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**Automotive parts — Diaphragm gas-
kets for hydraulic brake master cylin-
der reservoirs using a non-petroleum
base hydraulic brake fluid**

ICS 21.140;43.040.40

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Auto Parts Industries Association (JAPIA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS D 2610 : 1995** is replaced with this Standard.

This revision has been made based on **ISO 4929 : 1978** *Road vehicles—Diaphragm gaskets for hydraulic brake master cylinder reservoirs using a non-petroleum base hydraulic brake fluid* for the purpose of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

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Automotive parts — Diaphragm gaskets for hydraulic brake master cylinder reservoirs using a non-petroleum base hydraulic brake fluid

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 4929** *Road vehicles—Diaphragm gaskets for hydraulic brake master cylinder reservoirs using a non-petroleum base hydraulic brake fluid* published in 1978, adopting the parts corresponding to **JIS** with some modifications of the technical conditions, and also adding provisions that are unique to **JIS** (Types 1 and 3 in classification clause and hardness of A70 in performance clause, etc.).

The portions given sidelines or dotted underlines are the matters in which the contents of the original International Standards have been modified. A list of modifications with the explanations is given in Annex (informative).

1 Scope This Standard specifies the diaphragm gaskets (hereafter referred to as "diaphragm gaskets") assembled to the hydraulic brake master cylinder reservoirs for automobile using non-petroleum base hydraulic brake fluid for the purposes of prevention of liquid leakage and prevention of the intrusion of water and others into its inside.

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

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standards and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 4929 : 1978 *Road vehicles—Diaphragm gaskets for hydraulic brake master cylinder reservoirs using a non-petroleum base hydraulic brake fluid* (MOD)

2 Normative references The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS D 2605 *Automotive parts—Rubber cups for hydraulic braking cylinders using a non-petroleum base hydraulic brake fluid*

Remarks : **ISO 4928** : 1980 *Road vehicles—Elastomeric cups and seals for cylinders for hydraulic braking systems using a non-petroleum base hydraulic brake fluid (Service temperature 120 degrees C max.)* is equivalent to the said standard.

JIS K 2233 *Non-petroleum base motor vehicle brake fluids*

Remarks : **ISO 4925** : 1978 *Road vehicles—Non-petroleum base brake fluid* is equivalent to the said standard.

JIS K 2503 *Testing method of lubricating oil for aircraft*

JIS K 2839 *Glasswares for testing apparatus of petroleum products*

JIS K 6250 *Rubber—General rules of physical testing methods*

JIS K 6251 *Rubber, vulcanized or thermoplastic—Determination of tensile stress-strain properties*

Remarks : **ISO 37** : 1994 *Rubber, vulcanized or thermoplastic—Determination of tensile stress-strain properties* is equivalent to the said standard.

JIS K 6253 *Hardness testing methods for rubber, vulcanized or thermoplastic*

Remarks : **ISO 48** : 1994 *Rubber, vulcanized or thermoplastic—Determination of hardness (hardness between 10 IRHD and 100 IRHD)* is equivalent to the said standard.

JIS K 6257 *Rubber, vulcanized or thermoplastic—Determination of heat ageing properties*

Remarks : **ISO 188** : 1998 *Rubber, vulcanized or thermoplastic—Accelerated ageing and heat resistance tests* is equivalent to the said standard.

JIS K 6258 *Rubber, vulcanized or thermoplastic—Determination of the effect of liquids*

Remarks : **ISO 1817** : 1999 *Rubber, vulcanized—Determination of the effect of liquids* is equivalent to the said standard.

JIS K 6259 *Rubber, vulcanized or thermoplastics—Determination of ozone resistance*

Remarks : **ISO 1431-1** : 2004 *Rubber, vulcanized or thermoplastic—Resistance to ozone cracking—Part 1 : Static and dynamic strain testing* is equivalent to the said standard.

JIS K 6262 *Permanent set testing methods for rubber, vulcanized or thermoplastic*

Remarks : **ISO 815** : 1991 *Rubber, vulcanized or thermoplastic—Determination of compression set at ambient, elevated or low temperatures* is equivalent to the said standard.

JIS Z 8401 *Guide to the rounding of numbers*

3 Classification Diaphragm gaskets shall be classified as given in table 1.

Table 1 Classification of diaphragm gaskets

Classification	Symbol	Division
Type 1	L	Diaphragm gaskets usable under ordinary operating conditions
Type 2	H	Diaphragm gaskets usable under operating conditions at a high temperature
Type 3	–	Diaphragm gaskets usable under operating condition at specially high temperature

4 Quality

4.1 Appearance Diaphragm gaskets shall be free from blisterings, pinholes and cracks on the surfaces and shall not be mixed with foreign matters.

4.2 Performance The performance of diaphragm gaskets shall be as given in table 2 when tested in accordance with clause 6.

Table 2 Performance of diaphragm gasket

Item		Classification			Test method
		Type 1	Type 2	Type 3	
Ordinary state	Hardness	A50±5, A60±5 or A70±5			In accordance with 6.1.
Aging resistance	Temperature and time ⁽¹⁾	<u>70±2 °C, 120±2 h</u>	<u>120±2 °C, 70±2 h</u>	<u>150±2 °C, 70±2 h</u>	In accordance with 6.2.
	Hardness change	<u>A-5 to +5</u>	<u>A-5 to +10</u>		
	State	<u>There shall not be extreme adhesion and abnormality of appearance.</u>			
Fluid resistance	Temperature and time ⁽¹⁾	<u>70±2 °C, 120±2 h</u>	<u>120±2 °C, 70±2 h</u>	<u>150±2 °C, 70±2 h</u>	In accordance with 6.3.
	Percentage of volume change %	<u>-10 to +20</u>			
	Hardness change	<u>A-10 to +5</u>			
	State	<u>There shall not be extreme adhesion and abnormality of appearance.</u>			
Precipitation	Temperature and time ⁽¹⁾	<u>70±2 °C, 120±2 h</u>	<u>120±2 °C, 70±2 h</u>	<u>150±2 °C, 70±2 h</u>	In accordance with 6.4.
	Precipitate vol%	<u>0.3 max.</u>			
Low temperature bending resistance	Temperature and time ⁽¹⁾	<u>-43 to -40 °C, 22 h ±1 h</u>			In accordance with 6.5.
	State	The diaphragm gasket shall not crack and shall return to its approximate original shape within 1 min. Deformation may remain in a portion of “convolutions”.			
Ozone resistance	Ozone concentration ⁽¹⁾	<u>500 ±50 ppb</u>			In accordance with 6.6.
	Temperature and time ⁽¹⁾	<u>40 ±2 °C, 70 ±2 h</u>			
	Elongation (static) ⁽¹⁾ %	<u>15 ₋₃⁰</u>			
	State	Cracks observable with a magnifying glass of two magnifications shall not be generated.			
Operation endurance	Temperature and time ⁽¹⁾	<u>70±2 °C, 120±2 h (fluid) or 70±5 °C, 120±2 h (atmospheric)</u>	<u>120±2 °C, 70±2 h (fluid) or 120±5 °C, 70±2 h (atmospheric)</u>		In accordance with 6.7.
	State ⁽²⁾	There shall be no moisture on the surface of reservoir cap side except for portions in direct contact with the reservoir cap.			
Function of diaphragm	State	The “convolutions” of diaphragm shall be fully extended after the test. Otherwise, the level of test fluid shall be 3.2 mm max. above the port of master cylinder.			In accordance with 6.8.

Notes ⁽¹⁾ This item shows test conditions.

⁽²⁾ If air duct is constructed on the diaphragm gaskets by the valve mechanism and the like, the state shall be in accordance with the agreement between the parties concerned.

5 Materials The characteristics of materials to be used for diaphragm gaskets should satisfy the requirements given in table 3 when tested in accordance with clause 7.

Table 3 Material characteristics

Item		Classification			Test method
		Type 1	Type 2	Type 3	
Ordinary state	Hardness	A50±5, A60±5 or A70±5			In accordance with 7.1.
	Tensile strength MPa	7.0 MPa			
	Elongation %	250 min. For those of hardness A70±5, 200 min.			
Aging resistance	Temperature and time ⁽¹⁾	70±2 °C, 120±2 h	120±2 °C, 70±2 h	150±2 °C, 70±2 h	In accordance with 7.2.
	Hardness change	A-5 to +5	A-5 to +10		
	Percentage of tensile strength change % (percentage of degradation)	25 max.	40 max.		
	Percentage of elongation change % (percentage of degradation)	25 max.	40 max.		
Compression set	Temperature and time ⁽¹⁾	70±2 °C, 22±1 h	120±2 °C, 22±1 h	150±2 °C, 22±1 h	In accordance with 7.3.
	Compression set %	40 max.			
Fluid resistance	Temperature and time ⁽¹⁾	70±2 °C, 120±2 h	120±2 °C, 70±2 h	150±2 °C, 70±2 h	In accordance with 7.4.
	Volume change percentage %	-10 to +20			
	Hardness change	A-10 to +5			
	Percentage of tensile strength change % (percentage of degradation)	25 max.	40 max.		
	Percentage of elongation change % (percentage of degradation)	25 max.	40 max.		

Note ⁽¹⁾ This item shows test conditions.

6 Performance test methods

6.1 Ordinary state test

6.1.1 Specimen The specimen shall be as shown below :

The specimen used for the measurement of hardness shall be two sections taken from a diaphragm gasket, comprised of upper and lower surfaces that are flat and smooth and parallel to each other.

6.1.2 Testing apparatus The testing apparatuses shall be as follows :

The hardness tester shall be the Type A durometer specified in clause 5 of **JIS K 6253**. The microsize international rubber hardness meter for method M specified in clause 4 of **JIS K 6253** may be used on the basis of the agreement between the parties concerned.

6.1.3 Test method The measurement of hardness shall be in accordance with clause 5 of **JIS K 6253**. It may be in accordance with clause 4 of **JIS K 6253** on the basis of the agreement between the parties concerned.

6.1.4 Expression of test results The hardness shall be expressed according to 5.6 or 4.6 of **JIS K 6253** by rounding off the median of five measurements to an integer in accordance with **JIS Z 8401**.

6.2 Aging test

6.2.1 Specimen Two diaphragm gaskets shall be used.

6.2.2 Test apparatus The test apparatus shall be as follows.

- a) The forced circulation heat aging tester (cross wind type) specified in 7.2 of **JIS K 6257** shall be used.
- b) For testing the hardness, the apparatus specified in 6.1.2 shall be used.

6.2.3 Test conditions Aging test conditions shall be as given in table 4.

Table 4 Aging test conditions

Classification of diaphragm gasket	Test temperature °C	Test time h
Type 1	70± 2 °C	120±2 h
Type 2	120±2 °C	70±2 h
Type 3	150±2 °C	

6.2.4 Test method The test shall be carried out as follows :

- a) **Measurement of hardness** After measuring the hardness before test (H_0) in accordance with the method specified in 6.1.3, test the specimen in accordance with 6.4.2 of **JIS K 6257** under the conditions in table 4, and measure the hardness (H_1) in accordance with the above-mentioned method.
- b) **State** After aging in accordance with a), observe visually the state of surface of specimen and examine whether there are adhesion, blisters, cracks, deformation or other abnormalities.

6.2.5 Calculation The calculation of hardness change shall be as follows :

$$A_H = H_1 - H_0$$

where, A_H : hardness change
 H_0 : hardness before the test
 H_1 : hardness after the test

6.2.6 Expression of test results The hardness change obtained from the calculation in 6.2.5 shall be expressed by an integer value. The average of two measurement values shall be reported.

6.3 Fluid resistance test

6.3.1 Specimen The specimen shall be as follows :

- The specimens used for the measurement of hardness shall be two segments of the product or two whole products.
- The specimens used for the measurement of volume change shall be two segments of 3 g cut off from the product. In the case of the product not more than 3 g, two whole products shall be the specimens.

6.3.2 Testing apparatus The testing apparatus shall be as follows :

- Hardness tester** The hardness tester in 6.1.2 shall be used.
- Test chamber** The test chamber shall be able to maintain the test temperature shown in table 4.
- Test container** The test container shall be consist of a weighing bottle and a pressure-resistant container. An example of shape and dimensions of such test container is given in figure 1.

Unit : mm

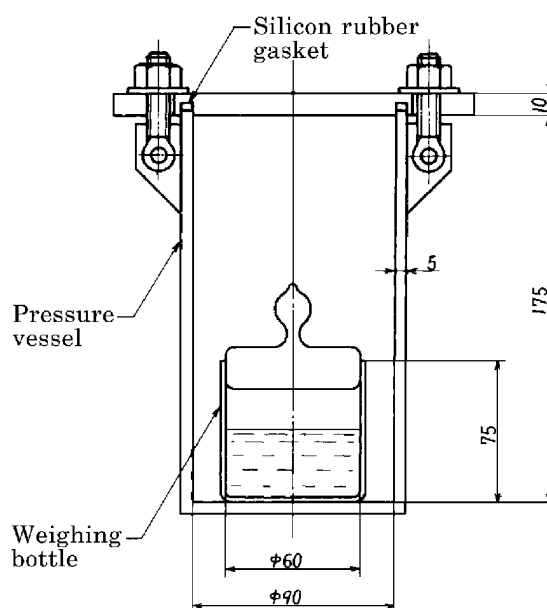


Figure 1 Test container for fluid resistance test (example)

6.3.3 Test condition The test condition shall be as shown in table 5.

Table 5 Fluid resistance test condition

Classification	Test temperature °C	Test time h	Test fluid
Type 1	70±2	120±2	The fluid conforming to JIS K 2233 .
Type 2	120±2	70±2	
Type 3	150±2		

6.3.4 Test method The test method shall be as follows :

- a) **Cleaning of specimen** Wash the specimen using isopropyl alcohol or ethyl alcohol (hereafter both of them are referred to as "alcohol") to remove the attached stain, test fluid, etc., and then wipe off the alcohol using dry cloth. When cleaning the specimen with alcohol, avoid dipping in alcohol for 30 s or more.
- b) **Immersion test** Put the specimen into a weighing bottle in **6.3.2 c)**, and 75 ml of test fluid, cover it and place it in a pressure-resistant container. Tightly seal the cover of pressure-resistant container and keep it in the thermostatic chamber regulated at the temperature for the test time shown in table 5. After completion of dipping, dip the specimen in new test fluid of the same kind (room temperature) for about 30 min to cool down to the room temperature.
- c) **Measurement of volume change** After cleaning the specimen by the method in **a)**, measure its mass (m_1) to the nearest 1 mg in the air. Then measure the apparent mass (m_2) in distilled water at room temperature, making sure that the specimen is free from adhesion of air bubbles. Clean again by the method in **a)**. Successively carry out the immersion test by the method in **b)**, after cleaning by the method in **a)**, measure immediately the mass of specimen in the air (m_3) and further measure the apparent mass (m_4) in distilled water at room temperature.
- d) **Measurement of hardness** Measure the hardness of specimen before the test by the method in **6.1.3**, carry out the immersion test by the method in **b)**, and after cleaning by the method in **a)**, measure the hardness by the method in **6.1.3**.
- e) **State** After the immersion test in **b)**, observe visually the state of surface of specimen and examine whether there are adhesion or other abnormality.

Remarks 1 The measurement and observation in **c)** and **d)** shall be carried out within 60 min after cleaning by alcohol following the completion of the immersion test.

2 **c)** and **d)** are allowed to be carried out on the same specimen.

6.3.5 Calculation The calculation shall be as follows :

- a) **Percentage of volume change** The percentage of volume change shall be calculated by the following formula :