
**Straight cylindrical involute splines —
Metric module, side fit —**

**Part 2:
Dimensions**

*Cannelures cylindriques droites à flancs en développante — Module
métrique, à centrage sur flancs —*

Partie 2: Dimensions





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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 14 *Shafts of machinery and accessories*.

This second edition cancels and replaces the first edition (ISO 4156-2:2005), which has been technically revised.

The main changes compared to the previous edition are as follows:

- ISO 4156-1 has been changed from dated to undated reference;
- ISO 4156-3 has been dated to refer to the new edition and moved to Bibliography;
- correction of descriptions of $D_{ie\ min}$ and $D_{ii\ min}$;
- correction of the title for Table 32.

A list of all parts in the ISO 4156 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 4156 (all parts) provides the data and indications necessary for the design, manufacture and inspection of straight (non-helical) side-fitting cylindrical involute splines.

Straight cylindrical involute splines manufactured in accordance with ISO 4156 (all parts) are used for clearance, sliding and interference connections of shafts and hubs. They contain all the necessary characteristics for the assembly, transmission of torque, and economic production.

The nominal pressure angles are 30° , $37,5^\circ$ and 45° . For electronic data processing purposes, the form of expression $37,5^\circ$ has been adopted instead of $37^\circ30'$. ISO 4156 (all parts) establishes a specification based on the following modules:

— for pressure angles of 30° and $37,5^\circ$ the module increments are:

0,5; 0,75; 1; 1,25; 1,5; 1,75; 2; 2,5; 3; 4; 5; 6; 8; 10;

— for pressure angle of 45° the module increments are:

0,25; 0,5; 0,75; 1; 1,25; 1,5; 1,75; 2; 2,5

Straight cylindrical involute splines — Metric module, side fit —

Part 2: Dimensions

1 Scope

This document specifies geometry and inspection dimensions for the design and manufacture of straight (non-helical) side-fitting cylindrical involute splines.

Limiting dimensions, tolerances, manufacturing errors and their effects on the fit between connecting coaxial spline elements are defined and tabulated. Linear dimensions are expressed in millimetres and angular dimensions in degrees.

The specified diameters for external splines in the geometry tables and the values in the inspection dimension tables are only valid for fundamental deviation “h”.

For fundamental deviations other than “h”, diameters and tooth thicknesses are calculated for external splines according to the formulae in ISO 4156-1 and inspection dimensions according to the formulae in ISO 4156-3.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4156-1, *Straight cylindrical involute splines — Metric module, side fit — Part 1: Generalities*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4156-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Symbols and abbreviated terms

D	Pitch diameter	mm
$D_{Fe\ max}$	Maximum form diameter, external spline	mm
$D_{Fi\ min}$	Minimum form diameter, internal spline	mm
D_{Re}	Diameter of measuring ball or pin for external spline	mm
D_{Ri}	Diameter of measuring ball or pin for internal spline	mm
D_b	Base diameter	mm
$D_{ee\ max}$	Maximum major diameter, external spline	mm
$D_{ei\ max}$	Maximum major diameter, internal spline	mm
$D_{ie\ min}$	Minimum minor diameter, external spline	mm
$D_{ii\ min}$	Minimum minor diameter, internal spline	mm
E_{max}	Maximum actual space width	mm
E_{min}	Minimum actual space width	mm
$E_{v\ min}$	Minimum effective space width	mm
K_e	Approximation factor for external spline	—
K_i	Approximation factor for internal spline	—
k	Number of measured teeth	—
M_{Re}	Measurement over two balls or pins, external spline	mm
M_{Ri}	Measurement between two balls or pins, internal spline	mm
S_{max}	Maximum actual tooth thickness	mm
S_{min}	Minimum actual tooth thickness	mm
$S_{v\ max}$	Maximum effective tooth thickness	mm
W	Measurement over k teeth, external spline	mm
z	Number of teeth	—

5 Geometry and inspection dimension

5.1 General

Geometry and inspection dimensions are given in Tables 1 to 148. Inspection dimensions for span measurement regarding ISO 4156-3:2021, 9.2 are given in Annex A.

5.2 30 ° pressure angle, module 0,5

Table 1 — Geometry internal spline, $\alpha = 30^\circ$, $m = 0,5$, flat and fillet root, $E_{v \min} = 0,785$

z	D	D_b	$D_{ei \max}$ Fillet root	$D_{ei \max}$ Flat	$D_{Fi \min}$	$D_{li \min}$	$E_{\max}$			
							4H	5H	6H	7H
6	3,00	2,598 1	4,06	3,91	3,60	2,72	0,808	0,822	0,843	0,878
7	3,50	3,031 1	4,56	4,41	4,10	3,18	0,809	0,823	0,844	0,879
8	4,00	3,464 1	5,07	4,92	4,60	3,66	0,809	0,823	0,845	0,880
9	4,50	3,897 1	5,57	5,42	5,10	4,14	0,809	0,824	0,845	0,881
10	5,00	4,330 1	6,07	5,92	5,60	4,62	0,809	0,824	0,846	0,883
11	5,50	4,763 1	6,57	6,42	6,10	5,11	0,810	0,824	0,847	0,884
12	6,00	5,196 2	7,07	6,92	6,60	5,60	0,810	0,825	0,847	0,884
13	6,50	5,629 2	7,57	7,42	7,10	6,09	0,810	0,825	0,848	0,885
14	7,00	6,062 2	8,08	7,93	7,60	6,58	0,810	0,826	0,848	0,886
15	7,50	6,495 2	8,58	8,43	8,10	7,08	0,811	0,826	0,849	0,887
16	8,00	6,928 2	9,08	8,93	8,60	7,57	0,811	0,826	0,849	0,888
17	8,50	7,361 2	9,58	9,43	9,10	8,07	0,811	0,826	0,850	0,889
18	9,00	7,794 2	10,08	9,93	9,60	8,56	0,811	0,827	0,850	0,889
19	9,50	8,227 2	10,58	10,43	10,10	9,06	0,811	0,827	0,851	0,890
20	10,00	8,660 3	11,08	10,93	10,60	9,56	0,811	0,827	0,851	0,891
21	10,50	9,093 3	11,58	11,43	11,10	10,05	0,812	0,828	0,851	0,891
22	11,00	9,526 3	12,09	11,94	11,60	10,55	0,812	0,828	0,852	0,892
23	11,50	9,959 3	12,59	12,44	12,10	11,05	0,812	0,828	0,852	0,893
24	12,00	10,392 3	13,09	12,94	12,60	11,55	0,812	0,828	0,853	0,893
25	12,50	10,825 3	13,59	13,44	13,10	12,05	0,812	0,829	0,853	0,894
26	13,00	11,258 3	14,09	13,94	13,60	12,54	0,812	0,829	0,853	0,894
27	13,50	11,691 3	14,59	14,44	14,10	13,04	0,812	0,829	0,854	0,895
28	14,00	12,124 4	15,09	14,94	14,60	13,54	0,813	0,829	0,854	0,895
29	14,50	12,557 4	15,59	15,44	15,10	14,04	0,813	0,829	0,854	0,896
30	15,00	12,990 4	16,09	15,94	15,60	14,54	0,813	0,830	0,855	0,897
31	15,50	13,423 4	16,59	16,44	16,10	15,04	0,813	0,830	0,855	0,897
32	16,00	13,856 4	17,09	16,94	16,60	15,54	0,813	0,830	0,855	0,898
33	16,50	14,289 4	17,60	17,45	17,10	16,03	0,813	0,830	0,856	0,898
34	17,00	14,722 4	18,10	17,95	17,60	16,53	0,813	0,830	0,856	0,899
35	17,50	15,155 4	18,60	18,45	18,10	17,03	0,813	0,831	0,856	0,899
36	18,00	15,588 5	19,10	18,95	18,60	17,53	0,814	0,831	0,857	0,899
37	18,50	16,021 5	19,60	19,45	19,10	18,03	0,814	0,831	0,857	0,900
38	19,00	16,454 5	20,10	19,95	19,60	18,53	0,814	0,831	0,857	0,900
39	19,50	16,887 5	20,60	20,45	20,10	19,03	0,814	0,831	0,857	0,901
40	20,00	17,320 5	21,10	20,95	20,60	19,53	0,814	0,831	0,858	0,901
41	20,50	17,753 5	21,60	21,45	21,10	20,03	0,814	0,832	0,858	0,902
42	21,00	18,186 5	22,10	21,95	21,60	20,53	0,814	0,832	0,858	0,902
43	21,50	18,619 5	22,60	22,45	22,10	21,03	0,814	0,832	0,858	0,902
44	22,00	19,052 6	23,10	22,95	22,60	21,53	0,814	0,832	0,859	0,903
45	22,50	19,485 6	23,60	23,45	23,10	22,02	0,815	0,832	0,859	0,903
46	23,00	19,918 6	24,11	23,96	23,60	22,52	0,815	0,832	0,859	0,904
47	23,50	20,351 6	24,61	24,46	24,10	23,02	0,815	0,833	0,859	0,904
48	24,00	20,784 6	25,11	24,96	24,60	23,52	0,815	0,833	0,860	0,904
49	24,50	21,217 6	25,61	25,46	25,10	24,02	0,815	0,833	0,860	0,905
50	25,00	21,650 6	26,11	25,96	25,60	24,52	0,815	0,833	0,860	0,905

Table 1 (continued)

z	D	D_b	$D_{ei \max}$ Fillet root	$D_{ei \max}$ Flat	$D_{Fi \min}$	$D_{li \min}$	$E_{\max}$			
							4H	5H	6H	7H
51	25,50	22,083 6	26,61	26,46	26,10	25,02	0,815	0,833	0,860	0,906
52	26,00	22,516 7	27,11	26,96	26,60	25,52	0,815	0,833	0,861	0,906
53	26,50	22,949 7	27,61	27,46	27,10	26,02	0,815	0,834	0,861	0,906
54	27,00	23,382 7	28,11	27,96	27,60	26,52	0,815	0,834	0,861	0,907
55	27,50	23,815 7	28,61	28,46	28,10	27,02	0,815	0,834	0,861	0,907
56	28,00	24,248 7	29,11	28,96	28,60	27,52	0,816	0,834	0,861	0,907
57	28,50	24,681 7	29,61	29,46	29,10	28,02	0,816	0,834	0,862	0,908
58	29,00	25,114 7	30,11	29,96	29,60	28,52	0,816	0,834	0,862	0,908
59	29,50	25,547 7	30,61	30,46	30,10	29,02	0,816	0,834	0,862	0,908
60	30,00	25,980 8	31,11	30,96	30,60	29,52	0,816	0,834	0,862	0,909
61	30,50	26,413 8	31,61	31,46	31,10	30,02	0,816	0,835	0,863	0,909
62	31,00	26,846 8	32,12	31,97	31,60	30,52	0,816	0,835	0,863	0,909
63	31,50	27,279 8	32,62	32,47	32,10	31,02	0,816	0,835	0,863	0,910
64	32,00	27,712 8	33,12	32,97	32,60	31,52	0,816	0,835	0,863	0,910
65	32,50	28,145 8	33,62	33,47	33,10	32,02	0,816	0,835	0,863	0,910
66	33,00	28,578 8	34,12	33,97	33,60	32,52	0,816	0,835	0,863	0,911
67	33,50	29,011 9	34,62	34,47	34,10	33,02	0,816	0,835	0,864	0,911
68	34,00	29,444 9	35,12	34,97	34,60	33,52	0,817	0,835	0,864	0,911
69	34,50	29,877 9	35,62	35,47	35,10	34,02	0,817	0,836	0,864	0,912
70	35,00	30,310 9	36,12	35,97	35,60	34,52	0,817	0,836	0,864	0,912
71	35,50	30,743 9	36,62	36,47	36,10	35,02	0,817	0,836	0,864	0,912
72	36,00	31,176 9	37,12	36,97	36,60	35,52	0,817	0,836	0,865	0,912
73	36,50	31,609 9	37,62	37,47	37,10	36,02	0,817	0,836	0,865	0,913
74	37,00	32,042 9	38,12	37,97	37,60	36,51	0,817	0,836	0,865	0,913
75	37,50	32,476 0	38,62	38,47	38,10	37,01	0,817	0,836	0,865	0,913
76	38,00	32,909 0	39,12	38,97	38,60	37,51	0,817	0,836	0,865	0,914
77	38,50	33,342 0	39,62	39,47	39,10	38,01	0,817	0,837	0,866	0,914
78	39,00	33,775 0	40,12	39,97	39,60	38,51	0,817	0,837	0,866	0,914
79	39,50	34,208 0	40,62	40,47	40,10	39,01	0,817	0,837	0,866	0,914
80	40,00	34,641 0	41,12	40,97	40,60	39,51	0,817	0,837	0,866	0,915
81	40,50	35,074 0	41,63	41,48	41,10	40,01	0,817	0,837	0,866	0,915
82	41,00	35,507 0	42,13	41,98	41,60	40,51	0,818	0,837	0,866	0,915
83	41,50	35,940 1	42,63	42,48	42,10	41,01	0,818	0,837	0,867	0,916
84	42,00	36,373 1	43,13	42,98	42,60	41,51	0,818	0,837	0,867	0,916
85	42,50	36,806 1	43,63	43,48	43,10	42,01	0,818	0,837	0,867	0,916
86	43,00	37,239 1	44,13	43,98	43,60	42,51	0,818	0,838	0,867	0,916
87	43,50	37,672 1	44,63	44,48	44,10	43,01	0,818	0,838	0,867	0,917
88	44,00	38,105 1	45,13	44,98	44,60	43,51	0,818	0,838	0,867	0,917
89	44,50	38,538 1	45,63	45,48	45,10	44,01	0,818	0,838	0,868	0,917
90	45,00	38,971 1	46,13	45,98	45,60	44,51	0,818	0,838	0,868	0,917
91	45,50	39,404 2	46,63	46,48	46,10	45,01	0,818	0,838	0,868	0,918
92	46,00	39,837 2	47,13	46,98	46,60	45,51	0,818	0,838	0,868	0,918
93	46,50	40,270 2	47,63	47,48	47,10	46,01	0,818	0,838	0,868	0,918
94	47,00	40,703 2	48,13	47,98	47,60	46,51	0,818	0,838	0,868	0,918
95	47,50	41,136 2	48,63	48,48	48,10	47,01	0,818	0,838	0,869	0,919
96	48,00	41,569 2	49,13	48,98	48,60	47,51	0,818	0,839	0,869	0,919
97	48,50	42,002 2	49,63	49,48	49,10	48,01	0,819	0,839	0,869	0,919
98	49,00	42,435 2	50,13	49,98	49,60	48,51	0,819	0,839	0,869	0,919
99	49,50	42,868 3	50,63	50,48	50,10	49,01	0,819	0,839	0,869	0,920
100	50,00	43,301 3	51,13	50,98	50,60	49,51	0,819	0,839	0,869	0,920

Table 2 — Geometry external spline, $\alpha = 30^\circ$, $m = 0,5$, flat and fillet root, $S_{v \max} = 0,785$

z	D	D_b	$D_{ee \max}$	$D_{Fe \max}$	$D_{ie \min}$ Fillet root	$D_{ie \min}$ Flat	$S_{\min}$			
							4h	5h	6h	7h
6	3,00	2,598 1	3,50	2,62	1,94	2,09	0,762	0,748	0,727	0,692
7	3,50	3,031 1	4,00	3,08	2,44	2,59	0,761	0,747	0,726	0,691
8	4,00	3,464 1	4,50	3,56	2,93	3,08	0,761	0,747	0,725	0,690
9	4,50	3,897 1	5,00	4,04	3,43	3,58	0,761	0,746	0,725	0,689
10	5,00	4,330 1	5,50	4,52	3,93	4,08	0,761	0,746	0,724	0,687
11	5,50	4,763 1	6,00	5,01	4,43	4,58	0,760	0,746	0,723	0,686
12	6,00	5,196 2	6,50	5,50	4,93	5,08	0,760	0,745	0,723	0,686
13	6,50	5,629 2	7,00	5,99	5,43	5,58	0,760	0,745	0,722	0,685
14	7,00	6,062 2	7,50	6,48	5,92	6,07	0,760	0,744	0,722	0,684
15	7,50	6,495 2	8,00	6,98	6,42	6,57	0,759	0,744	0,721	0,683
16	8,00	6,928 2	8,50	7,47	6,92	7,07	0,759	0,744	0,721	0,682
17	8,50	7,361 2	9,00	7,97	7,42	7,57	0,759	0,744	0,720	0,681
18	9,00	7,794 2	9,50	8,46	7,92	8,07	0,759	0,743	0,720	0,681
19	9,50	8,227 2	10,00	8,96	8,42	8,57	0,759	0,743	0,719	0,680
20	10,00	8,660 3	10,50	9,46	8,92	9,07	0,759	0,743	0,719	0,679
21	10,50	9,093 3	11,00	9,95	9,42	9,57	0,758	0,742	0,719	0,679
22	11,00	9,526 3	11,50	10,45	9,91	10,06	0,758	0,742	0,718	0,678
23	11,50	9,959 3	12,00	10,95	10,41	10,56	0,758	0,742	0,718	0,677
24	12,00	10,392 3	12,50	11,45	10,91	11,06	0,758	0,742	0,717	0,677
25	12,50	10,825 3	13,00	11,95	11,41	11,56	0,758	0,741	0,717	0,676
26	13,00	11,258 3	13,50	12,44	11,91	12,06	0,758	0,741	0,717	0,676
27	13,50	11,691 3	14,00	12,94	12,41	12,56	0,758	0,741	0,716	0,675
28	14,00	12,124 4	14,50	13,44	12,91	13,06	0,757	0,741	0,716	0,675
29	14,50	12,557 4	15,00	13,94	13,41	13,56	0,757	0,741	0,716	0,674
30	15,00	12,990 4	15,50	14,44	13,91	14,06	0,757	0,740	0,715	0,673
31	15,50	13,423 4	16,00	14,94	14,41	14,56	0,757	0,740	0,715	0,673
32	16,00	13,856 4	16,50	15,44	14,91	15,06	0,757	0,740	0,715	0,672
33	16,50	14,289 4	17,00	15,93	15,40	15,55	0,757	0,740	0,714	0,672
34	17,00	14,722 4	17,50	16,43	15,90	16,05	0,757	0,740	0,714	0,671
35	17,50	15,155 4	18,00	16,93	16,40	16,55	0,757	0,739	0,714	0,671
36	18,00	15,588 5	18,50	17,43	16,90	17,05	0,756	0,739	0,713	0,671
37	18,50	16,021 5	19,00	17,93	17,40	17,55	0,756	0,739	0,713	0,670
38	19,00	16,454 5	19,50	18,43	17,90	18,05	0,756	0,739	0,713	0,670
39	19,50	16,887 5	20,00	18,93	18,40	18,55	0,756	0,739	0,713	0,669
40	20,00	17,320 5	20,50	19,43	18,90	19,05	0,756	0,739	0,712	0,669
41	20,50	17,753 5	21,00	19,93	19,40	19,55	0,756	0,738	0,712	0,668
42	21,00	18,186 5	21,50	20,43	19,90	20,05	0,756	0,738	0,712	0,668
43	21,50	18,619 5	22,00	20,93	20,40	20,55	0,756	0,738	0,712	0,668
44	22,00	19,052 6	22,50	21,43	20,90	21,05	0,756	0,738	0,711	0,667
45	22,50	19,485 6	23,00	21,92	21,40	21,55	0,755	0,738	0,711	0,667
46	23,00	19,918 6	23,50	22,42	21,89	22,04	0,755	0,738	0,711	0,666
47	23,50	20,351 6	24,00	22,92	22,39	22,54	0,755	0,737	0,711	0,666
48	24,00	20,784 6	24,50	23,42	22,89	23,04	0,755	0,737	0,710	0,666
49	24,50	21,217 6	25,00	23,92	23,39	23,54	0,755	0,737	0,710	0,665
50	25,00	21,650 6	25,50	24,42	23,89	24,04	0,755	0,737	0,710	0,665
51	25,50	22,083 6	26,00	24,92	24,39	24,54	0,755	0,737	0,710	0,664
52	26,00	22,516 7	26,50	25,42	24,89	25,04	0,755	0,737	0,709	0,664
53	26,50	22,949 7	27,00	25,92	25,39	25,54	0,755	0,736	0,709	0,664
54	27,00	23,382 7	27,50	26,42	25,89	26,04	0,755	0,736	0,709	0,663
55	27,50	23,815 7	28,00	26,92	26,39	26,54	0,755	0,736	0,709	0,663
56	28,00	24,248 7	28,50	27,42	26,89	27,04	0,754	0,736	0,709	0,663
57	28,50	24,681 7	29,00	27,92	27,39	27,54	0,754	0,736	0,708	0,662
58	29,00	25,114 7	29,50	28,42	27,89	28,04	0,754	0,736	0,708	0,662
59	29,50	25,547 7	30,00	28,92	28,39	28,54	0,754	0,736	0,708	0,662
60	30,00	25,980 8	30,50	29,42	28,89	29,04	0,754	0,736	0,708	0,661
61	30,50	26,413 8	31,00	29,92	29,39	29,54	0,754	0,735	0,707	0,661
62	31,00	26,846 8	31,50	30,42	29,88	30,03	0,754	0,735	0,707	0,661
63	31,50	27,279 8	32,00	30,92	30,38	30,53	0,754	0,735	0,707	0,660