Nissan Engineering Standard

N E S	Testing Methods of Genuine Leather and Polyurethane Leather and Polyvinylchloride Coated Fabric for Automobiles

Contents

Normative References and References: See page 56.

1. Scope

This Standard stipulates methods for testing natural leathers (referred to as genuine leather hereafter) and polyurethane leathers used for seats, consoles, doors, instrument panels and linings of automobiles, and vinyl leather cloths used for seats, consoles and linings.

Remarks:

1. Polyurethane leather refers to materials composed of urethane sheets layered over foundation cloths.
2. The units and numerical values noted in { } are based on conventional units and are appended for informative reference.

2. Test method types

This Standard specifies 43 test methods shown in Table 2-A. The table also shows examples of application. Refer to M7109 Seat/Door Genuine Leather and Polyurethane Leather and Polyvinylchloride Coated Fabric for Automobiles for the types.

Table 2-A

	Genuine leather									Polyurethane leather		Vinyl leather cloth			
	NL1-1	NL1-2	NL1-3	NL2	NL3	NL4	NL5	NL6	NL7	UL1	UL2	VL1	VL2	VL3	VL4
	S/D	S/D	S/D	S/D	S/D	S/D	S/D	S/D	S/D	Seat	Door	Roof trim	Seat gusset	Seat insert	Console
4. Roll width measurement method	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○
5. Roll length measurement method	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○
6. Thickness measurement	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
7. Weight measurement method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
8. Bending strength test method	○	○	○	○	○	○	○	○	○	-	-	-	-	○	-
9. Acidity test method	○	○	○	○	○	○	○	○	○	-	-	-	-	-	-
10. Appearance test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
11. Tensile strength and elongation test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
12. Tearing strength test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
13. Seam strength test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
14. Seam fatigue test method	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○
15. Elongation under constant load and residual elongation test method	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○
16. Peeling resistance test method	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○
17. Scratch resistance test method	○	○	○	○	○	○	○	○	○	-	-	-	-	-	-
18. Crumpling resistance test method															
18.1 Crumpling resistance test method I	○	○	○	○	○	○	○	○	○	○	○	-	-	○	○
18.2 Crumpling resistance test method II	-	-	-	-	-	-	-	-	-	-	-	-	(○)	○	○
18.3 Crumpling resistance test method III	-	-	-	-	-	-	-	-	-	-	-	-	(○)	(○)	(○)
19. Abrasion resistance test method															
19.1 Abrasion resistance test method I	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
19.2 Abrasion resistance test method II															
19.2.1 Method II-1	○	○	○	○	○	○	○	○	○	-	-	-	-	-	-
19.2.2 Method II-2	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○
19.3 Abrasion resistance test method III	○	○	○	-	-	-	-	-	-	○	-	-	-	○	○
19.4 Abrasion resistance test method IV	○	○	○	-	-	-	-	-	-	-	-	-	-	-	-
20. Friction resistance test method (Gakushin friction test method)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
21. Test method for color fastness to dry rubbing	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
22. Test method for color fastness to wet rubbing	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
23. Wet cloth friction color fastness test method	○	○	○	○	○	○	○	○	○	-	-	-	-	-	-
24. Denim material color transfer resistance test method	○	○	○	○	○	○	○	○	○	○	○	-	○	○	○
25. Adhesion test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
26. Thermal aging test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
27. Heat shrinkage test method	-	-	-	-	-	○	-	○	-	○	○	○	○	○	○
28. Heat-humidity cycle test method	(○)	(○)	(○)	-	-	○	-	○	-	-	-	-	-	-	-
29. Volatilization loss test method	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○
30. Fog resistance test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
31. Cold resistance test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
32. Light resistance test method															
32.1 Discoloration and fading	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
32.2 Property deterioration	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
33. Bleed resistance test method	○	○	○	○	○	○	○	○	○	-	-	-	-	-	-
34. Sliding friction test method	○	○	○	-	-	-	-	-	-	○	-	-	○	○	○
35. Cleanability test method	○	○	○	○	○	○	○	○	○	-	-	-	-	-	-
36. Chemical resistance test method	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○
37. Flammability test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
38. Odor test method	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
39. Sweat abrasion and peel resistance test method	-	-	-	-	-	-	-	-	-	(○)	○	-	-	(○)	(○)
40. Flex resistance test method	-	-	-	-	-	-	-	-	-	○	(○)	-	-	(○)	(○)
41. Soil resistance test method	○	○	○	○	○	○	○	○	○	○	○	-	○	○	○
42. BLC test method	-	○	○	-	-	-	-	-	-	-	(○)	-	-	-	-

Remark:

O: Conduct test. (O): Conduct test if necessary.

3. General test conditions

3.1 Test room conditions

3.1.1 Table 3-A defines the standard test condition and the room temperature condition.
The tests shall be conducted under either the standard or room temperature condition as instructed for each test.

Table 3-A: Standard condition and room temperature condition

	Standard condition	Room temperature condition
Polyurethane leather	Standard condition: Standard temperature 23°C Class 2 (Temperature 23 ±2°C) and standard humidity 50% Class 5 (Humidity: 50 ±5%) as per JIS Z 8703.	Temperature: 15 ~ 30°C, Relative humidity: 40 ~ 80%
Vinyl leather cloth		
Genuine leather	Temperature at 20°C with a tolerance of Temperature Class 2 (18 ~ 22°C) and humidity at 65% RH with a tolerance of Humidity Class 5 (60 ~ 70% RH) as per JIS Z 8703 (Standard condition of test site).	

Remark:
Before conducting a test, the test pieces shall be left to stand in the test room adjusted to the standard condition until they reach a constant temperature. If it is difficult to adjust the test room to the standard condition, the test shall be conducted using test pieces freshly taken out of a constant temperature constant humidity chamber adjusted to the standard condition after being left for 72 h. In such cases, the temperature and humidity of the test room shall be recorded in the test result report.

3.2 Test pieces

3.2.1 Genuine leather test pieces

(1) Selvages and substandard sections
The test pieces shall be sampled from materials (in principle, longitudinally halved leather) excluding areas 10 mm from the selvages (ends) and substandard sections (ear and tail sections). (See Fig. 3-A.)

(2) Directions
If a sampling direction is specified, the test piece shall be cut out in parallel to the back line if longitudinal and vertically to the back line if lateral. (See Fig. 3-A.)

(3) Sampling areas

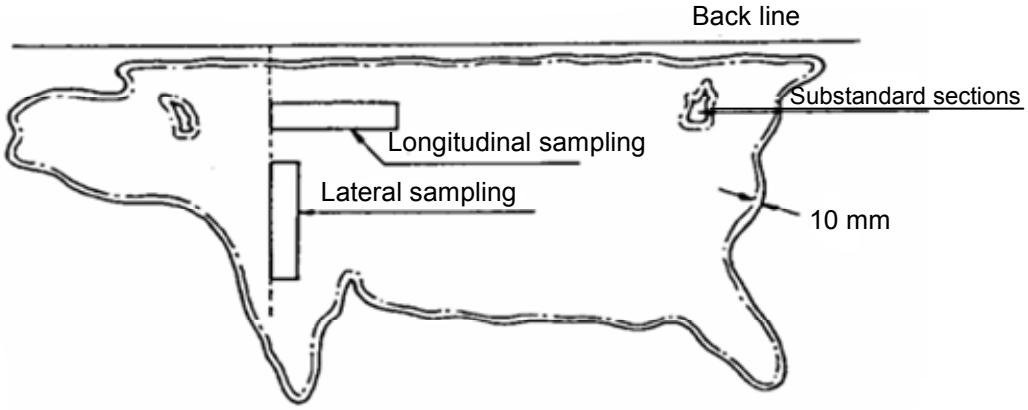


Fig. 3-A: Test piece sampling area

The test pieces shall be sampled from specified areas. If there are no instructions, they can be sampled from the remaining material. After the test, the areas the test pieces have been sampled from (A, B or C) shall be indicated on the test pieces.
See Fig. 3-B for definitions of areas.

Area A

$ik = \frac{1}{2} i\ell$

$jm = \frac{1}{2}$ jk

Area B

af = fd $\frac{1}{2}$ fg (ad = fg)

$Eg = \frac{1}{2}$ eh

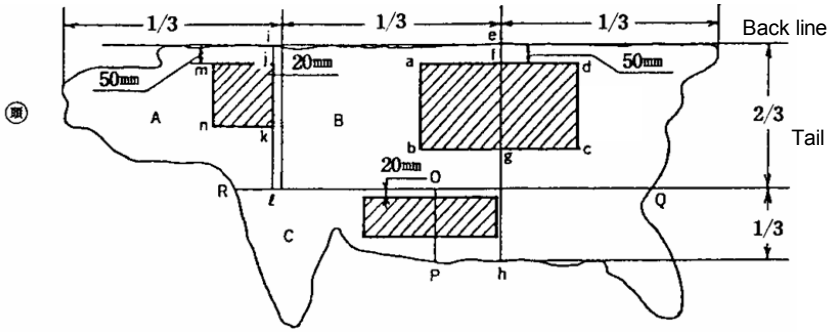


Fig. 3-B: Areas

Area C: QO = OR The sampling section shall be as close as possible to O.

3.2.2 Types of genuine leather test pieces

Table 3-B shows the types, shapes and dimensions of genuine leather test pieces. If there are no instructions, the sampling area shall be reported.

Table 3-B: Types, shapes and dimensions of genuine leather test pieces

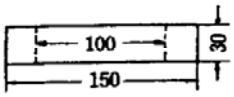
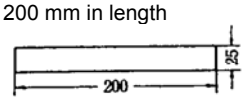
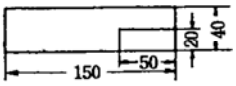
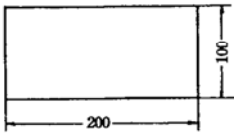
Type	Direction	Shape and dimension	Test	Sampling area and number of test pieces (Total)
Test piece No. 1	-	Sample (In principle, longitudinally halved leather)	Appearance test	—
Test piece No. 2	Longitudinal	Rectangle which measures 30 mm in width X 150 mm in length 	Thickness test Tensile strength and elongation test	A = 1, B = 3, C = 1 (5)
Test piece No. 3	Lateral			A = 1, B = 3, C = 1 (5)
Test piece No. 4	Longitudinal	Rectangle which measures 25 mm in width X 200 mm in length 	Bending strength test	A, B, C = 1 each (3)
Test piece No. 5	Lateral			A, B, C = 1 each (3)
Test piece No. 6	Longitudinal	Rectangle which measures 40 mm in width X 150 mm in length 	Tearing strength test method	A = 1, B = 3, C = 1 (5)
Test piece No. 7	Lateral			A = 1, B = 3, C = 1 (5)
Test piece No. 8	Longitudinal	Rectangle which measures 100 mm in width X 200 mm in length 	Seam strength test	(6)
Test piece No. 9	Lateral			(6)

Fig. 3-B (Continued)

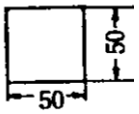
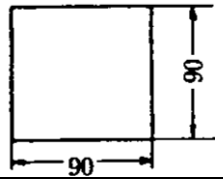
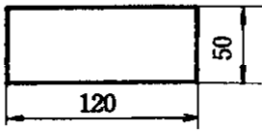
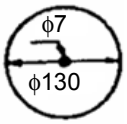
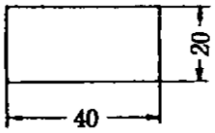
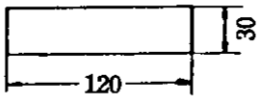
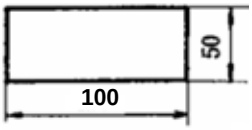
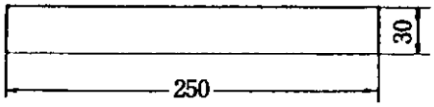
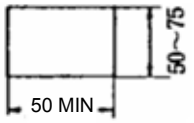
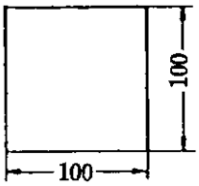
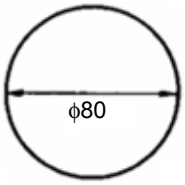
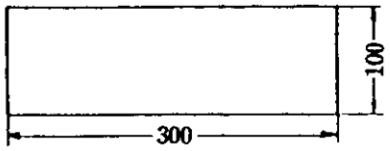
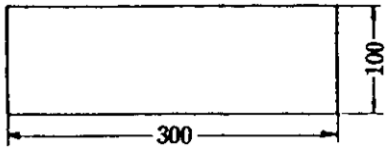
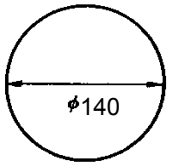
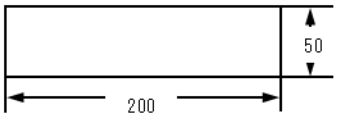
Type	Direction	Shape and dimension	Test	Sampling area and number of test pieces (Total)
Test piece No. 10	-	Square which measures 50 mm X 50 mm 	Stickiness test	(2)
			Cleanability test	(5)
			Chemical resistance test	(5)
Test piece No. 11	-	Square which measures 90 mm X 90 mm 	Scratch resistance test	(1)
Test piece No. 12	Longitudinal	Rectangle which measures 50 mm in width X 120 mm in length 	Abrasion resistance test (Method I)	B = 3, C = 3 (6)
Test piece No. 13	Lateral			B = 3, C = 3 (6)
Test piece No. 14	Longitudinal		Abrasion resistance test (Method III)	B = 3, C = 3 (6)
Test piece No. 15	Lateral			B = 3, C = 3 (6)
Test piece No. 16	Longitudinal		Abrasion resistance test (Method IV)	B = 3, C = 3 (6)
Test piece No. 17	Lateral			B = 3, C = 3 (6)
Test piece No. 18	Longitudinal		Light resistance test (Physical property)	B = 3, C = 3 (6)
Test piece No. 19	Lateral			B = 3, C = 3 (6)
Test piece No. 20	-	Circular piece with a diameter of 130 mm. Make a hole with a diameter of 7 mm at the center. 	Abrasion resistance test (Method II)	B = 2, C = 2 (4)
Test piece No. 21	-	Rectangle which measures 20 mm in width X 40 mm in length 	Abrasion resistance test (Gakushin type abrasion test method)	B = 2, C = 2 (4)
Test piece No. 22	-	Rectangle which measures 30 mm in width X 120 mm in length 	Crumpling resistance test method	(2)

Fig. 3-B (Continued)

Type	Direction	Shape and dimension	Test	Sampling area and number of test pieces (Total)
Test piece No. 23		Rectangle which measures 50 mm in width X 100 mm in length 	Cold resistance test	(1)
Test piece No. 24	-	Rectangle which measures 30 mm in width X 250 mm in length 	Test on color fastness to dry rubbing	(1)
			Test on color fastness to wet rubbing	(1)
			Wet cloth friction color fastness test	(1)
			Bleed resistance test	(1)
			Resistance to denim color transfer	(3)
			~~Soil resistance test~~	~~A, B, C: 3 each (9)~~
Test piece No. 25	-	Rectangle which measures 50 mm in width X 250 mm in length 	Light resistance test	(1)
Test piece No. 26	-	Square which measures 100 mm X 100 mm 	Weight test	A, B, C: 1 each (3)
			Thermal aging resistance test: Change in appearance	(2)
			Thermal aging resistance test: Shrinkage	A, B, C: 3 each (6)
			Humidity-heat cycle test	A, B, C: 3 each (6)
Test piece No. 27	- -	Circular piece with a diameter of 80 mm 	Cloudiness test	(3)
Test piece No. 28	Longitudinal	Rectangle which measures 100 mm in width X 300 mm in length 	Sliding abrasion test	(3)
Test piece No. 29	Lateral	Rectangle which measures 100 mm in width X 300 mm in length 	Sliding abrasion test	(3)
Test piece No.30	Longitudinal / Lateral		Soil resistance test Resistance to denim color transfer	(3)

Test piece No.31	-	Rectangle which measures 50 mm in width X 200 mm in length 	Soil resistance test	A, B, C: 3 each (9)

3.3.1 Polyurethane leather and vinyl leather cloth test pieces

(1) When foundation cloth is fabric

1) The test pieces shall be sampled from materials excluding areas 50 mm from the selvages on both ends. Longitudinal test pieces shall be sampled in parallel to the warp yarns and lateral test pieces shall be sampled in parallel to the weft yarns. (See Fig. 3-C.)

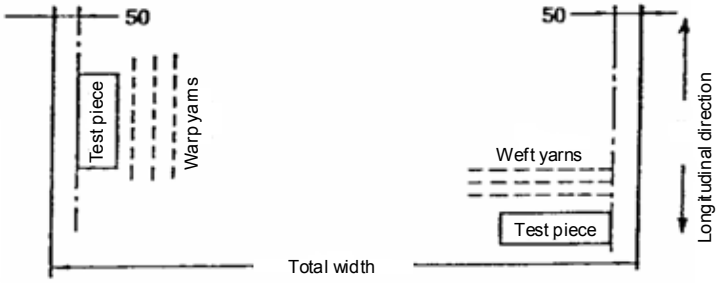


Fig. 3-C: Test piece sampling

2) Each longitudinal and lateral test piece shall be sampled without overlap in warp and woof yarns respectively. This requirement is not mandatory when there is only a small amount of test material. (See Fig. 3-D.)

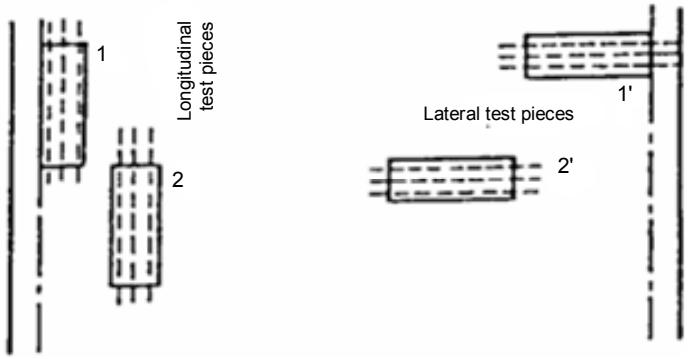


Fig. 3-D: Test piece sampling

(2) When foundation cloth is knitted web

1) The test pieces shall be sampled from materials excluding areas 50 mm from the selvages on both ends. Longitudinal test pieces shall be sampled in parallel to the wales (1) and lateral test pieces shall be sampled in parallel to the courses (2). (See Fig. 3-E.)

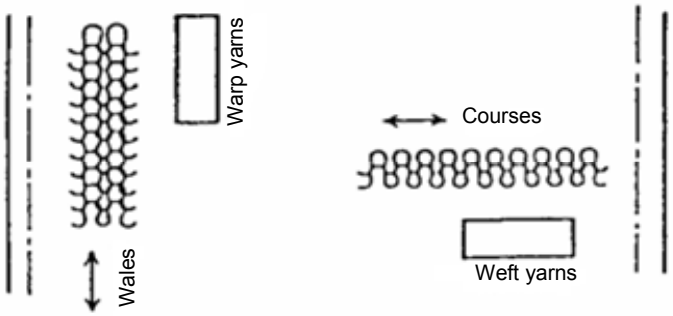


Fig. 3-E: Test piece sampling

2) Each longitudinal and lateral test piece shall be sampled without overlap in wales and courses respectively.

Note[1]: Wales: Longitudinal series of loops created by each needle in knitting (Correspond to warp yarns in flat woven fabric)
Note [2]: Courses: Lateral series of loops in knitting (Correspond to woof yarns in flat woven fabric)

3.3.2 Test piece types

There are 25 types of test pieces shown in Table 3-C. (Vinyl leather cloth: 22 types) Applicable tests are also shown in Table 3-C.

3.3.3 Test piece shapes and dimensions

Polyurethane leather and polyvinylchloride coated fabric test piece shapes and dimensions are shown in Table 3-C.

Table 3-C: Polyurethane leather and vinyl leather cloth test piece

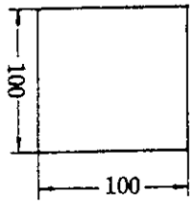
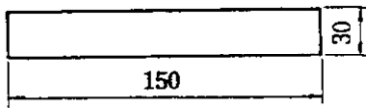
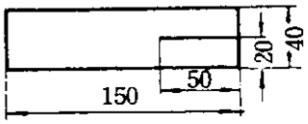
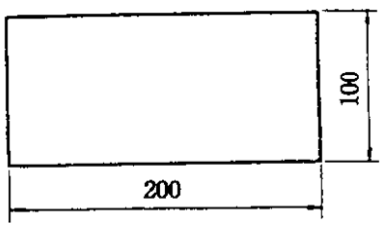
Type	Direction	Shape and dimension	Test
Test piece No. 1		Roll	Roll width, length, thickness measurement. Appearance
Test piece No. 2		Square which measures 100 mm X 100 mm 	Weight Change in appearance due to thermal aging
Test piece No. 3	Longitudinal	Rectangle which measures 30 mm in width X 150 mm in length 	Tensile strength and elongation Light resistance (Change in physical property) Thermal aging
Test piece No. 4	Lateral		
Test piece No. 5	Longitudinal	Rectangle which measures 40 mm in width X 150 mm in length A 50-cm inward slit in parallel to the long side shall be made from the mid point of the short side. 	Tearing strength
Test piece No. 6	Lateral		
Test piece No. 7	Longitudinal	Rectangle which measures 200 mm in width X 100 mm in length 	Seam strength
Test piece No. 8	Lateral		

Table 3-C (Continued)

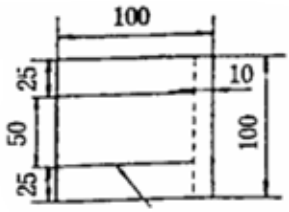
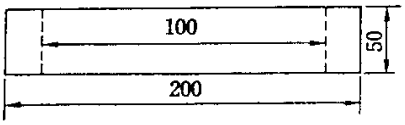
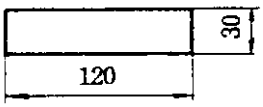
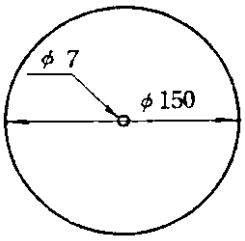
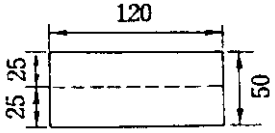
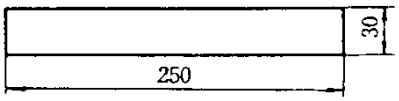
Type	Direction	Shape and dimension	Test
Test piece No. 9	Longitudinal	Square which measures 100 mm X 100 mm  88-mm slit	Seam fatigue
Test piece No. 10	Lateral		
Test piece No. 11	Longitudinal	Rectangle which measures 50 mm in width X 200 mm in length (Shall be marked with lines at the center with a distance of 100 mm between them.)  	Elongation under constant load and residual elongation
Test piece No. 12	Lateral		
Test piece No. 13	Longitudinal	Rectangle which measures 30 mm in width X 120 mm in length  	Peeling resistance Crumpling resistance
Test piece No. 14	Lateral		
Test piece No. 15	Longitudinal	Circular piece with a diameter of 150 mm. Make a hole with a diameter of 7 mm at the center.  	Abrasion resistance (Method II) Abrasion resistance (Vinyl leather cloth)
Test piece No. 16	Longitudinal	Rectangle which measures 50 mm in width X 120 mm in length  	Abrasion resistance (Method I) Abrasion resistance (Method III)
Test piece No. 17	Lateral		
Test piece No. 18		Rectangle which measures 30 mm in width X 250 mm in length  	Color fastness to rubbing Chemical resistance Color staining resistance (Denim)

Table 3-C (Continued)

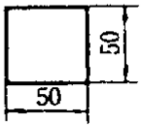
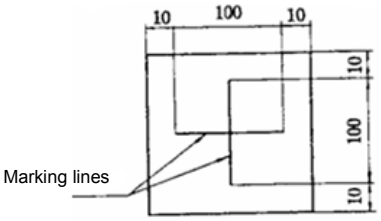
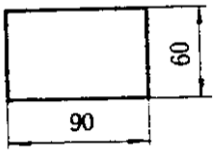
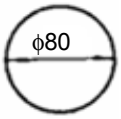
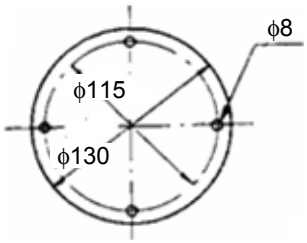
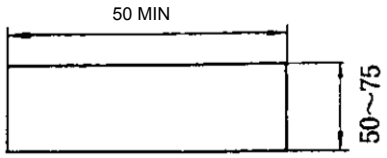
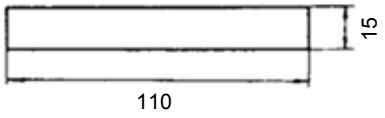
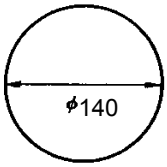
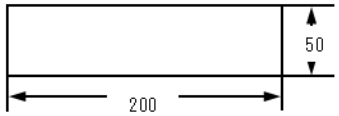
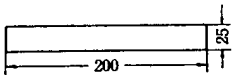
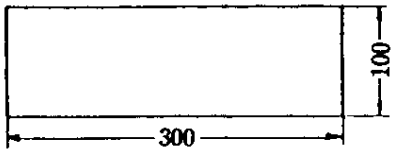
Type	Direction	Shape and dimension	Test
Test piece No. 19		Square which measures 50 mm X 50 mm 	Stickiness
Test piece No. 20		Square which measures 120 mm X 120 mm 2 marking lines at the center 	Heat shrinkage
Test piece No. 21		Rectangle which measures 60 mm in width X 90 mm in length 	Volatilization loss
Test piece No. 22		Circular piece with a diameter of 80 mm. 	Cloudiness
Test piece No. 23		Circular piece with a diameter of 130 mm. Make 4 holes with diameters of 8 mm. 	Cold resistance

Fig. 3-E: Test piece sampling

Type	Direction	Shape and dimension	Test
Test piece No. 24		Rectangle which measures 50 ~ 75 mm in width X 50 mm MIN in length 	Light resistance (Discoloration and fading)
Test piece No. 25	Longitudinal	Rectangle which measures 15 mm in width X 110 mm in length 	Flex resistance
Test piece No. 26	Lateral		
Test piece No. 27	Longitudinal / Lateral	Circular piece with a diameter of 140 mm 	Jeans color transfer resistance Soil resistance
Test piece No. 28		Rectangle which measures 50 mm in width X 200 mm in length 	Soil resistance
Test piece No. 29	Longitudinal	Rectangle which measures 25 mm in width X 200 mm in length 	Bending strength
	Lateral		
Test piece No. 30	Longitudinal	Rectangle which measures 100 mm in width X 300 mm in length 	Sliding abrasion
Test piece No. 31	Lateral		

4. Roll width measurement method

4.1 Objective Measurement of widths of polyurethane leather and vinyl leather rolls.

4.2 Test device and instrument
(1) Fabric inspecting device
(2) Scale

4.3 Test piece Test piece No. 1 as per Table 3-C. (Roll)

4.4 Test conditions Room temperature condition as per Table 3-A.

4.5 Test procedure
(1) Remove unnatural wrinkles and tension.
(2) Place the scale perpendicularly to the selvage. Measure the width inside the selvages down to the nearest mm.
(3) Perform Steps (1) and (2) above 5 times at different points. Determine the average value.

4.6 Indication
(1) The average values shall be rounded off to the nearest whole number.
(2) The values shall be indicated in the unit of mm.

5. Roll length measurement

5.1 Objective Measurement of lengths of polyurethane leather and vinyl leather rolls.

5.2 Test device and instrument
(1) Fabric inspecting device
(2) Fabric rotation counter, scale or measuring tape

5.3 Test piece Test piece No. 1 as per Table 3-C. (Roll)

5.4 Test conditions Room temperature condition as per Table 3-A.

5.5 Test procedure
(1) Using the fabric rotation counter
1) Place the roll on the fabric inspection device. Place the rotation counter at the crosswise center of the roll.
2) Operate the fabric inspection machine and take the reading to the nearest 1 cm on the rotation counter that reads up the scale as the raw material is advanced.
(2) Using the scale or measuring tape
Replace the roll counter in 4.5 (1) above with a scale or a measuring tape.

5.6 Indication
(1) The values shall be indicated in the unit of m.
(2) Values smaller than 1 m shall be indicated as shown below.

Table 5-A Indication of roll length

Unit: m

Actually measured length	Indication
< 0.25	0.00
0.25 ≤, < 0.50	0.25
0.50 ≤, < 0.75	0.50
0.75 ≤, < 1.00	0.75

6. Thickness measurement method

6.1 Objective Measurement of genuine leather, polyurethane leather, and polyvinylchloride coated fabric thickness.

6.1.2 Test device Dial thickness gauge (See Fig. 6-A)
(1) Pressurizing plate diameter: 10 ±1 mm
(2) Pressure to be applied: 3.9 N {400 gf}

6.1.3 Test piece Test piece No. 2 and No. 3 as per Table 3-B (30 mm X 150 mm). 5 pieces each.

6.1.4 Test procedure
(1) Place the test piece on the dial thickness gauge with the grain side facing upward. Apply pressure. 5 s after, read the dial indication down to the hundredth of a mm.
(2) Measure each test piece at 3 different points. (See Fig. 6-A.)
Perform Steps (1) and (2) on longitudinal and lateral test pieces each including five pieces.

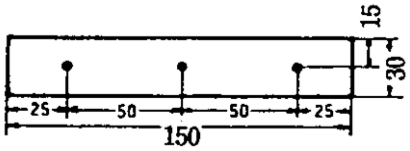


Fig. 6-A: Measurement points

6.1.5 Indication
(1) For each longitudinal and lateral test piece, the average value of 3 measuring points shall be indicated. In addition, the minimum and the maximum value of the 10 average values calculated shall be indicated.
(2) The values shall be indicated in the unit of mm.

6.2 Objective Measurement of polyurethane leather and vinyl leather cloth thickness.

6.2.1 Instrument Dial gauge [JIS B 7503 (Dial gauge)]

6.2.2 Test piece Test piece No. 1 as per Table 3-C. (Roll)

6.2.3 Test conditions Room temperature condition as per Table 3-A.

6.2.4 Test procedure

(1) Remove unnatural wrinkles and tension.
(2) Set the dial gauge at any point on the test piece other than areas 10 mm from both ends and read the pointer to the nearest 0.01 mm.
(3) Perform Steps (1) and (2) above at 5 different points. Determine the average value.

6.2.5 Indication

(1) The average values shall be rounded off to the second decimal place.
(2) The values shall be indicated in the unit of mm.

7. Weight measurement method

7.1 Objective Measurement of masses of genuine leather, polyurethane leather and vinyl leather cloth.

7.2 Instrument Chemical balance

7.3 Test piece
<Genuine leather>
Test piece No. 19 (50 X 120 mm) as per Table 3-B exposed to the standard condition specified in section 3.1.1 for 48 h or longer. 8 test pieces. Areas A to H: 1 piece each.

<Polyurethane leather, vinyl leather cloth>
Test piece No. 2 (100 X 100 mm) as per Table 3-C. 3 test pieces.

7.4 Test conditions Genuine leather: Standard condition as per Table 3-A. Polyurethane leather and vinyl leather cloth: Standard condition as per Table 3-A.

7.5 Test procedure
(1) Scale the test piece weight using the chemical balance. Read the value down to the nearest mg.
(2) Scale the weights of 3 test pieces and average the results.

7.6 Indication
(1) The average values shall be rounded off to the nearest 10 mg. The value shall be converted to its equivalent in 1 square meter of leather. (g/m^2)
(2) The values shall be indicated in the unit of g/m^2.

8. Bending strength measurement method
8.1 Objective Measurement of genuine leather and polyvinylchloride coated fabric stiffness.
8.2 Test device 45° cantilever bending strength test device (See Fig. 8-A.)

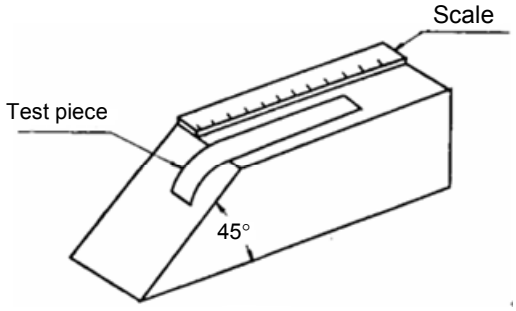


Fig. 8-A: 45° cantilever bending strength test device

8.3 Test piece Genuine leather: Table 3-B (25 mm X 200 mm). 3 pieces each.
Polyvinylchloride coated fabric: Test piece No. 29 as per Table 3-C (25 mm X 200 mm). 3 pieces each.

8.4 Test conditions Standard condition as per Table 3-A.

8.5 Test procedure
(1) Place a test piece along the scale of the test device. Place a retainer plate which sizes approximately the same as the test piece over the test piece.
(2) Gradually push the test piece together with the retainer plate until an end of the test piece contacts the 45° slope. (Note)
(3) When the end contacts the slope, read the position of the other end on the scale down to the nearest mm.
(4) Perform Steps (1) ~ (3) on the left end, right end, top side and back side of each test piece.
(5) Average the 4 test results and round it off to the nearest mm.
(6) Perform Steps (1) ~ (4) with longitudinal and lateral test pieces each including three pieces. For each test piece, calculate the average value of all measuring sections.
Note: Push the test piece at a speed of approx. 10 mm/s.

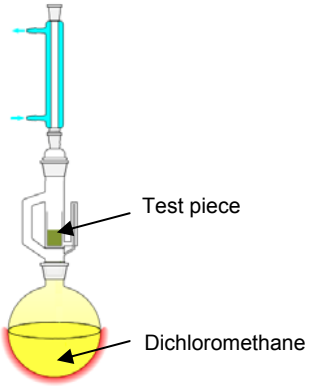
8.6 Indication
(1) The average values shall be rounded off to the nearest whole number. (Note)
(2) The values shall be indicated in the unit of mm.
Note: Stiffness of cover materials is assessed by this average. The leather is stiffer when the length of the pushed part is longer.

9. Acidity test method
9.1 Objective Measurement of genuine leather acidity.
9.2 Test device pH meter [as per Section 7.1 of JIS Z 8802 (pH measurement method)]

9.3 Test piece Test piece degreased as per Section 9.4. Approx. 10 g.

9.4 Test procedure

(1) Prepare 10 g of test piece by degreasing it with dichloromethane using a Soxhlet extractor.



(2) Put it in 100 ml of distilled water and leave it to stand for 24 h at room temperature.
(3) Measure the pH as per Section 7 of JIS Z 8802. Measure the value down to the second decimal place.

9.5 Indication The measurement result shall be rounded off to the nearest first decimal place.

10. Appearance test method

10.1 Color, grain, gloss, printed pattern and printed color

10.1.1 Objective

Examination of how the colors, grains, glosses, printed patterns and printed colors of the genuine leather, polyurethane leather and vinyl leather cloth match the sample or the limit sample.

10.1.2 Test device and sample

(1) Xenon day light (polyurethane leather and vinyl leather cloth) or standard light source
(2) Flat bench
(3) Limit sample

10.1.3 Test piece

Genuine leather: Test piece No. 1 as per Table 3-B.
Polyurethane leather, vinyl leather cloth: Test piece No. 1 as per Table 3-C.

10.1.4 Test conditions Room temperature condition as per Table 3-A.

10.1.5 Test procedure

(1) Place a test piece on the test bench and manually remove unnatural wrinkles and tension.
(2) Place the genuine leather or polyurethane leather or vinyl leather cloth test piece in parallel to the sample without any distance between them. Visually compare them under the xenon day light lamp or natural light. Assess the result as shown below.

Table 10-A Criteria

Criteria	Within the limit sample
	Exceeding the limit sample

10.1.6 Indication The result shall be indicated according to the criteria.

10.2 Substandard

10.2.1 Objective Visual examination of how defects such as scratches, unevenness in colors, dirt, unevenness in grain, unevenness in print or contamination of genuine leather, polyurethane leather, vinyl leather cloth meet the limit sample.

10.2.2 Test device and sample

(1) Fabric inspection device [flat or inclined (20 ~ 40°) equipped with a fabric test table of 1 m or longer]
(2) Limit sample

10.2.3 Test piece

Genuine leather: Test piece No. 1 as per Table 3-B.
Polyurethane leather, vinyl leather cloth: Test piece No. 1 as per Table 3-C.

10.2.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Brightness at test table: (750 ~ 300 lx) as per JIS Z 9110 (Brightness standard)

10.2.5 Test procedure

(1) Place a test piece on the test table and manually remove unnatural wrinkles and tension.
(2) Move the test sample along the test table.
(3) The test operator shall stand by the test table with a distance of 0.5 ~ 1 m and check substandards on the leather surface and the back fabric.
(4) Place the genuine leather or polyurethane leather or vinyl leather cloth test piece in parallel to the sample without any distance between them. Visually compare them under natural light and assess the defects (genuine leather) and grain quality (polyurethane leather and vinyl leather cloth) as shown below.

Table 10-C: Criteria

Criteria	Within the limit sample
	Exceeding the limit sample

10.2.6 Indication

(1) Substandards shall be indicated on the surface by the substandards.
(2) Grain quality shall be indicated according to the criteria.

11. Tensile strength and elongation test method

11.1 Objective Measurement of breaking resistance of genuine leather, polyurethane leather and vinyl leather cloth under constant-speed tension.

11.2 Test devices and instruments

(1) Tensile test device: An instron-type tensile test device or a test device having equivalent or superior performance capability.
(2) Clamps: Clamps capable of retaining the test piece evenly with a non-slippery construction.
(3) Thickness gauge: Thickness gauge with a precision of 0.01 mm. Dial gauge [JIS B 7503 (Dial gauge)]
(4) Cutting die: Clean-cut cross section must be obtained.
(5) Humidity control chamber: Chamber capable of preparing the test pieces as per the standard condition otherwise specified.
(6) Loading weight: 1.96 N

11.3 Test piece

Genuine leather: Test piece No. 2 and No. 3 as per Table 3-B (30 mm X 150 mm). 5 pieces each.

Polyurethane leather and vinyl leather cloth: Test piece No. 3 and No. 4 as per Table 3-C (30 mm X 150 mm). 5 pieces each.

11.4 Test conditions

(1) Genuine leather: Standard condition as per Table 3-A.
Polyurethane leather and vinyl leather cloth: Room temperature condition as per Table 3-A.
(2) Clamp width: 30 mm MIN. Distance between clamps: 100 mm
(3) Initial load: 1.96 N

(4) Tensile speed: 200 mm/min

11.5 Test procedure

(1) Set the test device as specified.
(2) Retain a test piece using the upper and lower clamps at points 25 mm from each end.
(3) Apply the initial load. Hold the test piece with tension so as not to make it warp. Lock the clamps.
(4) Operate the test device. Record the load when the distance between the clamps becomes 150 mm. (For genuine leather, record the elongation when the load is 245 N. For NL1-3, record the elongation obtained when the load has reached 29.4 N.) Continue to apply tension until the test piece breaks. Stop the test device as soon as the test piece breaks. Read the maximum load down to the first decimal place.
(5) Perform Steps (1) ~ (4) on longitudinal and lateral test pieces each including five pieces.

11.6 Indication

(1) The measured values and the minimum values (tensile strength and elongation) of the test pieces (5 each) shall be indicated down to the first decimal place.
(2) The thicknesses of the test pieces (5 each) shall be indicated down to the second decimal place.
(3) The tensile strength shall be indicated in the unit of N and the elongation in %.
(4) For genuine leather, elongation under 245 N shall also be indicated. For NL1-3, elongation under 29.4 N shall also be indicated.

12. Tearing strength test method

12.1 Objective Measurement of tear resistance of genuine leather, polyurethane leather and vinyl leather cloth under constant-speed tension.

12.2 Test devices An instron-type tensile test device or a test device having equivalent or superior performance capability.

12.3 Test piece Genuine leather: Test piece No. 6 and No. 7 as per Table 3-B (40 mm X 150 mm). 5 pieces each. Polyurethane leather and vinyl leather cloth: Test piece No. 5 and No. 6 as per Table 3-C (40 mm X 150 mm). 5 pieces each.

12.4 Test conditions

(1) Genuine leather: Standard condition as per Section 3.1.1
Polyurethane leather and vinyl leather cloth: Room temperature condition as per Table 3-A.
(2) Clamp width: 30 mm. Distance between clamps: Approx. 25 mm
(3) Initial load: 1.96 N
(4) Clamp movement speed: 200 mm/min

12.5 Test procedure

(1) Set the test device as specified.
(2) The upper clamp shall retain 20 mm of one side of the test piece cut as shown in Fig. 12-A so that each side is retained in opposite directions.

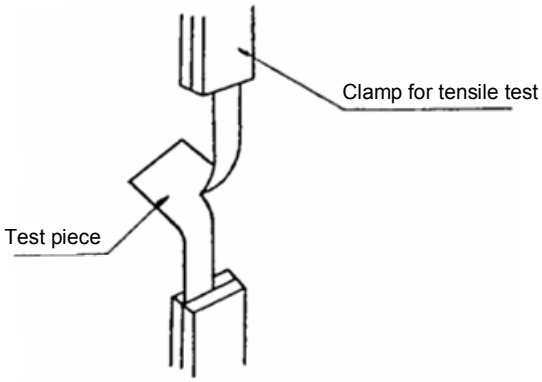


Fig. 12-A: Clamp

(3) The lower clamp shall retain the lower end of the test piece so that the cut opens vertically. Apply the initial load and lock the clamps.
(4) Operate the test device. Stop tearing as soon as the test piece is cut into two. Read the maximum load N indicated on the test device down to the first decimal place.

(5) Perform Steps (1) ~ (4) on longitudinal and lateral test pieces each including five pieces.
Note: Exclude test pieces torn in a curve.

12.6 Indication

(1) The measured values and the minimum value of 5 longitudinal and 5 lateral test pieces shall be indicated down to the first decimal place.
(2) The values shall be indicated in the unit of N.

13. Seam strength test method

13.1 Objective Measurement of seam strength of genuine leather, polyurethane leather and vinyl leather cloth under constant-speed tension.

13.2 Test devices

(1) Instron-type tensile test device or a test device having equivalent or superior performance capability.
Sewing thread: Polyester No. 8
(2) Sewing needle: No. 23, or the needles used for sewing at the time of mass-production

13.3 Test piece Genuine leather: Test piece No. 8 and No. 9 as per Table 3-B (100 mm X 200 mm). 6 pieces each.
Polyurethane leather and vinyl leather cloth: Test piece No. 7 and No. 8 as per Table 3-C (100 mm X 200 mm). 10 pieces each.

13.4 Test conditions

(1) Genuine leather: Standard condition as per Table 3-A.
Polyurethane leather and vinyl leather cloth: Room temperature condition as per Table 3-A.
(2) Clamp width: 50 mm. Distance between clamps: 100 mm
(3) Clamp movement speed: 200 mm/min

13.5 Test procedure

(1) Overlay 2 test pieces sampled in the same direction with their top surfaces facing inside. Sew them together using a sewing machine. (See Fig. 13-A.) Sew them in chain stitches at a pitch of 5 ±0.5 mm.

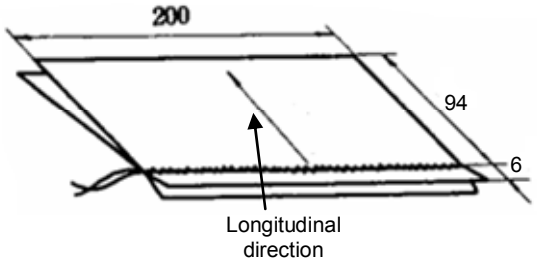


Fig. 13-A: Dimensions of seam strength test piece (Longitudinal)

(2) Set the test device as specified.
(3) Open the test pieces sewn together and retain them with the upper and lower clamps at the mid points so that the test pieces would not warp. (The seam shall be placed at the mid point of the upper and lower clamps. See Fig. 13-B.)

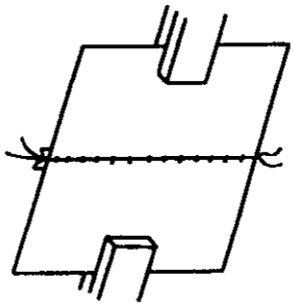


Fig. 13-B Retaining of test pieces for seam strength test

(4) Operate the test device. Stop as soon as the test piece is cut into two or the thread breaks. Read the maximum load down to the nearest N.
(5) Genuine leather: Perform Steps (1) to (4) on longitudinal and lateral test pieces each including three pieces.
Polyurethane leather and vinyl leather cloth: Perform Steps (1) to (4) on longitudinal and lateral test pieces each including five pieces.

13.6 Indication The measured values and the minimum values shall be indicated to the nearest N for longitudinal and lateral test pieces separately.

14. Seam fatigue test method

14.1 Objective Measurement of the stitch hole size after a constant tensile load is applied repeatedly to the seam connecting the polyurethane leather or vinyl leather cloth test pieces.

14.2 Test device and material

(1) Amsler type fabric wear test device or a test device having equivalent or superior performance capability. (See Fig. 14-A.)
(2) Industrial sewing machine
(3) Sewing needle: No. 23 or it can be selected during the test to suit the actual sewing conditions.
(4) Sewing thread: Polyester No. 8
(5) Stitch pitch: 5 ±0.5 mm

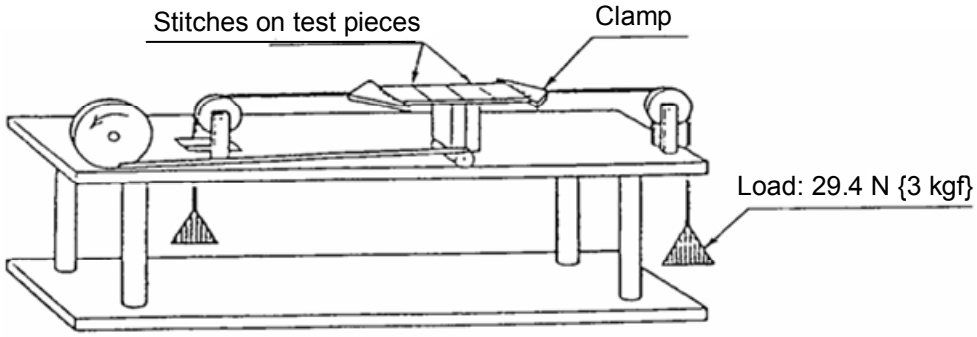


Fig. 14-A: Seam fatigue test

14.3 Test piece Test piece No. 9 and No. 10 as per Table 3-B (100 mm X 100 mm) under the standard condition specified in Section 3.1.2. 10 pieces each. (It is also acceptable to sew the pieces under the same composition and conditions as the actual seat trim.)

14.4 Test conditions

(1) Room temperature conditions as per Table 3-A.
(2) Distance between clamps: 120 mm
(3) Test load: 29.4 N
(4) Stroke: 150 mm
(5) Speed: 30 strokes/min
(6) Number of strokes: 2,500 times

14.5 Test procedure

(1) Overlay 2 test pieces sampled in the same direction with their top surfaces facing inside. Sew them together using a sewing machine as shown in Fig. 14-B.
(2) Set the test device as specified in Section 14.4 and conduct the test.
(3) Apply an initial load of 4.9 N to the test pieces. Measure the maximum dimension of the holes (a) generated by displacement of the seam connecting the test pieces using a magnifier. Read the size down to the tenth of a mm. (See Fig. 14-C.)
(4) Perform Steps (1) ~ (2) on longitudinal and lateral test pieces each including five pieces.

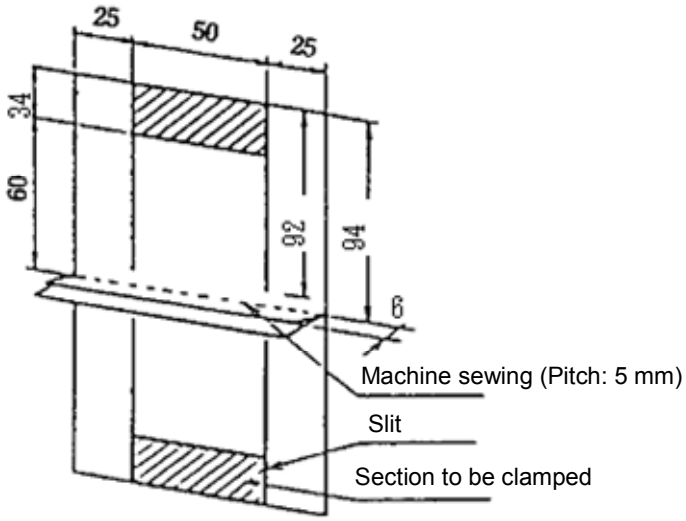


Fig. 14-B: Seam fatigue test piece

14.6 Indication

(1) Actually measured values and the maximum values of 5 longitudinal and 5 lateral test pieces shall be indicated down to the first decimal place.
(2) The values shall be indicated in the unit of mm.
(3) It shall be indicated if fabric yarn breaks.

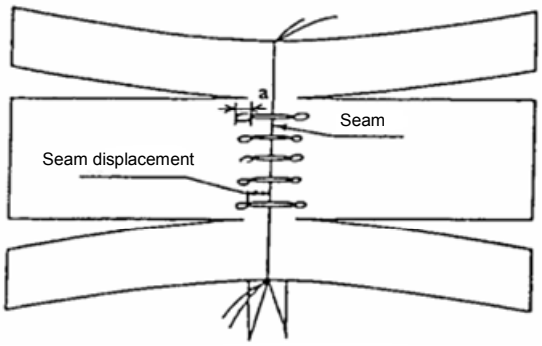


Fig. 14-C: Judgment

15. Elongation under constant load and residual elongation test method

15.1 Objective Measurement of elongation under constant load and residual elongation of Polyurethane leather or vinyl leather cloth.

15.2 Test device Martens fatigue test device or a test device having equivalent performance capability.

15.3 Test piece Test piece No. 11 and No. 12 as per Table 3-C (50 mm X 200 mm). 5 pieces each.

15.4 Test conditions

(1) Room temperature conditions as per Table 3-A.
(2) Clamp width: 50 mm, Distance between clamps: 100 mm
(3) Load
Polyurethane leather, vinyl leather cloth (for seat insert) : 29.4 N (Elongation under constant load), 98 N (Residual elongation)
Vinyl leather cloth (for roof trim and seat gusset) : Load 78.4 N (Elongation under constant load, residual elongation)
(4) Loading time
Polyurethane leather, vinyl leather cloth (for seat insert): 5 min
Vinyl leather cloth (for roof trim and seat gusset): 10 min
(5) Waiting time after load removal: 10 min (Residual elongation)

15.5 Test procedure

(1) Set the test device as specified.
(2) Retain both ends of the test sample with the clamps at positioned 20 mm outside the marking lines.

(3) Carefully apply the load to the test samples. The test sample shall be held with tension.
(4) Allow the load to be applied to the test sample for the specified period. After the period, measure the distance between the marking lines. Round off the measured distance to the nearest millimeter.
(5) Remove the load from the test sample. Remove the test sample from the test device. Lay the test sample on a flat surface and allow it to stand for 10 min.
(6) 10 min after, again measure the distance between the marking lines. Round off the measured distance to the nearest millimeter.
(7) Using the following formulas, calculate the constant load elongation rate and the residual elongation rate to two significant figures.

$$\text{Constant load elongation rate (\%)} = \frac{\ell_1 - \ell}{\ell} \times 100 \quad (29.4\ \text{N})$$

$$\text{Residual elongation rate (\%)} = \frac{\ell_2 - \ell}{\ell} \times 100 \quad (98\ \text{N})$$

Formula explanation:
ℓ : Distance between marking lines before load application (mm) = 100
ℓ_1: Distance between marking lines after 10 min of load application (mm)
ℓ_2: Distance between marking lines after removing the load and allowing the test sample to sit on a flat surface for 10 min. (mm)

(8) Perform Steps (1) to (7) on longitudinal and lateral test pieces each including five pieces.

15.6 Indication
(1) Out of the test results of 5 test pieces in longitudinal and lateral directions, the minimum value shall be indicated for the constant-load elongation and the maximum values shall be indicated for the residual elongation rate.
(2) The values shall be indicated in the unit of %.

16. Peeling resistance test method

16.1 Objective Measurement of peeling resistance between foundation cloth and the fabric PVC layer of polyurethane leather and vinyl leather cloth under a constant tensile load.

16.2 Test device An Instron-type tensile test device or a test device having equivalent or superior performance capability

16.3 Test piece Test piece No. 13 and No. 14 as per Table 3-B (30 mm X 120 mm). 5 pieces each.

16.4 Test conditions
(1) Room temperature condition as per Table 3-A.
(2) Clamp width: 30 mm. Distance between clamps: 20 mm
(3) Clamp movement speed: 200 mm/min

16.5 Test procedure
(1) Set the test device as specified.
(2) Use a small amount of ethyl acetate to peel the PVC layer off an area approximately 40 mm from one side of the test piece.
(3) Grip the peeled PVC layer with the upper clamp. Grip the foundation cloth (the section from which the PVC layer was peeled) in the lower clamp. Apply the initial test load. Lock the clamps.
(4) Operate the test device until the PVC layer completely separates from the foundation cloth. Turn off the test device as soon as the PVC layer is completely separated. Read the maximum load (N) on the indicator to the first decimal place.
(5) Perform Steps (1) to (4) on longitudinal and lateral test pieces each including five pieces.

16.6 Indication
(1) The values measured for the 5 vertical and 5 horizontal test samples and the minimum value shall be indicated to the first decimal place.
(2) The values shall be indicated in the unit of N/3 cm.

17. Scratch resistance test method

17.1 Objective Examining the leather coating's resistance against scratching.

17.2 Test device and instrument
(1) Scratch test device or a test device having equivalent or superior performance capability. (See Fig. 17-A.)
(2) Scratching tip (Material: SUS304. Shape and dimensions: See Figure 17-B.)

17.3 Test piece Test piece No. 11 as per Table 3-B (90 mm X 90 mm). 1 piece.

17.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Load: 4.9 N
(3) Scratching speed: 10 mm/s
(4) Scratching distance: 50 mm

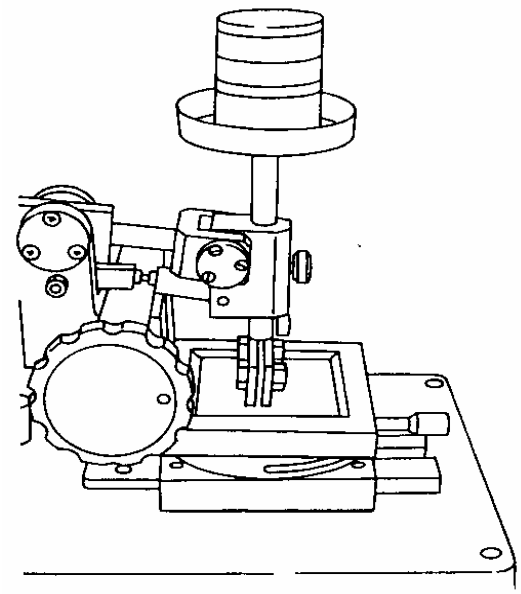


Fig. 17-A: Scratch test device

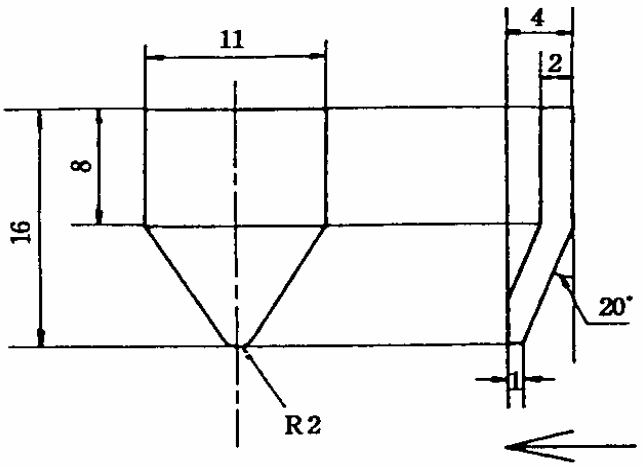


Fig. 17-B: Scratching tip

17.5 Test procedure

(1) Attach a scratching tip to the test device, and set it to the specified test conditions.
(2) Attach a test piece to the test device, and operate the test device to move the scratching tip in the direction indicated by the arrow.
(3) Scratch five times, shifting the test position each time.
(4) When it is necessary to judge increase of gloss, reflect a light against a test piece after the test under a general light source, and judge the degree of increase of gloss at an angle where the increase of gloss is maximum based on the evaluation scores specified in Table 17.

Table 17 Judgment criteria

Evaluation score	Judgment standard
5 points	Increase of gloss is not recognized.
4 points	Increase of gloss is slightly recognized.
3 points	Increase of gloss is recognized.
2 points	Significant increase of gloss is recognized.
1 point	Extremely significant increase of gloss is recognized.

17.6 Indication Presence of abnormality on the coating and the grain side, and judgment of increase of gloss (upon request) shall be indicated and the actual tested pieces shall be attached.

18. Crumpling resistance test method

18.1 Crumpling resistance test method I

18.1.1 Objective Examination of abnormality in crumpled genuine leather,polyurethane leather and vinyl leather cloth for seat insert.

18.1.2 Test device and material Scott type crumpling test device (In accordance with JIS L 1096 "Abrasion Strength Procedure B")

18.1.3 Test piece Genuine leather: Test piece No. 22 as per Table 3-B (30 mm X 120 mm). 2 test pieces used as a pair.
Polyurethane leather: Test piece No. 13 and No. 14 as per Table 3-C (30 mm X 120 mm). 2 pieces each.

18.1.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Distance between clamps: 30 mm
(3) Crumpling stroke: 50 mm
(4) Number of strokes: 2,000
(5) Load: 9.8 N

18.1.5.Test procedure

(1) Set the test device as specified.
(2) Overlay 2 test pieces sampled in the same direction with their cloth sides facing outside. Place them on the crumpling test device providing a distance of 30 mm between the clamps.
(3) Gradually reduce the distance between the clamps until the 2 test pieces separate from each other.
(4) Apply a load of 9.8 N when the cloth sides of both test pieces have lightly contacted.
(5) Operate the test device to crumple the test pieces for the specified number of times.
(6) After removing the test pieces from the clamps, visually check for any abnormalities such as peeling, tearing or damage to the coating, or damage to the foundation cloth.

18.1.6 Indication Any abnormalities observed shall be indicated.The actual test pieces shall be attached to the indication.

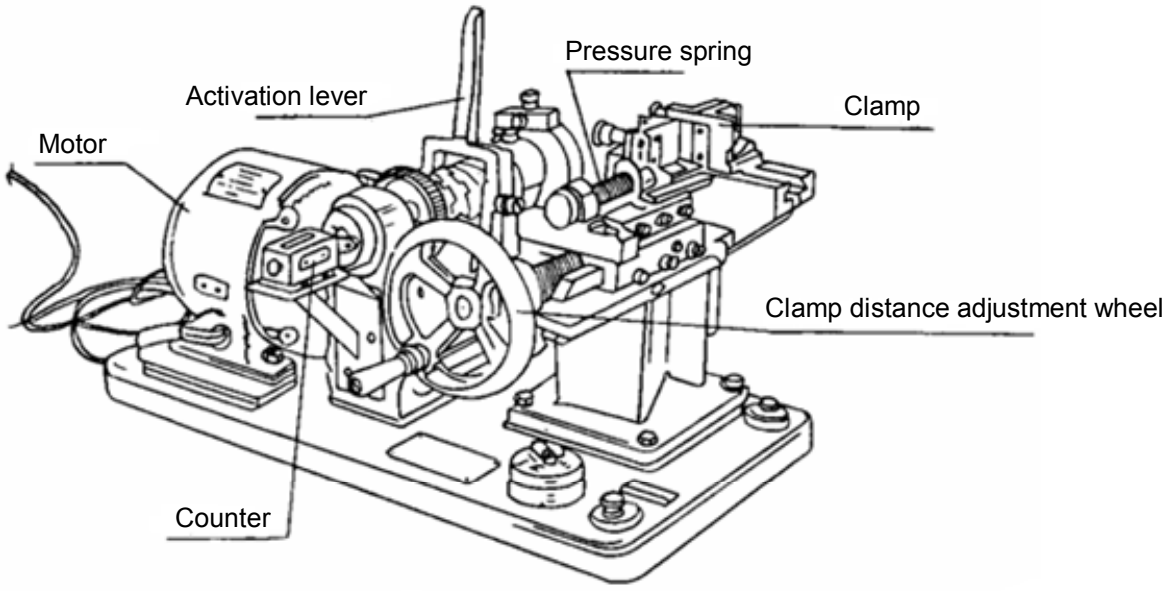


Fig. 18-A: Scott type crumpling test device

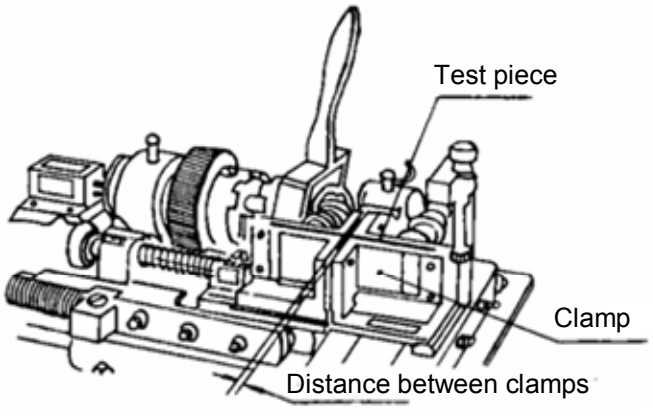


Fig. 18-B (Test piece clamped. Load applied)

18.2 Crumpling resistance test method II

18.2.1 Objective Examination of abnormality in PVC layer of crumpled vinyl leather cloth.

18.1.2 Test device and material
(1) Scott type crumpling test device (In accordance with JIS L 1096 "Abrasion Strength Procedure B")
(2) Thermostatic chamber
(3) 2 glass plates (When the test sample is placed between the glass plates, the oleic acid should spread over the entire surface of the test sample without contacting the back side of the test sample.)
Ex.) Glass plate size (lower plate): 25 cm x 35 cm x 5 mm, (upper plate): 20 cm x 25 cm x 5 mm
(4) 100% cotton gauze (Commercially available medical gauze)
Ex.) Concentration of gauze: 32.40 g/m2, Size of gauze: 20 cm x 25 cm x 0.21 mm
(5) Oleic acid (purity 95% or more) 100%

18.2.3 Test piece Test piece No. 13 and No. 14 as per Table 3-C (30 mm X 150 mm). 2 pieces each.

18.2.4 Test conditions
(1) Room temperature condition as per Table 3-A.
(2) Distance between clamps: 30 mm
(3) Crumpling stroke: 50 mm
(4) Number of strokes: 2,000
(5) Load: 9.8 N

18.2.5 Test procedure Pre-treatment of the test samples (oleic acid treatment) specified in 18.2.5.1 only applies to leather used for parts that contact with skin. For other parts, perform the test from 18.2.5.2.

18.2.5.1 Pre-treatment of the test samples (Oleic acid treatment)
(1) Place the leather (25 cm x 35 cm) on the glass plate (bottom plate) placed horizontally with the grain side facing upward.
(2) Overlay 4 sheets of gauges on the leather, and drip oleic acid (60 ml) onto the center.
(3) Place the glass plate (top plate) on the gauze so that the oleic acid will spread over the entire gauze surface taking a precaution to ensure that the oleic acid would not directly contact the back side of the leather foundation cloth.
(4) Leave it to stand for 72 h at 80°C.
(5) Take out the leather and wipe the oleic acid off lightly with a wiper paper to the extent that the oil will not drip down.
(6) Sample test pieces No.13 and No.14 (2 pieces each) out from the center of the leather treated with the oleic acid.

18.2.5.2 Test procedure
(1) Set the test device as specified.
(2) Overlay 2 test pieces sampled in the same direction with their cloth sides facing outside. Place them on the crumpling test device providing a distance of 30 mm between the clamps.
(3) Gradually reduce the space between the clamps until the 2 test pieces separate from each other.
(4) Apply a load of 9.8 N when the cloth sides of both test pieces have lightly contacted.
(5) Operate the test device to crumple the test pieces for the specified number of times.
(6) After removing the test pieces from the clamps, visually check for any abnormalities such as peeling, tearing or damage to the coating, or damage to the foundation cloth.

18.1.6 Indication Any abnormalities observed shall be indicated. The actual test samples shall be attached to the indicated.

18.3 Crumpling resistance test method III

18.3.1 Objective and scope Examination of abnormalities caused by crumpling of vinyl leather cloth (for vehicle Fr cushion outer side having a HP (hip point) that is 550 mm or more from the ground).

18.3.2 Test device Scott type crumpling test device

18.3.3 Test piece Test piece No. 13 and No. 14 as per Table 3-C (30 mm X 120 mm). 1 piece each.

18.3.4 Test conditions
(1) Room temperature condition as per Section 3.1.3
(2) Distance between clamps: 10 mm
(3) Crumpling stroke: 15 mm
(4) Number of crumpling: 2,500 times
(5) Crumpling speed: 120 strokes/min
(6) Load: 29.4 N

18.3.5.Test procedure

(1) Set the test device as specified.
(2) Place a test piece on the crumpling test device with the cloth side facing outside providing a distance of 10 mm between the clamps.
(3) While bending the test piece with the PVC side facing inward, gradually reduce the distance between the clamps. Apply a load of 29.4 N.
(4) Operate the test device to crumple the test pieces for the specified number of times.
(5) Remove the test piece from the test device and check for cracks on the PVC.

18.3.6 Indication Any abnormalities observed shall be indicated. The actual test pieces shall be attached to the report.

19. Abrasion resistance test method

19.1 Abrasion resistance test method

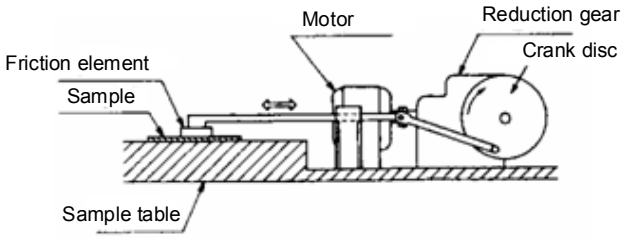
19.1.1 Objective Examination of abrasion resistance of genuine leather, polyurethane leather, and vinyl leather cloth.

19.1.2 Device and instrument

(1) Traverse type abrasion resistance test device or a test device having equivalent capacity. (See Figure 19-A.)
(2) Cotton canvas (average cotton canvas No. 9 as specified in JIS L 3102)
(3) Double-sided adhesive tape, etc.

19.1.3 Test piece Genuine leather : Test piece No. 12 and No. 33 as per Table 3-B (50 mm X 120 mm). 6 pieces each. Sample 3 pieces each from B and C areas.
Polyurethane leather, polyvinylchloride coated fabric: Test piece No. 16 and No. 17 as per Table 3-C (50 mm X 120 mm). 3 pieces each.

Fig. 19-A Traverse type abrasion test device

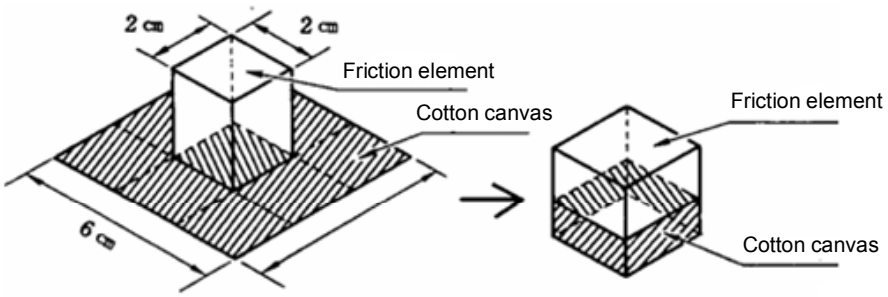


19.1.4 Test conditions

(1) Room temperature conditions as specified in 3.1.3
(2) Friction element shape: Flat plate 2 cm x 2 cm
(3) Load: 1.32 kg
(4) Stroke speed: 50 strokes/min
(5) Number of strokes: 10,000
(6) Stroke distance: 75 mm
(7) Cotton canvas piece: 6 cm x 6 cm
(Shall wrap the friction element)

19.1.5 Procedure

(1) Set the test device as specified.
(2) Secure the test sample to the test device table with a double-sided adhesive tape, etc. so the sample would not move during the test.
(3) Attach the cotton canvas to the friction element with a double-sided adhesive tape etc. so it would not move during test. See Fig. 19-B.
(4) Make sure that the load conforms to the specified conditions.
(5) Operate the test device to perform the test for the specified number of strokes.
(6) After the specified number of strokes, remove the test sample.
(7) Visually examine the abrasion conditions of the coated surface.
Remark: Replace the cotton canvas for each test.



Use a double-sided adhesive tape over
the whole surface and wrap the friction element so the canvas would not move.

Figure 19-B: Attachment of cotton canvas

19.1.6 Indication For genuine leather, any abnormalities on the coating observed shall be indicated. The actual test pieces shall be attached to the indication. For polyurethane leather and polyvinylchloride coated fabric, any abnormalities on the surface observed (crack, whitening, cut, peeling, pin hole, etc.) shall be indicated. The actual test pieces shall be attached to the indication.

19.2 Abrasion resistance test method II

19.2.1 Method II-1

19.2.1.1 Objective Examination of abrasion resistance of leather coating.

19.2.1.2 Device and instrument

(1) Taber type abrasion test device as specified in Section 19.2 of NES M 0154 (Testing Methods of Fabrics for Automobiles)
(2) S-11 paper
(3) Dust collector
(4) Taber mounting card (H-18 only)

19.2.1.3 Test piece Test piece No. 20 as per Table 3-B (Circular piece with a diameter of 130 mm. Make a hole with a diameter of 7 mm at the center.). 4 pieces (2 pieces each from areas B and C).
For the test piece for H-18, attach Taber mounting card.

19.2.1.4 Test conditions

(1) Room temperature condition as per Table 3-A
(2) Abrasion wheel: CS-10 and H-18
(3) Load: 9.8 N for CS-10 and 4.9 N for H-18 (including the arm weight)
(4) Rotation speed: 60 rpm
(5) Number of rotations: 1,000 times for both CS-10 and H-18

19.2.1.5 Procedure

(1) Polish the H-18 abrasion wheel using the diamond dresser attached to the tester (not required for CS-10).
(2) Set the test device as specified.
(3) Attach a test piece to the test device table (see Figure 19-C).
(4) Operate the test device together with the dust collector.
(5) Stop the test device after the specified number of rotations.
(6) Remove and lightly dust the test piece.
(7) Visually inspect the coating surface abrasion.
(8) Perform Steps (1) to (6) on both CS-10 and H-18.

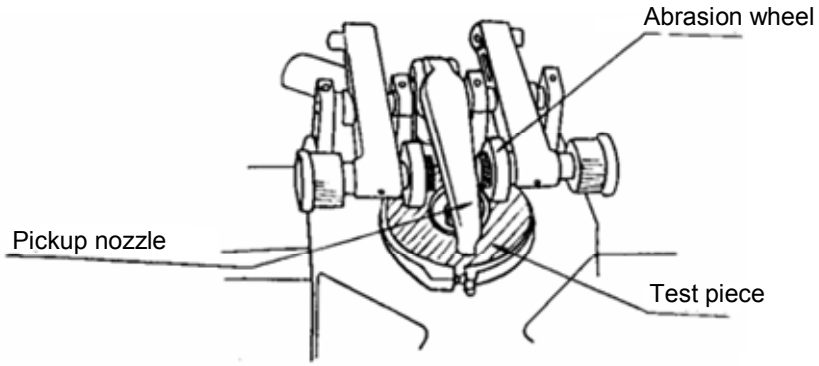


Fig. 19-C: (Attachment of test piece to the test device for abrasion test)

Remarks: When a new abrasion wheel is used, polish it with the diamond dresser attached to the tester before using it in the test. Polish the abrasion wheel every time before performing the test.

19.2.1.6 Indication Any abnormalities on the coating observed shall be indicated. The actual test pieces shall be attached to the indication.

19.2.2 Method II-2

19.2.2.1 Objective Examination of abrasion resistance of polyurethane leather and vinyl leather cloth.

19.2.2.2 Device and instrument

(1) Taber type rotary appressor as specified in Section 18.1.2 of NES M 0154 (Testing Methods of Fabrics for Automobiles) ⚠A
(2) S-11 paper

19.2.2.3 Test piece Test piece No. 15 as per Table 3-C (Circular piece with a diameter of 150 mm. Make a hole with a diameter of 7 mm at the center). 1 piece.

19.2.2.4 Test conditions

(1) Room temperature condition as per Table 3-A
(2) Abrasion wheel: CS-10
(3) Load: 9.8 N
(4) Rotation speed: 60 rpm
(5) Number of rotations: 2,000 times

19.2.2.5 Procedure

(1) Set the test device as specified.
(2) Attach the test piece to the test device table.
(3) Operate the test device together with the dust collector.
(4) Stop the test device after the specified number of rotations
(5) Grade the abrasion level according to the judgment criteria shown below. See Table 19-A for polyurethane leather and Table 19-B for vinyl leather cloth.

Table 19-A: Assessment criteria for polyurethane leather

Grade	Criteria
1	Excessive abrasion and cracking are evident in the synthetic film, exposing the foundation cloth.
2	Excessive grain and metallic wear, producing steps.
3	Grain and metallic wear clearly noticeable, with excessive gloss differences.
4	Slight grain and metallic wear evident, with remarkable changes in gloss.
5	Grain and metallic wear barely noticeable, with negligible changes in gloss.

Table 19-B: Assessment criteria for vinyl leather cloth

Grade	Criteria
1	Test sample significantly worn. The PVC layer is torn exposing the foundation cloth. A foam-type leather has many pinholes visible in the foam layer. The vinyl surface area is almost completely eroded.
2	Grain pattern and metallic finish show marked wear. A foam-type leather has many pinholes visible in the foam layer.
3	Grain pattern and metallic finish show obvious wear. Gloss is very uneven.
4	Grain pattern and metallic finish show slight wear. Gloss is uneven in some areas.
5	Grain pattern and metallic finish show no significant wear. Gloss shows negligible deterioration.

Remarks: 1. Polish the abrasion wheel with an S-11 paper 50 times before each test. During continuous testing, polish the abrasion wheel 25 times after every 1,000 rotations.
2. The S-11 paper shall be disposed once used.
3. It is acceptable to use a polishing machine instead of S-11 paper.

19.2.2.6 Indication The abrasion resistance shall be indicated according to the criteria. The actual test piece shall be attached.

19.3 Abrasion resistance test method III

19.3.1 Objective Examining abrasion resistance of genuine leather, polyurethane leather, and vinyl leather cloth (for seat insert).
Examining abrasion resistance of the coating surface of genuine leather when main and side parts are trimmed with piping.

19.3.2 Device and instruments

(1) A traverse type abrasion test device or a test device having equivalent capacity. (See Figure 19-A.)
(2) Average cotton canvas No. 9 specified in JIS L3102 (Cotton canvas)
(3) Double-sided adhesive tape, etc.
(4) Silicon tube: Inside diameter = 4 mm, outside diameter = 6 mm, length = 100 mm, hardness = 50
(Example: Code No. 55-586-12 manufactured by Iuchi Seieido Co., Ltd.)

19.3.3 Test piece

Genuine leather: Test piece No. 14 and No. 15 as per Table 3-B (50 mm X 120 mm). 3 pieces each in longitudinal and lateral directions. Sample from B and C areas. Total 12 pieces.
Polyurethane leather and vinyl leather cloth (for seat insert): Test piece No. 16 and No. 17 as per Table 3-C (50 mm X 120 mm). 3 pieces each.

19.3.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Friction element shape Flat plate 2 cm x 2 cm
(3) Surface pressure 330 g/cm2 (Load: 1.32 kg)
(4) Stroke speed 50 strokes per min (1 stroke = 1 reciprocating movement)
(5) Number of strokes Genuine leather: Repeat until an abnormality, such as crack or peeling of coating film, occurs. If no abnormality occurs, repeat up to 20,000 times.
Polyurethane leather: Repeat until a cut occurs. If no cut occurs, repeat up to 20,000 times.
Polyvinylchloride coated fabric: Repeat until an abnormality occurs on the coated surface. Abnormality on the surface refers to crack/whitening in surface preparation agent and PVC layers, generation of pinholes, exposure of base materials, etc. If no abnormality occurs, repeat up to 20,000 times.
(6) Movement distance 50 mm
(7) Cotton canvas piece 6 cm x 6 cm (Wrap the friction element)

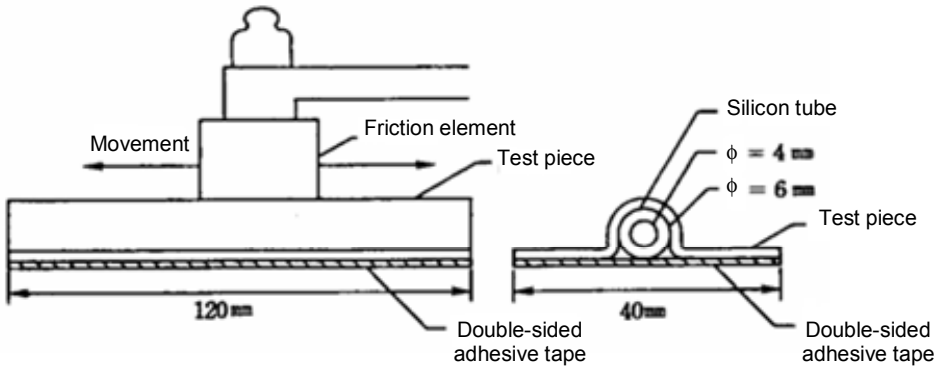


Fig. 19-D: Traverse type abrasion test device (for testing genuine leather)

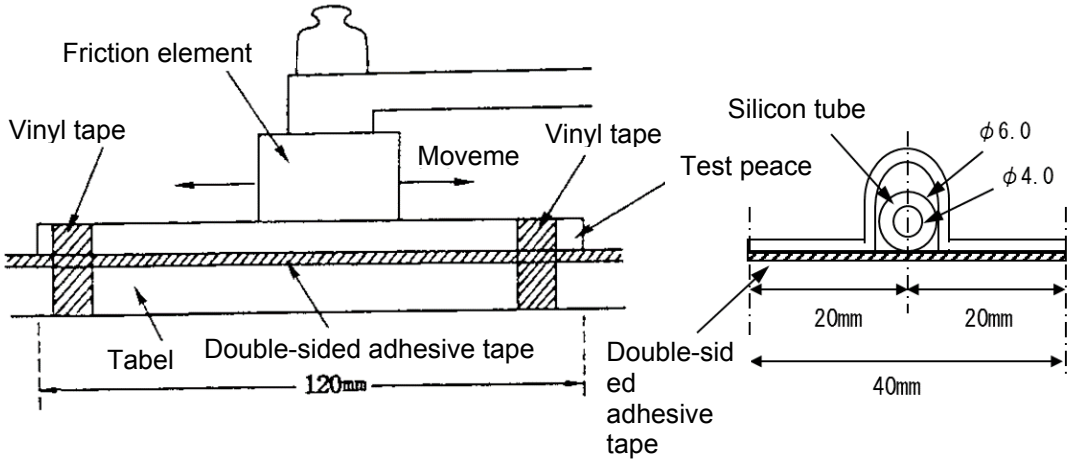


Fig. 19-E: Traverse type abrasion test device (for testing genuine leather and polyvinylchloride coated fabric)

19.3.5 Procedure

(1) Set the test device as specified.

(2)-1: Genuine leather

Attach the silicon tube to the test device table, and mount the test piece over it so that the test piece covers the silicon tube. The test piece width should become 40 mm (double-sided adhesive tape). (See Figure 19-D.)

(2)-2: Polyurethane leather and polyvinylchloride coated fabric

Attach the silicon tube at the center of the test device table with a double-sided adhesive tape. Mount the test piece over it placing the center line of the test piece onto the center of the silicon tube. Carefully cover the silicon tube with the test piece paying attention not to stretch it. The test piece width should become 40 mm. Secure both ends of the test piece, which do not affect the friction element movement, to the table with vinyl tape. (Fig. 19-E)

(3) Attach the cotton canvas to the friction element with a double-sided adhesive tape so that it would not move during the test.

(4) Make sure the surface pressure is applied as specified.

(5) Operate the test device, and continue testing as shown below.

Genuine leather: Until abnormality such as cracking or peeling of coating occurs.

Polyurethane leather: Until the surface cracks or tearing or peeling occurs.

Examine the coating for genuine leather and the surface for polyurethane leather and polyvinylchloride coated fabric after every 1,000 strokes. Continue the test up to 20,000 strokes MAX.

(6) Remove the test sample from the test device.

Remarks: The abrasion canvas shall be replaced for each test piece.

The silicon tube shall be replaced after every 100,000 strokes.

19.3.6 Indication

Genuine leather: The minimum number of strokes that caused the coating surface to crack or peel shall be indicated. The actual test piece shall be attached.

Polyurethane leather and polyvinylchloride coated fabric: The number of strokes that caused the surface to crack, whitening, cut, peel or damaged with pinholes shall be indicated. The actual test piece shall be attached.

19.4 Abrasion resistance test method IV

19.4.1 Objective Examine the abrasion resistance of leather coating surface when the leather is wrinkled.

19.4.2 Device and instruments

19.4.2 Device and instrument

(1) Traverse type abrasion test device or a test device having equivalent capacity (See Figure 19-A.)

(2) Average cotton canvas No. 9 specified in JIS L 3102

(3) Double-sided adhesive tape, etc.

(4) Silicon tube: Inside diameter = 4 mm, outside diameter = 6 mm, length = 100 mm

(Example: Code No. 55-586-12 manufactured by Iuchi Seieido Co., Ltd.)

19.4.3 Test piece Test piece No. 16 and No. 17 as per Table 3-C (50 mm X 120 mm). 6 pieces each.

3 pieces each shall be sampled from B and C areas. The test piece thickness shall be 1.0 ~ 1.2 mm.

19.4.4 Test conditions

(1) Room temperature condition as per Table 3-A.

(2) Friction element shape: Flat plate 2 cm x 2 cm

(3) Surface pressure 330 g/cm2 (Load: 1.32 kg)

(4) Stroke speed: 50 strokes per min (1 stroke = 1 reciprocating movement)

(5) Number of strokes: Until abnormality such as cracking or peeling of coating occurs.

(6) Movement distance: 50 mm

(7) Cotton canvas piece: 6 cm x 6 cm (Wrap the friction element)

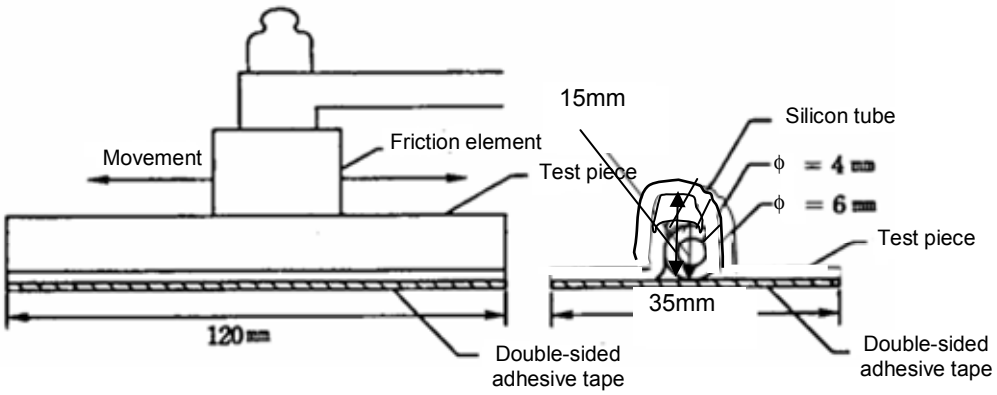


Fig. 19-F: Abrasion test method IV

19.4.5 Procedure

(1) Set the test device as specified.
(2) Attach the silicon tube to the test device table and mount the test piece over it providing a clearance of 15 mm between the silicon tube and the test piece. The test piece width should become 35 mm (double-sided adhesive tape). (See Figure 19-F).
(3) Attach the cotton canvas to the friction element so that it would not move during test (double-sided adhesive tape). (See Figure 19-B.)
(4) Make sure the load is adjusted as specified.
(5) Operate the test device and continue testing until cracking or peeling of the coating occurs. Check the coating surface condition after every 1,000 strokes. Continue the test up to 20,000 strokes MAX.
(6) Remove the test piece from the test device.

Remarks: The abrasion canvas shall be replaced for each test piece.
The silicon tube shall be replaced after every 100,000 strokes.

19.4.6 Indication The minimum number of strokes that caused the coating surface to crack or peel shall be indicated. The actual test piece shall be attached.

Note: Make sure the genuine leather or the coating is wrinkled by the friction element during the motion. If not, the test must be redone using a new test piece, slightly narrowing the width (35 mm) of the new test piece or adjusting the wrapping condition around the silicon tube. Make sure a slight wrinkling occurs.

20. Friction resistance test method (Gakushin friction test method)

20.1 Objective Examination of the abrasion resistance of genuine leather, polyurethane leather, and vinyl leather cloth seams.

20.2 Device and instruments

(1) Gakushin type friction test device (See Figure 20-A.)
(2) White denim cloth (14 ounces, 100% cotton)
Example: Katsuragi No. 14
(3) Wadding urethane (Thickness 10 mm, specific gravity: 0.020 g/cm3)
(4) Sewing thread: Nylon #8 or Polyester #8
(5) Sewing needle: #23

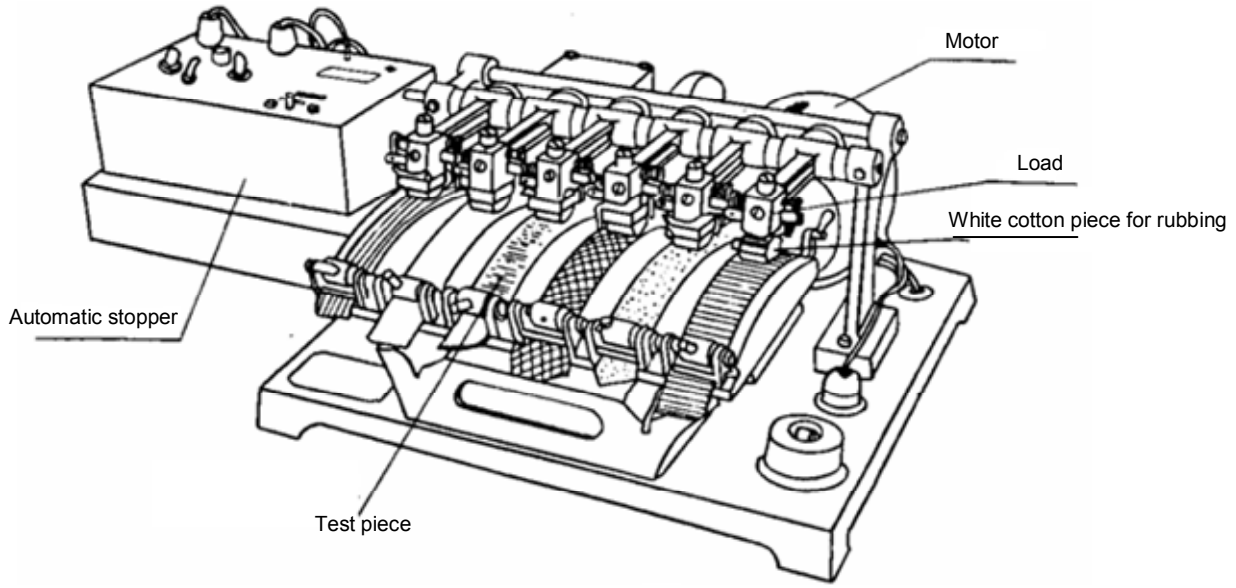


Fig. 20-A: Gakushin type friction test device

20.3 Test piece Test piece No. 21 as per Table 3-B. 2 pieces each shall be sampled from B and C areas.

20.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Load: 4.9 N
(3) Stroke speed: 30 strokes/ min (1 stroke = 1 reciprocating movement)
(4) Stroke distance: 200 mm
(5) Number strokes: 1,000

20.5 Procedure

(1) Overlay 2 test pieces with their top surfaces facing inside. Sew them together using a sewing machine. (See Fig. 20-B.) Sew them in chain stitches at a pitch of 5 mm. The thread shall be knotted at both ends of the test sample so that it will not come loose.
(2) Set the test device as specified.
(3) Open the sewn test sample, and put the wadding urethane at its back. Attach the piece to the friction element so that the grain side faces the friction table.
(4) Attach the white denim cloth to the friction table (see Figure 20-C).
(5) Operate the test device, to rub the test sample for 1,000 strokes.
(6) Remove the test sample, and check for the presence of abnormalities such as flaking or peeling of the coating.

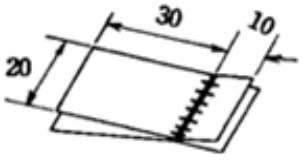


Fig. 20-B: Test piece for friction resistance test

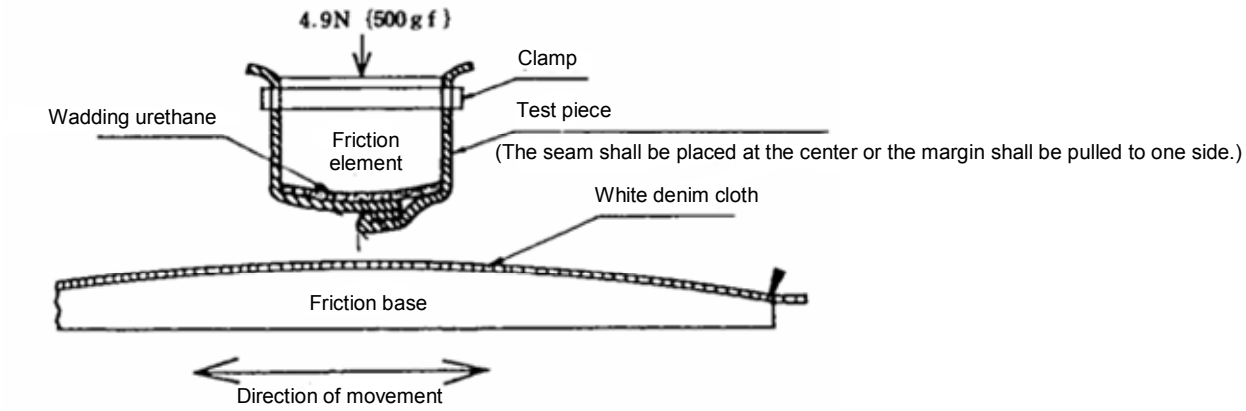


Fig. 20-C: Attachment of test piece

20.6 Indication Abnormality such as pealing of coating shall be indicated. The actual test piece shall be attached.

21. Test method for color fastness to dry rubbing

21.1 Objective Examination of staining by dry rubbing of the genuine leather, polyurethane leather and vinyl leather cloth surfaces.

21.2 Device and instrument

(1) Gakushin type friction test device (See Figure 20-A.)
(2) White cotton cloth for rubbing [Cotton No. 3 (shirting No. 3) listed in Table 1 of JIS L 0803 (Standard adjacent fabrics for staining of color fastness test), bleached and scoured, but not starched]
(3) Gray scale for stain evaluation [JIS L 0805 (Gray scale for assessing staining)]
(4) Standard light source (CIE D 65)

21.3 Test piece Genuine leather: Test piece No. 24 as per Table 3-B (250 mm X 30 mm). 1 piece
Polyurethane leather, vinyl leather cloth: Test piece No. 18 as per Table 3-C (250 X 30 mm).

21.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Load: 4.9N
(3) Stroke speed: 30 strokes/min.
(4) Stroke distance: 200 mm

21.5 Procedure

(1) Set the test device as specified.
(2) Attach a 50-mm-square piece of white cotton cloth for rubbing and a test piece to the test device.
(3) Start the tester and let it run for 300 strokes.
(4) Remove the test piece and using a gray scale for stain evaluation, grade the stain on the white cotton cloth according to the criteria shown below.

Table 21-A Criteria

Grade	Criteria	Stain on white cotton cloth
1	Stain is equivalent to or heavier than sample No. 1 of the gray scale for stain evaluation.	Excessive
2	Stain is equivalent to sample No. 2.	Fairly remarkable
3	Stain is equivalent to sample No. 3.	Remarkable
4	Stain is equivalent to sample No. 4.	Barely noticeable
5	Stain is equivalent to sample No. 5.	None

21.6 Indication The stain grade shall be indicated according to the criteria, with an actual sample attached.

22. Test method for color fastness to wet rubbing

22.1 Objective Examination of staining by wet rubbing of the genuine leather, polyurethane leather and vinyl leather cloth surfaces.

22.2 Device and instrument

(1) Gakushin type friction test device (See Figure 22-A.)
(2) White cotton cloth for rubbing [Cotton No. 3 (shirting No. 3) listed in Table 1 of JIS L 0803 (Standard adjacent fabrics for staining of color fastness test), bleached and scoured, but not starched]
(3) Gray scale for stain evaluation [JIS L 0805 (Gray scale for assessing staining)]
(4) Standard light source (CIE D 65)
(5) synthetic sweat
synthetic sweat as per Section 9.6.2 of JIS K 6772 (vinyl leather cloth) or JIS L 0804 (Method D). See Table 22-A for the components.

Table 22-A: Synthetic sweat

Components	Quantity
Disodium phosphate (crystal)	8 g
Sodium chloride	8 g
Acetic acid	5 g
Distilled water	1 L

22.3 Test piece Genuine leather: Test piece No. 24 as per Table 3-B (250 X 30 mm). 1 piece.
Polyurethane leather, vinyl leather cloth: Test piece No. 18 as per Table 3-C (250 mm X 30 mm).

22.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Load: 1.96N
(3) Stroke speed: 30 strokes/min.
(4) Stroke distance: 200 mm
(5) Synthetic sweat: [See Table 22-A]

22.5 Procedure

(1) Set the test device as specified.
(2) Immerse the white cotton cloth for rubbing in synthetic sweat for 10 min, wring the cloth lightly, and mount it to the test device.
(3) Operate the test device and let it run for 100 strokes.
(4) Remove the test piece and using the gray scale for stain evaluation, grade the stain on the white cotton cloth according to the criteria shown in Table 22-B.

Table 22-B Criteria

Grade	Criteria	Stain on white cotton cloth
1	Stain is equivalent to or heavier than sample No. 1 of the gray scale for stain evaluation.	Excessive
2	Stain is equivalent to sample No. 2.	Fairly remarkable
3	Stain is equivalent to sample No. 3.	Remarkable
4	Stain is equivalent to sample No. 4.	Barely noticeable
5	Stain is equivalent to sample No. 5.	None

22.6 Indication The stain grade shall be indicated according to the criteria, with an actual sample attached.

23. Wet cloth friction color fastness test method

23.1 Objective Examination of staining by wet rubbing of the genuine leather coating and grain with cotton cloth.

23.2 Device and material

(1) Gakushin type friction test device (Fig. 20-A)
(2) Standard light source (CIE D 65)

(3) White cotton cloth for rubbing (JIS L 0803)
(4) Purified water

23.3 Test piece Test piece No. 24 as per Table 3-B.1 piece.

23.4 Test conditions
(1) Room temperature condition as per Table 3-A.
(2) Load: 4.9 N
(3) Stroke speed: 30 strokes/min (1 stroke = 1 reciprocating movement)
(4) Stroke distance: 200 mm
(5) Number of strokes: 100

23.5 Procedure
(1) Set the test device as specified.
(2) Immerse the test piece and the white cotton cloth for rubbing in water for 10 min, then take them out.
(3) Mount the test piece and the white cotton cloth prepared as (2) above on the test device.
(4) Operate the test device and let it run for 100 strokes.
(5) Remove the test piece and the white cotton cloth and allow them to dry at room temperature.
(6) Grade the stain on the white cotton cloth according to the criteria shown in Table 23-A.

Table 23-A Criteria

Grade	Criteria	Stain on white cotton cloth
1	Stain is equivalent to or heavier than sample No. 1 of the gray scale for stain evaluation.	Excessive
2	Stain is equivalent to sample No. 2.	Fairly remarkable
3	Stain is equivalent to sample No. 3.	Remarkable
4	Stain is equivalent to sample No. 4.	Barely noticeable
5	Stain is equivalent to sample No. 5.	None

23.6 Indication The stain grade shall be indicated according to the criteria, with an actual sample attached.

24. Denim material color transfer resistance test method

24.1 Objective Examination of color transfer to genuine leather, polyurethane leather and vinyl leather cloth and cleanability of polyurethane leather when rubbed with dry denim cloth.

24.2 Device and material
(1) Use either a Gakusin abrasion tester or Martindale abrasion tester.
(2) Contaminating cloth: Testfabrics manufactured 2550Y [Reference: Purchase Denim 2550Y from Nippon Shizai Co., Ltd.]
(3) Wiping cloth used shall be the ones from which fabric softening agent has been removed by washing or the ones washed and dried without using fabric softening agent at the time of manufacturing. The color shall be white. For example, JIS L 4105 3 a) No.1 675 g / 12 pieces
[Reference: Purchase from Nippon Shizai Co., Ltd.]
(4) Colorimeter used shall be an integrating sphere type colorimeter with D65 light source which is capable of measuring colors of L*, a*, and b* (for example SP64 manufactured by X-rite).
(5) Water used when contaminating or wiping shall be distilled water.

24.3 Test piece
Gakusin abrasion tester:
Genuine leather: Test piece No. 24 as per Table 3-B. 3 pieces.
Polyurethane leather and vinyl leather cloth: Test piece No. 18 as per Table 3-C. 3 pieces.
Martindale tester
Genuine leather: Test piece No. 30 as per Table 3-B. 3 pieces.
Polyurethane leather and vinyl leather cloth: Test piece No. 27 as per Table 3-C. 3 pieces.

24.4 Test conditions
Gakusin abrasion tester:
(1) Room temperature condition as per Table 3-A
(2) Load: 1.96 N

(3) Friction stroke speed: 30 times/min
(4) Friction stroke distance: 100 mm for genuine leather; 200 mm for polyurethane leather and vinyl leather cloth
(5) Number of strokes: 200 times

Martindale tester
(1) Room temperature condition as per Table 3-A
(2) load: 12 kPa
(3) Stroke speed: 47.5±2.5 cyc/min
(4) Stroke frequency: 1000 cyc

24.5 Procedure

24.5.1. Application of stain

(1) Attach the cut-out denim to the friction element of the tester, then apply droplets of distilled water (Gakusin abrasion tester: 400 µl, Martindale tester: 600 µl) onto the denim using a syringe. Afterwards, perform testing under the test conditions in 24.4.
(2) Remove the test piece after 1,000 cycles and perform 3-point color measurement at ⊿b* of contaminated portion. Calculate the average value.

⊿b* = b* value (after testing) - b* value (initial)

24.5.2. Removal of stain

(1) Apply machine wiping. However, hand wiping shall also be allowable upon discussion between parties involved.
(1)-1 Hand wiping: Apply droplets of distilled water (300µl) to a wiping cloth cut out to be 25 mm × 25 mm (24.2(3)), and wipe a half of the evaluation range shown in Fig. 24-A for 10 strokes.
(1)-2 Machine wiping (Martindale): Apply droplets of distilled water (600 µl) to a wiping cloth using a syringe, and wipe the evaluation range shown in Fig. 24-A with a load of 12 kPa for 10 strokes.
(2) Perform 3-point color measurement at ⊿b* of the evaluation range shown in Fig. 24-A where stain is wiped off, and calculate the average value.

⊿b* = b* value (after the test) – b* value (initial)

24.6 Indication

For each of the 3 test pieces, indicate ⊿b* of 24.5.1 (6) and 24.5. 2 (4), and attach the actual test sample.

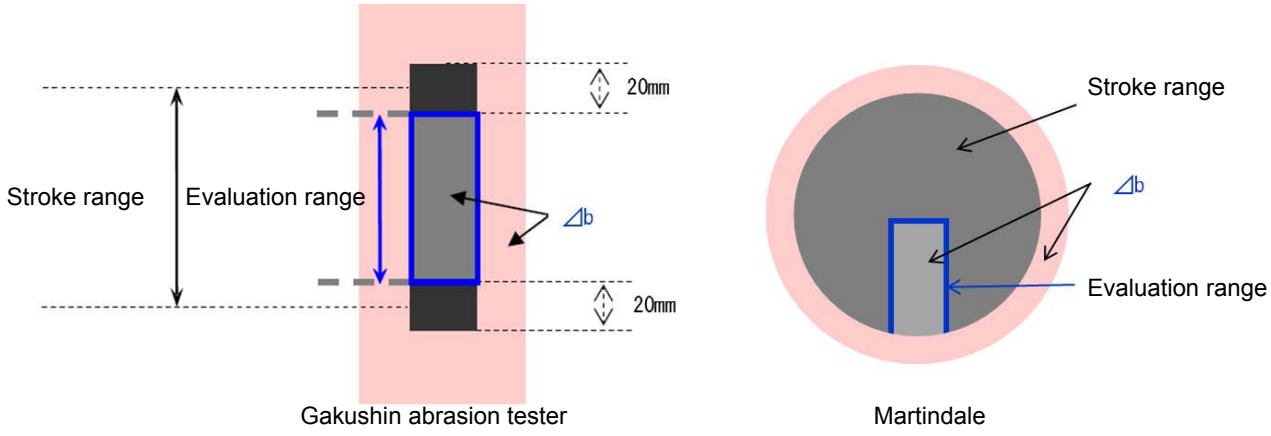


Fig. 24-A Evaluating portion

25. Adhesion test method

25.1 Objective Examination of adhesion of genuine leather, polyurethane leather and vinyl leather cloth surfaces under heated conditions.

25.2 Device and instrument

(1) Thermostatic chamber
(2) 2 glass sheets: (60 mm x 60 mm x approx. 2 mm in thickness) (Only for the genuine leather test)
(3) Weight (Load: 29.4 N) (The bottom area shall be smaller than the glass sheets above.) (Only for the genuine leather test)

25.3 Test piece Genuine leather: Test piece No.10 as per Table 3-B. 2 pieces.
Polyurethane leather and vinyl leather cloth: Test piece No. 19 as per Table 3-C. 2 pieces.

25.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Heating temperature: Genuine leather: 80 ±2°C
Polyurethane leather and vinyl leather cloth: 120 ±2°C
(3) Heating time: Genuine leather: 24 h

Polyurethane leather and vinyl leather cloth: 100 h and 400 h

25.5 Procedure

Genuine leather:

(1) Overlay 2 test pieces with their top surfaces facing inside. Place them between 2 glass plates, then in the thermostatic chamber horizontally. Place a weight specified in Section 25.2 (3) above at the center of the glass plate.
(2) Leave the test sample to stand at the specified temperature for the specified time. Take out the sample, remove the weight and leave it to stand at room temperature specified in Section 3.1.3 for 1 h.
(3) Slowly separate the 2 test pieces. Visually check the top surfaces for abnormalities such as adhesion or flaw.

Polyurethane leather and vinyl leather cloth:

(1) Place the test piece on a metal lack in the thermostatic chamber adjusted to the specified temperature, then start heating.
(2) After heating for the specified time, take out the test piece and tactually check for stickiness.

25.6 Indication

Genuine leather: Abnormality in coating or grain shall be indicated.
Polyurethane leather and vinyl leather cloth: The result of the stickiness check shall be indicated.

26. Thermal aging test method

26.1 Objective Genuine leather, polyurethane leather and polyvinylchloride coated fabric: Examination of changes in appearance caused by heat (discoloration, etc.). Vinyl leather cloth: Examination of physical properties (elongation rate) after thermal treatment.

26.2 Device and instrument

(1) Thermostatic chamber
(2) Colorimeter (Colorcom C spectrophotometer or a device having equivalent performance capability) (Only for change in appearance)
(3) Pulling test device: Instron type tensile test device or a test device having equivalent or superior capacity (Only for the vinyl leather cloth test)

26.3 Test piece

26.3.1 Change in appearance

Genuine leather: Test piece No. 26 as per Table 3-B × 2 each, polyurethane leather and polyvinylchloride coated fabric: Test piece No. 2 as per Table 3-C × 2 each

26.3.2 Elongation rate of polyvinylchloride coated fabric

Test pieces No. 3 and 4 as per Table 3-C × 6 each

26.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Heating temperatures Change in appearance: 110 ±2°C
Elongation rate of polyvinylchloride coated fabric: 120 ±2°C
(3) Heating time Change in appearance: 120 h for Japan and Europe. 200 h for North America and general export.
Elongation rate of polyvinylchloride coated fabric: 100 h and 400 h
(4) Tensile test conditions (Vinyl leather cloth only)
Clamp width: 30 mm MIN. Distance between clamps: 100 mm
Initial load: 1.96 N
Tensile speed: 200 mm/min

26.5 Procedure

26.5.1 Change in appearance

(1) Set the thermostatic chamber as specified. Suspend one test piece in the chamber not allowing it to contact other objects in the chamber. Heat the test piece for the specified time.
(2) At the completion of the heating process, remove the test piece from the chamber. Cool it to the room temperature.
(3) Measure the colors of tested and untested test pieces, and calculate Δb^* using the following formula.
Δb^* = b* value (after testing) - b* value (initial)

26.5.2 Elongation rate of polyvinylchloride coated fabric

(1) Set the thermostatic chamber as specified. Suspend a test piece in the chamber not allowing it to contact other objects in the chamber. Heat it for the specified time. (100 h: 3 pieces each, 400 h: 3 pieces each)
(2) Take out the test piece from the chamber and cool it to the room temperature in the desiccator.
(3) Set the test device as specified.
(4) Retain the test piece using the upper and lower clamps at points 25 mm from each end.
(5) Apply the initial load. Hold the test piece with tension so as not to make it warp. Lock the clamps.
(6) Operate the test device. Record the load when the distance between the clamps becomes 150 mm. Continue to apply tension until the test piece breaks. Stop the test device as soon as the test piece breaks. Read the maximum load and the distance between the clamps down to the first decimal place.

26.6 Indication

26.6.1 Change in appearance

The value Δb^* and the presence of abnormalities on the coated surface shall be indicated. The actual test piece shall be attached.
Note: Δb^* represents the value under the light source D65. Performance under a C-type light source is represented by Δb. The approximate relationship between them can be expressed as below.
$\Delta b^* = 1.6 \times \Delta b$

26.6.2 Elongation rate of polyvinylchloride coated fabric

Average of each test, each conducted with 3 test pieces, shall be indicated down to the first decimal place. The values shall be indicated in the unit of %.

27. Heat shrinkage test method

27.1 Objective Examination of heat shrinkage of polyurethane leather and vinyl leather cloth.

27.2 Device and instrument

(1) Thermostatic chamber
(2) Scale

27.3 Test piece

27.3.1 Genuine leather

Test piece No. 26 as per Table 3-B × 3 each for A, B, and C

27.3.2 Polyurethane leather and polyvinylchloride coated fabric

Test piece No. 20 as per Table 3-C × 3 each

27.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Heating temperatures: Genuine leather: 110°C ± 2°C
Polyurethane leather and polyvinylchloride coated fabric: 120°C ± 2°C
(3) Heating time: Genuine leather: 360 hours
Polyurethane leather and polyvinylchloride coated fabric: 100 hours

27.5 Procedure

(1) Remove unnatural wrinkles and tension of the test piece. Measure the marking line length to the nearest 0.5 mm.
(2) Horizontally place the test piece in the thermostatic chamber adjusted as specified ([3]) and heat for the specified time.
(3) Take the test piece out of the thermostatic chamber and allow it to cool down for 1 h at room temperature.
(4) Then, measure the marking line length again to the nearest 0.5 mm.
(5) Using the following equation, calculate the heat shrinkage rate to the first decimal place in the longitudinal and lateral directions.

$$\text{Heat shrinkage rate (\%) ([4])} = (\ell_1 - \ell_0)/\ell_1 \times 100$$

Where, ℓ_1: Marking line length before heating (mm)
ℓ_0: Marking line length after heating (mm)

Note ([3]): Place an asbestos sheet on the horizontal table inside the thermostatic chamber to prevent the test piece from sticking to the table.
([4]): Heat shrinkage shall be expressed in a negative value (-) if the test piece is elongated by heat.

27.6 Indication

(1) Average of the three measurements taken shall be indicated to the first decimal place.
(2) The values shall be indicated in the unit of %.

28. Heat-humidity cycle test method

28.1 Objective Examination of the degree of genuine leather hardening (shrinkage) resulting from changes in the environment.

28.2 Equipment

(1) Thermo-humidistatic chamber
(2) Vernier calipers

28.3 Test piece Test piece No. 26 as per Table 3-B. 3 pieces.

28.4 Test conditions

28.4.1 NL1 (seat)

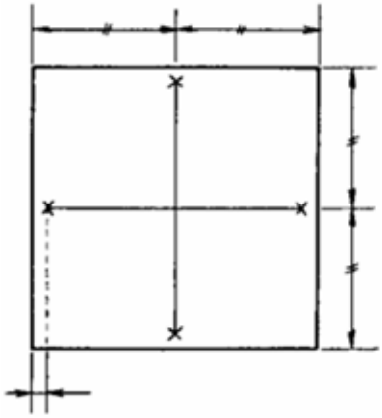
(1) Room temperature condition as per Table 3-A.
(2) Heat-humidity load conditions
A: 100 ±2°C for 22 h → Standard condition specified in Section 3.1.1 for 30 min
B: 50 ±2°C and 90 ±5% RH for 1 h → Standard condition specified in Section 3.1.1 for 30 min
→ 100 ±2°C for 22 h → Standard condition specified in Section 3.1.1 for 30 min

(3) Loading cycles
Apply the heat-humidity load in the sequence of A - B - B - B [Apply the load (2) A, then (2) B three times].

28.4.2 NL4, 6 (instrument panel)
(1) Room temperature specified in Table 3-A
(2) Humidity, temperature, and load application conditions
50 ± 2°C, 95 ± 5%RH, 3 hours → 23°C, 50% ± 5% × RH, 1 hour → 80°C, 50% ± 5%RH, 4 hours → 23°C, 50% ± 5%, 1 hour → -40°C, 50% ± 5% × RH, 1.5 hour → 23°C, 50% ± 5% × RH, 0.5 hour
(3) Load application cycle
10 cycles

28.5 Procedure
(1) Leave the test samples to stand under the standard condition specified in Table 3-A for 48 h or longer.
(2) Mark the test pieces both in longitudinal and lateral directions as shown in Figure 28-A. Use the vernier caliper to measure the initial test sample length to the first decimal place of a millimeter (to the nearest 0.1 mm).
(3) Perform the specified number of test cycles for each test sample.
(4) After completion of the specified number of test cycles, remove the test piece from the testing machine. Use the vernier caliper to again measure the test piece length, following the same procedure as that used in the measurement of the initial length.
(5) Calculate the shrinkage ratio using the following formula.
Shrinkage rate (%) = (Length after test - initial length) / initial length x 100

28.6 Indication The average shrinkage rates of the three test pieces in the longitudinal and lateral directions shall be indicated to the first decimal place. The values shall be indicated in the unit of %.



* Other points shall also be marked at approximately 5 mm from the edge, and the length shall be accurately measured with the vernier caliper.

Fig. 28-A: Heat-humidity cycle test piece

29. Volatilization loss test method
29.1 Objective Assessment of volatile loss of polyurethane leather and vinyl leather cloth.

29.2 Device and instrument
(1) Thermostatic chamber
(2) Weighing bottle
(3) Desiccator
(4) Chemical balance (graduated to 0.1 mg)
29.3 Test piece Test piece No. 21 as per Table 3-C. 5 pieces.

29.4 Test conditions
(1) Standard condition specified in Table 3-A.
(2) Heating temperature: 120±2°C
(3) Heating time: 100 h and 400 h
(4) Air replacement in thermostatic chamber: Approx. 6 times/h

29.5 Procedure
(1) Allow the test pieces to stand in the desiccator for 72 h.
(2) Take the test pieces out of the desiccator and using the weighing bottle weigh each test piece.
(3) Suspend five test pieces in a thermostatic chamber adjusted to the specified conditions, making sure that none of the test pieces contact each other. Heat the test pieces for the specified time.
(4) Take out the test pieces and immediately place them in the desiccator. Allow them to stand for about 2 h and using the weighing bottle weigh each test piece.

(5) Based on the results of the 5 measurements taken, calculate the loss on heating (%) using the following formula.

$$\text{Loss on heating (\%)} = \frac{(W_1 - W_2)}{W_1} \times 100$$

Where,
W_1: Mass before heating (g)
W_2: Mass after heating (g)

(6) The mean loss on heating (%) of the 5 test pieces shall be rounded off to the second decimal place.

29.6 Indication
(1) The calculated value shall be indicated to the second decimal place.
(2) The value shall be indicated in the unit of %.

30. Fog resistance test method

30.1 Objective Assessment of window fogging caused by genuine leather, polyurethane leather and vinyl leather cloth.

30.2 Test method As per Test Method 1 of NES M 0161 (Method of Fogging Test for Interior Materials).

30.2 Test conditions As per Table 30-A.

Table 30-A

	Oil bath temperature x Time	Window glass temperature	Exposure condition
Polyurethane leather and vinyl leather cloth	100°C x 5 h	21°C	24 h in standard condition specified in Section 3.1.2.
Genuine leather	90°C x 24 h	40°C	24 h in desiccator with desiccant.

31. Cold resistance test method

31.1 Objective Assessment of flex resistance of genuine leather coating and impact resistance of polyurethane leather and vinyl leather cloth under low temperature conditions.

31.2 Device and instrument
31.2.1 Genuine leather
(1) Mandrel: 10 mm in diameter
(2) Thermostatic chamber
31.2.2 Polyurethane leather and vinyl leather cloth
(1) DuPont impact test device (See Annex Fig. 31-A) ASTM D 3029
(2) Test piece retainer (See Annex Fig. 31-B)
(3) Thermostatic chamber
(4) Urethane pad (Specific gravity: 0.05) ϕ100 x t70 mm

31.3 Test piece
31.3.1 Genuine leather Test piece No. 23 as per Table 3-B. 1 piece

31.3.2 Polyurethane leather and vinyl leather cloth Test piece No. 23 as per Table 3-B. 3 pieces
31.4 Test conditions
31.4.1 Genuine leather
(1) Room temperature for genuine leather test Temperature: 15 ~ 30°C, Relative humidity: 40 ~ 80%
(2) Cold region: -40 ±2°C, Other: -30 ±2°C

(3) Cooling time: 24 h

31.4.2 Polyurethane leather and vinyl leather cloth

(1) Room temperature condition as per Table 3-A.
(2) Temperature: Cold regions; -40 ±2°C, Other: -30 ±2°C
(3) Cooling time: 60 min
(4) Impact energy (Load x drop distance): 800g x 15 cm
(5) Striker: R5 hemispheric

31.5 Procedure

31.5.1 Genuine leather

(1) Place the test sample and the mandrel in the thermostatic chamber adjusted to the specified temperature and leave them to stand for 24 h.
(2) Take out the test sample and the mandrel from the chamber, and immediately bend it 180 degrees as shown in Figure 31-D. Visually check for any abnormalities on the coating and the grain. Use gloves (e.g., leather gloves) when handling the test sample to protect operator's hands from getting frostbite.

31.5.2 Polyurethane leather and vinyl leather cloth

(1) Set the impact test device as specified (room temperature condition).
(2) Insert the urethane pad into the holder as shown in Annex Fig. 31-C.
(3) Attach a test piece to the holder. (Do not tighten the holder screws.) Place the holder in the thermostatic chamber set to the specified temperature.
(4) 60 min after freezing, tighten the screw and take out the holder. Set the holder to the impact testing device immediately (within 30 s MAX). (Place the test sample center directly below the striker.) Then, drop the weight. (See Annex Fig. 31-E.)
(5) Raise the striker and remove the holder from the testing device. Take out the test piece and visually check for cracks on the test piece surface (for all 3 pieces).

31.6 Indication

31.6.1 Genuine leather

Abnormality on the coating and grain of the test pieces shall be indicated. The actual test pieces shall be attached.

31.6.2 Polyurethane leather and vinyl leather cloth

Cracks on the test piece surface shall be indicated. The actual test pieces shall be attached.

Unit: mm

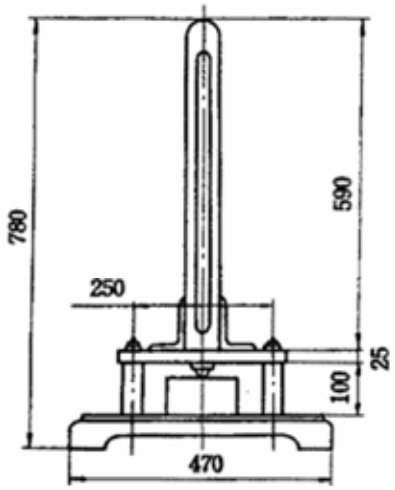


Figure 31-A:
DuPont type impact test device

Unit: mm

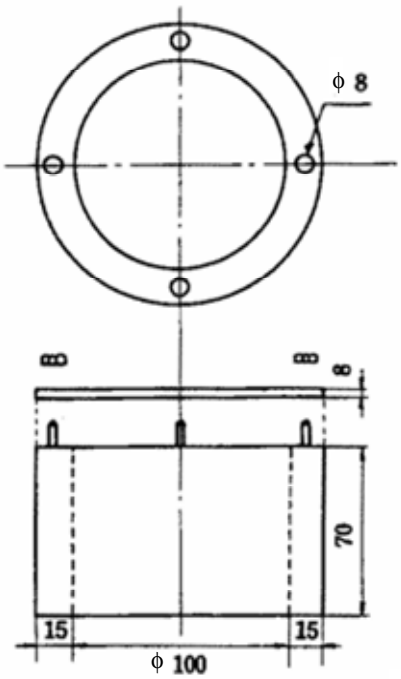


Figure 31-B: Test piece retainer

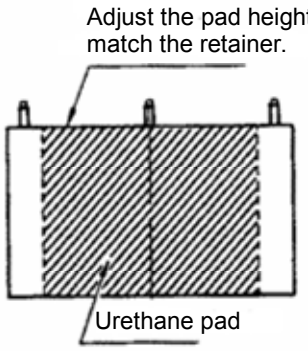


Figure 31-C:
How to stuff urethane pad

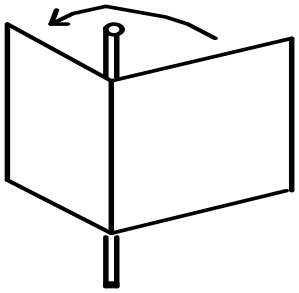
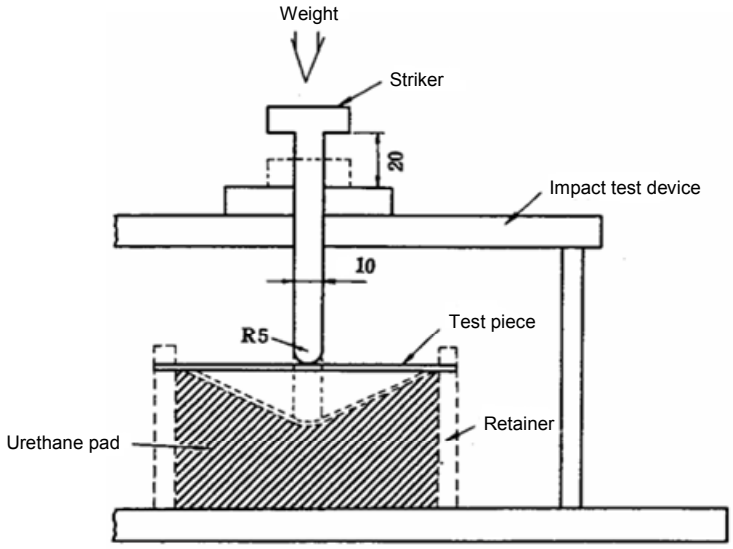


Fig. 31-D: Cold resistance test method



Remark: Replace the urethane pad if wear on the surface is tactually perceptible.

Fig. 31-E: Cold resistance test method

32. Light resistance test method

32.1 Discoloration and fading (Method I – Sunshine method)

32.1.1 Objective Examination of genuine leather, polyurethane leather and vinyl leather cloth discoloration and fading resulting from exposure to light.

32.1.2 Device and material

(1) Sunshine carbon weatherometer as per NES M 0135 (Weatherbility and Light-Resistance Test Methods for Synthetic Resin Parts). (A UV weatherometer or a fademeter may be used for testing polyurethane leather or vinyl leather cloth if a sunshine carbon weatherometer is unavailable. In such cases, specify the name of the test device in the test report. Genuine leather must be tested using the sunshine carbon weatherometer.)
(2) Standard light source (CIE D65)
(3) Discoloration gray scale (JIS L 0804)
(4) Genuine leather and vinyl leather cloth: Urethane wadding meeting flame-resistant specifications (Specific gravity: 0.020 g/cm3, Thickness: 10 mm)

32.1.3 Test piece Polyurethane leather and vinyl leather cloth: 3 rectangle pieces (Width 50 ~ 75 mm X Length 50 mm MIN)
Genuine leather: 1 rectangle piece (Width 50 mm X Length 120 mm MIN) (Sampled in longitudinal direction)

32.1.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Temperature inside test device (Black panel): 83 ±3°C, Humidity: 50 ±5% RH MAX
(3) Irradiation time: Polyurethane leather and vinyl leather cloth: 200 h, 400 h, and 600 h. Genuine leather: See Table 32-A.

Table 32-A

Section / Destination	NL1	NL2	NL3	NL4	NL5	NL6	NL7
	Seat insert / gusset / piping, headrest, pillar	Center console	Back of seat, assist grip	Door (waist)	Door (other than waist)	Instrument panel (UPR)	Instrument panel (LWR)
Japan, Europe	200 H	144 H	72 H	200 H	144 H	200 H	200 H
North America, General export	300 H	200 H	100 H	300 H	200 H	300 H	300 H

32.1.5 Procedure

(1) Make sure the test device is fully operational and capable of running as specified.
(2) Polyurethane leather: When mounting a test piece, try to make the sample surface level with the rack surface.
Genuine leather and vinyl leather cloth: Attach the wadding urethane over the back face of the test sample and put it in the test device. When mounting a test piece, try to make the sample surface level with the rack surface.
(3) Place the test piece in the test device. Irradiate the test piece for the specified time.

32.1.6 Judgment Test results shall be assessed according to the criteria shown in Table 32-B and the judgment method shown below.

(1) Criteria
The test pieces shall be compared with the gray scale. The gray scale rating that matches the degree of test piece discoloration shall be indicated.

Table 32-B Criteria

Grade	Criteria
5	Not noticeable
4	Barely noticeable
3	Remarkable
2	Fairly remarkable
1	Excessive

(2) Judgment procedure
1) Line up tested and untested test pieces side by side in the same yarn direction on a gray cardboard sheet having a Munsell value of 6. Compare the degrees of discoloration with the gray scale.
2) Under a xenon daylight lamp, view the test piece so that the viewing direction is at 45° to the lamp light axis on the surface of the test piece.

32.1.7 Indication Assessment results shall be indicated according to the criteria, with the test pieces attached. Indication shall be made as follows.
(1) If an assessment result is between two adjacent grades, hyphenate the two grades, as in 4-5.
(2) Assessment result worse than grade 1 shall be recorded as grade 1.
(3) If discoloration (color change) is evident, the type of discoloration (See Table 32-C) shall be recorded by appending the corresponding discoloration code after the fastness grading.
Example: Grade 4 (B)

Table 32-C: Discoloration code

Code	Type of discoloration	Code	Type of discoloration
R	Reddish	B	Bluish
O	Orangish	V	Purplish
Y	Yellowish	Br	More vivid
G	Greenish	D	Dull

32.2 Discoloration and fading (Method II – Xenon method)

32.2.1 Objective Examination of genuine leather, polyurethane leather and vinyl leather cloth discoloration and fading resulting from exposure to light. However, for genuine leather, Method II-2 in Table 32-E shall be used as the standard. If required equipment is not available, leveling of the test equipment shall be performed between the parties involved, and either of Method II-1 or Method II-3 shall be used.
For polyurethane leather and polyvinylchloride coated fabric, Method II-1 in Table 32-E shall be used as the standard. If required equipment is not available, leveling of the test equipment shall be performed between the parties involved, and either of Method II-2 or Method II-3 shall be used.

32.2.2 Device and material

(1) Xenon weatherometer conforming to NES M 0135 (Weatherability and Light-Resistance Test Methods for Synthetic Resin Parts).
(2) Standard light source (CIE D65)
(3) Discoloration gray scale (JIS L 0804)
(4) Vinyl leather cloth: Urethane wadding meeting flame-resistant specifications (Specific gravity: 0.020, Thickness: 10 mm)

32.2.3 Test piece The test piece shall be sized to fit in the test piece holder of the test device. At least a 50 mm × 50 mm area shall be irradiated.

32.2.4 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Test device operation: Continuous irradiation
(3) Temperature inside test device (black panel) and humidity
Black panel temperature: 89 ±3°C; humidity: 50 ±5% RH
Irradiated energy for genuine leather is specified in Table 32-D. The test device shall be operated continuously.

Table 32-D

Section / Destination	NL1	NL2	NL3	NL4	NL5	NL6	NL7
	Seat insert / gusset / piping, headrest, pillar	Center console	Back of seat, assist grip	Door (waist)	Door (other than waist)	Instrument panel (UPR)	Instrument panel (LWR)
Japan, Europe	(4)	(3)	(1)	(4)	(3)	(4)	(4)
North America, General export	(5)	(4)	(2)	(5)	(4)	(5)	(5)

(1) ~ (5): See Table 32-E.

Table 32-E

Tester		Xenon weather meter				
		Method II-1	Method II-1A	Method II-1B	Method II-2	Method II-3
Light source			Water-cooling xenon lamp	Air-cooling xenon lamp	Water-cooling xenon lamp	Air-cooling xenon lamp
No. of lamps			1	1	1	3
Optical rise wavelength			320 nm	320 nm	320 nm	320 nm
Light intensity on test piece surface (300 to 400 nm)			162 W/m^2		53 W/m^2	80 W/m^2
Polyurethane leather (MJ/m^2)	(1)	40 MJ/m^2			150 MJ/m^2	160 MJ/m^2
	(2)	70 MJ/m^2			250 MJ/m^2	270 MJ/m^2
Genuine leather (MJ/m^2)	(1)	–	98	120	26	52
	(2)	–	140	168	37	74
	(3)	–	196	216	53	103
	(4)	–	280	312	73	148
	(5)	–	478	528	110	252
Polyvinylchloride coated fabric (MJ/m^2)	(1)	40	–	–	150	160
	(2)	70	–	–	250	270
Tester		Suga Tester XEL-2W	Suga Tester XEL-2F	WACOM WT-341	ATLAS Ci35, Ci65	Heraeus 1200cps

Remark: Shown below are examples of xenon weatherometer suitable to each test method.
Method II-1A: Suga Test Instruments XEL-2F
Method II-1B: Wacom WT-341
Method II-2: Atlas Consulting Group Ci35, Ci65
Method II-3: Heraeus 1200 cps
Test energy (J/m^2) = test time x light intensity on sample surface (W/m^2) W = J/s

32.2.5 Procedure Genuine leather: As per (a) to (e) below. Polyurethane leather and vinyl leather cloth: As per Section 32.1.5
(a) Make sure that the test device is correctly operational as specified.
(b) Set the test piece on the holder (rack), and place them inside the test device.
(c) Operate the test device to irradiate the test piece for the specified time (one at a time).
(d) Irradiation energy: See Tables 9 and 10 below.

32.2.6 Judgment As per Section 32.1.6.
32.2.7 Indication As per Section 32.1.7.

32.3 Physical property deterioration (Method I) Applicable to polyurethane leather and vinyl leather cloth.

32.3.1 Objective Examination of physical properties (tensile strength and elongation) of polyurethane leather and vinyl leather cloth resulted from exposure to light.

32.3.2 Device and material
(1) Light resistance test device as per Section 32.1.2 (SWOM) or 32.2.2 (XWOM)
(2) Tensile test device: Instron-type tensile test device or a test device having equivalent or superior performance capability.
(3) Vinyl leather cloth: Urethane wadding as per Section 32.1.2.

32.3.3 Test piece Test piece No. 3 and No. 4 as per Table 3-C (30 mm X 150 mm). 3 pieces each.

32.3.4 Test conditions
(1) Light resistance test
Polyurethane leather: As per Section 32.1.4. However, the irradiation time shall be 600 h only.
Vinyl leather cloth: As per Section 32.1.4 or 32.2.4.
(2) Tensile strength and elongation shall be measured under the following conditions.
Room temperature as per Section 3.1.3. Test device clamp width: 30 mm MIN. Distance between clamps: 50 mm
Initial load: 1.96 N Tensile speed: 200 mm/min

32.3.5 Procedure
(1) Carry out the light resistance test as per Section 32.1.5 or 32.2.5. (The irradiation area on the test piece shall be 30 mm X 50 mm or larger at the center of the test piece.)
(2) Set the test device as specified to measure the tensile strength and elongation after the light resistance test.
(3) Retain a test piece using the upper and lower clamps at points 25 mm from each end.
(4) Apply the initial load. Hold the test piece with tension so as not to make it warp. Lock the clamps.
(5) Operate the test device. Record the load when the distance between the clamps becomes 150 mm. Continue to apply tension until the test piece breaks. Stop the test device as soon as the test piece breaks. Read the maximum load down to the first decimal place.
(6) Perform Steps (2) ~ (5) on longitudinal and lateral test pieces each including three pieces.

32.3.6 Indication
(1) Average of 3 values measured shall be indicated down to the first decimal place.
(2) The tensile strength shall be indicated in the unit of N and the elongation in %.

32.4 Physical property deterioration (Method II) Applicable to genuine leather only.

32.4.1 Objective Examination of deterioration in genuine leather coating and grains resulted from light exposure through abrasion resistance test.

32.4.2 Device and material
(1) Light resistance test device as per Section 32.1.2 (Method I) or 32.2.2 (Method II)
(2) Urethane wadding as per Section 32.1.2.
(3) Traverse type abrasion test device or a test device having equivalent performance capability.

32.4.3 Test piece Test piece No. 18 and No. 19 as per Table 3-B. 6 pieces each. Sample three pieces each from areas B and C.

32.4.4 Test conditions

(1) Light resistance test: As per Section 32.1.4 or 32.2.4.
(2) Abrasion resistance test: As per Section 19.4.4. However, the number of strokes shall be 5,000 times.

32.4.5 Procedure

(1) Carry out the light resistance test as per Section 32.1.5 or 32.2.5
(2) Carry out the abrasion resistance test as per 19.4.5.

32.4.6 Indication Presence of abnormality on the coating and the grains shall be indicated and the actual test pieces shall be attached.

Test energy (J/m^2) = test time x light intensity on sample surface (W/m^2) W = J/s

33. Bleed resistance test method

33.1 Objective Examination of resistance to bleeding (migration) of pigment onto the coated surface layer.

33.2 Device and instrument

(1) Thermostatic chamber
(2) Gakushin type friction test device (See Section 22.2.)
(3) White cotton cloth for rubbing (See Section 22.2.)
(4) Gray scale for stain evaluation (See Section 22.2.)
(5) Synthetic sweat: (See Section 22.2.)

33.3 Test piece Test piece No. 24 as per Table 3-B. 1 piece.

33.4 Test conditions.

(1) Room temperature condition as per Table 3-A.
(2) Heating temperature: 150 ±5°C
(3) Heating time: 2 h
(4) Load: 4.9 N
(5) Stroke speed: 30 strokes/min (1 stroke = 1 reciprocating movement)
(6) Stroke distance: 200 mm
(7) Number of strokes: Sweat-soaked cloth: 100 times, Dry cloth: 100 times

33.5 Procedure

(1) Place a test piece in the thermostatic chamber adjusted to the specified conditions and heat it for the specified time.
(2) After heating, mount the test piece on the friction test device that is set to the specified test conditions, and rub the test piece 100 times with the sweat-soaked cloth.
(3) After allowing the test piece to stand at room temperature for 8 h or more, rub it 100 times with the dry cloth.
(4) Remove the test piece and the friction cloth from the test device.
(5) Visually check for any abnormalities on the surface of the test piece. Judge the degree of staining on the friction cloth based on the judgment standard specified in Table 22-A using the gray scale for stain evaluation.

33.6 Indication Presence of abnormality on the coating and the grain side shall be indicated. The degree of staining on the friction cloth shall be indicated according to the criteria and the actual tested pieces shall be attached.

34. Sliding friction test method

34.1 Objective Examination of friction coefficient of genuine leather, polyurethane leather, and vinyl leather cloth.

34.2 Device and material

(1) DS type friction coefficient test device or a test device having equivalent or superior performance capability. (See Figure 34-A.)
(2) Test cloth (friction cloth): Three pieces of No. 1 white wool cloth that meet the standard conditions specified in 3.2 (JIS L 0803) (50 mm in length x 110 mm in width)

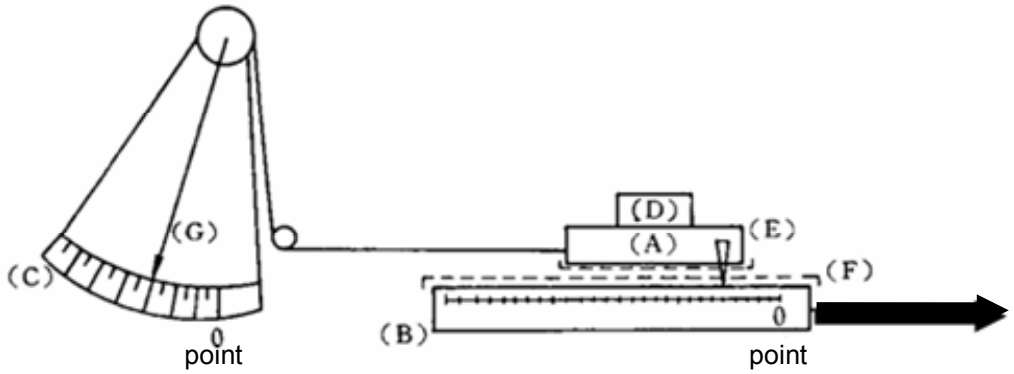
34.3 Test piece (Cloth to be rubbed) Genuine leather: Test piece No. 28 and No. 29 as per Table 3-B. 3 pieces each. Polyurethane leather and polyvinylchloride coated fabric: Test piece No. 30 and No. 31 as per Table 3-C. 3 pieces each

34.4 Test conditions

(1) Standard condition as per Table 3-A.
(2) Load: 9.8 N
(3) Tensile speed: 100 mm/min

34.5 Procedure

(1) Set the test device to the test conditions specified above.
(2) Mount the test piece on the slide base.
(3) Mount the test cloth on the slide base.
(4) Place the slide piece on the slide base, and place the weight on the slide piece.



(A) Slide piece (B) Slide base (C) Measuring scale (D) Weight (load)
(E) Test cloth (F) Test piece (G) Pointer

Figure 34-A: Rough sketch of test device

(5) Adjust the test device so that the measuring scale and the slide piece indicate the 0 point.
(6) Operate the test device to pull the slide base backward (in the direction of the arrow shown in the figure) at a constant speed.
(7) The slide piece appears to slide on the slide base.
(8) When the pointer keeps pointing a constant value, read the value (Fd).
(9) Calculate the dynamic friction coefficient (μd) using the following formula.

$$\mu d = Fd/D$$

where, Fd: Load shown by pointer (G)
D: Load of 9.8 N

(10) Perform steps (1) to (9) on longitudinal and lateral test pieces, each including three pieces.

34.6 Indication Separately for longitudinal and lateral test pieces, indicate three measurement results and their minimum value, rounded to the first decimal place.

35. Cleanability test method

35.1 Objective Examination of the ease of removing stains from genuine leather.

35.2 Device and material

(1) Urethane foam (sponge)

(2) Towel
(3) Standard light source (CIE D 65)
(4) Stains: As per Table 35-A.
(5) Cleaning agent: Select a cleaner for genuine leather (e.g., Nissan-brand leather seat cleaner) or a neutral detergent (e.g., Kao Mypet), and indicate the selected cleaning agent.

Table 35-A

Stain	Description	Product name (Example)
Chocolate	Chocolate bar	Morinaga Hi-milk
Hair liquid	Generally used product	Kanebo Eroica
Coffee	Coffee (with milk and sugar)	Nescafe Excella
Lipstick	Generally used red colored lipstick	Kanebo lipstick
Engine oil	Nissan brand oil	10W30

35.3 Test piece Test piece No. 10. 5 pieces.

35.4 Test condition Room temperature condition as per Table 3-A.

35.5 Procedure
(1) Stain the test piece with a spot approximately 15 mm in diameter, and leave it to stand for 24 h at room temperature. One test piece shall be used for one type of stain.
(2) To remove the stain, rub in a circular motion using urethane foam moistened with the cleaning agent.
(3) Wipe the stain with a water soaked towel and squeezed.
(4) Dry the test piece at room temperature.
(5) Place the test piece under the standard light source and make a visual judgment according to criteria specified in Table 35-B.

Table 35-B Criteria

Grade	Criteria
5	Stain is not noticeable
4	Stain is barely noticeable
3	Stain is remarkable
2	Stain is fairly remarkable
1	Excessively stained

35.7 Indication The result shall be indicated according to the criteria. Actual test pieces shall be attached. The cleaning agent used shall be indicated.

36. Chemical resistance test method
As per Method 2 specified in NES M 0133. Annex Table 36-A lists the types and densities of chemicals to be used. The specific brands of the chemicals shall be decided among parties concerned.

36.1 Objective Examination of polyurethane leather and vinyl leather cloth conditions after chemical wiping.
(Chemical wiping: The surface of the test piece is wiped lightly 2 or 3 times with a piece of chemical-soaked gause cloth.)

36.2 Device and instrument
(1) Thermostatic chamber
(2) Commercially available medical gauze

36.3 Test piece Test piece No. 18 as per Table 3-C. 1 test piece per chemical.

36.4 Chemical types and concentration Types and concentrations of chemicals used for the test shall conform to Method 2 specified in NES M 0133 and Annex Table 36-A.

Table 36-A: Types and concentrations of chemicals

Chemical type	Application	Concentration (wt%)
Leather cleaner	Standard equipment only	100
Leather wax		
Glass cleaner		

36.5 Test conditions

(1) Room temperature condition as per Table 3-A.
(2) Number of wiping movements: 2 ~ 3 times
(3) Time to leave the test piece to stand after wiping: 4 h

36.6 Procedure

(1) Allow a piece of gause to be soaked with the specified chemical.
(2) Lightly pressing the surface of the test piece with the gauze soaked with the specified chemical, wipe the surface the specified number of cycles making it slightly wet.
(3) Leave the test piece to stand at room temperature specified in Section 3.1.3 for 4h.
(4) Then, wipe the chemical off the surface using a new piece of gauze and visually check for discoloration, dulled gloss, fading, or other abnormalities.

36.7 Indication Any abnormal condition shall be indicated with a sample of the tested piece attached.

37. Flammability test method

37.1 Objective Examination of flammability of genuine leather, polyurethane leather and vinyl leather cloth.

37.2 Test method As per NES M 0094 (Test Method of Flammability of Interior Materials for Automobiles).

38. Odor test method

38.1 Objective Examination of odor of genuine leather, polyurethane leather, and vinyl leather cloth.

38.2 Test method As per NES M 0160 (Method of Testing the Smell of Interior Parts). For substances used, refer to M0297 (Odor substance usage restrictions).

39. Sweat abrasion and peel resistance test method

39.1 Objective Examination of whether the bonded interface of the face layer and the foundation cloth of polyurethane leather and vinyl leather cloth (for seat insert) swells and deteriorates due to fatty acid contained in sweat.

39.2 Device and instrument

(1) Glass sheet: At least 25 cm x 25 cm, two pieces
(2) Thermostatic chamber
(3) Traverse type abrasion test device, clock meter or a test device having equivalent capability.
(4) Cotton gauze (Commercially available medical gauze)
(5) Oleic acid (of general reagent grade)
(6) Plate for mounting abrasion test pieces (resin plate or plywood approx. 6 mm thick)
(7) Tacker
(8) Double-sided adhesive tape

39.3 Test piece Two pieces, 30 cm x 30 cm square

39.4 Test conditions

39.4.1 Oleic acid processing

(1) Room temperature condition as per Section 3.1.3.
(2) Standing time: 72h
(3) Drying temperature: 90°C
(4) Drying time: 1 h

39.4.2 Abrasion resistance test

(1) Room temperature condition as per Section 3.1.3.
(2) Friction plate: Silicone rubber plate (See Figure 18.)
(3) Unit pressure: 0.5 kg/cm2
(4) Stroke speed: 60 strokes/min
(1 stroke = 1 reciprocating movement)
(5) Number of strokes: 3,000 strokes and 6,000 strokes
(6) Stroke distance: 50 mm

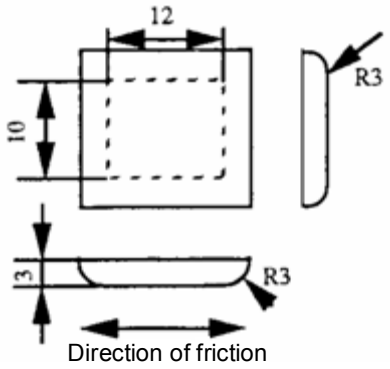


Figure 18: Friction plate

39.5 Procedure

39.5.1 Oleic acid processing

(1) Place a test piece, with the grained side facing up, on a horizontally disposed glass sheet.
(2) Stack four pieces of 15 cm x 15 cm gauze on the test piece, and drip 30 ml of oleic acid onto the center of the test piece.
(3) Place another glass sheet over the gauze stack so that oleic acid will spread over the entire gauze surface. At that time, take care not to have oleic acid come in direct contact with the foundation cloth side of the test piece.
(4) Allow the test piece to stand at room temperature for 72 h.
(5) Take out the test piece, and using wiper paper, etc., wipe oleic acid to the extent that it will not drip down.
(6) Place the test piece in a thermostatic chamber adjusted to 90°C and let it stand for 1 h.

39.5.2 Abrasion resistance test

(1) Cut out a 40 mm × 90 mm piece from the middle of the oleic-processed test piece and use it as an abrasion test piece. (Two pieces in longitudinal direction and two pieces in lateral direction)
(2) Fix the abrasion test piece on the mounting plate, in the manner of Figure 39-A, using a tacker and double-sided adhesive tape.
(3) Using a acetone-soaked wiper paper, etc., wipe the abrasion test piece face and the silicone rubber abrasive plate face, to remove oleic acid and other stains.
(4) Using a double-sided adhesive tape, additionally fix the mounting plate to the abrasion tester.
(5) Make sure that the unit pressure is adjusted as specified.
(6) Start the tester and conduct the test to the specified cycles.
(7) After completion of the specified cycles, take out the test piece from the tester, and check for breakage, peeling, pinholes, etc.

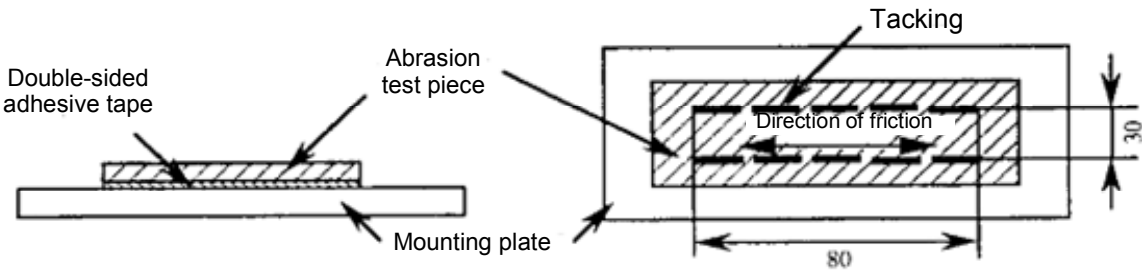


Figure 19: Condition of sweat abrasion resistance test

39.6 Indication Presence of abnormalities such as breakage, peeling, pinholes, etc. shall be indicated. The actual test piece shall be attached.

40. Flex resistance test method

40.1 Objective and scope Examination of abnormalities resulting from bending of the polyurethane leather and vinyl leather cloth used for the side gusset of the front cushion outer.

40.2 Device MIT type test device specified in JIS P8115 (Paper and board - Determination of folding endurance by MIT tester) (Figure 40-A)

40.3 Test piece Test piece No. 25 and 26 as per Table 3-B. 3 pieces each.

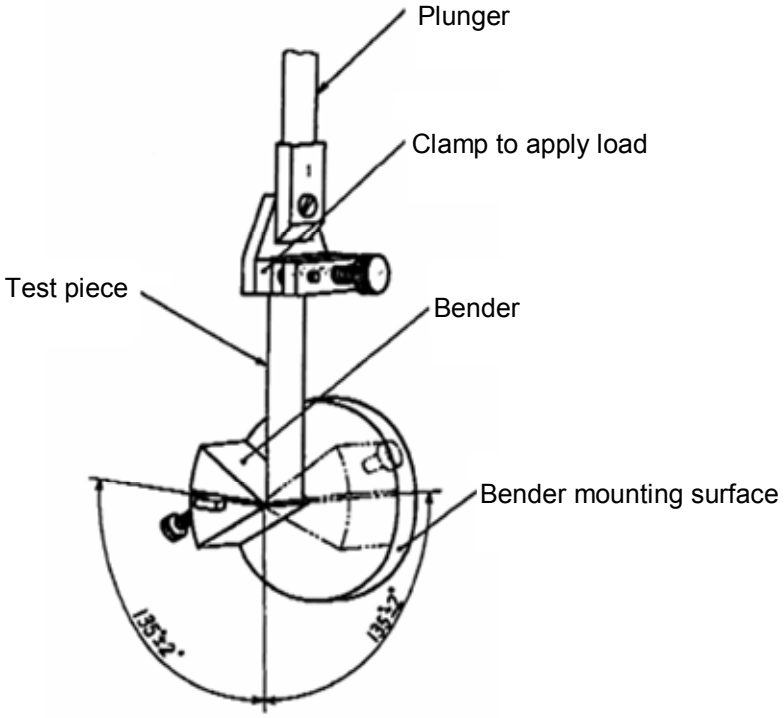


Fig. 40-A: MIT type test device

40.4 Test conditions

(1) Standard condition as per Table 3-A.
(2) Speed: 175 ±10 rpm
(3) Angle: 135 ±2°
(4) Count: 100,000 times (1 reciprocating movement is counted as one.)
(5) Load: 9.8N

40.5 Procedure

(1) Place the tester in a vertical position.
(2) Apply the load specified in Section 40.4 to the plunger.
(3) Fix the plunger with the setting screw.
(4) Retain the test piece with the upper and lower clamps. At this point, do not touch the area to be bent.
(5) Loosen the setting screw of the plunger and apply the load specified in Section 40.4 to the plunger. If the reading of the load indicator has changed, adjust it with the adjusting screw.

(6) Bend the test piece at a speed specified in Section 40.4.
(7) Check the condition every 10,000 times.

40.6 Indication The number of strokes that caused the surface cracking or peeling shall be indicated, with the actual test piece attached.

41. Soil resistance test method

41.1 Objective Examination of black soil resistance of genuine leather, polyurethane leather, and vinyl leather cloth.

41.2 Device and material

(1) Tester: Flat wear tester (Fig. 41-A) or Martindale tester
(2) Contaminating cloth: Standard contaminating cloth manufactured by EMPA: EMPA 104 [Reference: Purchase from Nippon Shizai Co., Ltd.]
(3) Colorimetry gauge: One which is an integrating sphere type, D65 light source colorimetry gauge capable of measuring L*, a*, and b* (for example: SP64 manufactured by X-rite)
(4) Wiping cloth
The cloth used shall either be one that has been processed through washing to remove the softening agents, or one which was not processed with softening agents at the time of manufacture.
It shall be white in color. For example, JIS L 4105 3 a) No. 1 657 g/12 pcs [Reference: Purchase from Nippon Shizai Co., Ltd.]
(5) Water used when contaminating or wiping shall be distilled water.

Fig. 41-A: Flat friction test device

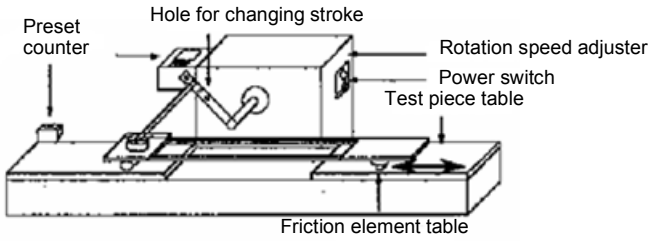
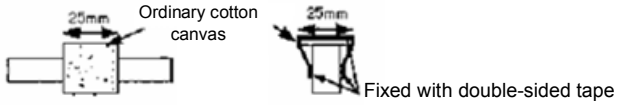


Fig. 51: Attachment of ordinary cotton canvas piece (friction cloth) to friction element



41.3 Test piece

41.3.1 Flat wear tester

Genuine leather: Test piece No. 31 as per Table 3-B × 3 each for A, B, and C.
Polyurethane leather and polyvinylchloride coated fabric: Test piece No. 28 as per Table 3-C × 3

41.3.2 Martindale tester

Genuine leather: Test piece No. 30 as per Table 3-B × 3
Polyurethane leather and polyvinylchloride coated fabric: Test piece No. 27 as per Table 3-C × 3

41.4 Test conditions

Flat wear tester
(1) Room temperature condition as per Table 3-A
(2) Friction stroke: 100 mm
(3) Friction speed: 12000 mm/min
(4) Dimensions for contaminating cloth sliding surface: 25 mm x 25 mm
(5) Load: 20.6 N (surface pressure: 33 kPa)

Martindale tester
(1) Room temperature condition as per Table 3-A
(2) Load: 12 kPa
(3) Stroke speed: 47.5±2.5 cyc/min

41.5 Operation

41.5.1 Soiling

Flat wear tester

(1) Attach the contaminating cloth to the friction element of the tester, then drip droplets of distilled water (300 µl) onto the contaminating cloth using a syringe. Afterwards, perform 1000 strokes under the test conditions in 41.4.
Then, replace the contaminating cloth with a new one and perform 1000 cycles of wiping with a dry cloth. Do this twice (1000 cycles wiping with wet cloth ⇒ 1000 cycles wiping with dry cloth ⇒ 1000 cycles wiping with dry cloth; total 3000 cycles).
(2) Using a test piece from both before and after testing, determine the grade through subjective evaluation in accordance with Table 41-B below. For the determination, shall refer to the separately distributed limit sample and Table 41-C Grade based on colorimetry determination standards. Regarding colorimetry, measure the evaluation range at 3 points as shown in Fig. 41-B. Calculate the mean value for the color difference ⊿E*.

Martindale tester

(1) Attach the contaminating cloth to the friction element of the tester, then drip droplets of distilled water (600 µl) onto the contaminating cloth using a syringe. Afterwards, perform 1000 cycles under the test conditions in 24.4. Then, replace the contaminating cloth with a new one and perform 1000 cycles of wiping with a dry cloth. Do this three times (1000 cycles wiping with wet cloth ⇒ 1000 cycles wiping with dry cloth ⇒ 1000 cycles wiping with dry cloth ⇒ 1000 cycles wiping with dry cloth; total 4000 cycles).
(2) Using a test piece from both before and after testing, determine the grade through subjective evaluation in accordance with Table 41-B below. For the determination, shall refer to the separately distributed limit sample and Table 41-C Grade based on colorimetry determination standards. Regarding colorimetry, measure the evaluation range at 3 points as shown in Fig. 41-B. Calculate the mean value for the color difference ⊿E*.

Table 41-B Sensory grading

Grade	
5	No soil is observed
4	Soil is slightly noticeable, but is not disturbing
3	Soil is noticeable but is not very disturbing
2	Soil is noticeable and disturbing
1	Soil is clearly noticeable and very disturbing

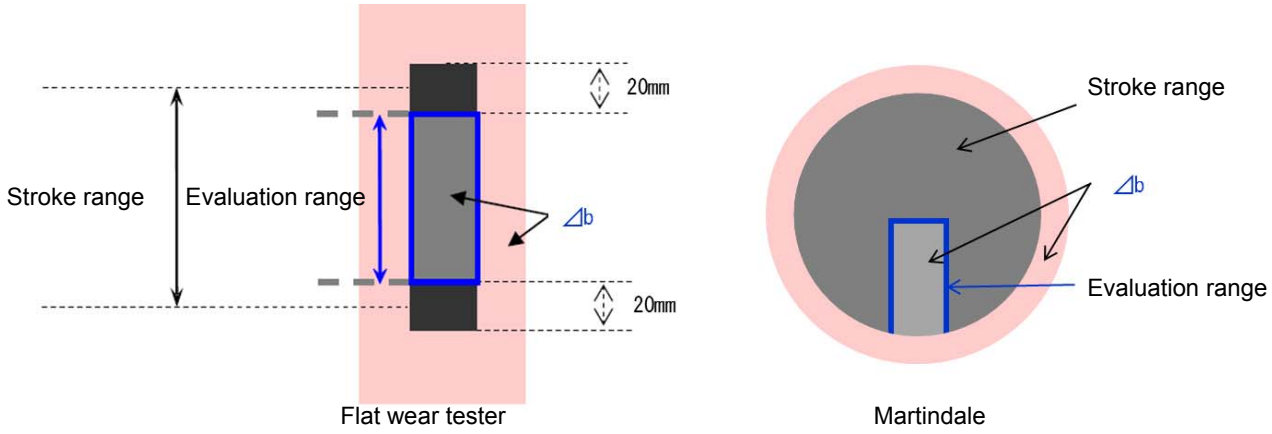


Fig. 41-B Evaluating portion

Table 41-C Grade based on colorimetry (reference value)

Color difference	Grade
0.0 ≤ ΔE* ≤ 2.0	5
2.0 < ΔE* ≤ 4.0	4
4.0 < ΔE* ≤ 6.0	3
6.0 < ΔE* ≤ 10.0	2
10.0 < ΔE*	1

41.5.2 Removal of soil

(1) (1) Apply machine wiping. However, hand wiping shall also be allowable upon discussion between parties involved.
(1)-1 Hand wiping: Apply droplets of distilled water (300 µl) to a wiping cloth cut out to be 25 mm × 25 mm, and wipe a half of the evaluation range shown in Fig. 41-B for 10 strokes.
(1) -2 Machine wiping (Martindale): Apply droplets of distilled water (600 µl) to a wiping cloth using a syringe, and wipe the evaluation range shown in Fig. 41-B with a load of 12 kPa for 10 strokes.

(1)-3 Machine wiping (flat wear tester): Attach a wiping cloth cut out to be 25 mm × 25 mm to the load head using both-sided adhesive tape, apply droplets of distilled water (300 µl), and wipe a half of the evaluation range shown in Fig. 41-B with a load of 12.25 N (surface pressure of 20 kPa) for 10 strokes.
(2) Perform determination with the test piece after wiping in accordance with the determination method in 41.5.1 (2).

42. BLC test method
42.1 Objective
Examination of genuine leather and polyurethane leather deflection under constant load.
42.2 Device and test piece
42.2.1 Device
ST300 Leather Softness Tester of BLC Leather Technology Center Ltd. See Table 42-A for the outline.

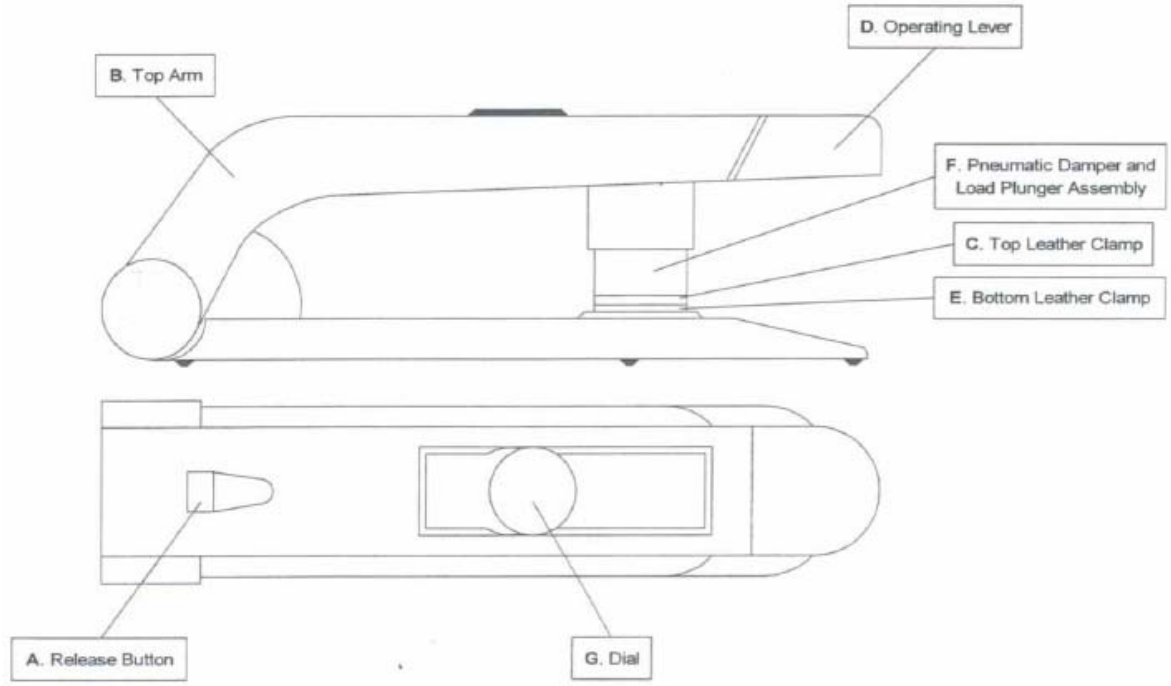


Fig. 42-A BLC test device

42.2.2 Test condition
Room temperature condition as per Table 3-A.

42.3 Procedure
(1) To open the top arm (B), press down the operating lever (D) and the release button (A).
(By this operation the clamp mechanism is pressure opened, and the top arm rises)
(2) Place the genuine leather to be measured on the bottom leather clamp (E), completely covering it.
(3) Press the operating lever (D) until it clicks.
(The loading plunger (F) remains retracted until being locked. It clicks when properly locked.)
(4) Release the operating lever (D).
(The loading plunger (F) is activated and presses the genuine leather surface with the small pneumatic damper (F) constantly by a load of 500 g.)
(5) The loading plunger deflects the leather. Record the measured deflection indicated by the dial.
(6) After reading the deflection, press the top arm release button (A).

* Perform the test on test pieces specified in Section 42.2.2 (n = 3 each) and indicate the average values.

43. Fine wrinkles test method
43.1 Objective
Confirmation of level of fine wrinkles on genuine leather.
43.2 Device and test piece
43.2.1 Device
Semicircular pipe with a width of 300 mm and a diameter of 36 mm
43.2.2 Test piece
Test a piece cut at the part of the seat specified in RFQ

(X and Y directions are specified in RFQ)

43.3 Test condition

Room temperature condition as per Table 3-A.

43.4 Procedure

Place a test piece on the test jig and press it lightly (Fig. 43-A) to visually check that the fine wrinkles are equivalent to or more than the limit sample.

The limit sample provided by XI2 shall be used.

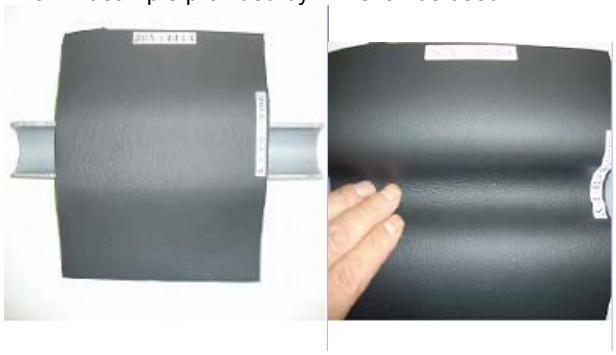
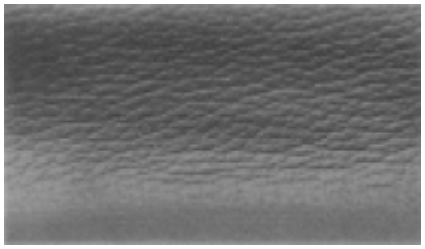
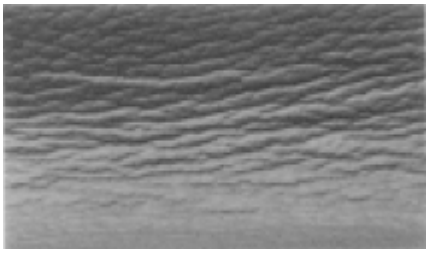


Fig. 43-A

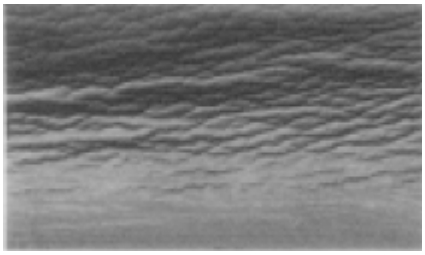
For reference, examples of Classes 1 to 5 are shown below.



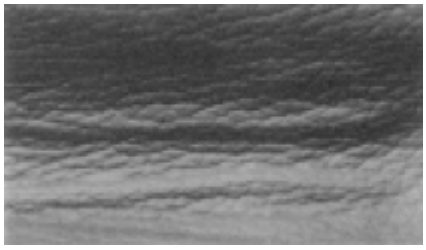
Class 5



Class 4



Class 3



Class 2

Class 1

Normative references: NES M0297 Odor substance usage restrictions
NES M 0094 Test Method of Flammability of Interior Materials for Automobiles
NES M 0160 Method of Testing the Smell of Interior Parts
NES M 0135 Weatherbility and Light-Resistance Test Methods for Synthetic Resin Parts
NES M 0154 Testing Methods of Fabrics for Automobiles
NES M 0161 Method of Fogging Test for Interior Materials
NES M 7109 Seat/Door Genuine Leather and Polyurethane Leather and Polyvinylchloride Coated Fabric for Automobiles
JIS L 0803 2005 Standard adjacent fabrics for staining of colour fastness test
JIS L 0804 2004 Gray scale for assessing change in colour
JIS L 0805 2005 Gray scale for assessing staining
JIS L 0848 2004 Test method for color fastness to perspiration
JIS Z 8703 1983 Standard atmospheric conditions for testing
JIS Z 8802 1984 Methods for determination of pH of aqueous solutions
JIS Z 9110 1979 Recommended levels of illumination

References: JIS K 6550 1991 Testing methods for leathers
DIN 75 201 Determination of the windscreen fogging characteristics of trim materials in motor vehicles

ANNEX

Revision objectives in 2016

1. Types of test method
Genuine leather NL6/7: Instrument panel, polyvinylchloride coated fabric VL4: Console was newly specified, and erroneous descriptions were corrected.

3.2 Test piece
Erroneous descriptions in Table 3-B and Table 3-C were corrected, and test pieces for new tests were added.

8. Bending strength test method
Polyvinylchloride coated fabric VL3: For seat insert, the evaluation of bending resistance that affects seat performances was added.

17. Scratch resistance test method
Genuine leather NL6/7: Associated with the new specification of instrument panel, method of judging increase of gloss was added.

18.2 Crumpling resistance test method (Method II)
The amount of oleic acid was reduced from 120 ml to 60 ml. This was because the evaluation could not be performed as specified when 120 ml of oleic acid was used as it adhered on the back surface of the test piece. It was confirmed that the results with the current materials would be equivalent when the acid is reduced to 60 ml.

18.3 Crumpling resistance test method (Method III)
Polyvinylchloride coated fabric VL3: Seat insert was excluded. This modification was made because the crumpling resistance (Method III) was a standard that assumed compression of the cushion outer gusset of high H.P vehicles.

19. Abrasion resistance test method
19.1 Abrasion resistance (Method I) Supplementary explanation was added to the judgment criteria of polyurethane leather and polyvinylchloride coated fabric.
19.2 Abasion resistance (Method II) The method of polishing H-18 abrasion wheel was changed from S-11 paper to the diamond dresser. This was because polishing with S-11 paper causes variations in the surface conditions. The previous polishing timing was every 1,000 times; however, to match the test conditions of the samples, the timing was changed to before the test. For genuine leather, to minimize the variations of the evaluation results, an instruction to use the special mount manufactured by Taber (Mounting Card) was added.
19.3 Abrasion resistance (Method III) Operation: In the old figure, the test piece was in contact with the tube; therefore, the figure was corrected. Supplementary explanations for the judgment criteria of polyurethane leather and polyvinylchloride coated fabric were added.

24. Denim material color transfer resistance test method
Since there was no description instructing how to wipe off dirt, a description that permits both machine wiping and hand wiping were added, and descriptions that instruct how to wipe were added respectively.

26. Thermal aging resistance method
In consideration of the expansion of application of highly-bright interior materials and differentiation from use of genuine leather, the evaluation of thermal aging resistance (change in appearance) for polyurethane leather and polyvinylchloride coated fabric was added.

27. Heat shrinkage test method
Genuine leather NL6/7: Associated with the new specification of instrument panel, the evaluation of heat shrinkage was specified.

28. Heat-humidity cycle test method
Genuine leather NL6/7: Associated with the new specification of instrument panel, the evaluation of heat-humidity cycle was specified.

32. Light resistance test method
Genuine leather NL6/7: Associated with the new specification of instrument panel, descriptions were added to Table 32-A/D.
Regarding light resistance of genuine leather, the test energy of Method II-2 xenon weather meter was revised. The evaluation with the sunshine weather meter was standardized in the past versions of this NEM, and the evaluation with the xenon weather meter was only a condition for reference. However, the genuine leather manufacturer did not possess the sunshine weather meter, and thus it was difficult to perform evaluation; therefore, the amount of test energy of the ATLAS xenon weather meter: Method II-2, which was possessed by the genuine leather manufacturer, was revised so as to match with the appearance deterioration standard of the sunshine weather meter. Associated to this change, the test conditions of Method II-1 and Method II-3 were specified as reference conditions.

38. Odor test method
Associated with the new establishment of NES M0297, the standard was added.

41. Soil resistance test method
Since there was no description instructing how to wipe off dirt, a description that permits both machine wiping and hand wiping were added, and descriptions that instruct how to wipe were added respectively.

Others
Writing clarification

1. Revision objectives in 2015

(1) As vinyl leather cloth is applicable for the seat insert, the test method types were separated into seat gusset, seat insert. The respective evaluation items were subsequently detailed (Table 2-A Test method types).

(2) The color staining resistance (Jeans) test method was changed as follows.
- Parallel descriptions of testers: Although the tester was changed from a Gakushin wear tester to a Martindale tester in consideration of global correspondence, it was decided to also detail the Gakushin wear tester in parallel, in consideration of cases where a Martindale tester is not available.
- In consideration of obtaining denim globally, it was decided to use Testfabrics 2550Y in place of Levi's. Further, in accordance with the change in denim, the water droplet conditions were also changed respectively.

(3) The anti-fouling test method was changed as follows.
- Parallel descriptions of testers: The Martindale tester, which is easy to obtain globally, was detailed in parallel.
- Change in contaminating cloth: To correspond to the indication of large variations in the quality of the contaminating cloth, the conventional contaminating cloth was changed to EMPA104, a standard contaminating cloth manufactured by EMPA. In accordance with the change in contaminating cloth, the test method was also changed after confirming the correlation with the conventional test results.

(4) Regarding the abrasion resistance II test method, while the frequency of occurrence of coating abnormalities was to be reported for the abrasion test using conventional H-18, it was decided that there shall be no peeling at 1000 cycles, with the aim of preventing reoccurrence of coating peeling.

(5) Made corrections to the contents page.

1. Revision objectives in 2014

(1) As countermeasures against the discoloration due to the dye in jeans, which was pointed out in the market, 24. Jeans color transfer resistance test method was changed.
The following shows the main points of the change.
- Test conditions: Considering the mechanism where jeans color transfer occurs, as pointed out in the market, although the conventional method did not include dripping of water, dripping of water was included this time to the sliding test (Mechanism: The dyes of jeans penetrates into the urethane of the surface with water as medium). In addition, the test load and the number of times of sliding were set to levels equivalent to the standards of competitor companies.
- Tester: Changed to a device which is easily available all over the world and capable of evaluating at most 9 samples at the same time (requested from the sites in Europe and the U.S.A.).
- Judgment: The conventional method was sensory evaluation; however, it was changed to a method to use Δb^* which indicates the degree of yellowness-blueness (change from initial color).

(2) The contents page was modified.

1. Revision objectives in 2012

(1) It was associated with M7109 Seat/Door Genuine Leather and Polyurethane Leather and Polyvinylchloride Coated Fabric for Automobiles.

(2) Although the sewing needle used in the seam strength test method is set only No.23 as same as M0154, use of mass produced needle is described jointly. Since assuming the needle is finer than thread, the needle used at the mass production is available.

(3) Correction of descriptions

1. Revision objectives in 2011

Regarding the genuine leather type NL1-3 added in "M7109 Seat/Door Genuine Leather and Polyurethane Leather and Polyvinylchloride Coated Fabric for Automobiles.", as a load of 29.4 N was newly specified for measurement of tensile strength and elongation, it was added to the test method.

1. Revision objectives in 2010

Review of fogging test conditions and judgment criteria for genuine leather (NL1-1 and NL1-2) differs depending on specifications, however, to prevent recurrence of market concerns, the test conditions and judgment criteria have been standardized.
Also, according to review of the standard system, the physical property table for each material grade described in ANNEX previously shall be deleted from this NES and transcribed/integrated to the engineering standard (NEM) together with the know-how related to the material development. This NES shall be applied continuously as a standard to judge material quality in the future.

1. Revision objectives in 2009

2-1. Fogging test
Fogging performance is specified to measure fogging rate on glasses due to plasticizer contained in covering material. Interior decorative parts were fogged as well as glasses due to fat liquor contained in genuine leather during the vehicle performance test. In the fogging test with genuine leather material (NL1-2), the glass surface temperature condition was reviewed because condensation occurs on the glass surface due to the low surface temperature and volatile component is not likely to adhere to the glass surface. In addition, the oil temperature was specified to be 90°C as the temperature around seat is 85°C in vehicle fogging North America test conditions. Also, the dry time was changed to evaporate the moisture adhered to the glass after the test. For NL1-1, the continued study of review will be conducted in the future.

2-2. Fine wrinkle test
Fine wrinkles on genuine leather seat whose reverse face is bonded on laminated urethane were pointed out in the market. This Standard specifies evaluation of fine wrinkle performance of genuine leather to prevent recurrence. Fine wrinkle performance after bonding shall be specified in NDS.

2. 2008 revision objectives

To eliminate the risk of incoherent testing methods and conditions, specifications have been systematized on the material basis (plastic, covering material, paint, fabric). Likewise, the test methods have been organized into common test methods (light resistance, chemical resistance, odor, etc.) and ones specified for each material. (This matter has been discussed in the Polymer Planning Meeting in '07.) In this revision, test methods for and specifications of synthetic leathers used for vehicle seats and doors, natural and genuine leathers used for vehicle seats and doors and vinyl leather cloth used for vehicle seats and linings shown in Table 1 below have been reorganized as shown in Table 2. This Standard specifies the test methods.

Table 1: Conventional standard

Material	Test method	Specifications

Synthetic leather	M0164 Testing Methods Polyurethane Leather for Seat and Door of Automobiles	M7107 Polyurethane Leather for Seat and Door of Automobiles
Genuine leather	M0155 Testing Methods of Seat / Door for Automobiles	M7102 Seat and Door Leather for Automobiles
Vinyl leather cloth	M7081 Polyvinylchloride Coated Fabric for Automobiles	

Table 2: This standard

Material	Test method	Specifications
Covering for vehicles (Synthetic leather, genuine leather, vinyl leather cloth)	Test methods for covering materials for automobiles (synthetic leather, genuine leather and vinyl leather cloth)	Covering materials for automobiles (synthetic leather, genuine leather and vinyl leather cloth)

Table 3-1 ~ 3-3 show the methods and conditions for tests specified in this Standard.
* Bold font: Test conditions are different for each material.

Table 3-1

		Application				Test Method of Flammability of Interior Materials for Automobiles M0094		Method of Testing the Smell of Interior Parts M0160		Method of Fogging Test for Interior Materials M0161	
						Test method	Judgment	Test method	Judgment	Test method, test conditions	Judgment
M7102 Seat and Door Leather for Automobiles	M0155 Testing Methods of Seat / Door for Automobiles	NL1-1	S	Seat	Main, main side gusset, seat piping, headrest, pillar	M0094	M0094	Not applicable		As per M0155 ⇒ As per M0161: 110°C x 3 h	As per M0155: 6 mg MAX ⇒ As per M0161: 6 mg MAX
			D								
		NL1-2	S		Same as above						
			D								
		NL2	S		Center console						
			D								
		NL3	S		Back of seat, Assist grip						
			D								
		NL4	S	Door	Waist section						
			D								
		NL5	S		Other than waist section						
			D								
M7107 Polyurethane Leather for Seat and Door of Automobiles	M0164 Testing Methods Polyurethane Leather for Seat and Door of Automobiles	UL1	Seat		Main, main side					As per M0161: 100°C x 5 h	As per M7107: 20% MAX
					Front and side gusset						
					Back						
					Piping						
					Headrest						
		UL-2	Door		Waist section						
					Armrest						
					Patch						
M7081 Polyvinylchloride Coated Fabric for Automobiles		VL1		Foamed	Roof trim					As per M0781: 110°C x 5 h ⇒ As per M0161: 110°C x 5 h	As per M0781: 110°C x 5 h ⇒ As per M0161: 110°C x 5 h
		VL2			Seat gusset						
		VL3			Main, main side, gusset						
		VL4-A		Non-foamed	Main, main side and gusset						
		VL4-B									

Table 3-2

No. (Old standard)		Application				Volatilization loss		Light resistance			
						-		M0135 SWOM		M0135 XWOM	
						Test method, test conditions	Judgment	Test method, test conditions	Judgment	Test method, test conditions	Judgment
M7102 Seat and Door Leather for Automobiles	M0155 Testing Methods of Seat / Door for Automobiles	NL1-1	S	Seat	Main, main side gusset, seat piping, headrest, pillar	Not applicable		Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 300 h. Physical property: 300 h	As per M7107. No discoloration. Fading: Grade 4 MIN. There shall be no abnormality in coating or grains. There shall be no abnormality in coating or grains after traverse x 5,000 times.	Test method: As per M0135. Test conditions: M0155. XWOM: 89°C, Appearance: 478 MJ, Physical property: 478 MJ	As per M7102. Appearance: Shall be reported. Physical property: Shall be reported.
			D					Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 200 h. Physical property: 200 h		Test method: As per M0135. Test conditions: M0155. XWOM: 89°C, Appearance: 280 MJ, Physical property: 280 MJ	
		NL1-2	S		Same as above			Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 200 h. Physical property: 300 h			
			D					Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 144 h. Physical property: 144 h			
		NL2	S		Center console			Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 200 h. Physical property: 200 h		Test method: As per M0135. Test conditions: M0155. XWOM: 89°C, Appearance: 196 MJ, Physical property: 196 MJ	
			D					Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 144 h. Physical property: 144 h			
		NL3	S		Back of seat, assist grip			Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 100 h. Physical property: 100 h		Test method: As per M0135. Test conditions: M0155. XWOM: 89°C, Appearance: 140 MJ, Physical property: 140 MJ	
			D					Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 72 h. Physical property: 72 h		Test method: As per M0135. Test conditions: M0155. XWOM: 89°C, Appearance: 98 MJ, Physical property: 98 MJ	
		NL4	S	Door	Waist section			Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 300 h. Physical property: 300 h		Test method: As per M0135. Test conditions: M0155. XWOM: 89°C, Appearance: 478 MJ, Physical property: 478 MJ	
			D					Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 200 h. Physical property: 200 h		Test method: As per M0135. Test conditions: M0155. XWOM: 89°C, Appearance: 280 MJ, Physical property: 280 MJ	
		NL5	S		Other than waist section			Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 200 h. Physical property: 200 h			
			D					Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 144 h. Physical property: 144 h		Test method: As per M0135. Test conditions: M0155. XWOM: 89°C, Appearance: 196 MJ, Physical property: 196 MJ	
M7107 Polyurethane Leather for Seat and Door of Automobiles	M0164 Testing Methods Polyurethane Leather for Seat and Door of Automobiles	UL1		Seat	Main, main side	As per M0164 120°C x 100 h and 400 h	As per M7107 5.0% MAX, 12.0% MAX after 400 h	Test method: As per M0135. Test conditions: M0164. SWOM black panel temperature: 83°C Discoloration: 200 h. Physical property: 400 h	As per M7107. Discoloration and fading: Grade 4 MIN Physical property: 98 N/ 3 cm MIN	Test method: As per M0135. Test conditions: M0164. XWOM: 89°C, Japan and Europe: 280 MJ/ m2 North America and general export: 478 MJ/m2	As per M7107. Discoloration and fading: Shall be reported. Physical property: Shall be reported.
					Front and side gusset						
					Back					Test method: As per M0135. Test conditions: M0164. XWOM: 89°C, Japan and Europe: 98 MJ/ m2 North America and general export: 140 MJ/ m2	
					Piping					Test method: As per M0135. Test conditions: M0164. XWOM: 89°C, Japan and Europe: 280 MJ/ m2 North America and general export: 478 MJ/ m2	
					Headrest					Test method: As per M0135. Test conditions: M0164. XWOM: 89°C, Japan and Europe: 280 MJ/ m2 North America and general export: 478 MJ/ m2	
		UL-2		Door	Waist section					Test method: As per M0135. Test conditions: M0164. XWOM: 89°C, Japan and Europe: 280 MJ/ m2 North America and general export: 478 MJ/ m2	
					Armrest					Test method: As per M0135. Test conditions: M0164. XWOM: 89°C, Japan and Europe: 196 MJ/ m2 North America and general export: 280 MJ /m2	
					Patch						
M7081 Polyvinylchloride Coated Fabric for Automobiles		VL1		Non-foamed	Roof trim	As per M7081. 120°C x 100 h and 400 h	M7081 5% MAX and 12% MAX (Assist grip, seat grip: 2% MAX, 5% MAX)	Test method: As per M0135. Test conditions: M0155. SWOM black panel temperature: 83°C Appearance: 200 h. Physical property: 600 h	As per M7081. Discoloration and fading: Grade 4 MIN Physical property: Tensile strength: 49 N/ 3 cm MIN. Tensile elongation: 30 MIN	Test method: As per M0135. Test conditions: M7081. XWOM: 89°C, Appearance: 40 MJ, Physical property: 70 MJ/	As per M7081. Discoloration and fading: Grade 4 MIN. Physical property: Shall be reported.
		VL2			Seat gusset						
		VL3			Main, main side, gusset						
		VL4-A		Foamed	Main, main side and gusset						
		VL4-B							Discoloration and fading: Grade 4 MIN Physical property: Tensile strength: 98 N/ 3 cm MIN. Tensile elongation: 50 MIN		

Table 3-3

No. (Old standard)		Application				Chemical resistance		Thermal cycle test method for plastic parts	Thermal aging	
						M0133		M0132	-	
						Test method, test conditions	Judgment		Test method, test conditions	Judgment
M7102 Seat and Door Leather for Automobiles	M0155 Testing Methods of Seat / Door for Automobiles	NL1-1	S	Seat	Main, main side gusset, seat piping, headrest, pillar	Not applicable			As per M0155. 110°C x 200 h	As per M7102. Δb: 7 MAX. There shall be no abnormality in coating and grains.
			D						As per M0155. 120°C x 200 h	
		NL1-2	S		Same as above				As per M0155. 110°C x 200 h	
			D						As per M0155. 120°C x 200 h	
		NL2	S		Center console				As per M0155. 110°C x 200 h	
			D						As per M0155. 120°C x 200 h	
		NL3	S		Back of seat, Assist grip				As per M0155. 110°C x 200 h	
			D						As per M0155. 120°C x 200 h	
		NL4	S	Door	Waist section				As per M0155. 110°C x 200 h	
			D						As per M0155. 120°C x 200 h	
		NL5	S		Other than waist section				As per M0155. 110°C x 200 h	
			D						As per M0155. 120°C x 200 h	
M7107 Polyurethane Leather for Seat and Door of Automobiles	M0164 Testing Methods Polyurethane Leather for Seat and Door of Automobiles	UL1		Seat	Main, main side	**Types of chemical: As per M0133 Method 2 and M0164. Test method: As per M0164. 2 ~ 3 strokes, then leave to stand at 15 ~ 30°C for 4 h. (M0133 requires high temperature test.)**	As per M0164. There shall be no abnormality.		Not applicable	
					Front and side gusset					
					Back					
					Piping					
					Headrest					
		UL-2		Door	Waist					
					Armrest					
					Patch					
M7081 Polyvinylchloride Coated Fabric for Automobiles		VL1		Non-foamed	Roof trim	**Types of chemical: As per M0133 Method 2 and M0164. Test method: As per M7081. 2 ~ 3 strokes, then leave to stand at 15 ~ 30°C for 4 h. (M0133 requires high temperature test.)**	As per M7081. There shall be no abnormality.		As per M7081. 120°C x 100 h, 400 h	As per M7081. Elongation: 50% MIN, 30% MIN
		VL2			Seat gusset					
		VL3			Main, main side, and gusset					
		VL4-A		Foamed	Main, main side and gusset					As per M7081. Elongation: 70% MIN, 50% MIN
		VL4-B								

2. Details of the revision

1. Scope (Hereafter, the section numbers correspond to the numbers in the main text.)

Not changed from the scope specified in M0164, M0155 and M7081.

2. Test method types

For synthetic leather and vinyl leather cloth, the previous standard provided tables of test application on the part and section basis. This standard has newly provided a table of test application for genuine leather in addition to tables for synthetic leather and vinyl leather cloth.

3. General test conditions

3.1 Test room conditions

The previous standards stipulated the test room conditions to be "standard condition". This standard requires either "standard condition" or "room temperature condition". (Correction of errors.) Application of those conditions are specified in the "Test conditions" sections.

	Test room condition	Room temperature condition
Synthetic leather	Standard conditions: Standard temperature 23°C Class 2 (Temperature 23 ±2°C) and standard humidity 50% Class 5 (Humidity: 50 ±5%) as per JIS Z 8703.	Temperature: 15 ~ 30°C, Relative humidity: 40 ~ 80%
Vinyl leather cloth	Standard conditions: Standard temperature 23°C Class 2 (Temperature 23 ±2°C) and standard humidity 50% Class 5 (Humidity: 50 ±5%) as per JIS Z 8703.	Temperature: 15 ~ 30°C, Relative humidity: 40 ~ 80%
Genuine leather	Temperature at 20°C with a tolerance of Temperature Class 2 (18 ~ 22°C) and humidity at 65% RH with a tolerance of Humidity Class 5 (60 ~ 70% RH) as per JIS Z 8703 (Standard conditions of test site).	Temperature: 15 ~ 30°C, Relative humidity: 40 ~ 80%

3.1 Test room conditions

The test room conditions have been stipulated in a table. Application of "standard condition" and "room temperature condition" is stipulated for each test in the "Test conditions" section.

3.2 Test piece

Test piece requirements for synthetic leathers and vinyl leather cloth have been integrated because the difference was limited to the test piece numbers. Requirements for genuine leathers are specified in a table separately from the requirements for synthetic leathers and vinyl leather cloth because there are size requirements as well as sampling area requirements. (Not changed from the previous standards.)

4. Roll width measurement method

The roll width measurement methods for synthetic leather and vinyl leather cloth have been integrated because the same method has applied to both of them.

5. Roll length measurement method

The war fabric length measurement methods for synthetic leather and vinyl leather cloth have been integrated because the same method has applied to both of them.

6. Roll thickness measurement method

The roll thickness measurement methods for synthetic leather and vinyl leather cloth have been integrated because the same method has applied to both of them. The measurement method for genuine leather including different sampling and testing methods have been stipulated separately.

7. Weight measurement method

The weight measurement methods for genuine leather, synthetic leather and vinyl leather cloth have been integrated. The method for synthetic leather and vinyl leather cloth are the same. Different conditions for genuine leather such as test piece preparation and test conditions have been provided separately as needed.

8. Bending strength test method

This test method is only applicable to genuine leather. Not changed from the previous standard.

9. Acidity test method

This test method is only applicable to genuine leather. Not changed from the previous standard.

10. Appearance test method

The test methods have been integrated because the same method has applied to all three materials.

11. Tensile strength and elongation test method

Test methods for synthetic leather, genuine leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

12. Tearing strength test method
Test methods for synthetic leather, genuine leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

13. Seam strength test method
Test methods for synthetic leather, genuine leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

14. Seam fatigue test method
Test methods for synthetic leather, genuine leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

15. Elongation under constant load and residual elongation test method
Test methods for synthetic leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

16. Peeling resistance test method
Test methods for synthetic leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

17. Scratch resistance test method
This test method is only applicable to genuine leather. Not changed from the previous standard.

18. Crumpling resistance test method
The crumpling resistance test methods for genuine leather and synthetic leather are the same. This common method has been specified as Method I. The methods for vinyl leather cloth which includes different test conditions and methods have been specified as Method II and III.

19. Abrasion resistance test method
As shown in Table X, Method I and IV are only applicable to genuine leather.
Method II is applicable to synthetic leather, genuine leather and vinyl leather cloth. However, based on the differences in the test conditions and abrasion wheel, they have been subdivided into Method II-1 for genuine leather, II-2 for synthetic leather and vinyl leather cloth. Method III applicable to synthetic leather and genuine leather have been integrated. Change from the previous standard: Load specifications for genuine leather in Method III and IV have been converted to surface pressure to ensure consistency with requirements for synthetic leather.

20. Friction resistance test method
This test method is only applicable to genuine leather. Not changed from the previous standard.

21. Test method for color fastness to dry rubbing
The common test methods for genuine leather, synthetic leather and vinyl leather cloth have been integrated.

22. Test method for color fastness to wet rubbing
The common test methods for genuine leather, synthetic leather and vinyl leather cloth have been integrated.
An error in synthetic leather test piece specification (50 X 50 mm) has been corrected to the size equivalent to that of genuine leather and vinyl leather cloth test piece.

23. Wet cloth friction color fastness test method
This test method is only applicable to genuine leather. Not changed from the previous standard.

24. Denim material color transfer resistance test method
Test methods for synthetic leather and vinyl leather cloth have been integrated. Requirements for genuine leather which include difference from other materials have been specified separately.

25. Adhesion test method
The common test conditions and methods for synthetic leather and vinyl leather cloth have been integrated.
The test method, test conditions and judgment method for genuine leather have been specified separately.

26. Thermal aging test method
Separate test methods have been specified for genuine leather and vinyl leather cloth. The genuine leather test aims to assess the thermal change (color change) in coating and grains while the vinyl leather cloth test aims to assess elongation after thermal processing. Not changed from the previous standard.

27. Heat shrinkage test method
The common test conditions and methods for synthetic leather and vinyl leather cloth have been integrated.
Not changed from the previous standard.

28. Heat-humidity cycle test method
This test method is only applicable to genuine leather. Not changed from the previous standard.

29. Volatilization loss test method
The common test conditions and methods for synthetic leather and vinyl leather cloth have been integrated.
Not changed from the previous standard.

30. Fog resistance test method
This test was previously specified as "cloudiness test method" and inconsistent with the referenced standard NES M 0161 "Method of Fogging Test for Interior Materials". The term used in NES 0161 has been employed in this standard because it is also referenced in standard for other parts. The common test methods for genuine leather, synthetic leather and vinyl leather cloth have been integrated. Test conditions different for each material have been summarized in a table.

31. Cold resistance test method

The common test methods for synthetic leather and vinyl leather cloth have been integrated. The method and conditions for genuine leather test which aim to examine the flex resistance of the coating at low temperature have been specified separately. (synthetic leather and vinyl leather cloth test aims to examine the impact resistance.)

32. Light resistance test method

32.1 Appearance (Discoloration and fading) Sunshine method

The common test methods for genuine leather, synthetic leather and vinyl leather cloth have been integrated. Irradiation time requirements for genuine leather, which are different from those for synthetic leather and vinyl leather cloth, have been specified in a table.

32.2 Appearance (Discoloration and fading) Xenon method

The common test methods for genuine leather, synthetic leather and vinyl leather cloth have been integrated. Irradiation energy requirements for genuine leather, which are different from those for synthetic leather and vinyl leather cloth, have been specified in a table.

32.3 Property deterioration

For synthetic leather and vinyl leather cloth, tensile strength and elongation are measured after performing the light resistance test. For genuine leather, an abrasion test is conducted after the light resistance test. The test method for synthetic leather and vinyl leather cloth has been specified as property deterioration test method I and that for genuine leather as method II.

33. Bleed resistance test method

This test method is only applicable to genuine leather. Not changed from the previous standard.

34. Sliding friction test method

This test method is only applicable to genuine leather. Not changed from the previous standard.

35. Cleanability test method

This test method is only applicable to genuine leather. Not changed from the previous standard.

36. Chemical resistance test method

The common test methods for synthetic leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

37. Flammability test method

The common test methods for genuine leather, synthetic leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

38. Odor test method

The common test methods for synthetic leather and vinyl leather cloth have been integrated. Not changed from the previous standard.

39. Sweat abrasion and peel resistance test method

This test method is only applicable to synthetic leather. Not changed from the previous standard.

40. Flex resistance test method

This test method is only applicable to synthetic leather. Not changed from the previous standard.

41. Dirt resistance test method

This test method is only applicable to genuine leather. Not changed from the previous standard.

42. BLC test method

This test previously was applicable only to genuine leather. The new standard requires this test to be performed on synthetic leather if requested in the Specification Tender or RFQ.

43. Annex

Descriptions of previous standards have been provided.

3. Purpose of revision in 2005

(1) Revision of a rule for changing numbers of Normative References

2. Revision point

(1) The changing numbers were added to the list of Normative References of the final item of the body.

1. Purpose of revision in 2000

(1) Change to the test condition that matches with current design standards
(2) Addition of new tests and abolition of tests along with the addition
(3) Abolition of description of conventional units
(4) Correction of errors

2. Revision points

(1) Seam strength
The test condition (margin for seam) was matched to the sewing condition of mass production and changed.

(2) Seam fatigue
The test condition (margin for seam) was matched to the sewing condition of mass production and changed.

(3) Flexing resistance test
The outer gore of the front seat cushion undergoes repeated bending and the narrow portions may crack. For this reason, the test by which this crack could be detected was added.

(4) Crumpling resistance method II
This was abolished along with addition of the flexing resistance test.

(5) Chemical resistance test
Method 2 specified in NES M 0133 was quoted and chemicals that were not included in this method were deleted from the Table.

4. ANNEX at the 1995 establishment

1. Purpose of establishment

The polyurethane leather is a comparatively new material as surface film material for the automobile interior, and the standards for vinyl leather whose construction is similar have been tentatively used. However, the usable range of the polyurethane leather has been expanding recently, and the necessity of establishing a separate standard is indicated by related departments in-house or outside the company to respond to these matters. This Standard was established by adding the test method in which properties unique to the polyurethane leather were considered based on the standards of fabrics, genuine leather, and vinyl leather used for seats and doors in order to apply the polyurethane leather to these portions.

2. Main contents established

The polyurethane leather has a structure that is composed of the foundation cloth that is the main fabrics (woven goods and knitted goods) and the thin polyurethane surface layer of 20 to 50 μm that adheres to the foundation cloth. Although this Standard is based on NES of vinyl leather, NES of fabrics and genuine leather is added in consideration of how to use. For the environmental resistance characteristics in which the chemical characteristics of material play an important role, the standard of its own for the polyurethane leather is considered to be necessary. But there are some items whose correlation with the market has not been obtained yet, therefore, a study for future revision is necessary. Points different from the vinyl leather NES are mainly described as follows.

2.1 Physical properties 1 (mechanical properties)

(1) Tearing strength
Although the actual value was not so high as the vinyl leather because of difference of the foundation cloth structure, the standard value was decided to be similar to the genuine leather or higher than that in consideration of the actual value of the genuine leather with actual results. For the test method, vinyl leather NES was quoted.

(2) Constant-load elongation and residual elongation
Fabric NES in which balance of the part shape and material elongation was arranged was carried over in consideration of part formability.

(3) Seam fatigue test
Although this is an important item in practicability evaluation and the standards for fabrics are carried over, the test methods are common to the fabrics, vinyl leather and genuine leather.

(4) For others such as the tensile test, seam strength, and peeling strength test methods, vinyl leather NES was quoted.

2.2 Physical properties 2 (superficial mechanical properties)

(1) Abrasion resistance method 2
Method 2 was introduced in consideration of how to use in the market because of the concern about the polyurethane leather surface separation due to the thinner surface layer than that of the vinyl leather. The test machine has a mode in which the test piece is wound on the rubber tube and worn while wrinkles are generated using the traverse type plane abrasion (clock meter).
For others such as abrasion resistance method 1, crumpling resistance method 1, crumpling resistance method 2, rubbing color fastness, and denim material color-transfer resistance test methods, the vinyl leather NES was quoted.

2.3 Physical properties 3 (environmental properties)

(1) Odor
This test that is applied to all interior material is also applied to the polyurethane leather.

(2) Light resistance
Although the standard of the vinyl leather sunshine method is carried over, the correlation between Okinawa exposure and light resistance by the xenon weatherometer that is to be obtained hereinafter will be incorporated into the next revision.
For others such as adhesion, heat shrinkage, volatilization loss, cold resistance, light resistance, chemical resistance, flammability and fogging test methods, vinyl leather NES was quoted. The hydrolysis property and sweat resistance, which are a concern because of the properties of the polyurethane leather, are under study for introduction into the next revision in consideration of practical use in the market. Although the standards of the test methods for the vinyl leather are carried over, the results obtained from the correlation between Okinawa exposure and light resistance by the xenon weatherometer will be incorporated into the next revision.

2.4 Applicable portions

The Standard applies only to the seat cloth and doors. Because the polyurethane leather is also applied to pillars, center console lids, grips, steering wheels and shift boots, these will be incorporated into the future revision in consideration of how they are used in the market.

M0155: Testing Methods of Seat / Door for Automobiles (Before revision in 2007)

5. Outline of revisions in 2007

(1) In recent years, the adoption of semi-aniline leather which enhances tactile sense for seats has started. Therefore this NES establishes NL1 - 2 as standard values which confirm the use of semi-aniline leather.

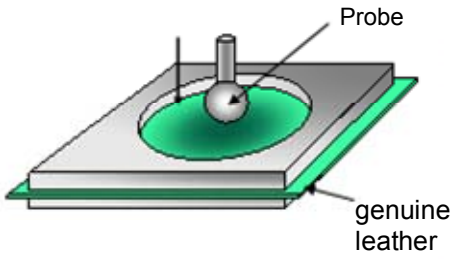
(2) Until recently, regarding stains that come with the passage of time on genuine leather seats, the color brightness and saturation limits for interior materials was regulated by Document "Guide line of Soiling Resistance for high bright and light interior parts", but in accordance with marketing requirements in trends of interior colors with high brightness and saturation, adoption of interior colors with high brightness and saturation in this NEM is being studied. On the other hand, stain resistance technology are improving and standards based on the guidelines above and on brightness and saturation are becoming unsuitable. Therefore, concerning stain resistance of genuine leather seats, the test method and standard values have been established for stain resistance of genuine leather (change in color after the stain resistance test) and not by the old standard for brightness and saturation.

2. Revision points

(1) BLC test method has been added

BLC test which distinguishes semi-aniline leather from other leather has been added. The test method which measures the amount of deflection when a constant load is applied has been chosen (BLC measurement principle: reference below).

BLC **measurement principle**



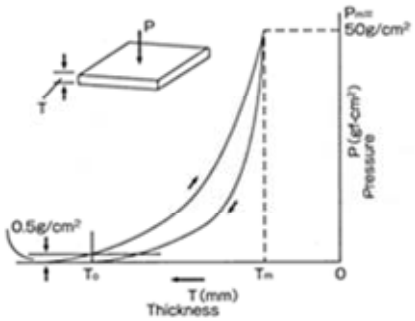
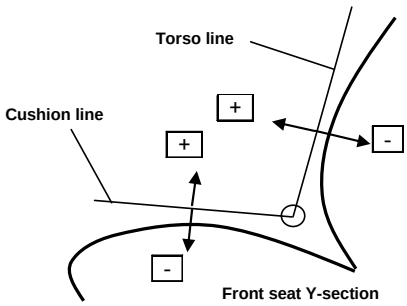


Fig. 1 BLC measurement method

(2) Stain resistance test method was added
The following has been established as the test method for genuine leather, based on NES M 0154 "Testing Method of Fabrics for Automobiles" 33.2 stain resistance test method II.
1. Stain components
Genuine leather seats were collected from the market, and stained ones were analyzed by GC-MS, XPS, etc. Sebum was detected as an organic constituent, and sand and carbon were detected as mineral constituents. From this it has been determined that black stains are adhesions of sebum and atmospheric dust, and NES M 0154 33.2 stain resistance test method II are the same for synthetic sebum and synthetic stains.
2. Surface pressure when stain is applied and removed
The surface pressure when stain is applied corresponds to the surface pressure when leaving and getting up the seat, and the surface pressure has been determined to be 33 kPa, which is equivalent to that of abrasion resistance test methods I, III, and IV. The surface pressure when the stain was removed by wiping operation was measured, and it has been determined that surface pressure shall be 20 kPa.
3. Stain adhesion amount and sliding frequency
The stain adhesion amount and sliding frequency have been determined by investigation of stain extent in the market, and stain extent (∆E) after 5 years (60,000 km).
4. Judgment method
Sensory evaluation was performed using stain samples in-company, and sensory points have been determined. Correlation with ∆E basically provides a way to determine stain regardless of genuine leather color, but the surface shape, etc. of leather differs from the impression of stain, so the method of sensory evaluation as reference of the judgment method of ∆E has been described.
(3) Normative references and issuing years of related standards have been added. Abolished standards have been deleted.

6. Revision objectives in 2006
(1) With the increase of genuine leather seats, or vehicle types having them, that have a configuration (high bolster configuration) whose side outer portion is subject to high surface pressures, there has been a requirement for an evaluation method with high correlation to actual field use. Therefore, the scopes and test methods are added to the items related to the abrasion resistance of genuine leather coating.
(2) Some genuine cowhide leather has different wear performances in lengthwise and widthwise directions. Therefore, the specifications about lengthwise and widthwise directions are added with respect to the tests including abrasion resistance tests (Methods I, III, and IV) and physical deterioration test.
(3) Errors have been corrected.
(4) Standard examples of fittings have been added and reviewed.

2. Revision points
(1) Addition of abrasion resistance test method (Method IV)
The old standard did not assume the mode in which the front seat side outer portion of certain vehicle type or bolster height is subject to a high surface pressure accompanied with wrinkling, when a vehicle occupant gets in and out of the vehicle. Therefore, this standard has introduced the evaluation method in which a high surface pressure is applied accompanied with wrinkling to the genuine leather surface. The bolster of a two-door vehicle whose hip point height is less than 500 mm from the ground receives a high input force, due to the vehicle layout characteristics. Accordingly, the specification has been set to 8000 cycles (4 getting in and out per day x 365 days x 5 years [warranty period] 8,000 cycles) irrespective of bolster height. However, in case of a four-door vehicle with hip point height less than 500 mm from the ground, or a vehicle type with hip point height of 500 mm or more from the ground, the surface pressure to the bolster can be low depending on the bolster height. Therefore, as shown in the table below, the specification has been established so that the numbers of cycles resulted from abrasion of current genuine leather become the minimum values. In addition, different parts (back and belly) of cowhide can have different potential values of abrasion resistance. Accordingly, if some part of cowhide is judged OK and other part is not, the part that is judged OK can be specified as usable, through consultation between parties involved. The bolster heights have been defined as distances from the cushion line and the torso line as shown in the figure below.



Location		Front cushion side outer Front back side outer	
Distance from cushion line/torso line to bolster top		0≤	0>
Vehicle type	2-door vehicle with hip point height from ground < 500 mm	8000 cycles	8000 cycles
	4-door vehicle with hip point height from ground < 500 mm	8000 cycles	2000 cycles
	Vehicle with hip point height from ground > 500 mm	8000 cycles	2000 cycles

(2) Types of test sample
Along with specification of the directions of cowhide in Methods I, III, and IV of abrasion resistance test, and physical
deterioration test, additions have been made to the types, dimensions, and quantities of test samples in Table 1. Moreover, in Table 1, additions and error corrections with respect to other items (Gakushin abrasion test method and thermal aging test) have been made.

(3) Collection of test samples
Although the area from the middle of the back to the hip is defined as Location B, the previous notation (near back and hip) in Figure 2 was Location C. Therefore, the erroneous notation in Figure 2 has been corrected to Location B.

(4) Denim color transfer resistance test
Because the denim material for friction (BIG JOHN SPILIT SP303BW), which was a standard example of fittings, has become out of production, the denim material for evaluation BILL CLPPINGER 336-259-4533 manufactured by Test Fabrics Inc. has been added.

Annex on 2004 Revision

1. Revision objectives in 2004

(1) With increased oversensitivity in the field to the smell of genuine leather, there has been a requirement for an Evaluation method with better accuracy. Therefore, the scopes and test methods are reviewed with respect to the items related to the smell of leather.
(2) Standard examples of fittings have been added and reviewed.
(3) Errors have been corrected.
(4) Use of conventional units of measurement has been abolished.

2. Revision points

(1) Smell test method
To revise the ambiguous test standard, NES M 0160 Method of Testing the Smell of Interior Parts, which uses a point-rating system for smell, has been introduced.

(2) Friction resistance test method (Gakushin friction test method)
White denim cloth (14 ounces, cotton 100%) Katsuragi No. 14 has been added as a standard example of fittings. In addition, errors in Figure 15 have been corrected.

(3) Denim color transfer resistance test method
Because the denim material for friction (BIG JOHN SPILIT SP305), which was a standard example of fittings, has become out of production, the same material BIG JOHN SPILIT SP303BW has been added.

1. Partial revision objectives in 2000
- Alteration of test conditions by review of the basis of a related standard

Along with the review of the basis of NES M 0161 Fogging Resistance of Interior Materials, the test conditions have been reviewed.

Annex on 2000 Revision

(3) Purposes of 2000 Revision
(1) The test conditions have been reviewed in line with current design standard.
(2) Errors have been corrected.
(3) Use of conventional units of measurement has been abolished.

3.Revision points
(5) Seam strength
The test conditions (seam allowance, sewing thread, and sewing pitch) have been altered in line with the sewing conditions for volume production.
(6) Abrasion resistance test method III
The number of times of silicon tube use has been added.
(7) Cleanability
Errors have been corrected.

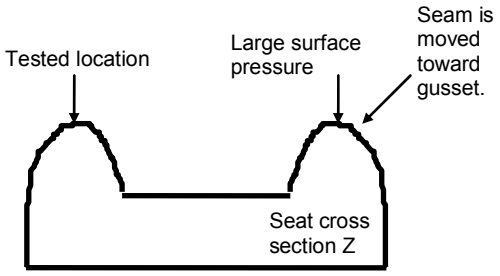
Annex on 1999 Revision

1. Revision objectives in 1999
With increased adoption of genuine leather with soft feel, there has been a requirement for an evaluation method with higher correlation to actual field use, especially with respect to the paint film performance. Therefore, the scopes and test methods are reviewed with respect to the related items.

2. Outline of Revised Items

2.1 Test sample collection locations
Since different parts of leather have become to be used depending on the applied location, it is necessary to obtain the physical property of each location. Therefore, designation of test sample collection locations has been added with respect to abrasion resistance test (Methods I and II) and friction resistance test. In addition, it has been specified to report the test sample collection locations, even if the collection locations are not designated.

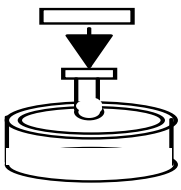
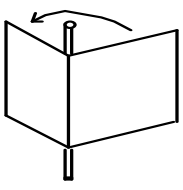
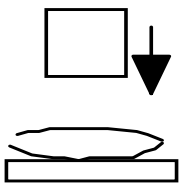
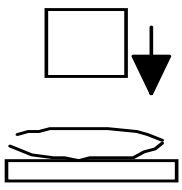
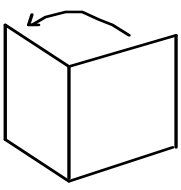
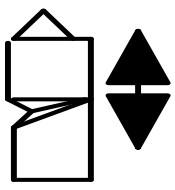
Figure 1 Tested location of abrasion resistance



2.2 Abrasion resistance test (Method III)
The old standard assumed the case in which the seam is located at the top of the convex surface of the bolster when the seat has piping or double stitch. However, as shown in the right-hand figure, when the seam is moved in the direction of the gusset by design, the surface pressure is reduced, and wrinkling does not occur. Consequently, a limitation has been given to the tested location.

2.2 Cold resistance test
The paint film cracking of leather at low temperature is caused by occurrence of the difference of elongation between the paint film and the leather when the leather is wrinkled (bent). In the old standard, impact resistance at low temperature was evaluated. Therefore, referring also to test methods of other companies, the test method has been altered to evaluate the flexibility.

Table 1 Cold resistance tests of other companies

Company	Nissan (old)	A	B	C	D	
Test method	DuPont impact test	Cold bending test	Methanol drop method (JIS K6772)	Methanol drop method (JIS K6772)	Cold bending test	Low temperature flexo test De Mattia flexing fatigue test
Test temperature	-30°C	-30°C	-30°C	-20°C	-20°C	-10°C
Holding time	60 min	24 h	5 min	5 min	90 min	
Energy	800g×15cm	Folded 180° (10ϕ core)	2.5Kg x 50mm	2.5Kg x 50mm	Folded 180° (no core)	30,000 cycles
						

Annex on 1994 Revision

1) Abrasion resistance test (Method 2)
The bucket seat can be locally subject to a large load depending on the seat configuration. In consideration of this, H-18, which has a higher load, has been added to the current friction wheel. To accumulate the future data for studying the establishment of specification, check is to be performed every 100 cycles, and the number of cycles for paint film flaking or peeling is to be obtained.

2) Light resistance test
A xenon weatherometer is superior to a sunshine weatherometer in field-test repeatability because the wavelength distribution of the light source is approximate to that of sunlight. This time, the test conditions for Method 2 (xenon) have been established taking correlation with Okinawa exposure. However, judgment of discoloration and physical deterioration remains to be performed by method I on a priority basis, and Method 2 (xenon) is used only for reporting at the moment.

3) Thermal aging resistance test
Previously, judgment (no discoloration) has been performed visually, having a large variation. This time, to reduce the variation, the judgment method has been replaced with the method using color measurement to achieve quantification. As discoloration cause by thermal aging is the discoloration (yellowing) of top coat (urethane), judgment is determined to be performed using the value of Δb^*, which is selected among L*, a*, and b* because of representing the yellowish color.

4) Heat-humidity cycle test
This test method is newly established to evaluate shrinkage and hardening of genuine leather especially on the upper surface of rear seat back. Shrinkage and hardening are reproduced by heat-humidity cycle. The test conditions have been established by taking correlation between actual field and the number of heat-humidity cycles, using the data from Okinawa exposure vehicles, vehicles collected from the field, and the result of component test.

5) Fogging test
Leather contains much water. To eliminate this influence, judgment is to be performed using the weight change after 24 h, instead of the previous method using the weight change immediately after the test.

6) Denim color transfer resistance
With the trend of reduction in interior color shade, there is a high demand for reduction in interior staining. General staining of genuine leather can be treated with genuine leather refresh set. However, there is a case in which the dye of the cloth that easily loses color like denim penetrates into the paint film, and the color cannot be erased. For this reason, the new test method has been added.

7) Abrasion resistance test (Method 3)
This test method takes into account the case in which paint film cracking and flaking/peeling occur on the side of the seat because it is rubbed and wrinkled when an occupant gets in and out of the vehicle. The traverse flat abrasion (clock meter) testing machine is used. In the test, leather is wrapped around a rubber tube, and it is wrinkled and abraded at the same time.

Annex on 1992 Revision

1. Abrasion resistance test
The old standard is specified in consideration of the severest use, resulting in over-specification for normal way of use. There are cases in which the old standard judges not OK, while the result of seat getting on and off durability test is OK. The severest use includes the increase of surface pressure in rare cases such as the case in which a reinforcing member touches the back face of the bucket of a bucket seat, and the case in which a seam exists on the bucket. Therefore, this time, the abrasion resistance necessary for normal use is revised, taking correlation with getting on and off durability test. The conventional Tabor abrasion test remains as a test method, in consideration of a possibility that future design may cause high surface pressure or high shear stress. However, with regard to abnormal increase of surface pressure by touching of a frame or a reinforcing member, study, including design study, is considered to be necessary.

2. Thermal resistance test
The current NES thermal resistance test has been diverted from thermal aging test in Polyvinyl Chloride Coated Fabric for Automobiles (NES M 7081). Whereas the purpose of the test for vinyl leather cloth (PVC leather) is to evaluate the deterioration by volatilization of plasticizer, the purpose of the thermal resistance test for genuine leather to evaluate the discoloration of urethane coating.
Therefore, the conditions of thermal resistance test have been reviewed, taking correlation with the field (exposure) with respect to the discoloration of urethane coating. However, these conditions are the conditions for urethane coating. If other paint than urethane is used, correlation must be studied. (All types of paint traditionally used are urethane, and it is considered to be the main paint also in the future.)

3. Cold resistance test
Because the old standard had a low correlation with components (field), the test conditions have been reviewed, studying the component impact mode.

4. Light resistance (Physical deterioration)
In the old standard, crease-flex resistance test evaluated the physical deterioration of genuine leather by light. The evaluation test has been changed to Gakushin abrasion test because crease-flex mode is rare in normal seats.

5. Fogging test
Genuine leather contains volatile components such as fatliquoring agent (to soften the leather). Although currently in Nissan vehicles, fogging caused by genuine leather has not occurred, there is a concern about fogging caused by increased addition of the fatliquoring agent for improvement of feeling in the future. In addition, by stronger customer requirement about fogging, the necessity of reduction of genuine leather fogging value may arise. Therefore, the fogging test method has been added in this revision. The establishment of specification will be studied by future accumulation of data. The test method conforms to DIN 75 201, except with two differences: 1) the fogging value is measured in transmittance (reflectance in DIN), and 2) oil temperature of oil bath (100°C in DIN).

4.1 Measurement method
Because the vehicle window fogging test in testing division evaluates transmittance in consideration of visibility through window, the fogging value of the component is also evaluated in transmittance.

4.2 Oil temperature
The temperature of interior parts reaches 100°C or more in the vehicle. Because different gas can be emitted from interior parts at different temperature, the oil temperature has been made to correspond to actual vehicle (temperature in window fogging test). In the test method, the relation between weight change and window fogging is currently not obtained sufficiently. This fogging test method includes measurement of weight change because it can be measured with transmittance measurement. The data are measured after 3 h (the weight change is measured after 16 h in DIN). By future accumulation of data, the relation with window fogging is to be clarified, and future establishment of specification is to be studied, including the test conditions (1).
Note (1) The test conditions will be harmonized with DIN.

M7081: Polyvinylchloride Coated Fabric for Automobiles (Before revision in 2006)

ANNEX (Revision in 2006)

1. Revision objectives in 2006
(1) Revision to reflect the market requirements more accurately
(2) Correction of descriptions

2. Revision points
(1) Crumpling resistance test method (Method I)
North American marketing research reveals that the covering of vinyl leather might stiffen and tear during and egress. This is because oil and fat components included in sweat or suntan oil, etc. adhere to the vinyl leather covering of driver's seat's outer side gusset, and the plasticizer in the vinyl leather comes off under at high temperatures.
The crumpling resistance test has been added to substitute for this phenomenon. Also, pre-treatment of the test samples (Oleic acid treatment: Oleic acid is a representative of oil and fat components) has been added.
This treatment applies to leather used for sections that may make contact with the skin. Application shall be determined by the design section in charge for each project.

ANNEX (Revision in 2004)

1. Revision objectives in 2004
(1) Correction of descriptions
(2) Elimination of the Japanese era entered in Normative Reference

2. Revision points
(1) Heat shrinkage testing procedure
Formula of heat shrinkage ratio has been changed.

ANNEX (Revision in 2000)

1. Revision objectives in 2004
(1) Correction of descriptions
(2) Elimination of the Japanese era entered in Normative Reference

2. Revision points
(1) Heat shrinkage testing procedure
Formula of heat shrinkage ratio has been changed.
(2) Seam fatigue
The test conditions (amount of seam) have been changed in order to meet mass production sewing conditions.
(3) Chemical resistance test
The test is quoted from Method 2 in NES M0133. Chemicals that are not included in the standard have been deleted.

ANNEX (Revision in 1997)

1. Revision objectives
This standard has been established for automotive polyvinylchloride coated fabric. The standard has been revised in response to the change in the guaranteed cold resistance standard for cold regions.

2. Major revision points
2.1 Cold resistance
The test temperature for cold regions has been from -30°C to -40°C in response to the revision of the guaranteed cold resistance standard. (Only the test temperature has been changed. Other conditions remain the same.) Additionally testing time restrictions have been specified. (30 s MAX)
The conventional material shall meet the new specifications.