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# JIS

## JAPANESE INDUSTRIAL STANDARD

# Rotary shaft lip type seals

## JIS B 2402–1996

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JAPANESE INDUSTRIAL STANDARD JIS B 2402-1996

# Rotary shaft lip type seals

**1 Scope** This Japanese Industrial Standard specifies the rotary shaft lip type seals (hereafter, referred to as "rotary shaft lip seals") conforming to the ranges of shaft diameter from 6 mm to 500 mm and diameter of housing bore from 16 mm to 550 mm and the related matters thereof.

Remarks 1 The cited standards to this Standard are given in the following:

| | |
|---|---|
| JIS B 0401 | *System of limits and fits* |
| JIS B 0601 | *Surface roughness - Definitions and designation* |
| JIS G 3141 | *Cold-reduced carbon steel sheets and strip* |
| JIS G 3521 | *Hard drawn steel wires* |
| JIS G 3522 | *Piano wires* |
| JIS G 4051 | *Carbon steels for machine structural use* |
| JIS K 2215 | *Internal combustion engine oils* |
| JIS K 6257 | *Accelerated aging test methods for vulcanized rubber* |
| JIS K 6258 | *Testing methods of the effect of liquids for vulcanized rubber* |
| JIS K 6261 | *Low temperature testing methods for vulcanized rubber* |
| JIS K 6262 | *Permanent set testing methods for vulcanized rubber* |
| JIS K 6301 | *Physical testing methods for vulcanized rubber* |

2 The corresponding International Standards to this Standard are given in the following:

| | |
|---|---|
| ISO 6194-1:1982 | *Rotary shaft lip type seals—Part 1: Nominal dimensions and tolerances* |
| ISO 6194-2:1991 | *Rotary shaft lip type seals—Part 2: Vocabulary* |
| ISO 6194-3:1988 | *Rotary shaft lip type seals—Part 3: Storage, handling and installation* |
| ISO 6194-4:1988 | *Rotary shaft lip type seals—Part 4: Performance test procedures* |
| ISO 6194-5:1990 | *Rotary shaft lip type seals—Part 5: Identification of visual imperfections* |

**2 Definitions** The definitions of the terms to be used in this Standard shall be in accordance with Annex 1.

**3 Types** The types of the rotary shaft lip seals shall be nine types classified according to the structure, and be in accordance with Attached Table 1.

## 4 Qualities

**4.1 Performances** The performances of the rotary shaft lip seals shall be in accordance with the following:

(1) **Rotary shaft lip seal with spring** The rotary shaft lip seal with spring, when tested in accordance with the performance test procedures of Annex 2 using the Class 1 No. 2 for land specified in JIS K 2215 or the test oil as agreed between the parties concerned with delivery, shall conform to the Class 1 of Table 1. However, upon agreement between the parties concerned with delivery, the provisions of Class 2 may also be applied.

Further, the performances and the test procedures of the rotary shaft lip seal with spring used for the grease shall be as agreed between the parties concerned with delivery.

**Table 1** Performances

| Division | Performance |
|---|---|
| Class 1 | There shall be no oil leakage. |
| Class 2 (1) | The maximum permitted oil leakage from 6 pieces of test rotary shaft lip seals shall be 12 g and the maximum leakage from any single seal be 3 g. |

Note (1) The performance of the Class 2 is in accordance with ISO 6194-4.

(2) **Rotary shaft lip seal without spring** The performances and test procedures of the rotary shaft lip seal without spring shall be as agreed between the parties concerned with delivery.

**4.2 Appearance** The sealing edge part of rotary shaft lip seal shall be finished well and be free from the defect of harmful flaws, unevenness and the like and deterioration, and the metal portion shall be free from harmful flaws, deformation, rust and the like.

Further, the area of the sealing edge part of rotary shaft lip seal is indicated in Attached Fig. 1, the types and names of visual imperfections in Attached Fig. 2, and the examples of visual imperfections in Attached Figs 3.1 to 3.5.

Remarks: The Attached Figs 1 to 3.5 are based on ISO 6194-5.

## 5 Nominal dimensions and tolerances

**5.1 Nominal dimensions** The nominal dimensions of the rotary shaft lip seals shall be in accordance with Attached Table 2.1 or Attached Table 2.2.

For the inside diameter ($d_1$), the nominal dimension of the shaft diameter corresponding to the rotary shaft lip seal shall be used, and for the outside diameter ($D$), the nominal dimension of the housing bore diameter shall be used. The width ($b$) shall be the nominal width of the rotary shaft lip seal, and it shall be related to the housing bore depth.

**5.2 Tolerances on outside diameter and width** In order to maintain the interference fit between the rotary shaft lip seal and housing, the tolerances on the seal outside diameter shall be in accordance with Attached Table 3.1 or Attached Table 3.2. The tolerances on width shall be in accordance with Attached Table 4.

**6 Materials** The materials of the rotary shaft lip seals shall be in accordance with the following:

(1) **Rubber material** The rubber material shall be that of equivalent to the nitrile rubber or that of equivalent to the acrylic rubber, and when tested in accordance with JIS K 6301 using the test pieces manufactured under the same conditions as the products, the results shall conform to the physical properties of Attached Table 5. However, the test may also be carried out in accordance with 4 of JIS K 6257, JIS K 6258, 4 of JIS K 6261 and JIS K 6262. The physical properties in this case shall be as agreed between the parties concerned with delivery.

(2) **Case material** The case material shall be the material specified in JIS G 3141 or that equal to or superior to this.

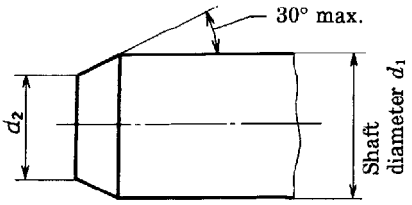
(3) **Spring material** The spring material shall be the material specified in JIS G 3521 or G 3522, or that equal to or superior to these.

**7 Shaft** The shaft shall be in accordance with the following:

(1) **Chamfering of shaft end** The shaft end shall be provided with a lead-in chamfer as given in Table 2, and be free from burrs, sharp corners, rough machining marks.

**Table 2** Lead-in chamfer of shaft end

Unit: mm




| Nominal shaft diameter $d_1$ | $d_1 - d_2$ (2) | Nominal shaft diameter $d_1$ | $d_1 - d_2$ (2) |
|---|---|---|---|
| $d_1 \leqq 10$ | 1.5 or over | $50 < d_1 \leqq 70$ | 4.0 or over |
| $10 < d_1 \leqq 20$ | 2.0 or over | $70 < d_1 \leqq 95$ | 4.5 or over |
| $20 < d_1 \leqq 30$ | 2.5 or over | $95 < d_1 \leqq 130$ | 5.5 or over |
| $30 < d_1 \leqq 40$ | 3.0 or over | $130 < d_1 \leqq 240$ | 7.0 or over |
| $40 < d_1 \leqq 50$ | 3.5 or over | $240 < d_1 \leqq 500$ | 11.0 or over |

Note (2) If a shaft lead-in chamfer radius is to be processed, it shall be not less than this value.

(2) **Tolerances on shaft diameter** The tolerances on the shaft diameter shall be h11 of JIS B 0401.

(3) **Surface conditions and finish of shafts** The surface conditions of the shafts shall be free from flaws and machining leads.

The finish should preferably be made by plunge grinding without feed.

(4) **Surface roughness of shaft** The surface roughness of shaft shall be (0.63 to 0.2) μm$R_a$ and (2.5 to 0.8) μm$R_y$ specified in JIS B 0601.

**Informative reference:** The material of shaft should preferably be the material specified in JIS G 4051 or low alloy steel.

The hardness of shaft should preferably be 30HRC or harder.

The shaft runout shall be expressed by the difference between the maximum value and minimum value of the readings of the dial gauge, when the shaft has been rotated, and it should preferably be 0.25 mm max.

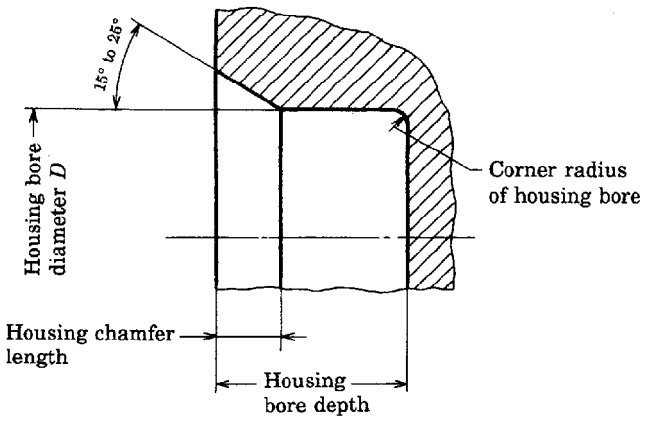
**8 Housing** The housing, when the material is of machined iron or steel, shall be in accordance with the following: However, when the housing is of nonferrous or nonmetallic material, and when it is of press formed, these shall be as agreed between the parties concerned with delivery.

(1) **Dimensions of housing** The dimensions of housing shall be in accordance with Table 3.

Further, the chamfered part shall be free from burrs.

**Table 3** Dimensions of housing

Unit: mm




| Nominal width of rotary shaft lip seal $b$ | Housing bore depth | Housing chamfer length | Housing bore corner radius (Max.) |
|---|---|---|---|
| ≦ 10 | $b$ + 0.9 | 0.70 to 1.00 | 0.50 |
| > 10 | $b$ + 1.2 | 1.20 to 1.50 | 0.75 |

(2) **Tolerances on housing bore diameter** The tolerances on housing bore diameter shall be H8 of JIS B 0401.

(3) **Surface roughness of housing bore** The surface roughness of housing bore shall be (3.2 to 0.4) μm$R_a$ or (12.5 to 1.6) μm$R_y$ specified in JIS B 0601.

Further, the surface conditions of housing bore may be of as machined.

Remarks: The surface roughness may require the smaller values than the values of above (3) when the metal cased rotary shaft lip seals are used.

**9 Inspection** The inspection on the rotary shaft lip seals shall be carried out on the performances, appearance, dimensions and materials, and the results shall conform to the requirements of 4 to 6.

**10 Designation** The products shall be designated by the following matters in this order.

(1) Standard number

(2) Symbol of type

(3) Symbol indicating nominal inside diameter (a number of three figures)

(4) Symbol indicating nominal outside diameter (a number of three figures)

(5) Symbol indicating nominal width (a number of two figures)

(6) Symbol of type of rubber material given in Attached Table 5

(7) Type of tolerances on seal outside diameter

(8) Symbol indicating performances of rotary shaft lip seal with spring (For the Class 1 of Table 1, this is omitted.)