INTERNATIONAL STANDARD

ISO 1641-1

Third edition
2016-08-01

End mills and slot drills —

Part 1: Milling cutters with cylindrical shanks

Fraises cylindriques 2 tailles et fraises à rainurer —

Partie 1: Fraises à queue cylindrique

Reference number
ISO 1641-1:2016(E)

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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).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html

The committee responsible for this document is ISO/TC 29, *Small tools*, Subcommittee SC 9, *Tools with defined cutting edges, cutting items*.

This third edition cancels and replaces the second edition (ISO 1641-1:2003), of which it constitutes a minor revision.

ISO 1641 consists of the following parts, under the general title *End mills and slot drills*:

— *Part 1: Milling cutters with cylindrical shanks*

— *Part 2: Dimensions and designation of milling cutters with Morse taper shanks*

— *Part 3: Dimensions and designation of milling cutters with 7/24 taper shanks*

End mills and slot drills —

Part 1:
Milling cutters with cylindrical shanks

1 Scope

This part of ISO 1641 specifies the general dimensions of the following milling cutters with plain cylindrical, flatted cylindrical and threaded shanks:

— end mills, flat-ended or ball-nosed — standard series and long series;

— slot drills — short series and standard series.

The dimensional characteristics of cylindrical shanks are in accordance with ISO 3338-1, ISO 3338-2 and ISO 3338-3.

NOTE These same milling cutters with Morse taper shanks having a tapped hole are dealt with in ISO 1641-2, those with 7/24 taper shanks in ISO 1641-3.

This part of ISO 1641 does not apply to solid hard metal end mills and slot drills.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3338-1, *Cylindrical shanks for milling cutters — Part 1: Dimensional characteristics of plain cylindrical shanks*

ISO 3338-2, *Cylindrical shanks for milling cutters — Part 2: Dimensional characteristics of flatted cylindrical shanks*

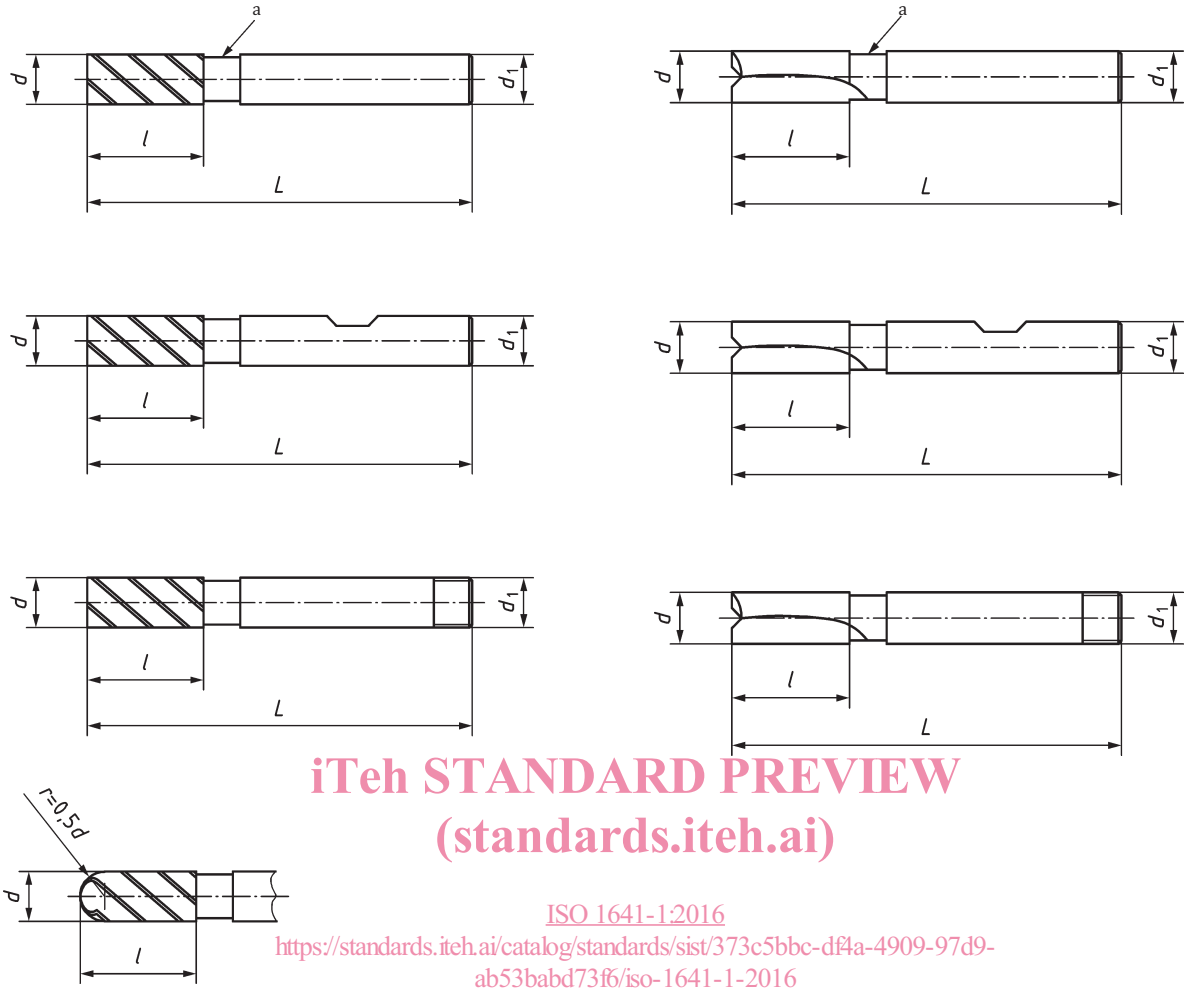
ISO 3338-3, *Cylindrical shanks for milling cutters — Part 3: Dimensional characteristics of threaded shanks*

3 Dimensions

For flat-ended end mills and ball-nosed cylindrical end mills, the standard series and long series given in Table 1 according to the cutting length, *l*, shall be used.

For slot drills, the short series and standard series given in Table 1 according to the cutting length, *l*, shall be used.

See Figure 1, Table 1 and Table 2.



a) End mills, flat-ended and ball-nosed **b) Slot drills**

a Optional recess.

Figure 1 — Milling cutters with cylindrical shanks

Table 1

Dimensions in millimetres

Range of diameters d	Recommended diameter d		Shank d_1[a] Alternative I	Shank d_1[a] Alternative II	Short series l	Short series L[b] Alternative I	Short series L[b] Alternative II	Standard series l	Standard series L[b] Alternative I	Standard series L[b] Alternative II	Long series l	Long series L[b] Alternative I	Long series L[b] Alternative II
1,9 < d ≤ 2,36	**2**	—			4	36	48	7	39	51	10	42	54
2,36 < d ≤ 3	**2,5**	—			5	37	49	8	40	52	12	44	56
	3		4[c]	6									
3 < d ≤ 3,75	—	**3,5**			6	38	50	10	42	54	15	47	59
3,75 < d ≤ 4	**4**	—			7	39	51	11	13	55	19	51	63
4 < d ≤ 4,75	—		5[c]	6		41			45			53	
4,75 < d ≤ 5	**5**	—			8	42	52	13	47	57	24	58	68
5 < d ≤ 6	**6**	—	6			52			57			68	
6 < d ≤ 7,5	—	**7**	8	10	10	54	60	16	60	66	30	74	80
7,5 < d ≤ 8	**8**	—			11	55	61	19	63	69	38	82	88
8 < d ≤ 9,5	—	**9**	10			61			69			88	
9,5 < d ≤ 10	**10**	—			13	63		22	72		45	95	
10 < d ≤ 11,8	—	**11**	12		14	70			79			102	
11,8 < d ≤ 15	**12**	**14**			16	73		26	83		53	110	
15 < d ≤ 19	**16**	**18**	16		19	79		32	92		63	123	
19 < d ≤ 23,6	**20**	**22**	20		22	88		38	104		75	141	
23,6 < d ≤ 30	**24** and **25**	**28**	25		26	102		45	121		90	166	
30 < d ≤ 37,5	**32**	**36**	32		32	112		53	133		106	186	
37,5 < d ≤ 47,5	**40**	**45**	40		38	130		63	155		125	217	
47,5 < d ≤ 60	**50**	**56**	50		45	147		75	177		150	252	
60 < d ≤ 67	**63**	—	50	63	53	155	165	90	192	202	180	282	292
67 < d ≤ 75	—	**71**	63			165			202			292	

[a] Tolerances on d1 in accordance with ISO 3338-1, ISO 3338-2 and ISO 3338-3.

[b] The two alternatives for the total length result from the two alternatives for the shanks.

[c] Only for plain cylindrical shanks.

The values L and l have been so chosen that the length difference ($L - l$) remains constant whatever the series, short, standard or long (see Table 2).

Table 2

Dimensions in millimetres

Range of diameters *d*	*L* – *l*	
	Alternative I	Alternative II
1,9 < *d* ≤ 4	32	44
4 < *d* ≤ 5	34	44
5 < *d* ≤ 6	44	
6 < *d* ≤ 8	44	50
8 < *d* ≤ 10	50	
10 < *d* ≤ 15	57	
15 < *d* ≤ 19	60	
19 < *d* ≤ 23,6	66	
23,6 < *d* ≤ 30	76	
30 < *d* ≤ 37,5	80	
37,5 < *d* ≤ 47,5	92	
47,5 < *d* ≤ 60	102	
60 < *d* ≤ 67	102	112
67 < *d* ≤ 75	112	

4 Tolerances

Tolerances on cutting diameter, *d*, shall be as follows:

— js 14, for end mills;

— e8, for slot drills.

In the case of double-ended end milling cutters having a cutting diameter nominally equal to the shank diameter, the maximum cutting diameter should be slightly smaller than the minimum shank diameter.

Annex A
(informative)

Relationship between designations in this part of ISO 1641 and ISO 13399

A.1 Relationship between designations

For the relationship between the designations in this part of ISO 1641 and preferred symbols according to ISO 13399, see Table A.1.

Table A.1 — Relationship between designations in this part of ISO 1641 and ISO 13399

Symbol in this part of ISO 1641	Reference in this part of ISO 1641	Property name in the ISO 13399 series	Symbol in the ISO 13399 series	Reference in the ISO 13399 series
d	Figure 1 and Table 1	cutting diameter	DC	ISO/TS 13399-3 BSU 71D084653E57F
d_1	Figure 1 and Table 1	connection diameter machine side	DCONMS	ISO/TS 13399-3 BSU 71EBDBF5060E6
l	Figure 1 and Table 1	depth of cut maximum	APMX	ISO/TS 13399-3 BSU 71D07576C0558
L	Figure 1 and Table 1	overall length	OAL	ISO/TS 13399-3 BSU 71D078EB7C086
r	Figure 1	profile radius	PRFRAD	ISO/TS 13399-3 BSU 71E019EBAE1B1