

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 775

CYLINDRICAL AND 1/10 CONICAL SHAFT ENDS

1st EDITION

March 1969

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BRIEF HISTORY

The ISO Recommendation R 775, *Cylindrical and 1/10 conical shaft ends*, was drawn up by Technical Committee ISO/TC 14, *Shaft ends*, the Secretariat of which is held by the Institut Belge de Normalisation (IBN).

Work on this question led to the adoption of a Draft ISO Recommendation.

In May 1966, this Draft ISO Recommendation (No. 1015) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Austria	Germany	Norway
Belgium	Greece	Sweden
Brazil	India	Switzerland
Bulgaria	Israel	Turkey
Chile	Japan	U.A.R.
Czechoslovakia	Korea, Rep. of	United Kingdom
Denmark	Netherlands	U.S.S.R.
France	New Zealand	

No Member Body opposed the approval of the Draft.

The Technical Committee decided to make certain modifications, of relatively minor importance, in Draft ISO Recommendation No. 1015; these were incorporated in a new Draft ISO Recommendation (No. 1702).

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in March 1969, to accept it as an ISO RECOMMENDATION.

CYLINDRICAL AND 1/10 CONICAL SHAFT ENDS

1. SCOPE

This ISO Recommendation determines the dimensional characteristics of

- cylindrical shaft ends (long series and short series);
- 1/10 conical shaft ends (long series and short series), without keys and keyways or with keyways for parallel keys.

For cylindrical shaft ends, the transmissible torques for various applications (pure torque, torque and bending moment) are also given.

This ISO Recommendation will be completed later by details of

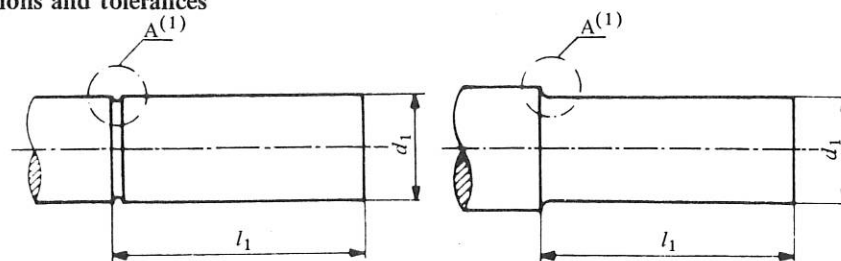
- the joining fillets for cylindrical shaft ends,
- the external and internal threads for conical shaft ends,
- the tolerances on form and position,

and by the addition of

- cylindrical shaft ends with internal thread,
- 1/10 conical shaft ends with Woodruff keys,
- conical shaft ends without keyways.

2. CYLINDRICAL SHAFT ENDS

2.1 Dimensions and tolerances



Dimensions in millimetres

Diameter d_1		Length l_1	
nominal	tolerance ⁽²⁾	long series	short series
6 7	j6	16	—
8 9	j6	20	—
10 11	j6	23	20 ⁽³⁾
12 14	j6	30	25 ⁽³⁾
16 18 19	j6	40	28
20 22 24	j6	50	36
25 28	j6	60	42
30 32 35 38	j6 k6	80	58
40 42 45 48 50 55 56	k6 m6	110	82
60 63 65 70 71 75	m6	140	105
80 85 90 95	m6	170	130

Diameter d_1		Length l_1	
nominal	tolerance ⁽²⁾	long series	short series
100	m6	210	165
110			
120			
125			
130		250	200
140			
150			
160		300	240
170			
180			
190		350	280
200			
220			
240		410	330
250			
260			
280		470	380
300			
320			
340		550	450
360			
380			
400		650	540
420			
440			
450			
460			
480			
500			
530		800	680
560			
600			
630			

Keys and keyways. The order relating to the keys and keyways, if required, should specify keys and keyways in conformity with one of the following ISO Recommendations :

ISO Recommendation R 773, *Rectangular or square parallel keys and their corresponding keyways (Dimensions in millimetres);*

ISO Recommendation R 774, *Taper keys and their corresponding keyways with or without gib head (Dimensions in millimetres);*

ISO Recommendation R . . . ,⁽⁴⁾ *Woodruff keys and their corresponding keyways.*

NOTE. — Tolerances on form and position will be specified later.

(1) Detail A will be specified later.

(2) See ISO Recommendation R 286, *ISO System of limits and fits — Part 1 : General, tolerances and deviations.*

(3) The dimensions thus indicated are not in agreement with the related dimensions of the long series conical shaft ends of the table in clause 3.1.1, and attention is drawn to this deviation from the relationship stated in the Annex.

(4) At present at the stage of draft proposal.

2.2 Transmissible torques

Transmissible torque in kilogramme-force metres

Shaft end dia- meter d_1 mm	Transmissible torque			Shaft end dia- meter d_1 mm	Transmissible torque		
	T kgf.m				T kgf.m		
	(a)	(b)	(c)		(a)	(b)	(c)
6		0.0315	0.015	90	580	412	195
7		0.0545	0.025	95	670	500	236
8		0.0875	0.04	100	775	600	280
9		0.132	0.0615	110	1 030	850	387
10		0.19	0.09	120	1 360	1 120	530
11		0.265	0.122	125	1 550	1 320	615
12		0.355	0.17	130	1 700	1 500	
14		0.615	0.29	140	2 120	1 950	
16		0.975	0.462	150	2 650	2 500	
18		1.5	0.69	160	3 250	3 070	
19		1.8	0.85	170	3 870	3 870	
20		2.12	1	180	4 620		
22		3	1.4	190	5 300		
24		4.12	1.9	200	6 300		
25		4.75	2.18	220	8 250		
28		6.9	3.25	240	10 900		
30	21.2	9	4.12	250	12 200		
32	25.8	11.2	5.15	260	13 600		
35	33.5	15	7.1	280	17 000		
38	42.5	20	9.5	300	21 200		
40	50	24.3	11.2	320	25 800		
42	58	29	13.2	340	30 700		
45	71	36.5	17	360	36 500		
48	87.5	46.2	21.2	380	42 500		
50	97.5	53	25	400	50 000		
55	128	75	34.5	420	58 000		
56	136	80	36.5	440	67 000		
60	170	100	47.5	450	71 000		
63	195	118	56	460	75 000		
65	212	132	61.5	480	87 500		
70	272	175	80	500	97 500		
71	280	180	85	530	115 000		
75	335	218	103	560	136 000		
80	400	272	128	600	170 000		
85	487	335	160	630	195 000		

Transmissible torque in newton metres

Shaft end dia- meter d_1 mm	Transmissible torque			Shaft end dia- meter d_1 mm	Transmissible torque		
	T N·m				T N·m		
	(a)	(b)	(c)		(a)	(b)	(c)
6		0.307	0.145	90	5 600	4 120	1 900
7		0.53	0.25	95	6 500	4 870	2 300
8		0.85	0.4	100	7 750	5 800	2 720
9		1.28	0.6	110	10 300	8 250	3 870
10		1.85	0.875	120	13 200	11 200	5 150
11		2.58	1.22	125	15 000	12 800	6 000
12		3.55	1.65	130	17 000	14 500	
14		6	2.8	140	21 200	19 000	
16		9.75	4.5	150	25 800	24 300	
18		14.5	6.7	160	31 500	30 700	
19		17.5	8.25	170	37 500	37 500	
20		21.2	9.75	180	45 000		
22		29	13.6	190	53 000		
24		40	18.5	200	61 500		
25		46.2	21.2	220	82 500		
28		69	31.5	240	106 000		
30	206	87.5	40	250	118 000		
32	250	109	50	260	136 000		
35	325	150	69	280	170 000		
38	425	200	92.5	300	206 000		
40	487	236	112	320	250 000		
42	560	280	132	340	300 000		
45	710	355	170	360	355 000		
48	850	450	212	380	425 000		
50	950	515	243	400	487 000		
55	1 280	730	345	420	560 000		
56	1 360	775	355	440	650 000		
60	1 650	975	462	450	690 000		
63	1 900	1 150	545	460	750 000		
65	2 120	1 280	600	480	850 000		
70	2 650	1 700	800	500	950 000		
71	2 720	1 800	825	530	1 150 000		
75	3 250	2 120	1 000	560	1 360 000		
80	3 870	2 650	1 250	600	1 650 000		
85	4 750	3 350	1 550	630	1 900 000		

The values of transmissible torques have been calculated from the following formulae and rounded off to normal numbers of the exceptional R 80 series ⁽¹⁾ :

- (a) *transmission of pure torque :*

$$T = \frac{\pi}{4} \times 10^{-3} \times d_1^3 \text{ (kgf}\cdot\text{m)} \quad \text{or} \quad \frac{9.80665 \pi}{4} \times 10^{-3} \times d_1^3 \text{ (N}\cdot\text{m)}$$

This torque corresponds to a stress of 4 kgf/mm². In case of reversal of rotation fluctuations, of high or irregular torque, or of high bending and deformation moments in the coupling, the stresses will have to be checked by appropriate means.

- (b) *transmission of torque and bending moment both of a known size :*

$$T = 6 \times 10^{-5} \times d_1^{3.5} \text{ (kgf}\cdot\text{m)} \quad \text{or} \quad 58.8399 \times 10^{-5} \times d_1^{3.5} \text{ (N}\cdot\text{m)}$$

This formula may be applied subject to checking when the torque and bending moment are disproportionate in their influence.

- (c) *transmission both of a known torque and of an undetermined bending moment :*

$$T = 2.8 \times 10^{-5} \times d_1^{3.5} \text{ (kgf}\cdot\text{m)} \quad \text{or} \quad 27.45862 \times 10^{-5} \times d_1^{3.5} \text{ (N}\cdot\text{m)}$$

This formula is applicable to the dimensioning of shaft ends of primary machines (for example, electric motors, pumps, etc.) of general manufacture and capable of meeting all conditions of usage.

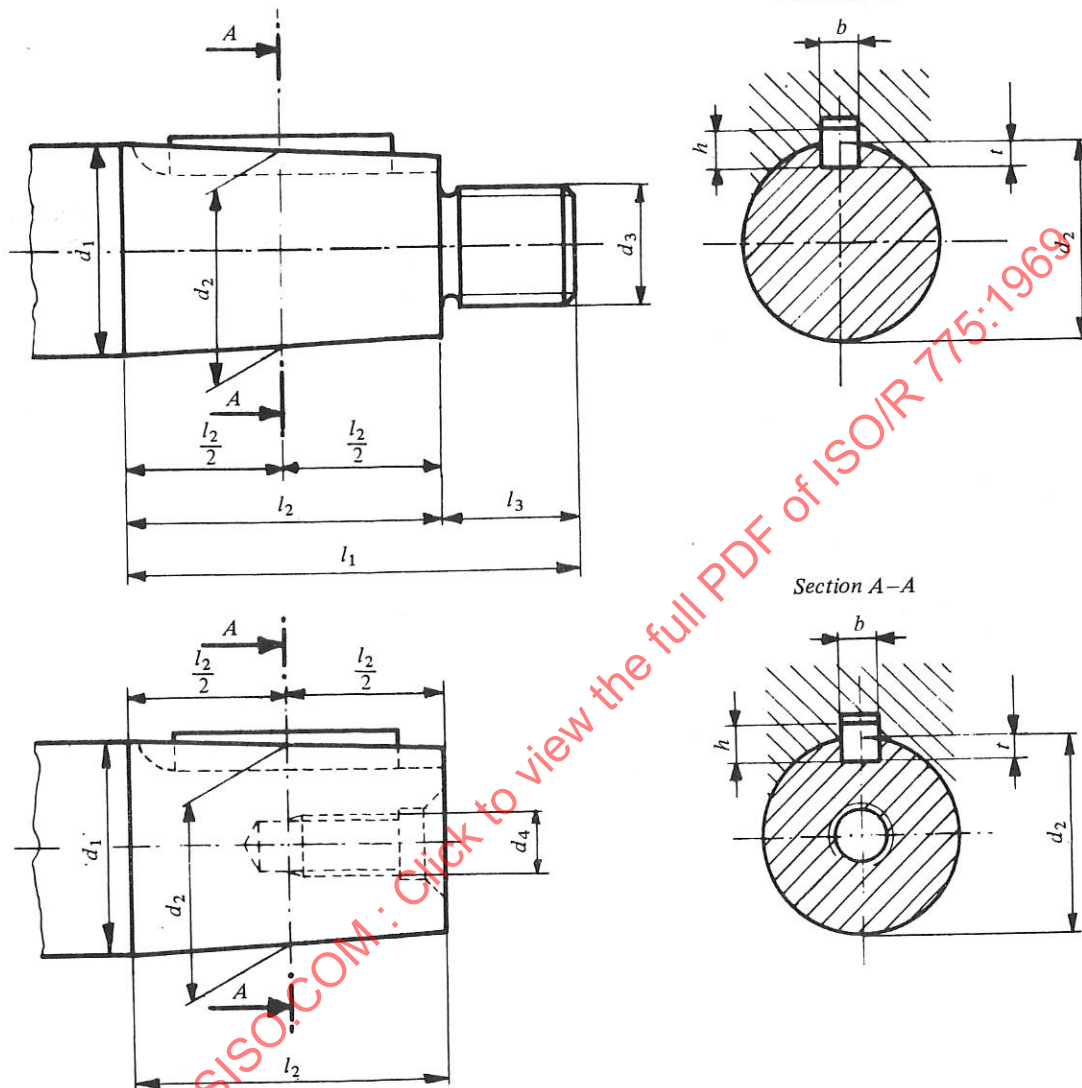
NOTE. – The three formulae assume the use of steel having a tensile strength of 50 to 60 kgf/mm².

(1) See ISO Recommendation R 3, *Preferred numbers – Series of preferred numbers*.

3. 1/10 CONICAL SHAFT ENDS

3.1 Long series

3.1.1 Diameters ≤ 220 mm



Keys and keyways⁽¹⁾. The keys and keyways should conform to ISO Recommendation R 773, Rectangular or square parallel keys and their corresponding keyways (Dimensions in millimetres).

(1) 1/10 conical shaft ends can also be made without key and keyway.

1/10 conical shaft ends with Woodruff keys will be the subject of a later ISO Recommendation.

Dimensions in millimetres

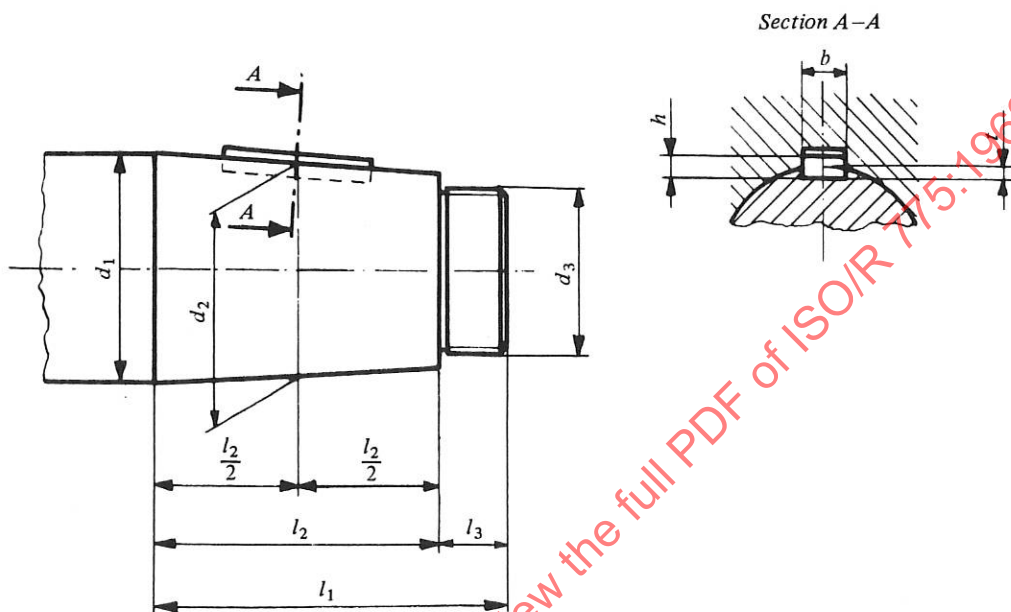
Dia- meter	Length			Key and keyway			External thread	Internal thread (1)
	l_1	l_2	l_3	d_2	$b \times h$	t		
d_1	l_1	l_2	l_3	d_2	$b \times h$	t	d_3	d_4
60				54.75	16X10	6	M42X3	M20
63				57.75	16X10	6	M42X3	M20
65				59.75	16X10	6	M42X3	M20
70	140	105	35	64.75	18X11	7	M48X3	M24
71				65.75	18X11	7	M48X3	M24
75				69.75	18X11	7	M48X3	M24
80				73.5	20X12	7.5	M56X4	M30
85	170	130	40	78.5	20X12	7.5	M56X4	M30
90				83.5	22X14	9	M64X4	M30
95				88.5	22X14	9	M64X4	M36
100				91.75	25X14	9	M72X4	M36
110	210	165	45	101.75	25X14	9	M80X4	M42
120				111.75	28X16	10	M90X4	M42
125				116.75	28X16	10	M90X4	M48
130				120	28X16	10	M100X4	-
140	250	200	50	130	32X18	11	M100X4	-
150				140	32X18	11	M110X4	-
160				148	36X20	12	M125X4	-
170	300	240	60	158	36X20	12	M125X4	-
180				168	40X22	13	M140X6	-
190				176	40X22	13	M140X6	-
200	350	280	70	186	40X22	13	M160X6	-
220				206	45X25	15	M160X6	-

Dia- meter	Length			Key and keyway			External thread	Internal thread (1)
	l_1	l_2	l_3	d_2	$b \times h$	t		
d_1	l_1	l_2	l_3	d_2	$b \times h$	t	d_3	d_4
6	16	10	6	5.5	-	-	M4	-
7				6.5	-	-	M4	-
8	20	12	8	7.4	-	-	M6	-
9				8.4	-	-	M6	-
10	23	15 ⁽²⁾	8	9.25	-	-	M6	-
11				10.25	2X2	1.2	M6	-
12	30	18 ⁽²⁾	12	11.1	2X2	1.2	M8X1	M4
14				13.1	3X3	1.8	M8X1	M4
16				14.6	3X3	1.8	M10X1.25	M4
18	40	28	12	16.6	4X4	2.5	M10X1.25	M5
19				17.6	4X4	2.5	M10X1.25	M5
20				18.2	4X4	2.5	M12X1.25	M6
22	50	36	14	20.2	4X4	2.5	M12X1.25	M6
24				22.2	5X5	3	M12X1.25	M6
25	60	42	18	22.9	5X5	3	M16X1.5	M8
28				25.9	5X5	3	M16X1.5	M8
30				27.1	5X5	3	M20X1.5	M10
32	80	58	22	29.1	6X6	3.5	M20X1.5	M10
35				32.1	6X6	3.5	M20X1.5	M10
38				35.1	6X6	3.5	M24X2	M12
40				35.9	10X8	5	M24X2	M12
42				37.9	10X8	5	M24X2	M12
45				40.9	12X8	5	M30X2	M16
48	110	82	28	43.9	12X8	5	M30X2	M16
50				45.9	12X8	5	M36X3	M16
55				50.9	14X9	5.5	M36X3	M20
56				51.9	14X9	5.5	M36X3	M20

(1) Details of the internal thread will be specified later.

(2) See corresponding shaft diameters in the table in clause 2.1, and footnote (3) to that table.

3.1.2 Diameters > 220 mm



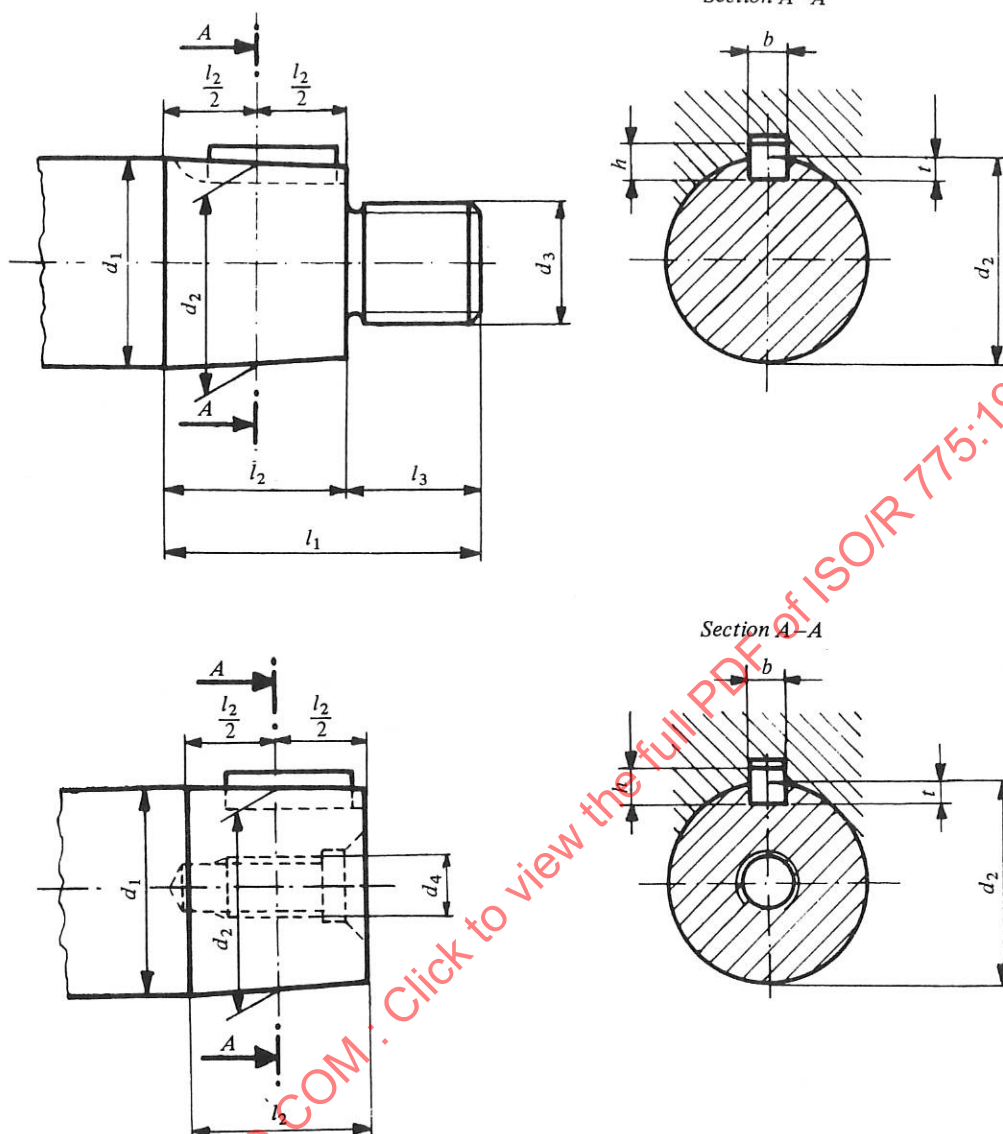
Keys and keyways⁽¹⁾. The keys and keyways should conform to ISO Recommendation R 773, Rectangular or square parallel keys and their corresponding keyways (Dimensions in millimetres).

(1) 1/10 conical shaft ends can also be made without key and keyway.

Dimensions in millimetres

Diameter d_1	Length			Key and keyway			External thread d_3
	l_1	l_2	l_3	d_2	$b \times h$	t	
240	410	330	80	223.5	50 × 28	17	M180 × 6
250				223.5	50 × 28	17	M180 × 6
260				243.5	50 × 28	17	M200 × 6
280	470	380	90	261	56 × 32	20	M220 × 6
300				281	63 × 32	20	M220 × 6
320				301	63 × 32	20	M250 × 6
340	550	450	100	317.5	70 × 36	22	M280 × 6
360				337.5	70 × 36	22	M280 × 6
380				357.5	70 × 36	22	M300 × 6
400	650	540	110	373	80 × 40	25	M320 × 6
420				393	80 × 40	25	M320 × 6
440				413	80 × 40	25	M350 × 6
450				423	90 × 45	28	M350 × 6
460				433	90 × 45	28	M380 × 6
480				453	90 × 45	28	M380 × 6
500				473	90 × 45	28	M420 × 6
530	800	680	120	496	100 × 50	31	M420 × 6
560				526	100 × 50	31	M450 × 6
600				566	100 × 50	31	M500 × 6
630				596	100 × 50	31	M550 × 6

3.2 Short series



Keys and keyways⁽¹⁾. The keys and keyways should conform to ISO Recommendation R 773, *Rectangular or square parallel keys and their corresponding keyways* (Dimensions in millimetres).

(1) 1/10 conical shaft ends can also be made without key and keyway.