in the test item "Color fastness to light (Xenon arc lamp method, carbon arc lamp method, weathermeter)" in **Table 2** of **MES MN 400**, **Table 3** of **MES MN 401**, or **Table 2** of **MES MN 402**.

(2) Operation

1) Irradiate each test piece under the same conditions as those for the color fastness to light (Tester temperature, radiant exposure, and duration). Then, keep them at room temperature for at least 1 hour.

2) In longitudinal and lateral directions, bend the test piece 180° to the surface side and 180 ° to the backside 3 times respectively. Then check for cracks.

(3) Expression of test results Show the results by either "Crack is found." or " No crack is found."

7.25 Color fastness to heat The scope is as shown in **Table 42**.

Table 42

	400	401	402
Scope	O	O	

(1) Preparation of test piece Prepare 1 test piece measuring 100 mm in width and 100 mm in length.

(2) Operation

1) Hang the test piece in a Geer air oven (^{10}) at 120±2°C for 500 hours.

2) Take the test piece out of the oven, leave it at room temperature for at least 1 hour.

3) Visually compare the test piece with non-treated product on discoloration and fading using a grey scale for color-change assessment specified in **JIS L 0804**, and judge it in accordance with **Table 37**.

(3) Expression of test results (Test piece shall be submitted.) Show the color fastness to heat with grades.

7.26 Chemical resistance The scope is as shown in **Table 43**.

Table 43

		400	401	402
Scope	Method A		O	
	Method B		O	

7.26.1 Method A (Acid and alkali method)

(1) Preparation of test pieces Prepare 1 test piece of 50 mm wide and 100 mm long.

(2) Operation

1) Carefully drop 0.5 cm^3 each of hydrochloric acid (HCl) ([37]), nitric acid (HNO3) ([38]) and sodium hydroxide (NaOH) ([39]) solutions of 0.5 normal concentration on the test piece surface respectively so that they do not overlap each other on the test piece surface.

Notes ([37]) Use Grade 1 or higher hydrochloric acid specified in **JIS K 8180**.

([38]) Use Grade 1 or higher nitric acid specified in **JIS K 8541**.

([39]) Use Grade 1 or higher sodium hydroxide specified in **JIS K 8576**.

2) After leaving the test piece for 24 hours, rinse it with water and dry it. Visually check for discoloration at the solution-dropped part.

(3) Expression of test results (Test piece shall be submitted.) Show the chemical resistance by either "No abnormality found" or "Abnormality found."

7.26.2 Method B (Hydrogen sulphide method)

(1) Preparation of test piece Prepare 1 test piece of 50 mm wide and 100 mm long.

(2) Operation

1) Immerse the test piece in saturate aqueous solution ([40]) at normal temperature for 15 minutes.

Note ([40]) Saturate aqueous solution shall be made by passing hydrogen sulphide gas through 100 to 150 cm^3 distilled water for 5 minutes.

2) Take out the test piece, rinse it with water, and dry it. Visually compare the test piece with non-treated product, and judge in accordance with **Table 18**.

(3) Expression of test results (Test piece shall be submitted.) Express the chemical resistance with grades (Grade may be indicated in 0.5 points. e.g., Grade 4.5).

7.27 Bleeding resistance The scope is as shown in **Table 44**.

Table 44

	400	401	402
Scope			○

(1) Preparation of test piece Prepare 1 test piece of 60 mm wide and 90 mm long.

(2) Operation

1) Overlay white soft PVC leather ([41]) (60 mm × 60 mm) on the test piece so that the surfaces face to each other. Place a glass plate (60 mm × 60 mm) on them.

Note ([41]) Soft PVC leather shall be unexpanded pear grain PVC leather containing at least 40 wt% of D. O. P. (Dioctyl phthalate) with D. O. P. only as plasticizer.

2) While applying a load of 9.8 N on the glass plate, heat them in an air oven adjusted to 80±2 °C for 4 hours. Check transfer of the color of the leather to the white PVC leather using a staining-assessment grey scale specified in **JIS L 0805** and judge in accordance with **Table 35**.

(3) Expression of test results (Test piece shall be submitted.) Show the bleeding resistance with grades.

7.28 Dimensional variation rate The scope is as shown in **Table 45**.

Table 45

		400	401	402
Scope	Method A-a	Carpet, unwoven fabric		
	Method A-b		Exterior roof	
	Method B-a	Other than fashioned carpet and fashioned unwoven fabric	Other than exterior roof	○
	Method B-b		Exterior roof	
	Method B-c	Fashioned carpet, fashioned unwoven fabric		
	Method C	Fabric	○	○
	Method D	Fashioned carpet, fashioned unwoven fabric		

(1) Preparation of test pieces Take 2 test pieces, which measure 250 mm in width and 250 mm in length, and draw reference lines as shown in **Fig. 34**.

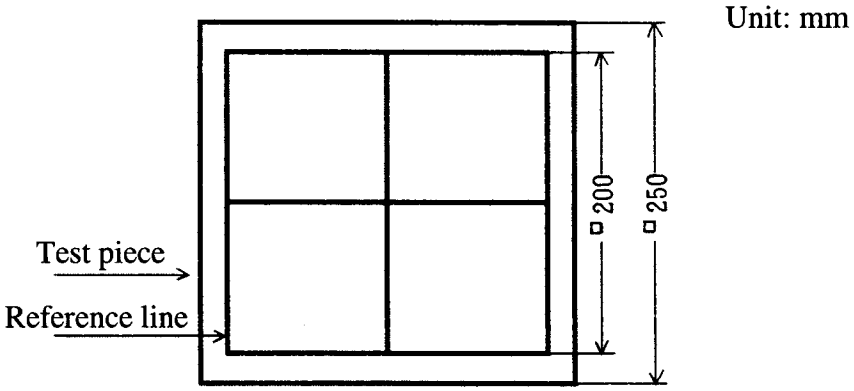


Fig. 34

(2) Operation

1) Apply treatment on the test piece under the conditions specified in **Table 46**.

2) Measure 3 reference lines in longitudinal and lateral directions respectively to the nearest 0.1 mm. Regard the average of 3 measurements for each longitudinal and lateral direction as the reference line after the test [ℓ_1].

3) Dimensional variation rate shall be calculated using the formula [8] below.

$$\text{Dimensional variation rate (\%) } (^{42}) = \frac{\ell_1 - 200}{200} \times 100 \cdots\cdots [8]$$

ℓ_1= length of reference line after test (mm)

Note (^{42}) When dimension is shrunk, it shall be indicated with – (minus), and if elongated, with + (plus).

Table 46

Category	Method	Sub category	Treatment Condition	Handling after Treatment
Method A	Immersion in water	Method "a"	Immerse in normal-temperature water for 30 minutes. (Keep test piece in a horizontal position.)	Air drying on air-dry stand
		Method "b"	Immerse in normal-temperature water for 24 hours. (Keep test piece in a horizontal position.)	
Method B	Heating	Method "a"	Place test piece in a horizontal position at 100±2 °C for 1 hour.	Immediately
		Method "b"	Place test piece in a horizontal position at 100±2 °C for 10 days.	
		Method "c"	Place test piece in a horizontal position at 150±2 °C for 10 minutes.	
Method C	Humid heating	-	Place test piece in a horizontal position at 50±2 °C and 95±3 % RH for 4 hours.	Immediately
Method D	Cold resistance		Place test piece in a horizontal position at – 30±2 °C for 4 hours.	

(3) Expression of test results Express the dimensional variation rate in the average of the two test pieces, obtained to the first decimal place for longitudinal and lateral directions respectively.

7.29 Heat aging of backing material The scope is as shown in **Table 47**.

Table 47

	400	401	402
Scope	O		

(1) Preparation of test piece Prepare 1 test piece of 60 mm wide and 70 mm long.

(2) Operation

1) Keep the test piece in a Geer air oven ([10]) of 100±2 °C for 4 days and then return to room temperature.

2) In the longitudinal and lateral directions, bend the test piece 180° to the surface side and 180° to the backside 3 times respectively.

3) Check for crack, adhesion and other abnormal conditions on the backing material (laminate material such as PVC or urethane) and judge it in accordance with **Table 18**.

(3) Expression of test results (Test piece shall be submitted.) Show the heat aging of backing material with grades.

7.30 Loss on heating The scope is as shown in **Table 48**.

Table 48

	400	401	402
Scope		○	

(1) Preparation of test pieces Prepare 3 test pieces, which measure 100 mm in width and 100 mm in length.

(2) Operation

1) Keep the test piece in a Geer air oven ([10]) of 100 ± 2 °C for 30 minutes.

2) After taking the test piece out of the oven, keep it in a desiccator (without desiccating agent) at room temperature for 1 hour. Measure the mass of the test piece to the nearest 1 mg [W_0].

3) Heat the test piece under the condition specified in **Table 49**. Immediately after taking the test piece out of the oven, keep it in the desiccator at room temperature for 1 hour. Measure the test piece mass to the nearest 1 mg [W_1].

4) Loss on heating (g/m²) and loss rate (%) shall be calculated using the formulas [9] and [10] respectively.

Loss on heating (g/m²) = $(W_0 - W_1) \times 100$.....[9] 48 hours heating

$$\text{Loss rate } (\%) = \frac{W_0 - W_1}{W_0} \times 100 \text{.....[10]}$$ 240 hours heating

W_0 = Mass before heating (g)

W_1 = Mass after heating and cooling (g)

Table 49

Applied Part / Heating Condition	Exterior Roof	Rear Package	Other than Exterior Roof and Rear Package
100 °C × 48 hours			○
120 °C × 48 hours		○	
100 °C × 240 hours	○		

(3) Expression of test results Show the loss on heating using the average of the three test piece, obtained to the first decimal place.

7.31 Stickiness The scope is as shown in **Table 50**.

Table 50

	400	401	402
Scope		○	

(1) Preparation of test pieces Prepare 2 test pieces, which measure 60 mm in width and 90 mm in length.

(2) Operation

1) Place the test pieces between two 60 mm-square glass plates with their surfaces face to each other, so that one side of the glass plate is in line with one side of the test piece width.

2) Place 3 kg weight on the glass plates and leave them in an air oven at 80±2 °C for 24 hours.

3) Remove the weight and cool them at room temperature for 1 hour and peel the test pieces softly.

4) Check for damage on the surface and judge in accordance with **Table 51**.

(3) Expression of test results (Test piece shall be submitted.) Show the stickiness with grades.

Table 51

Grade	Criterion
5	No stickiness is found.
4	A little stickiness is observed but test pieces can be peeled off easily.
3	Stickiness is seen clearly but test pieces can be peeled off without damage.
2	Stickiness is rather remarkable and the test pieces are damaged by peeling.
1	Stickiness is remarkable and the test pieces are severely damaged by peeling.

7.32 Cold resistance The scope is as shown in **Table 52**.

Table 52

		400	401	402
Scope	Method A		○	○
	Method B			

7.32.1 Method A

(1) Preparation of test pieces

1) Take 2 samples, which measure min.100 mm in width and min.100 mm in length, and leave them in Geer air oven ([10]) of 100 ± 2 °C for 48 hours.

2) Take 3 test pieces, which measure 20 mm in width and 100 mm in length from longitudinal and lateral directions respectively, excluding the both ends.

(2) Operation

1) Use a cold resistance test device specified in **section 7.9** of **JIS K 6772**, as shown in **Fig. 35**.

2) Keep the low-temperature chamber of the cold resistance test device at – 20 °C or – 30 °C ([43]).

Note ([43]) Pour mixture of methanol specified in **JIS K 1501** and water in the low-temperature chamber, and cool the chamber down to the specified temperature with dry ice.

3) Clearance between the bottom plate of falling weight ([44]) and the anvil shall be 50 mm.

Note ([44]) The mass of the falling weight (including weight) shall be 2.5 kg.

4) Overlap both longitudinal ends of the test piece with the surface facing outside. Set approximately 5 mm end of the test piece to the clamp of the test piece holder.

5) Set the test piece holder to the cold resistance test device so that bending part of the test piece locates at the center of the anvil.

6) After 5 minutes, press the button to disengage the pawl of the supporting stand and drop the falling weight.

7) Immediately pull up the falling weight and take off the test piece holder. Remove the test piece and check for cracks.

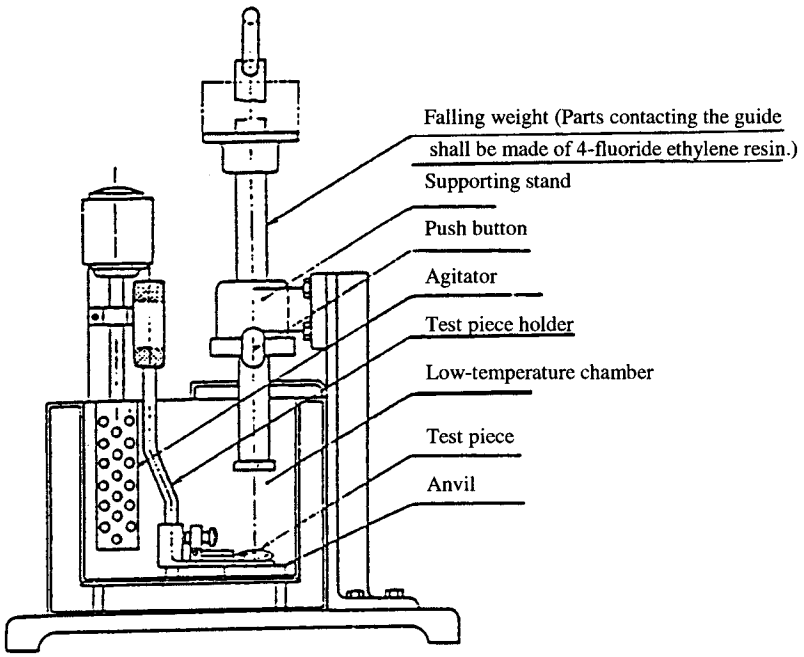


Fig. 35

(3) Expression of test results (Test piece shall be submitted) Express the cold resistance by either "No crack is found." or "Crack is found."

7.32.2 Method B

(1) Preparation of test piece Take 1 sample of 100 mm in width and 100 mm in length and leave it in a Geer air oven ([10]) of 100±2 °C for 240 hours. Create a test piece as shown in **Fig. 36**.

Unit: mm

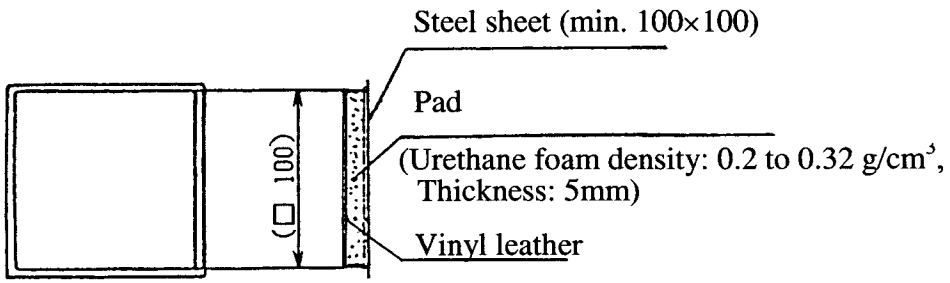


Fig. 36

(2) Operation

1) Set a ball impact tester (Dupon impact tester) specified in **section 5-3** of **JIS K 5600** in a low-temperature chamber at – 20°C or – 30 °C.

2) Pull up the falling weight ([45]) by 300 mm.

Note ([45]) The falling weight shall be a sphere of 100 g mass and 12.7 mm diameter.

3) Set the test piece to the tester with the surface facing upward and keep it for 30 minutes.

4) Drop the falling weight on 3 different places of the test piece and check for crack.

(3) Expression of test results (Test piece shall be submitted.) Show the results by either "No crack found" or "Crack found."

7.33 Fire retardancy The scope is as shown in **Table 53**.

Table 53

	400	401	402
Scope	O	O	O

(1) Preparation of test pieces
(2) Measurement
(3) Expression of test results
} Conform to **MES CF 050**.

7.34 Haze value The scope is as shown in **Table 54**.

Table 54

		400	401	402
Scope	Method A	Seat	Other than rear package	O
	Method B	Rear package	Rear package	

(1) Preparation of test pieces Prepare 5 circular test pieces of ϕ70 mm.

(2) Measurement

1) Place a test piece with the surface facing upward in a beaker of the haze value test device shown in **Fig. 37**.

2) Place a stainless-steel lid which has a 40mm-diameter round hole. On the hole, place a transparent glass plate (Haze value: 1 % or less) which measures 50mm in length, 50mm in width and 3 to 5mm in thickness.

3) Heat them in an oil basin under the condition specified in **Table 55**.

4) Using an integrating sphere type light transmittance measuring equipment specified in **JIS K 7105** and shown in **Fig. 38**, measure haze value at 3 points round the mostly-hazing part of the glass plate according to the process shown in **Table 56**.

5) Calculate the haze value using the formula [11] below. Regard the average of the 3 measurements as the measured value for 1 test piece.

$$\text{Haze value}(\%) = \frac{T_4}{T_2} - \frac{T_3}{T_1} \times 100 \cdots\cdots [11]$$

Unit: mm

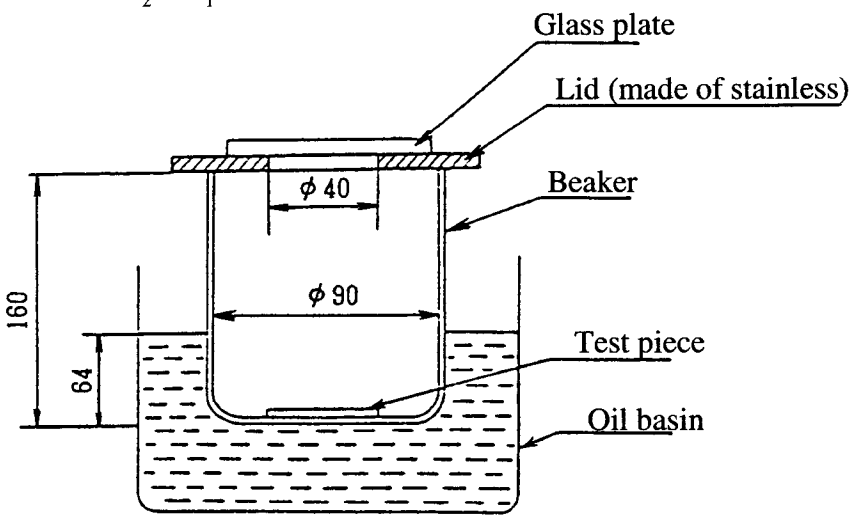


Fig. 37

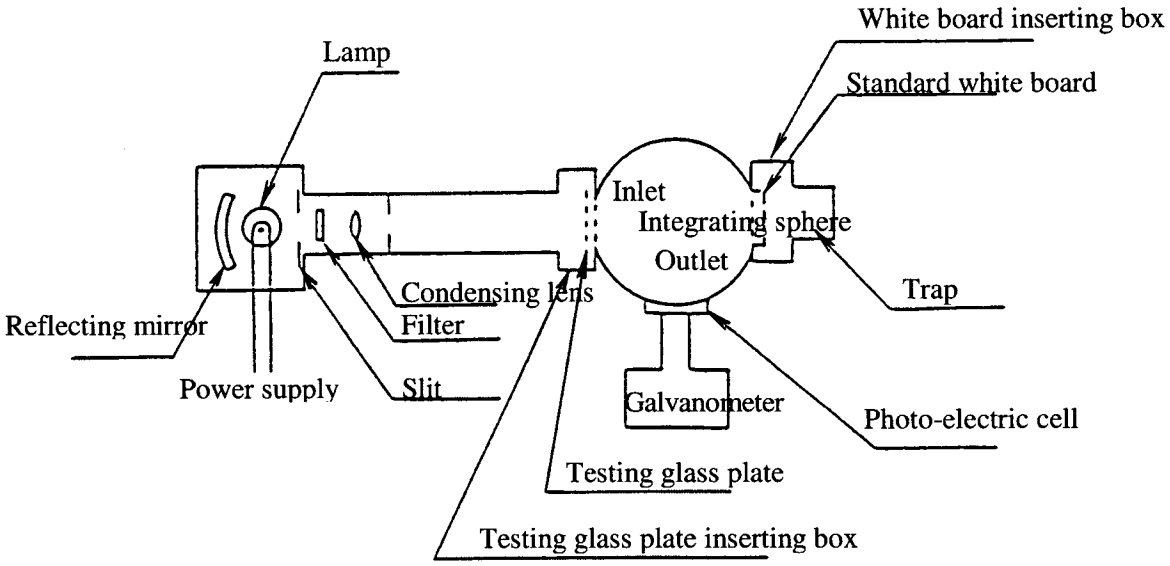


Fig. 38

Table 55

	Temperature °C	Duration h
Method A	100 ± 2	7
Method B	120 ± 2	

Table 56

Procedure	Mounting of Glass Plate	Mounting of Trap	Mounting of Standard White Board	Reading of Galvanometer	Obtainable Light
1	No	No	Yes	T_1 (Set to 100.)	Incident light
2	Yes			T_2	Total light transmittance
3	No	Yes	No	T_3	Light scattered by equipment
4	Yes			T_4	Light scattered by equipment and glass plate

(3) Show the average of the 5 test pieces obtained to digit of integer.

7.35 Electrification The scope is as shown in **Table 57**.

Table 57

	400	401	402
Scope	Fabric		○

(1) Preparation of test pieces Prepare 3 test pieces, which measure 50 mm in width and 80 mm in length, from longitudinal and lateral directions respectively.

(2) Operation

1) Prepare 6 friction clothes ([47]) which measure 25 mm in width ([46]) and approximately 150 mm in length.

Notes ([46]) The width of friction cloth shall be smaller than the hollow part of a test piece clamping frame so that the friction cloth contacts the test piece.

([47]) Wool friction cloth (No. 1) specified in **JIS L 0803** shall be used. It shall be renewed for every test and shall not be reused.

2) Leave the test piece and the friction cloth at 20±2 °C and 40±2 % RH humidity for 24 hours or more and perform the test in that atmosphere.

3) Connect an oscilloscope or recorder to an electrostatic potential tester specified in **section 5.2.1** of **JIS L 1094**. Set the distance between the electrode of the voltage-receiving section and the test piece mounting frame to approximately15 mm.

4) Discharge electricity of the test piece and friction cloth with an electrostatic discharger ([48]).

Note ([48]) Use self-discharging type or potential compensator.

5) Then, set the friction cloth at the position **1)** of the electrostatic potential tester shown in **Fig. 39** and adjust it ([49]) as specified in **Fig. 42**. Apply 4.9N load, and set the test piece to one place of the mounting frame so that the test piece surface can be rubbed as shown in **Fig. 43** ([50]).

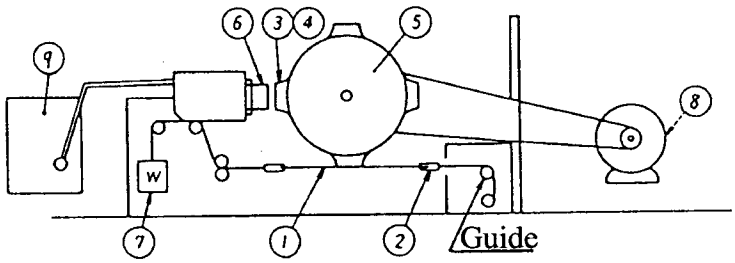
Notes ([49]) Applying 4.9N load to the friction cloth without the test piece, adjust the clamp height for both right & left so that friction can be caused smoothly. If the test piece is remarkably thick, adjust the clamp height to match the test piece thickness.

([50]) Affix adhesive two-sided tape on both sides of the mounting frame. Mount the test piece in line with the curve of the mounting frame pulling in the arrow direction to avoid loosening, and fix it with the clamp frame.

6) Rotate the rotating drum to give friction to the test piece. After 3 minutes, measure electrification voltage (V).

Remarks **1.** If the test piece has strip conductive fibers at constant intervals, measured value may vary depending on the test-piece-taking method. As a rule, therefore, test piece shall be taken so that the conductive fibers are at the center of the test piece as shown in **Fig. 44**.

2. Before the test, the electrostatic potential tester shall be calibrated. Set the electrode for calibration [exposed area $(20 \pm 1) \times (25 \pm 1)$ mm] to the test piece mounting part, and apply (+) 100V or (+) 1000V of DC voltage for calibration. Rotate the rotating drum and calibrate the voltage-receiving area.



1) Friction cloth

2) Clamp of friction cloth (Width: 25±1 mm, distance between clamps: 130±3 mm)

3) Test piece mounting frame (See **Fig. 40.**)

4) Test piece clamping frame (See **Fig. 41.**)

5) Rotating drum (Outer diameter: 150±1 mm, width: approximately 60 mm, rotating speed: Approximately 400 rpm)

6) Voltage-receiving area (Electrode diameter: 20±1 mm)

7) Load (4.9 N)

8) Motor

9) Amplifier

Fig. 39

Unit: mm

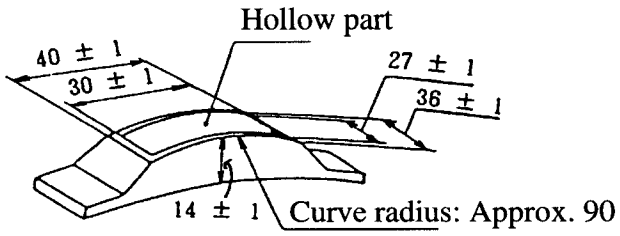


Fig. 40

Unit: mm

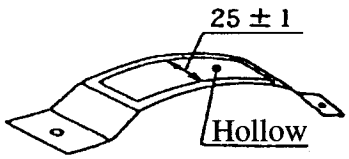


Fig. 41

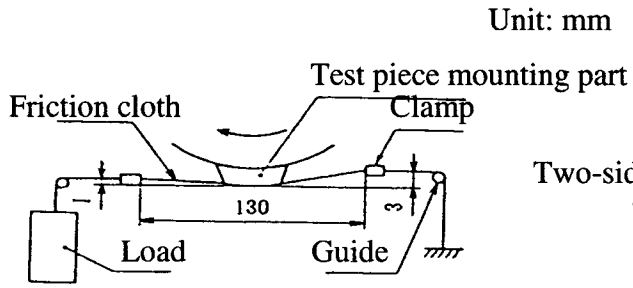


Fig. 42

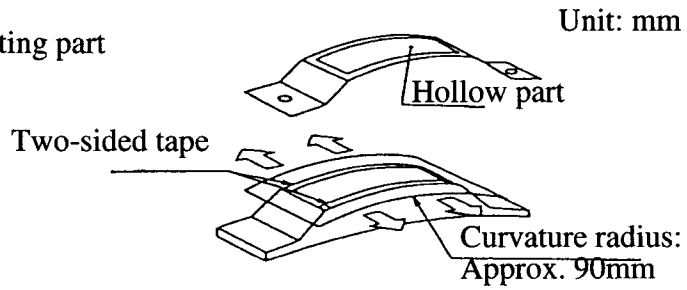


Fig. 43

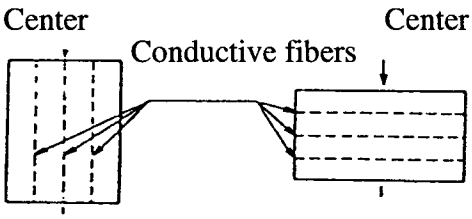


Fig. 44

(3) Expression of test results Express the electrification in an average of the three test pieces, obtained to digit of integer separately for longitudinal and lateral directions.

7.36 Air permeability The scope is as shown in **Table 58**.

Table 58

	400	401	402
Scope			

(1) Preparation of test pieces Prepare 3 test pieces, which measure 180 mm in width and 180 mm in length.

(2) Measurement

1) Set the test piece to a Frazir type tester shown in **Fig. 45** so that the surface faces upward to an end of the cylinder.

2) With the rheostat, adjust the suction fan so that the inclined barometer shows 125 Pa {12.7 mm H_2O} pressure on water column. Obtain the volume of air ($cm^3/cm^2 \cdot s$) which passes through the test piece by looking up the table attached to this tester according to the pressure indicated by the vertical barometer and the type of air orifice.

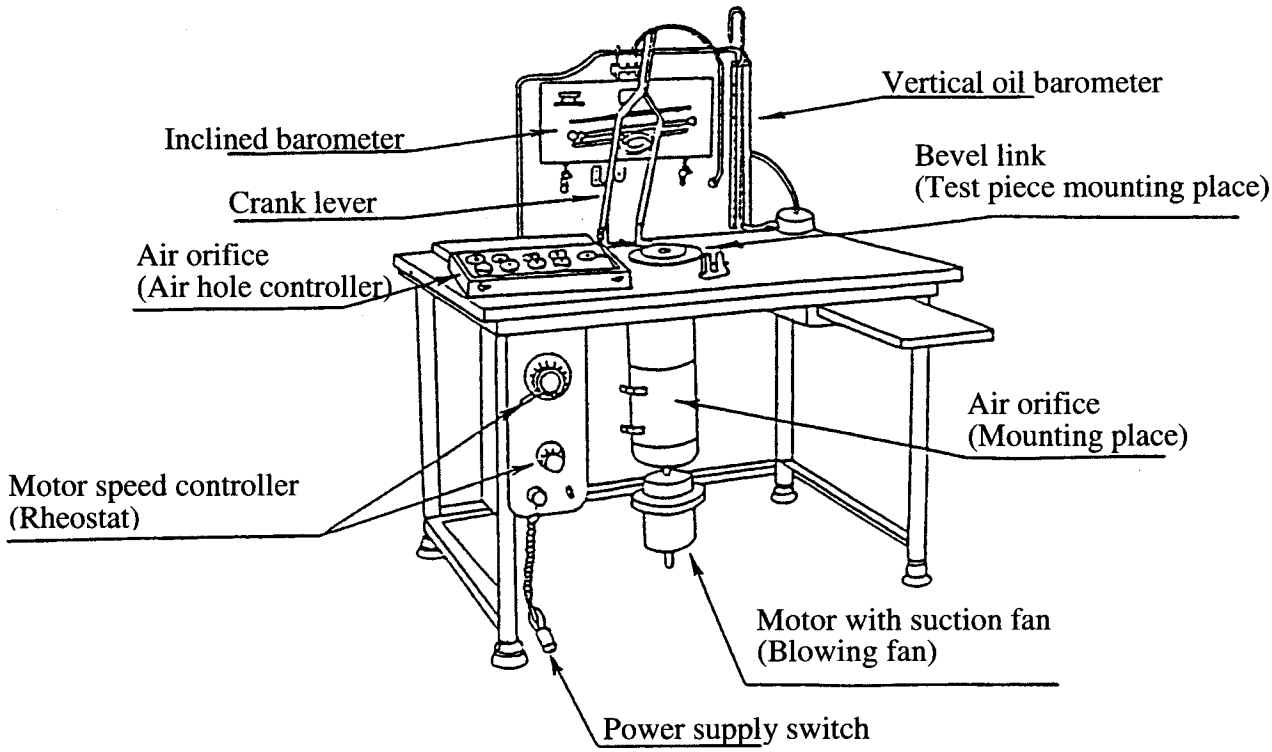


Fig. 45

(3) Expression of test results Express the air permeability in an average of the three test pieces, obtained to digit of integer.

7.37 Odor The scope is as shown in **Table 59**.

Table 59

	400	401	402
Scope			O

(1) Preparation of test piece Prepare 1 test piece, which measures 100 mm in width and 100 mm in length.

(2) Measurement

1) Place the test piece in a sealed container of 1 to 1.5 L in volume. Heat them in an air oven adjusted to 100±2 °C for 10 minutes. Take them out of the oven and check immediately for pungent or unpleasant odor caused by plasticizer, stabilizer or other substances.

2) Judgment shall be made in accordance with **Table 60**.

Table 60

Grade	Criterion
5	No odor
4	Slight odor
3	Odor is recognized but it is not unpleasant.
2	Odor is recognized and it is unpleasant.
1	Offensive odor

(3) Expression of test results Express the odor with grades.

7.38 Mildew resistance The scope is as shown in **Table 61**.

Table 61

	400	401	402
Scope		○	

(1) Preparation of test piece Prepare 1 test piece, which measures 70 mm in width and 150 mm in length.

(2) Measurement

1) Hang the test piece in a box specified in **section 5.34** of **JIS K 2246** (Humidity test), and leave it at 40±1 °C and min. 95 % relative humidity for 90 days.

2) Check for mildew on the test piece surface.

(3) Expression of test results Express the mildew resistance by either "Mildew is found." or "No mildew is found".

8. Revision of Standard

The MES revision shall be made in accordance with MES Suggestion Sheet.

9. Indication Methods on Specification Drawing

The test methods for fabrics, carpets, unwoven fabrics, vinyl and leather shall conform to **MES MN 405**.

Remark Although the suffix which indicates revision is not included on the drawing, the supplier shall refer to the MES with the latest revision.

10. Applicable Standards

Refer to the latest editions for applicable standards.

JIS B 7503	Dial Gauges
JIS B 7754	Light-exposure and light-and-water-exposure apparatus (Xenon-arc lamp type)
JIS B 9076	Needles for industrial sewing machines
JIS D 0205	Test Method of Weatherability for Automotive Parts
JIS K 1501	Methanol
JIS K 1524	Methyl Ethyl Ketone
JIS K 2246	Rust Preventive Oils
JIS K 5600-5-3	Testing methods for paints—Part 5 : Mechanical property of filmSectitn 3 : Falling-weight test
JIS K 6772	Polyvinylchloride Coated Fabric
JIS K 7105	Testing Methods for Optical Properties of Plastics
JIS K 7212	General Rules for Tests for Thermal Ageing Properties of Thermoplastics in the Form of Sheet by Means of Ovens
JIS K 8150	Sodium Chloride
JIS K 8180	Hydrochloric Acid
JIS K 8355	Acetic Acid
JIS K 8541	Nitric Acid
JIS K 8576	Sodium hydroxide
JIS K 9019	Disodium Hydrogenphosphate 12-water
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 Revised in 1998
JIS L 0849	Test methods for colour fastness to rubbing
JIS L 0842	Test methods for colour fastness to enclosed carbon arc lamp light
JIS L 1058	Testing Methods for Snag of Woven Fabrics and Knitted Fabrics
JIS L 1094	Testing Methods for Electrostatic Propensity of Woven and Knitted Fabrics
JIS L 2511	Polyester sewing thread
JIS L 3102:1978	Cotton Canvas
JIS Z 8401	Rules for Rounding Off of Numerical Values
JIS Z 8703	Standard Atmospheric Conditions for Testing
MES CF 050	Flammability of Interior Parts
MES MN 400	Fabrics, Carpets and Unwoven Fabrics for Automobiles
MES MN 401	Vinyl Leather for Automobiles
MES MN 402	Leather for Automobiles

*Questions concerning Japanese Industrial Standards (JIS) may be addressed at any of the following:

AUSTRALIA (SAA)
Standards Australia
PO Box 5420
Sydney NSW 2001

AUSTRIA (ON)
Osterreichisches Normungsinstitut
Heinestrasse 38
1020 Vienna

CANADA (SCC)
Standards Council of Canada
270 Albert Street, Suite 200
Ottawa ON, K1P 6N7

FRANCE (AFNOR)
Association française de normalisation
11, avenue Francis de Pressensé
FR-93571 Saint-Denis La Plaine Cedex

GERMANY (DIN)
DIN Deutsches Institut für Normung
Burggrafenstrasse 6
DE-10787 Berlin

ITALY (UNI)
Ente Nazionale Italiano di Unificazione
Via Battistotti Sassi 11/b
1-20133 Milano

KOREA, Rep. of (KSA)
Korean Standards Association
13-31, Yoido-dong, Youngdungpo-gu
Seoul 150-010

NEW ZEALAND (SANZ)
Standards Association of New Zealand
155 The Terrace
Private Bag 2439
Wellington

SWITZERLAND (SNV)
Swiss Association for Standardization
Bürglistr. 29
8400 Winterthur

UNITED KINGDOM (BSI)
British Standards Institution
389 Chiswick High Road
GB-London W4 4AL

USA (ANSI)
American National Standards Institute
25 West 43rd Street , Fourth Floor
US-New York N.Y. 10036

***Questions concerning Japanese Automobile Standards (JASO) may be addressed at the following:**

Society of Automotive Engineers of Japan, Inc.
10-2, Goban-cho, Chiyoda-ku
Tokyo 102-0076
Japan