

JIS

JAPANESE INDUSTRIAL STANDARD

**Straight-sided splines for
cylindrical shafts with internal centering—
Dimensions, tolerances and verification**

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Preface

This Japanese Industrial Standard has described based on ISO 14-1982, 2nd edition (Straight-sided splines for cylindrical shafts with internal centering—Dimensions, tolerances and verification) without any alteration in the technical contents. In addition, the irreducible minimum of necessary items was collected from the former Standard R 1601-1976 and transferred to Annex.

"Informative references" underlined (dotted lines) in the text of this Standard are those not prescribed in the original International Standard.

1. Scope and field of application This Standard lays down dimensions, in millimeters, of straight-sided splines for cylindrical shafts with internal centering, light series and medium series.

This Standard also specifies control methods and corresponding gauges.

Informative reference: This Standard refers to the following International Standards.

ISO/R 1938: 1971 ISO system of limits and fits—Part II: Inspection of plain workpieces

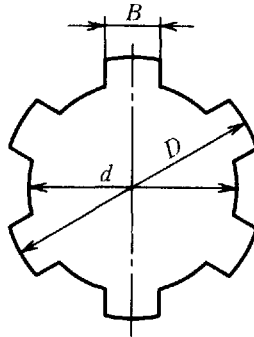
ISO 3670 Blanks for plug gauges and handles (taper lock and trilock) and ring gauges—Design and general dimensions

2. Dimensions The nominal dimensions common to shaft and hub, d , D and B are given in Table 1.

3. Designation The profile of a splined shaft or hub shall be designated by stating, in the following order: the number of splines N , the minor diameter d and the outside diameter D , these three numbers being separated by the sign $\times$.

Example: Shaft (or hub) 6 $\times$ 23 $\times$ 26

Table 1. Nominal dimensions



d mm	Light series				Medium series			
	Designation	N	D mm	B mm	Designation	N	D mm	B mm
11	—	—	—	—	6×11×14	6	14	3
13	—	—	—	—	6×13×16	6	16	3.5
16	—	—	—	—	6×16×20	6	20	4
18	—	—	—	—	6×18×22	6	22	5
21	—	—	—	—	6×21×25	6	25	5
23	6×23×26	6	26	6	6×23×28	6	28	6
26	6×26×30	6	30	6	6×26×32	6	32	6
28	6×28×32	6	32	7	6×28×34	6	34	7
32	8×32×36	8	36	6	8×32×38	8	38	6
36	8×36×40	8	40	7	8×36×42	8	42	7
42	8×42×46	8	46	8	8×42×48	8	48	8
46	8×46×50	8	50	9	8×46×54	8	54	9
52	8×52×58	8	58	10	8×52×60	8	60	10
56	8×56×62	8	62	10	8×56×65	8	65	10
62	8×62×68	8	68	12	8×62×72	8	72	12
72	10×72×78	10	78	12	10×72×82	10	82	12
82	10×82×88	10	88	12	10×82×92	10	92	12
92	10×92×98	10	98	14	10×92×102	10	102	14
102	10×102×108	10	108	16	10×102×112	10	112	16
112	10×112×120	10	120	18	10×112×125	10	125	18

4. **Tolerances on holes and shaft** The dimensional tolerances on holes and shafts are given in Table 2, whilst Table 3 indicates tolerances on symmetry.

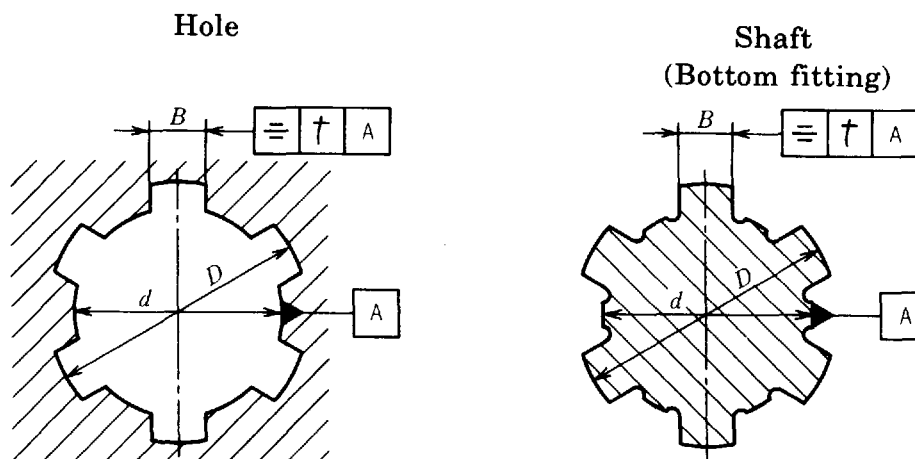
With certain milling cutters, it is possible for special applications to produce splines without bottom tool clearance with a very reduced fillet radius between the spline side and the minor diameter d (for example, milling cutters with fixed working positions).

The tolerances in Table 2 relate to entirely finished workpieces (shafts and hubs). Tooling should therefore be different for untreated workpieces or workpieces treated before machining and for workpieces treated after machining.

The tolerance specified on B includes the index variation (and the symmetry variation).

For alignment errors, see 5.7.

Table 2. Tolerances on holes and shafts



Tolerances on hole						Tolerances on shaft			Mounting type
Not treaded after broaching			Treated after broaching						
<i>B</i>	<i>D</i>	<i>d</i>	<i>B</i>	<i>D</i>	<i>d</i>	<i>B</i>	<i>D</i>	<i>d</i>	
H9	H10	H7	H11	H10	H7	d10	a11	f7	Sliding
						f9	a11	g7	Close sliding
						h10	a11	h7	Fixed

Table 3. Tolerances on symmetry

Unit: mm				
Spline width B	3	3.5, 4, 5, 6	7, 8, 9, 10	12, 14, 16, 18
Tolerance of symmetry t	0.010 (IT7)	0.012 (IT7)	0.015 (IT7)	0.018 (IT7)

5. Gauging

5.1 General This clause gives general information concerning gauges and gauge control; all the other requirements concerning gauges are given in clause 6 for the case where limit gauges are used, which is not compulsory. Direct measurement gauging can be permitted by previous agreement between the parties concerned according to rules to be defined to the best of requirements.

5.2 Reference temperature and measuring force The standard reference temperature of industrial measurements is 20 °C. The dimensions prescribed for parts and gauges are measured at this temperature and shall normally be checked at this temperature.

If measurements are carried out at a different temperature, the result shall be corrected taking account of the linear expansion coefficients of workpieces and gauges respectively.

Unless otherwise specified, measurements are understood with reference to a zero measuring force.

If measurements are carried out with a measuring force differing from zero, the results shall be corrected consequently. Correction however is not required for comparative measurements carried out using the same means of comparison and the same measuring force between similar elements of the same material and surface finish.

5.3 Conditions of application A workpiece is conventionally acknowledged good when its splines are found satisfactory using gauges according to the requirements of clauses 5 and 6 of this Standard which are authoritative for gauging. Consequently, if the customer uses his own gauges for acceptance purposes, they shall be close enough to the external limits prescribed not to reject splines already accepted by the manufacturer's gauges.

In the case of dispute, both the manufacturer and customer should make their gauges available to each other for checking at their respective sites. In the event of continuing dispute the gauges shall be referred to a recognized calibration authority.

Informative reference: The external limits shown in this clause mean that; gauge wear limit for GO gauges; maximum permissible limit of hole gauge and minimum permissible limit of shaft gauge for NOT GO gauges.

5.4 Shaft gauging

5.4.1 GO side Shaft gauging on the GO side is carried out using a spline GO ring gauge simultaneously checking those characteristics relating to:

5.4.1.1 fitting, i.e. :

- spline minor diameter.

5.4.1.2 mounting, i.e. :

- spline major diameter;
- spline thickness;
- major and minor diameter concentricity;
- spline position and orientation with respect to the axis.¹⁾

5.4.2 NOT GO side Shaft gauging on the NOT GO side is carried out using segmental NOT GO gauges checking each element separately, i.e. :

- for spline major diameters : a calliper gauge or a plain ring gauge;
- for spline minor diameters : a calliper gauge (with appropriate special anvils, if necessary);

¹⁾ Spline position and orientation with respect to the axis need be verified only where gauges are lacking.

- for spline thicknesses : a calliper gauge (of appropriate external shape if necessary).

5.5 Hole gauging

5.5.1 GO side Hole gauging on the GO side is carried out using a spline GO plug gauge simultaneously checking those characteristics relating to :

5.5.1.1 fitting, i.e :

- spline minor diameter.

5.5.1.2 mounting, i.e :

- spline major diameter;
- spline space width;
- major and minor diameter concentricity;
- spline angular position;
- spline position and orientation with respect to the axis. ¹⁾

5.5.2 NOT GO side Hole gauging on the NOT GO side is carried out using NOT GO segmental gauges checking each element separately, i.e. :

- for spline minor diameters : a cylindrical plain plug gauge;
- for spline major diameters : a cylindrical plate gauge with appropriate measuring faces;
- for spline space widths : a plate gauge.

5.6 Additional gauging Workpiece (hole or shaft) gauging on the GO side by means of spline (plug or ring) gauges does not make it possible, if a workpiece is rejected by the gauge, to determine which element of the workpiece has provoked rejection.

In case such indications are required, they may be obtained by additional gauging (to be prescribed explicitly) using segmental gauges controlling each element separately on the GO side.

5.7 Influence of active length and engagement length

Length of engagement g_r : The axial length of contact between mating splines.

Active length g_w : The maximum axial length in contact (when working) with the mating spline. For sliding splines, the active length exceeds the length of engagement.