International Standard 3019/2

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

Hydraulic fluid power — Positive displacement pumps and motors — Dimensions and identification code for mounting flanges and shaft ends — Part 2: Two- and four-hole flanges and shaft ends — Metric series

Transmissions hydrauliques — Pompes volumétriques et moteurs — Dimensions et code d'identification des flasques de montage et des bouts d'arbres — Partie 2: Flasques à deux et quatre trous et bouts d'arbres — Série métrique

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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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 3019/2 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

This second edition cancels and replaces the first edition (ISO 3019/2-1980), of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Hydraulic fluid power — Positive displacement pumps and motors — Dimensions and identification code for mounting flanges and shaft ends — Part 2: Two- and four-hole flanges and shaft ends — Metric series

0 Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Pumps are components which convert mechanical power into hydraulic fluid power. Motors are components which convert hydraulic fluid power into mechanical power.

1 Scope and field of application

1.1 This part of ISO 3019 specifies dimensions and establishes an identification code for mounting flanges of positive displacement rotary hydraulic fluid power pumps and motors of the following types:

- two-hole oval flanges;
- four-hole square flanges;
- four-hole rectangular flanges.

NOTE — A series of circular and polygonal flanges, for products having geometry unsuitable for any of the above flanges, is included in ISO 3019/3.

1.2 This part of ISO 3019 also specifies dimensions and establishes an identification code for shaft ends of positive displacement rotary hydraulic fluid power pumps and motors of the following types:

- cylindrical shaft end with key;
- conical shaft end with key and external thread;
- cylindrical shaft end with metric involute spline.

NOTE — Additional shaft sizes required for circular and polygonal flanges are included in ISO 3019/3.

1.3 This part of ISO 3019 establishes a metric series of mounting flanges and shaft ends for positive displacement rotary hydraulic fluid power pumps and motors. The preferred series shall be used for all future pump and motor designs.

The non-preferred series in annex A and the inch-based series in ISO 3019/1 should be avoided whenever possible.

1.4 This part of ISO 3019 provides

- a minimum number of flanges and shaft sizes to cover probable present and future requirements: short and long flange spigot options are included;
- dimensional interchangeability of flange and shaft end mountings;
- a facility for making certain flanges from castings designed originally for sizes specified in ISO 3019/1;
- flange and spigot dimensions which allow for recommended sealing arrangements when sealing is required between a flange and its mating housing (see annex B);
- identification codes for flanges and shaft ends — these codes can be used separately or in combination.

2 References

ISO 261, *ISO general purpose metric screw threads — General plan.*

ISO 286, *ISO system of limits and fits.* [1)]

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

ISO/R 775, *Cylindrical and 1/10 conical shaft ends.*

ISO 1101, *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings.*

ISO 1302, *Technical drawings — Method of indicating surface texture on drawings.*

ISO 3019/1, *Hydraulic fluid power — Positive displacement pumps and motors — Dimensions and identification code for mounting flanges and shaft ends — Part 1: Inch series shown in metric units.*

ISO 3019/3, *Hydraulic fluid power — Positive displacement pumps and motors — Dimensions and identification code for mounting flanges and shaft ends — Part 3: Polygonal flanges (including circular flanges).*

ISO 3912, *Woodruff keys and keyways.*

ISO 4156, *Straight cylindrical involute splines — Metric module, side fit — Generalities, dimensions and inspection.*

ISO 5598, *Fluid power systems and components — Vocabulary.*

3 Definitions

For the purposes of this part of ISO 3019, the definitions given in ISO 5598 apply.

4 Dimensions

4.1 Tolerances

4.1.1 Dimensions shown without tolerances are nominal.

4.1.2 Tolerances of form and of position are shown in accordance with ISO 1101.

4.2 Selection of sizes

4.2.1 Preferred mounting flanges and shaft dimensions for pumps and motors manufactured shall be selected in accordance with this part of ISO 3019 as follows:

— flanges from tables 1 to 3 inclusive;

— shaft ends from 4.6.

4.2.2 If the non-preferred series is required, the selection shall be made as follows:

— flanges from annex A (clause A.1), and tables 8 to 10 inclusive;

— shaft ends from annex A (clause A.2).

4.3 Mounting flanges — Preferred series

Mounting flange dimensions shall be selected from the following tables:

a) preferred range of oval mounting flanges, table 1, figure 1;

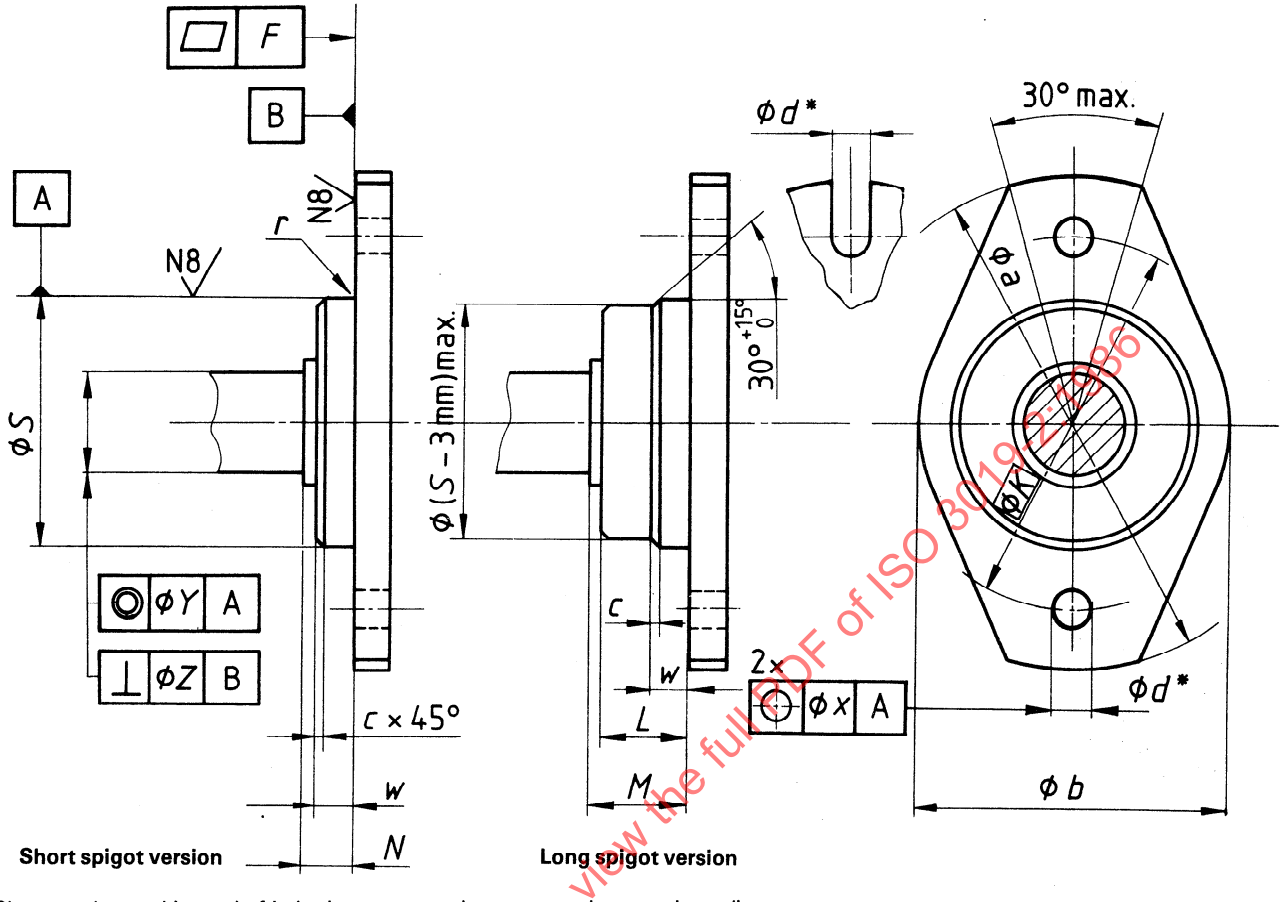
b) preferred range of square mounting flanges, table 2, figure 2;

c) preferred range of rectangular mounting flanges, table 3, figure 3.

4.4 Mating components

The dimensions and related tolerances of the mating components shall be compatible with the dimensions and tolerances specified in this part of ISO 3019 so as to avoid undue body strain and transverse loads on shafts in excess of those permitted by the pump or motor manufacturer.

1) At present at the stage of draft. (Revision of ISO/R 286-1962.)



* Slots may be used instead of holes by agreement between purchaser and supplier.

NOTE — Surface roughness is indicated in accordance with ISO 1302.

Figure 1 — Basic layout of oval mounting flange

Table 1 — Preferred series of oval mounting flanges

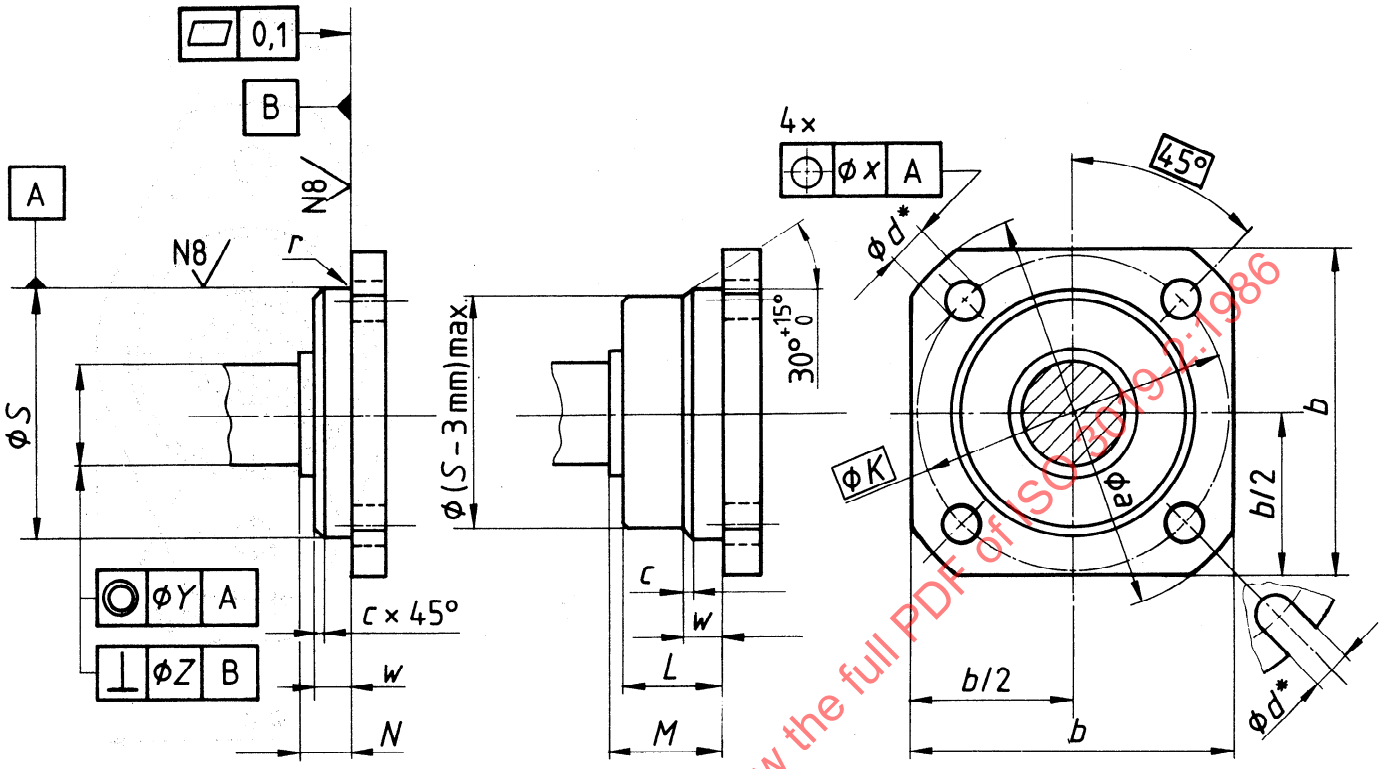
Dimensions in millimetres

Short and long spigot versions														Short spigot version	Long spigot version	
S h8 [1]	K	Fixings: Bolts: Quantity	Fixings: Bolts: Nominal diameter	Fixings: Clearance holes (slots): d H13 [1]	Fixings: Clearance holes (slots): x	a max.	b max.	w $^{+0,5}_{0}$	c max.	r max. (r min. = 0)	Y [2]	Z [2] mm/mm	F	N $^{+1}_{0}$	M	L max.
32	56	2	M6	6,6	0,3	75	50	7	1,5	0,5	0,20	0,0015	0,08	8	16 $^{+1}_{0}$	15,5
40	63					80	56									
50	80		M8	9	0,5	106	65						0,10		20 $^{+1}_{0}$	19,5
63	100					125	80									
80	109		M10	11		140	100				0,25					
100	140		M12	14	1	177	125	9	2,0	1,6	0,30	0,0020		10	25 $^{+1}_{0}$	24,5
125	180		M16	18		224	150				0,35				32 $^{+1}_{0}$	31,5
160	224		M20	22		280	200								40 $^{+1}_{0}$	39,5
200	280		M24	26		335	236								50 $^{+1,2}_{0}$	49,5

1) For tolerance values, see ISO 286.

2) Tolerances stated are for the unladen condition. (Rigid couplings may require tighter tolerances.)

Flatness tolerance in millimetres



Short spigot version **Long spigot version**

* Slots may be used instead of holes by agreement between purchaser and supplier.

NOTE — Surface roughness is indicated in accordance with ISO 1302.

Figure 2 — Basic layout of square flange

Table 2 — Preferred series of square mounting flanges

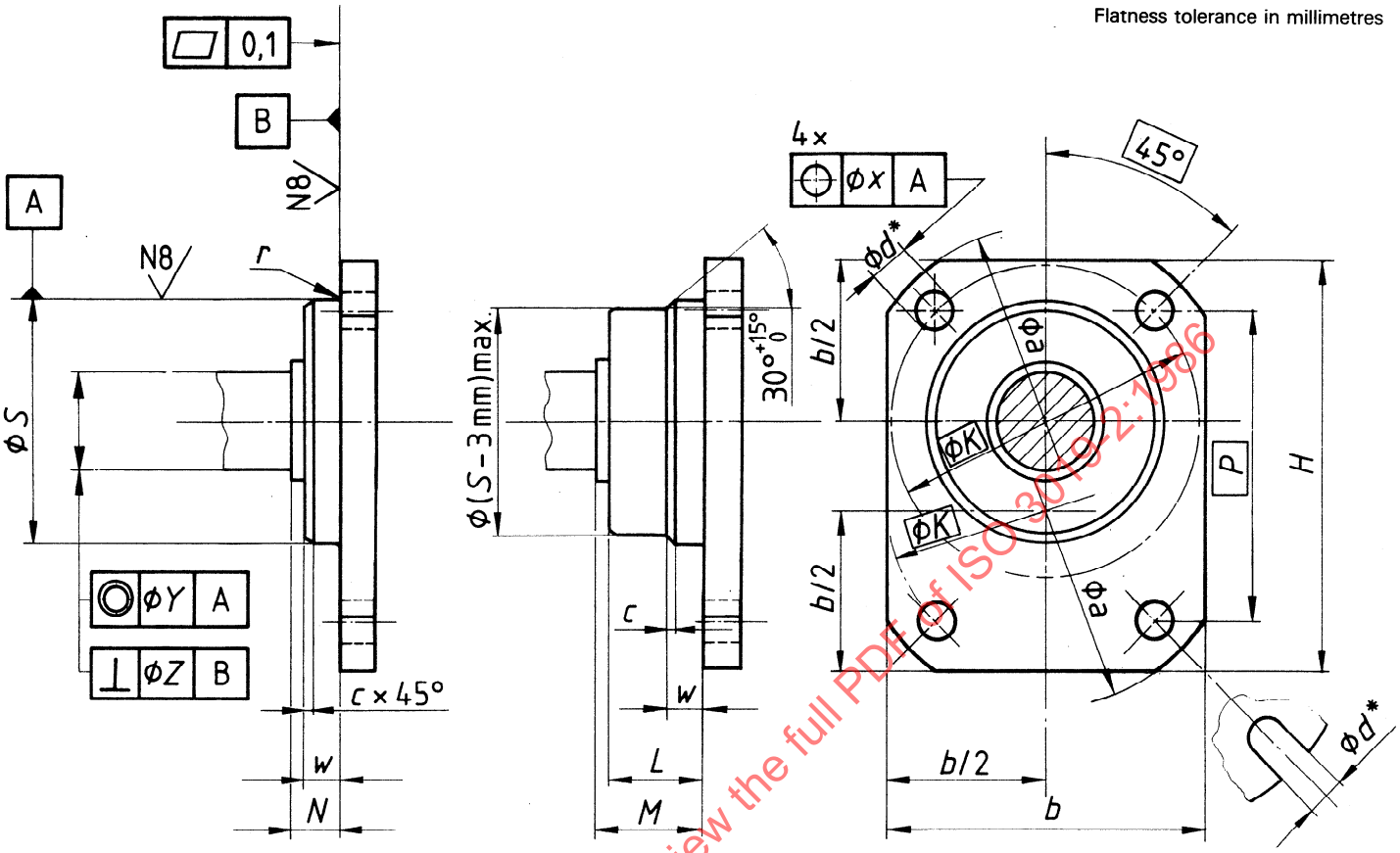
Dimensions in millimetres

Short and long spigot versions													Short spigot version	Long spigot version	
S h8 [1]	K	Fixings				a max.	b max.	w $^{+0,5}_{0}$	c max.	r max. (r min. = 0)	Y [2]	Z [2] mm/mm	N $^{+1}_{0}$	M	L max.
		Bolts		Clearance holes (slots)											
		Quantity	Nominal diameter	d H13 [1]	x										
63	85	4	M8	9	0,5	106	80	7	1,5	0,5	0,20	0,0015	8	$20\ ^{+1}_{0}$	19,5
80	103					125	100				0,25				
100	125		M10	11		160	125	9	2,0	1,6	0,30		10	$25\ ^{+1}_{0}$	24,5
125	160		M12	14	1	200	150				0,35	0,0020		$32\ ^{+1}_{0}$	31,5
160	200		M16	18		250	190							$40\ ^{+1}_{0}$	39,5
200	250		M20	22		300	236							$50\ ^{+1,2}_{0}$	49,5
250	315		M24	26		375	301				0,40				

1) For tolerance values, see ISO 286.

2) Tolerances stated are for the unladen condition. (Rigid couplings may require tighter tolerances.)

Flatness tolerance in millimetres



Short spigot version **Long spigot version**

* Slots may be used instead of holes by agreement between purchaser and supplier.

NOTE — Surface roughness is indicated in accordance with ISO 1302.

Figure 3 — Basic layout of rectangular flange

Table 3 — Preferred series of rectangular mounting flanges

Dimensions in millimetres

Short and long spigot versions															Short spigot version	Long spigot version	
S h8 [1]	K	P	Fixings: Bolts Quantity	Fixings: Bolts Nominal diameter	Fixings: Clearance holes (slots) d H13 [1]	Fixings: Clearance holes (slots) x	a max.	b max.	H max.	w $^{+0,5}_{0}$	c max.	r max. (r min. = 0)	Y [2]	Z [2] mm/mm	N $^{+1}_{0}$	M	L max.
50	68	72	4	M6	6,6	0,3	82	62	86	7	1,5	0,5	0,15	0,001 5	8	20 $^{+1}_{0}$	19,5
63	85	90		M8	9	0,5	106	80	110				0,20				
80	103	109					125	100	136				0,25				
100	125	132		M10	11		160	125	169	9	2,0	1,6	0,30		10	25 $^{+1}_{0}$	24,5
125	160	170		M12	14	1	200	150	207				0,35	0,002 0		32 $^{+1}_{0}$	31,5
160	200	212		M16	18		250	190	261							40 $^{+1}_{0}$	39,5
200	250	265		M20	22		300	236	324							50 $^{+1,2}_{0}$	49,5

1) For tolerance values, see ISO 286.

2) Tolerances stated are for the unladen condition. (Rigid couplings may require tighter tolerances.)

4.5 Use of mounting flange castings specified in ISO 3019/1

Certain short spigot flanges in this part of ISO 3019 can be made from those similar castings specified in ISO 3019/1 that have adequate machining allowance for the spigots. Table 4 provides a cross-reference.

Table 4 — Flanges as per ISO 3019/2 and the related flange castings as per ISO 3019/1

Flange in accordance with this part of ISO 3019 (ISO 3019/2)		Flange castings in accordance with ISO 3019/1
Relevant reference	Identification code	Identification code
Table 1	50A2*W	50-2
	80A2*W	82-2
	100A2*W	101-2
	125A2*W	127-2
	160A2*W	152-2
Table 2	100B4*W	101-4
	125B4*W	127-4
	250B4*W	177-4**
Table 10	180B4*W	152-4
	224B4*W	165-4

* See 5.1 f) for hole option.

** Remove corners to conform with ø *a* in figure 2.

4.6 Shaft ends — Preferred series

The characteristics specified in 4.6.1 to 4.6.6 have been taken from ISO/R 775, unless otherwise stated.

4.6.1 Nominal shaft end diameters (d_1 in figures 4 and 5) in relation to flange spigot diameter (S) shall be selected from table 5.

Table 5 — Preferred series of shaft ends

Dimensions in millimetres

Flange spigot S	Shaft end d_1	
	1st choice	2nd choice
32	10	—
40	12	—
50	12	16
63	16	20
80	20	25
100	25	32
125	32	40
160	40	50
200	50	63
250	63	—

NOTE — For some applications, such as those involving high torque or heavy side loads, other shaft dimensions may be selected.

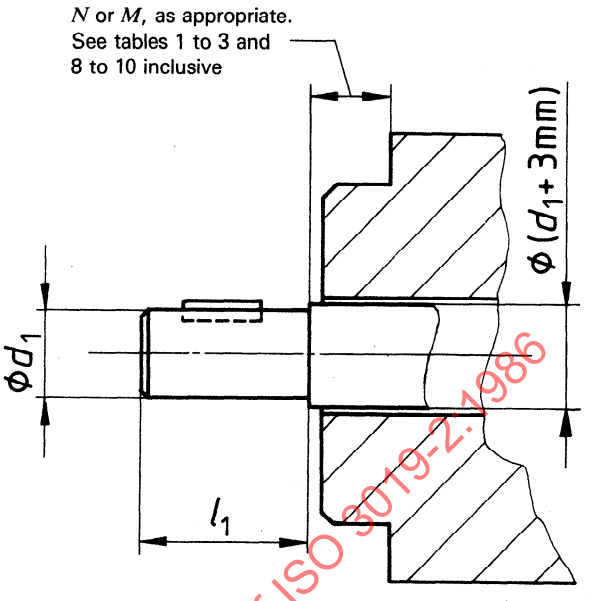


Figure 4 — Cylindrical shaft end with key

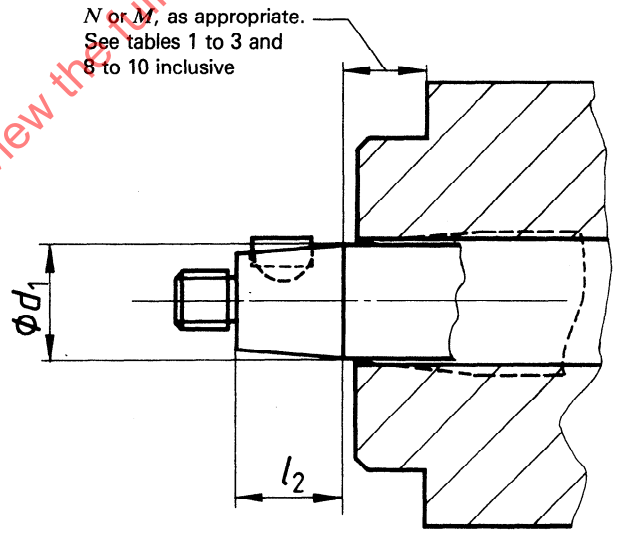


Figure 5 — Conical shaft end with key and external thread

4.6.2 Shaft end shapes shall be one of the following types:

a) cylindrical shaft end with key, see figure 4;

b) conical shaft end with key and external thread, see figure 5;

c) metric involute spline shaft end in accordance with ISO 4156. The module of involute spline shaft end (and corresponding number of teeth with respect to the maximum major diameter) in relation to the nominal shaft end diameter (d_1) shall be selected from table 6.

4.6.3 Only parallel keys in accordance with ISO/R 773 or Woodruff keys in accordance with ISO 3912 shall be used.

Table 6 — Compatible metric involute spline shaft ends

Nominal shaft end diameter d_1 mm	Involute spline shaft end		
	Module	Number of teeth	Maximum major diameter mm
10	0,5	19	10
12	0,75	15	12
16	1	15	16
20	1	19	20
25	1	24	25
32	1	31	32
40	1	39	40
50	2,5	19	50
63	2,5	24	62,5

4.6.4 Shaft end lengths, l_1 and l_2, shall be selected from the short series in ISO/R 775, except for conical shaft ends of nominal diameters 10 and 12 for which the long series only is available.

4.6.5 Other shaft end dimensions shall be selected from ISO/R 775, except for the tolerances on the diameter of cylindrical shaft ends which shall be of grade 7 instead of 6.

NOTE — On conical shafts, the length of the conical surface can exceed l_2 towards the mounting flange provided that diameter d_1 is located at l_2.

4.6.6 The shaft ends with metric involute splines in accordance with ISO 4156 shall have an angle of pressure of 30° and shall be selected from table 6.

5 Identification code

5.1 Code for mounting flanges

When it is required to identify mounting flanges in accordance with this part of ISO 3019, the following code shall be used:

a) use the word "Flange";

b) refer to this part of ISO 3019: ISO 3019/2;

c) indicate the size reference of the flange by using the spigot diameter (S) in millimetres;

d) indicate the flange shape, using the following code:

— oval flange with two holes: A

— square flange with four holes: B

— rectangular flange with four holes: C

e) indicate the number of fixing holes: 2 or 4;

NOTE — Slots can be used in place of holes by agreement between the user and the supplier.

f) "H" indicates clearance holes (preferred);

"T" indicates tapped holes (non-preferred, see annex A);

g) "W" indicates short spigot;

"L" indicates long spigot.

NOTE — When both a flange and a shaft are coded jointly, this reference should be omitted.

See 5.3 for designation examples.

5.2 Code for shaft ends

When it is required to identify shaft ends in accordance with this part of ISO 3019, the following code shall be used:

a) use the words "Shaft end";

b) refer to this part of ISO 3019: ISO 3019/2;

c) indicate the shape of the shaft end using the following code:

— cylindrical shaft end with key, but without internal thread: E

— conical shaft end with external thread: F

— cylindrical shaft end with key and internal thread (non-preferred, see A.2.2.2): G

— metric involute spline shaft end: K

d) indicate the size reference of the shaft by using the nominal diameter (d_1) in millimetres;

e) "N" indicates short shaft;

"M" indicates long shaft.

See 5.3 for designation examples.

5.3 Designation examples

5.3.1 A four-hole square mounting flange of spigot diameter 100 mm, having short spigot with clearance holes, shall be designated as follows:

Flange ISO 3019/2 - 100B4HW

5.3.2 A conical shaft end, with external thread, of nominal diameter (d_1) 63 mm, short series, shall be designated as follows:

Shaft end ISO 3019/2 - F63N

5.3.3 The combination of both elements defined in 5.3.1 and 5.3.2 shall be designated as follows:

Flange and shaft end ISO 3019/2 - 100B4HW - F63N

6 Identification statement (Reference to this International Standard)

Use the following statement in test reports, catalogue and sales literature when electing to comply with this part of !SO 3019:

> "Dimensions and identification code for mounting flanges and shaft ends, metric series, are in accordance with ISO 3019/2, *Hydraulic fluid power — Positive displacement pumps and motors — Dimensions and identification code for mounting flanges and shaft ends — Part 2: Two- and four-hole flanges and shaft ends — Metric series.*"

7 Marking

To assist in distinguishing mounting flanges made in accordance with this part of ISO 3019 from similar flanges made in accordance with ISO 3019/1, the capital letter "M" shall be permanently marked at a normally visible location on every flange made to this part of ISO 3019.

For the same reason, the letter "M" should likewise be permanently marked, immediately adjacent to the mounting face, on the mating housing.

Annex A

Non-preferred metric series: Mounting flanges, shaft ends and other features

NOTE — This series shall be avoided whenever possible.

A.1 Mounting flanges

A.1.1 Oval flanges

See table 8.

A.1.2 Square flanges

See table 9.

A.1.3 Rectangular flanges

See table 10.

A.1.4 Tapped fixing hole option for mounting flanges

Tapped holes of the same nominal diameter as the flange fixing bolts and conforming to ISO 261 can be substituted for the "d" clearance holes in all flange shapes and sizes in this part of ISO 3019.

A.2 Shaft ends

The characteristics specified in A.2.1 and A.2.2 have also been taken from ISO/R 775.

A.2.1 Nominal shaft end diameters

Nominal shaft end diameters (d_1) in relation to flange spigot diameter (S) shall be selected from table 7.

Table 7 — Non-preferred series of shaft ends

Dimensions in millimetres

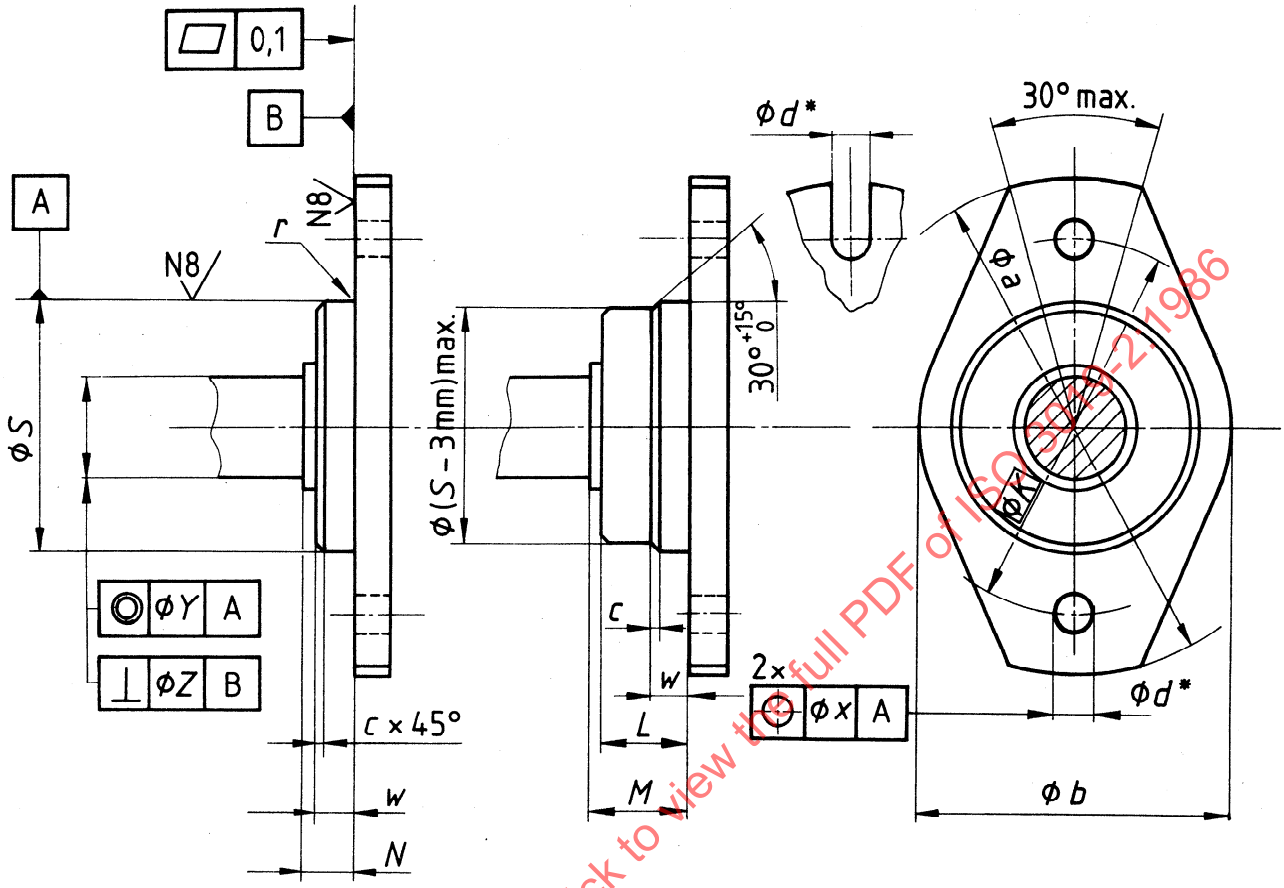
Flange spigot S	Shaft end d_1	
	1st choice	2nd choice
112	25	32
140	32	40
180	40	50
224	50	63

A.2.2 Shaft end shapes

A.2.2.1 The sizes in A.2.1 shall be applied to any shaft end shape specified in this part of ISO 3019.

A.2.2.2 Cylindrical shaft ends with keys (see figure 4) can be provided with a tapped hole, conforming to this variation in ISO/R 775. Tapped holes can be provided in all sizes of cylindrical shaft specified in this part of ISO 3019.

Flatness tolerance in millimetres



Short spigot version **Long spigot version**

* Slots may be used instead of holes by agreement between purchaser and supplier.

NOTE — Surface roughness is indicated in accordance with ISO 1302.

Figure 6 — Basic layout of oval mounting flange

Table 8 — Non-preferred series of oval mounting flanges

Dimensions in millimetres

Short and long spigot versions													Short spigot version	Long spigot version	
S h8 [1]	K	Fixings				a max.	b max.	w $^{+0,5}_{0}$	c max.	r max. (r min. = 0)	Y [2]	Z [2] mm/mm	N $^{+1}_{0}$	M $^{+1}_{0}$	L max.
		Bolts		Clearance holes (slots)											
		Quantity	Nominal diameter	d H13 [1]	x										
112	160	2	M12	14	1	200	132	9	2	1,6	0,30	0,0015	10	25	24,5
140	200		M16	18		250	170				0,35	0,0020		32	31,5
180	250		M20	22		300	212							40	39,5

1) For tolerance values, see ISO 286.

2) Tolerances stated are for the unladen condition. (Rigid couplings may require tighter tolerances.)