

TOYOTA ENGINEERING STANDARD

NO. : **TSM6716G** _____

TITLE : POLYURETHANE FOAM MATERIALS FOR SAFETY PADS

CLASS : **C1** _____

Established/Revised : **Rev.9(Apr.2006)** _____

This standard has been revised in consequence of the following changes:
(1) a statement has been added that conformance to prohibitions and restrictions
for substances of environmental concern in TSZ0001G is required;
(2) applicable standard has been changed.

Engineering Data Planning Dept.
Engineering Data Control and
Management Div.
TOYOTA MOTOR CORPORATION

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|------------------------------------|-----------------|-----------|
| TOYOTA ENGINEERING STANDARD | TSM6716G | CLASS |
| | | C1 |

POLYURETHANE FOAM MATERIALS FOR SAFETY PADS

1. Scope

This standard covers molded polyurethane foam materials to be used for safety pads (hereinafter referred to as "pads") for interior parts, such as instrument panel, head restraints and arm rests. However, rigid polyurethane foam, chip polyurethane foam, bead foam and any other materials to be covered by other standards shall be excluded from this standard. The parts made of materials provided by this standard shall conform to prohibitions and restrictions for substances of environmental concern in TSZ0001G. Exempt uses specified by EU ELV Directive shall conform to the latest version of the Directive.

2. Classification

Pads are classified as shown in Table 1 in accordance with the application and materials.

Table 1

| Classification | Material code | Application * Material |
|----------------|---------------|---|
| Class 1 | TSM6716G-1 | Semi-rigid polyurethane foam for instrument panel safety pads |
| Class 2 | TSM6716G-2 | Flexible polyurethane foam for head restraints and center arm rests foamed with the skin integrated |
| Class 3 | TSM6716G-3 | Semi-rigid polyurethane foam for door arm rests |
| Class 4 | A | Flexible polyurethane foam for center arm rests |
| | B | Semi-rigid HR foam for special center arm rests |

Pads requiring flame resistance shall be identified by the suffix N.

3. Quality

3.1 Appearance

Pads shall be free of surface unevenness, stains, flaws, cavities, foreign matter and other abnormalities detrimental in appearance or functioning.

| | |
|--|--|
| Prepared and Written by: Organic Material Dept. Material Engineering Div.2 | Engineering Data Control and Management Div. © TOYOTA MOTOR CORPORATION |
| | Established/ 9 Revised: Apr.2006 |

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3.2 Properties

Pads shall meet the requirements given in Table 2 when tested in accordance with Section 4. Pad materials requiring flame resistance also need to meet the requirements given in Table 3 in addition to those of Table 2.

Table 2

| Item | Class | | | | | |
|---|---------------------------------------|--------------|-------------|--------------|------------|-----------------------------------|
| | Class 1 | Class 2 | Class 3 | Class 4A | Class 4B | |
| Apparent density (g/cm ³) | 0.12 min. | 0.03 to 0.08 | 0.08 min. | 0.02 to 0.04 | 0.08±0.02 | |
| Tensile strength (kPa) | 245 min. | 78 min. | 245 min. | 78 min. | | |
| Elongation (%) | 30 min. | 60 min. | 20 min. | 80 min. | 60 min. | |
| Tear strength (N/cm) | 7.8 min. | 3.9 min. | 7.8 min. | 4.9 min. | 3.9 min. | |
| Compression set after heat resistance (%) | - | 15 max. | - | 12 max. | | |
| Impact resilience (%) | - | 35 min. | - | 40 min. | | |
| Hardness | Method A (degrees) | 30 to 60 | | | | |
| | Method B (kPa) | - | 1.96 to 9.8 | Report | 1.5 to 3.9 | 19.6 ⁺¹⁰ ₋₅ |
| | Method C (N-φ100) | - | 88.2±19.6 | - | 88.2±19.6 | - |
| Smell | Shall comply with TSM0505G. | | | | | |
| After heat aging | Tensile strength (kPa) | 245 min. | 78 min. | 245 min. | 78 min. | |
| | Elongation (%) | 20 min. | 60 min. | 20 min. | 80 min. | 60 min. |
| After wet heat aging | Tensile strength (kPa) | 245 min. | 78 min. | 245 min. | 78 min. | |
| | Elongation (%) | 20 min. | 60 min. | 20 min. | 80 min. | 60 min. |
| Glass fogging rate (%) | Method A: 5 max. Method B: 90 min. | | | | | |

Table 3

| Suffix | Item | Standard value |
|--------|-----------------------|------------------|
| N | Flammability (mm/min) | Original state |
| | | After heat aging |
| | | 100 max. |

4. Test Methods

4.1 Standard Condition in Laboratory

The standard condition in laboratory shall be as specified in Section 3.1 of TSM7100G.

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Sample out the specimen in accordance with Section 3.2 of TSM7100G. Any other sampling method is subject to the prior approval of TOYOTA MOTOR CORPORATION (Material Engineering Div. II, and Quality Control Div.).

4.3 Apparent Density Test

Carry out the test in accordance with Section 4.1 of TSM7100G. Any other test method is subject to the prior approval of TOYOTA MOTOR CORPORATION (Material Engineering Div. II, and Quality Control Div.).

4.4 Tensile Strength and Elongation Tests

Carry out the test in accordance with Section 4.5 of TSM7100G.

4.5 Tear Strength Test

Carry out the test in accordance with Method A specified in Section 4.6.1 of TSM7100G.

4.6 Compression Set after Heat Resistance

Carry out the test in accordance with Section 4.8.1 of TSM7100G. Size of the specimen shall be 50×50×25 mm, and the compression rate for pads of Class 2 shall be 25 %.

4.7 Impact Resilience Test

Carry out the test in accordance with Section 4.7 of TSM7100G.

4.8 Hardness Test**4.8.1 Method A**

Take a specimen of about 50×50×20 mm or larger from the pad to be tested. Measure the hardness at several points using an Asker C type hardness tester and obtain the mean value. (Take readings immediately after compression.) If the pad to be tested is not thick enough to take a specimen 20 mm or more in thickness, pile several specimen on top of each other to obtain an adequate thickness.

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Take a specimen of about 50×50 with a thickness of 25 mm from the pad to be tested, and place it on a flat board. Compress the specimen downwards with a preload of 0.392 N using a plate 100 mm in diameter. Measure the thickness of the specimen under this condition (initial thickness). Compress 75 % of its initial thickness of the specimen at the speed of 50 mm/min. Remove the load immediately and compress again 25 % of its initial thickness at the speed of 50 mm/min. Maintain this condition and measure the load 20 s later. Report the measurement as the hardness (expressed in kPa).

4.8.3 Method C

Hardness shall be measured in accordance with the 25 % hardness measurement method specified in Section 4.2 of TSM7100G except for the following conditions. A center arm rest shall be used and circular compression plate shall be 100 mm in diameter. The preload shall be 1.2 N and the precompression shall be 50 % instead of 75 %.

4.9 Smell Test

Carry out the test in accordance with TSM0505G. Heating temperature shall be 100 °C and the sample size shall be 3×3×1 cm unless specified otherwise in drawing.

4.10 Tensile Strength and Elongation Tests after Heat Aging

Carry out the tests in accordance with Section 4.11 of TSM7100G except that the specimens of Class 1 are to be tested at 110±2 °C for 400 h.

4.11 Tensile Strength and Elongation Tests after Wet Heat Aging

Carry out the tests in accordance with Section 4.12.1 of TSM7100G.

4.12 Flammability Test

Carry out the test both under the original state and after heat aging in accordance with TSM0500G.

4.13 Glass Fogging Test

Carry out the test in accordance with either Method A or B specified in TSM0503G.

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5. Method of Indication on Drawing

Informations with regard to the pads shall be indicated on drawings by its material code and suffix for flame resistance when necessary. Other requirements such as hardness shall be indicated in parentheses.

Example 1:

TSM6716G-1N

Example 2:

TSM6716G-2N (Hardness: Method B, 0.06 ± 0.02)

Example 3:

TSM6716G-3

Example 4:

TSM6716G-4AN (Hardness: Method C, 6 ± 2)

Applicable Standards

| | |
|----------|--|
| TSM0500G | Flammability Test Method for Interior Non-Metallic Materials |
| TSM0503G | Fogging Test Method for Non-Metallic Materials |
| TSM0505G | Smell Quality of Non-Metallic Materials |
| TSM7100G | General Test Method for Polyurethane Foams |
| TSZ0001G | Control Method for Substances of Environmental Concern |

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