
International Standard



14

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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

Cannelures cylindriques à flancs parallèles, à centrage intérieur — Dimensions, tolérances et vérification

Second edition — 1982-10-01

UDC 621.824.4

Ref. No. ISO 14-1982 (E)

Descriptors : shaft (machine elements), cylindrical shaft, splines, straight-sided splines, dimensions.

Price based on 12 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 14 was developed by Technical Committee ISO/TC 32, *Splines and serrations*, and was circulated to the member bodies in June 1980.

It has been approved by the member bodies of the following countries :

Australia	Germany, F. R.	Romania
Austria	India	South Africa, Rep. of
Belgium	Ireland	Spain
Brazil	Italy	Sweden
Czechoslovakia	Japan	United Kingdom
France	Korea, Rep. of	USSR

The member body of the following country expressed disapproval of the document on technical grounds :

China

This second edition cancels and replaces the first edition (i.e. ISO 14-1978).

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

1 Scope and field of application

This International Standard lays down dimensions, in millimetres, of straight-sided splines for cylindrical shafts with internal centering, light series and medium series.

This International Standard also specifies control methods and corresponding gauges.

2 Dimensions

The nominal dimensions common to shaft and hub, d , D and B are given in table 1. The tolerances are indicated in tables 2 and 3.

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 ; for example :

Shaft (or hub) 6 \times 23 \times 26

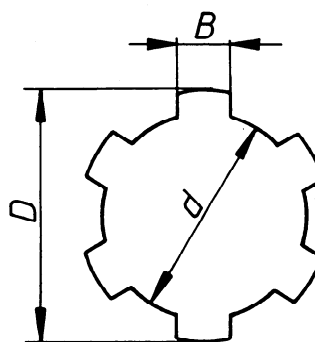


Table 1 – Nominal dimensions

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

4 Tolerances on holes and shaft

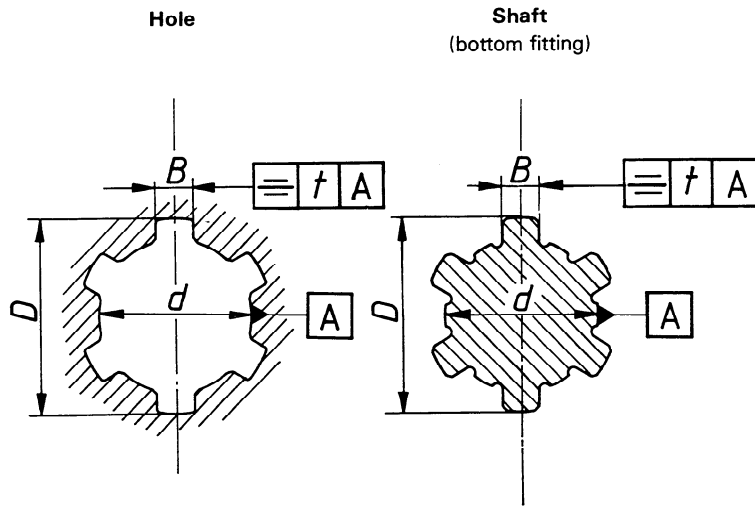


Table 2 – Tolerances on holes and shafts

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

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 above 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.

Table 3 – Tolerances on symmetry

Dimensions in millimetres

Spline width	B	3	3,5 4 5 6	7 8 9 10	12 14 16 18
Tolerance of symmetry	<i>t</i>	0,010 (IT7)	0,012 (IT7)	0,015 (IT7)	0,018 (IT7)

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

For alignment errors, see 5.7.

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

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 International 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.

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 angular position;
- 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);
- 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_y : 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.

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



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