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**Automotive parts — Disk brake pads
— Test procedure of thermal expansion**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS D 4416 : 1996** is replaced with **JIS D 4416 : 1998**.

In this revision, the relevant provisions of ISO Standard are described in the text, intending conformance with International Standard, and the provisions of the former Standard are described in the Annex.

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Automotive parts—Disk brake pads— Test procedure of thermal expansion

Introduction This Japanese Industrial Standard has been prepared on the basis of the first edition of **ISO 6313** *Road vehicles—Brake linings—Effects of heat on dimensions and form of disc pads—Test procedure* published in 1980 without any modification in technical contents, and specifies the conventional test procedure specified in the former Japanese Industrial Standard as the Annex (normative).

This Standard specifies a method for measuring dimensional changes of disc brake pads under the influence of heat. At the same time, it gives an indication of the resistance of whole disc brake pads to heat transfer in the direction of applied pressures.

An extension of this Standard for drum brake linings is still to be prepared.

1 Scope This Standard specifies a combined method of measuring disc brake pads (hereafter, referred to as “pads”) to determine their dimensional changes in relation to temperature and their resistance to heat transfer.

The dimensions concerned are:

- thickness dimension ;
- certain dimensions of the lining outline when their variation may involve a misfunctioning of the brake.

This Standard applies to pads for road vehicles. Their dimensions should not exceed 80 mm in depth, 120 mm in width and 20 mm in thickness, being of integral moulded or bonded type, and the backing plate of solid type.

Remarks : The International Standard corresponding to this Standard is listed as follows.

ISO 6313:1980 *Road vehicles—Brake linings—Effects of heat on dimensions and form of disc brake pads—Test procedure*

2 Normative reference The following standard contains provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent edition of the standard indicated below shall be applied.

ISO 611 *Road vehicles—Brake of automotive vehicles and their trailers—Vocabulary*

3 Symbols and designations For general definitions, see **ISO 611**.

Symbol	Designation
d_m	Mean thickness of specimen pad (see 4)
d_{A_i}	Dimensions, possibly concerned, of the lining outline (see 4)
d_{B_i}	Dimensions, possibly concerned, of the lining outline at room temperature after test (see 6)
Δd_i	Changes of the possibly concerned dimensions of the lining outline (see 7)

4 Sampling and conditioning Take the samples from stock.

Before placing the pads into the test rig, rub them down on both sides with emery paper (grain size No. 120) so as to remove the coat of paint from the backing plate and to render the rubbing surface itself smooth and free from unevenness.

Remove any friction material from spigot holes in the backing plate to a depth sufficient to avoid influencing the test results.

In the case of pads fitted with a thin flexible anti-noise strip on the back face of the backing plate, prepare this strip in the same way as the friction material to give a good contact surface.

Determine two reference points as shown in Attached Fig. 1, and measure the thickness of the pad at the reference points to an accuracy of 0.01 mm. The mean value of these two measurements is designated d_m .

Measure the dimensions, if concerned, of the lining outline. These values are designated d_{Ai} .

Drill a 2 mm diameter hole in the side of the lining down to one of the reference points described above. This hole shall be parallel to the rubbing surface at a distance of 5 mm, and is used to house a sheathed thermocouple.

Drill a 2 mm diameter hole in the lining backing plate parallel to and same depth as the hole described above, to house a sheathed thermocouple. In the case of pads equipped with anti-noise strips, this hole is omitted.

Linings exceeding the limits of (120×80×20) mm shall be reduced to this size by cutting with a parting-off disc and/or by surface grinding.

5 Test rig

5.1 The test rig is composed of an electrically heated steel plate, 80 mm high, 170 mm wide and 40 mm thick, with devices for clamping the brake pad and for the measuring equipment.

The test rig may be designed for two pads.

An example of a test rig is shown in Attached Fig. 2.

The rig consists of (see Attached Fig. 2) :

- a) a clamping block ① provided with a piston of 48 mm diameter moving easily in the block ;
- b) various coil springs ② ensuring by deflection the force through the piston ;
- c) a screw thread with adjuster nut ③ to deflect the springs ;
- d) a dial gauge ④ measuring displacement from the pad backing plate or intermediate plate through the device ensuring the compressive force.

5.2 **Heating capacity** The heating source shall be capable of bringing the plate to a temperature of 400 °C in (10±0.5) min.

In certain cases, especially with a view to utilization of tested brake linings on a given vehicle type, it may be necessary to adopt a heating source capable of bringing a plate to a temperature above 400 °C in less than 10 min.

5.3 Measuring equipment Temperature is measured centrally in the heating plate by means of a sheathed thermocouple in a hole running parallel to, and 5 mm from, the contact surface with friction material (see Attached Fig. 2).

In the case of pads equipped with anti-noise strips, a 4 mm thick (80×100) mm thermal conductive plate is placed between the pad and the clamping device for the measurement of heat transfer. The temperature measurement on this intermediate plate is taken by means of a sheathed thermocouple which is situated in a hole drilled to the center of the plate (see Attached Fig. 2).

The block for clamping the pad is provided with a device capable of applying a force range of 20 to 200 N. The displacement measuring devices fixed on the same side of the clamping block shall measure the displacement from the pad backing plate or intermediate plate.

6 Test method Place the pad prepared in accordance with 4 above between the heating plate and the clamping block, with the rubbing surface towards the heating plate, and clamped with a pad surface pressure of about 20 kPa (0.02 N/mm²).

In the case of the pads equipped with anti-noise strips, insert the intermediate plate between the pad and the clamping block. The dial gauges or inductive displacement transducers are mounted and set to zero.

Switch on the heating source at a setting which will result in a final temperature of 400 °C at the end of a 10 min heating period.

Remarks : In certain cases, especially with a view to utilization of tested brake linings on a given vehicle type it may be necessary that this final temperature be above 400 °C and reached in less than 10 min.

According to the equipment used, measure the variations in the pad thickness and the temperature of the heating plate, the temperature of the friction material and the temperature of the pad backing plate or intermediate plate during the heating and cooling period.

If the measurements are not taken by means of a recorder, these shall be read at 25 °C intervals of heating plate temperature between 50 °C and the final temperature.

After the final temperature has been reached, the heat source is switched off, and the cooling period begins during which the system is allowed to cool naturally, without any cooling air blown on to the heating plate.

As soon as the heating plate reaches 50 °C, switch the heating source on again and repeat the process described above. No readjustment shall take place under any circumstances at the beginning of the second heating period.

At the end of the test, measure the dimensions, if concerned, of the lining outline at room temperature. These values shall be designated d_{Bi} .

7 Presentation of results

7.1 If a recorder is used, the traces shall be suitably identified so that the recording of change of pad thickness, heating plate temperature, lining temperature, and pad backing plate temperature or intermediate plate temperature can be unambiguously related to the appropriate factors. If an $X-Y$ plotter is used, the direction of the abscissas is controlled by