INTERNATIONAL STANDARD

**ISO 3019-2**

Third edition
2001-06-01

# Hydraulic fluid power — Dimensions and identification code for mounting flanges and shaft ends of displacement pumps and motors —

## Part 2: **Metric series**

*Transmissions hydrauliques — Dimensions et code d'identification des flasques de montage et des bouts d'arbres des pompes volumétriques et moteurs —*

*Partie 2: Série métrique*

Reference number
ISO 3019-2:2001(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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 3019 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 3019-2 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 2, *Pumps, motors and integral transmissions*.

This third edition cancels and replaces the second edition (ISO 3019-2:1986) and ISO 3019-3:1988, which have been technically revised.

ISO 3019 consists of the following parts, under the general title *Hydraulic fluid power — Dimensions and identification code for mounting flanges and shaft ends of displacement pumps and motors*:

— *Part 1: Inch series shown in metric units*

— *Part 2: Metric series*

Annex A of this part of ISO 3019 is for information only.

# Introduction

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

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,

— flange and spigot dimensions allowing for recommended sealing arrangements when sealing is required between a flange and its mating housing (see annex A), and

— identification codes for flanges and shaft ends that can be used separately or in combination.

# Hydraulic fluid power — Dimensions and identification code for mounting flanges and shaft ends of displacement pumps and motors —

## Part 2:
## Metric series

## 1 Scope

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. It specifies sizes and dimensions and establishes an identification code for two- and four-bolt, and polygonal (including circular), mounting flanges, as well as for cylindrical keyed shaft ends, conical keyed shaft ends with an external thread and metric involute spline shaft ends.

NOTE Involute spline is in accordance with DIN 5480 [1]...[8].

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 3019. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 3019 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 261:1998, *ISO general-purpose metric screw threads — General plan*.

ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts*.

ISO 1101:—[1)], *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*.

ISO 3912:1977, *Woodruff keys and keyways*.

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

## 3 Terms and definitions

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

## 4 Dimensions

### 4.1 Tolerances

Dimensions shown without tolerances are nominal.

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

### 4.2 Selection of mounting flanges and shaft ends

#### 4.2.1 General

Selection of mounting flange (4.2.2) and shaft end (4.2.3) dimensions for pumps and motors manufactured in accordance with this part of ISO 3019 shall be according to Tables 1 to 6 and Figures 1 to 6.

For the dimensions of cylindrical keyed shaft ends without internal thread, conical shaft ends with external thread and metric involute spline shaft ends, see Figures 4, 5 and 6, and Tables 7, 8 and 9, respectively.

#### 4.2.2 Mounting flanges

Select mounting flanges according to the following.

— For two-bolt mounting flanges, choose from Table 4, see Figure 1.

— For four-bolt mounting flanges, choose from Table 5, see Figure 2.

— For polygonal (including circular) mounting flanges, choose from Table 6, see Figure 3.

— Avoid, whenever possible, the non-preferred series of two- and four-bolt mounting flanges identified in Tables 1, 4 and 5.

1) To be published. (Revision of ISO 1101:1983)

### 4.2.3 Shaft ends

**4.2.3.1** Nominal shaft end diameter, $D$ (see Figure 4 and Figure 5), in relation to flange spigot diameter, $A$, shall be selected from Table 1 or 2, depending on the type of mounting flange.

**Table 1 — Series of shaft ends for two- and four-bolt mounting flanges**

Dimensions in millimetres

| **Flange spigot** $A$ | **Shaft end** $D$ | | |
|---|---|---|---|
| | 1st choice | 2nd choice | Non-preferred |
| 32 | 10 | — | — |
| 40 | 12 | — | — |
| 50 | 12 | 16 | 10 |
| 63 | 16 | 20 | 12 |
| 80 | 20 | 25 | 16 |
| 100 | 25 | 32 | 20 |
| 125 | 32 | 40 | 25 |
| 140 [a] | 32 | 40 | 25 |
| 160 | 40 | 50 | 32 |
| 180 [a] | 40 | 50 | 32 |
| 200 | 50 | 63/60 [b] | 40 |
| 224 [a] | 50 | 63/60 [b] | 40 |
| 250 | 63/60[b] | 80 | 50 |
| For applications such as those involving high torque or heavy side loads, other shaft dimensions may be selected. | | | |

[a] Non-preferred flange spigot dimensions.

[b] Reference diameter for spline shaft.

**Table 2 — Series of shaft ends for polygonal mounting flanges**

Dimensions in millimetres

| Flange spigot $A$ | Shaft end $D$ | | |
|---|---|---|---|
| | 1st choice | 2nd choice | Non-preferred |
| 80 | 20 | 25 | 16 |
| 100 | 25 | 32 | 20 |
| 125 | 32 | 40 | 25 |
| 160 | 40 | 50 | 32 |
| 180 | 40 | 50 | 32 |
| 200 | 50 | 63 | 40 |
| 224 | 50 | 63 | 40 |
| 250 | 63 | 70 | 50 |
| 280 | 63 | 80 | — |
| 315 | 70 | 80 | — |
| 355 | 70 | 80 | — |
| 400 | 80 | 90 | — |
| 450 | 90 | 110 | — |
| 500 | 90 | 110 | — |
| 560 | 110 | 125/120 [a] | — |
| 630 | 125/120 [a] | 140 | — |
| 710 | 140 | 160 | — |
| 800 | 160 | 180 | — |
| 900 | 160 | 180 | — |
| 1 000 | 180 | 200 | — |
| For applications such as those involving high torque or heavy side loads, other shaft dimensions may be selected. | | | |
| [a] Reference diameter for spline shaft. | | | |

**4.2.3.2** The shaft end shape shall be of one of the following types:

a) cylindrical keyed shaft end (see Figure 4),

b) conical keyed shaft end with external thread (see Figure 5), or

c) metric involute spline shaft end (see Figure 6).

For the nominal shaft end diameter, $D$, select the module of involute spline shaft end and the corresponding number of teeth with respect to the reference diameter from Table 3.

Shaft ends a) and c) may be provided with a tapped hole.

**4.2.3.3** Only parallel or Woodruff keys in accordance with ISO 3912 shall be used.

**4.2.3.4** For the first and second choices, select shaft end lengths $L_L$, $L_S$ and $L_{ST}$ from the short series, except for conical shaft ends of nominal diameters 10 and 12, for which the long series only is available.

For the non-preferred series, select the shaft end lengths $L_L$, $L_S$ and $L_{ST}$ from the long series.

On conical shaft ends, the length of the conical surface may exceed $L_{ST}$ towards the mounting flange, provided $D$ is located at $L_{ST}$.

**Table 3 — Compatible metric involute spline shaft ends**

| Shaft end reference diameter $d_B$ | Module | | | | | Number of teeth | | Min. shaft diameter [a] $U_{min}$ | |
|---|---|---|---|---|---|---|---|---|---|
| mm | 0,8 | 1,25 | 2 | 3 | 5 | ● | ○ | mm ● | mm ○ |
| 10 | ● | | | | | 11 | — | 7,6 | — |
| 12 | ● | | | | | 13 | — | 9,6 | — |
| 16 | | ● | | | | 11 | — | 12,4 | — |
| 20 | | ● | | | | 14 | — | 16,4 | — |
| 25 | | ● | | | | 18 | — | 21,4 | — |
| 32 | | | ● | | | 14 | — | 26,4 | — |
| 40 | | | ● | ○ | | 18 | 12 | 34,4 | 31,8 |
| 50 | | | ● | ○ | | 24 | 15 | 44,4 | 41,8 |
| 60 | | | ● | ○ | | 28 | 18 | 54,4 | 51,7 |
| 70 | | | | ● | | 22 | — | 61,7 | — |
| 80 | | | | ● | | 25 | — | 71,7 | — |
| 90 | | | | ● | ○ | 28 | 16 | 81,7 | 76,4 |
| 110 | | | | ● | ○ | 35 | 20 | 101,7 | 96,4 |
| 120 | | | | ● | ○ | 38 | 22 | 111,7 | 106,4 |
| 140 | | | | ● | ○ | 45 | 26 | 131,7 | 126,4 |
| 160 | | | | | ● | 30 | — | 146,4 | — |
| 180 | | | | | ● | 34 | — | 166,4 | — |
| 200 | | | | | ● | 38 | — | 186,4 | — |

● Preferred module/series.

○ Non-preferred module/series.

[a] See Figure 6.

### 4.3 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, thus avoiding undue body strain as well as transverse loads on shafts in excess of those permitted by the pump or motor manufacturer.

## 5 Identification code

### 5.1 Mounting flanges

When identifying mounting flanges in accordance with this part of ISO 3019, the following code shall be used.

a) Use the term “Flange”.

b) Refer to this part of ISO 3019: ISO 3019-2.

c) Indicate the size reference of the flange by stating the spigot diameter, $A$, in millimetres.

d) Indicate the flange shape:

— two-bolt mounting flange: A;

— four-bolt mounting flange: B;

— polygonal mounting flange (including circular flange): D.

e) Indicate the number of fixing holes: 2 to 14.

f) Indicate the kinds of holes or slots:

— clearance holes (preferred): H;

— tapped holes (non-preferred): T;

— slots: S.

g) Indicate the spigot version:

— short spigot: W;

— long spigot: L.

When both a flange and shaft are coded jointly, this indication should be omitted from the code.

See 5.3 for designation examples.

## 5.2 Shaft ends

When identifying shaft ends in accordance with this part of ISO 3019, the following code shall be used.

a) Use the term “Shaft ends”.

b) Refer to this part of ISO 3019: ISO 3019-2.

c) Indicate the shape of the shaft end:

— cylindrical keyed shaft end, but without internal thread: E;

— conical keyed shaft end with external thread: F;

— cylindrical keyed shaft end with internal thread (non-preferred): G;

— metric involute spline shaft end according to Table 3: P.

d) Indicate the size reference of the shaft by using the nominal diameter, $D$, in millimetres.

e) Indicate the shaft end length:

— short shaft end: N;

— long shaft end: M.

See 5.3 for designation examples.

### 5.3 Designation examples

EXAMPLE 1 A four-bolt mounting flange of spigot diameter 100 mm, having a short spigot with clearance holes:

**Flange ISO 3019-2 - 100B4HW**

EXAMPLE 2 A conical shaft end, with external thread, of nominal diameter ($D$) 32 mm, short series:

**Shaft end ISO 3019-2 - F32N**

EXAMPLE 3 The combination of both elements designated in the above examples:

**Flange and shaft end ISO 3019-2 - 100B4HW - F32N**

## 6 Flange/shaft end concentricity and perpendicularity

Maintain flange or shaft end concentricity and perpendicularity within the limits shown in Figures 1 to 3 and given in Tables 4 to 6.

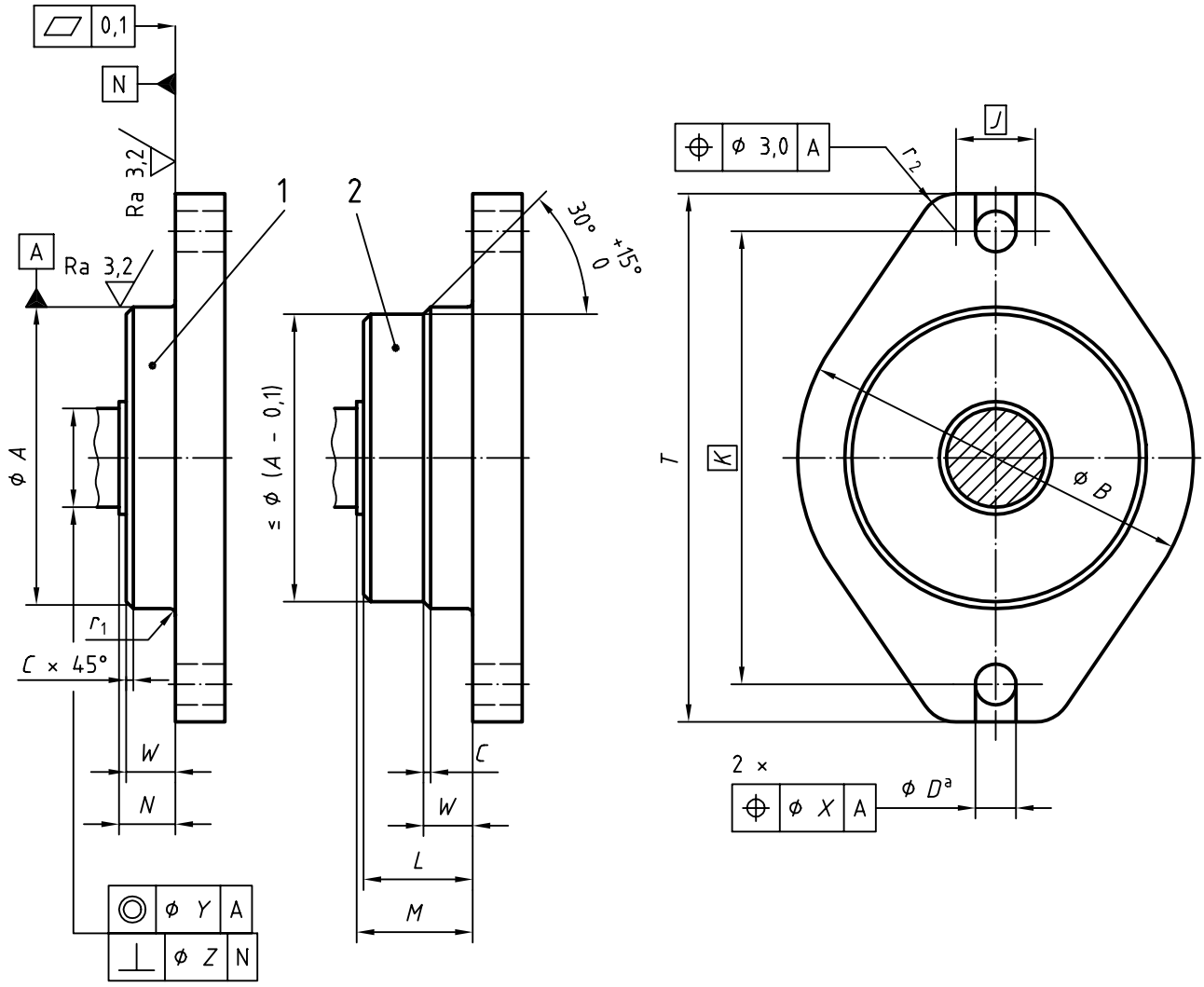
NOTE Rigid couplings may require closer tolerances.

## 7 **Identification statement** (Reference to this part of ISO 3019)

It is strongly recommended that manufacturers use the following statement in test reports, catalogues and sales literature when electing to comply with this part of ISO 3019:

"Dimensions and identification code for mounting flanges and shaft ends in accordance with ISO 3019-2:2001, *Hydraulic fluid power — Dimensions and identification code for mounting flanges and shaft ends of displacement pumps and motors — Part 2: Metric series*."

Dimensions in millimetres,
surface roughness values in micrometres




**Key**

1 Short spigot version

2 Long spigot version

[a] Slots or threaded holes may be used instead of holes.

**Figure 1 — Basic layout of two-bolt mounting flanges**

## Table 4 — Dimensions of two-bolt mounting flanges

Dimensions in millimetres

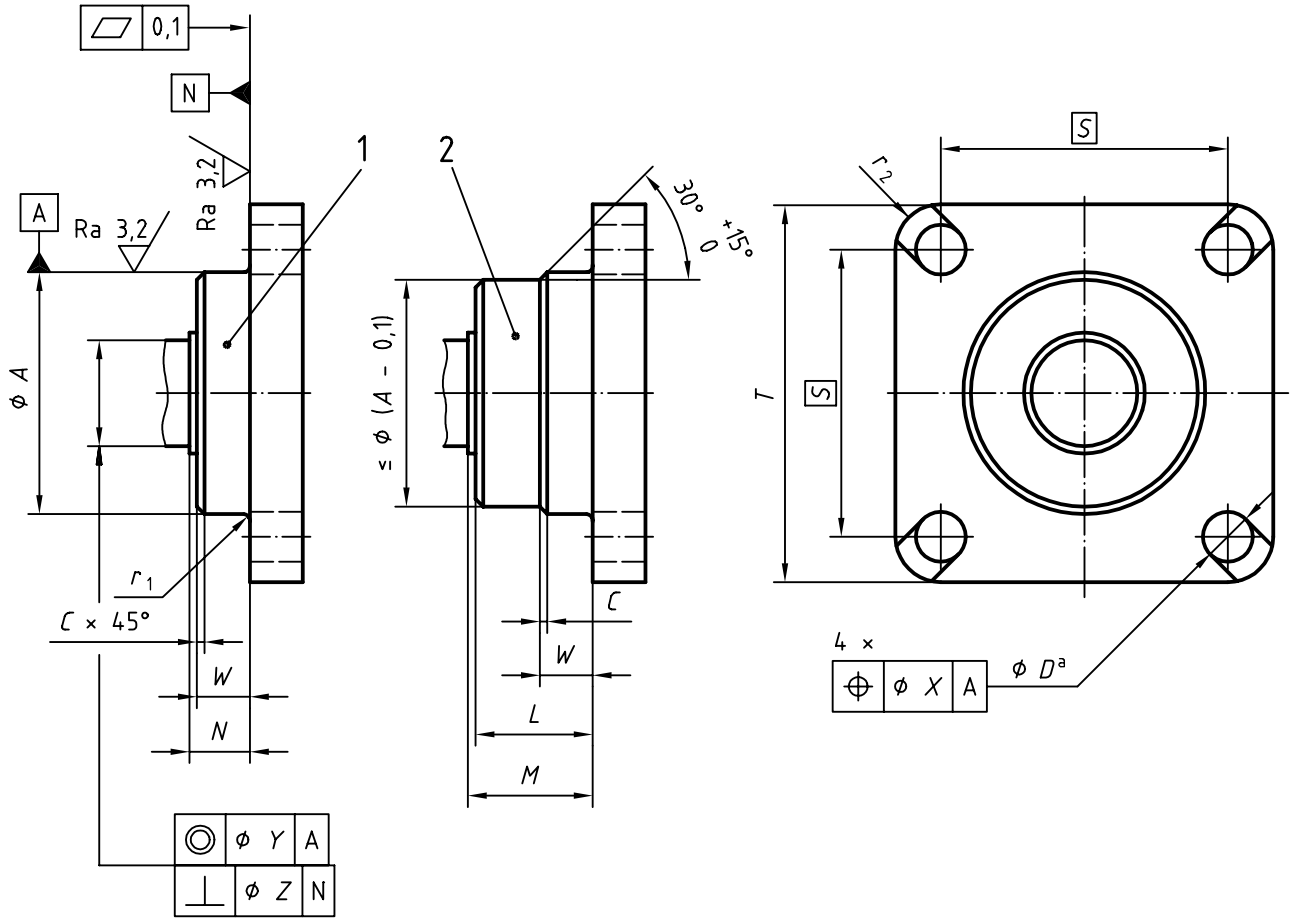
| Pilot dimensions | | | | | | | | | Flange dimensions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $A$ | $W$ | $N$ Flange spigot (short) | $L$ | $M$ Flange spigot (long) | $C$ | $r_1$ | $Y$ [b] | $Z$ [b] mm/mm | $B$ | | $J$ | $K$ | $D$ 2 bolts | $D$ Clear holes | $X$ | $T$ | | $r_2$ |
| h8 | $+0{,}5\ 0$ | $+0{,}1\ 0$ | max. | | max. | max. | | | | tol. | | | Thread | H13 | | | tol. | max. |
| 32 | 7 | 8 | 15,5 | $16\ ^{+1}_{0}$ | 1,5 | 0,5 | 0,2 | 0,001 5 | 50 | ± 0,5 | 8 | 56 | M6 | 6,6 | 0,3 | 72 | ± 0,5 | 8 |
| 40 | | | | | | | | | 56 | | 10 | 63 | | | | 79 | | |
| 50 | | | 19,5 | $20\ ^{+1}_{0}$ | | | | | 65 | | 12 | 80 | M8 | 9 | 0,5 | 100 | | 10 |
| 63 | | | | | | | | | 80 | | 14 | 100 | | | | 120 | | |
| 80 | | | | | | | 0,25 | | 100 | | 18 | 109 | M10 | 11 | | 133 | | 12 |
| 100 | 9 | 10 | 24,5 | $25\ ^{+1}_{0}$ | 2 | 1,6 | 0,3 | | 125 | | 20 | 140 | M12 | 13,5 | 0,75 | 168 | | 14 |
| 125 | | | 31,5 | $32\ ^{+1}_{0}$ | | | 0,35 | 0,002 | 150 | ± 1,5 | 24 | 180 | M16 | 17,5 | | 216 | ± 1,5 | 18 |
| 140 [a] | | | | | | | | | 170 | | 34 | 200 | | | 1 | 236 | | |
| 160 | | | 39,5 | $40\ ^{+1}_{0}$ | | | | | 200 | | 42 | 224 | M20 | 22 | | 268 | | 22 |
| 180 [a] | | | | | | | | | 212 | | 52 | 250 | | | | 294 | | |
| 200 | | | 49,5 | $50\ ^{+1,2}_{0}$ | | | | | 236 | | 56 | 280 | M24 | 26 | | 332 | | 26 |

NOTE For tolerance values, see ISO 286-2.

[a] Non-preferred size.

[b] Tolerances stated are for the unloaded condition. (Rigid couplings may require tighter tolerances.)

Dimensions in millimetres,
surface roughness values in micrometres




**Key**

1 Short spigot version

2 Long spigot version

a Slots or threaded holes may be used instead of holes.

**Figure 2 — Basic layout of four-bolt mounting flanges**

## Table 5 — Dimensions of four-bolt mounting flanges

Dimensions in millimetres

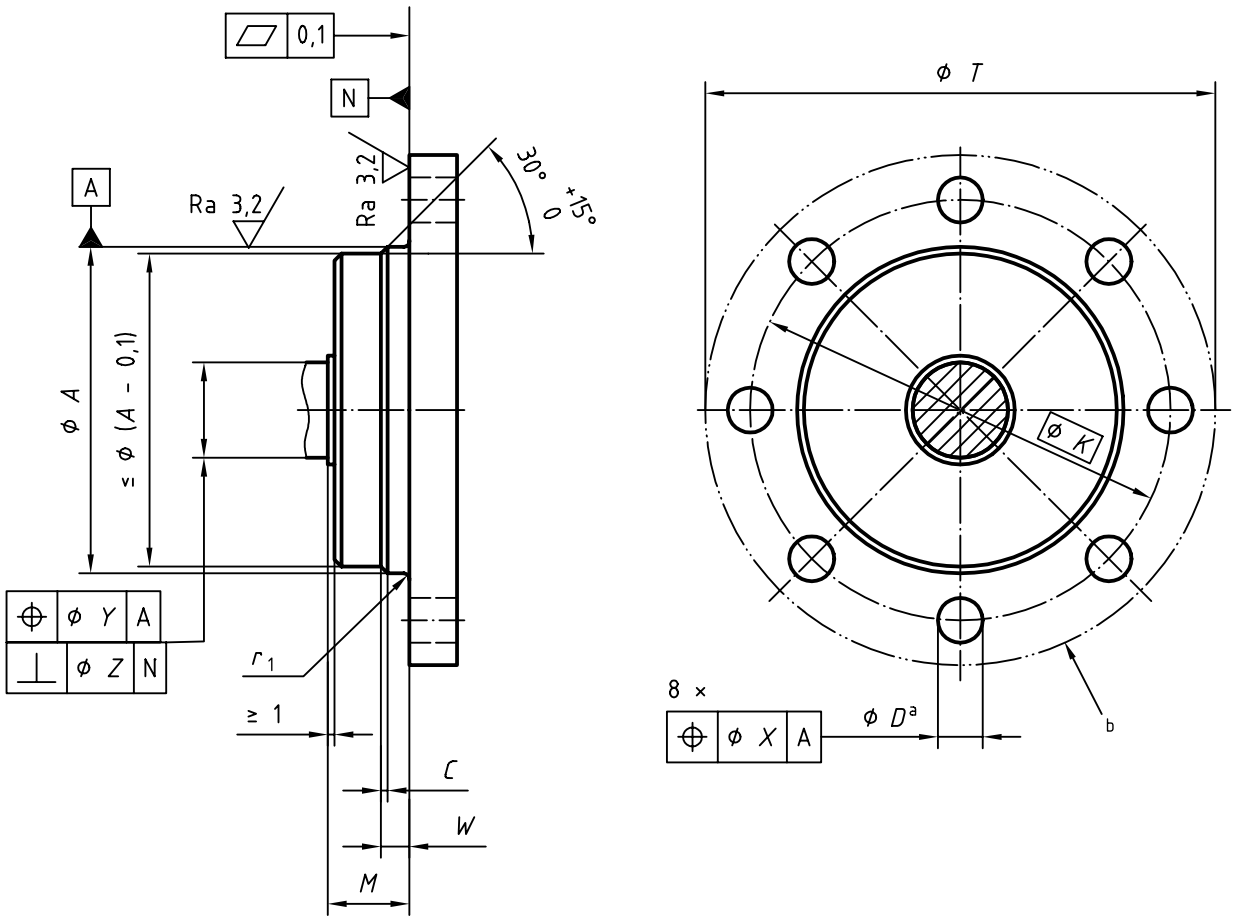
| Pilot dimensions | | | | | | | | | Flange dimensions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $A$ | $W$ | $N$ Flange spigot (short) | $L$ | $M$ Flange spigot (long) | $C$ | $r_1$ | $Y$ [b] | $Z$ [b] mm/mm | $S$ | $D$ 4 bolts | $D$ Clear holes | $X$ | $T$ | $r_2$ |
| h8 | $^{+0,5}_{0}$ | $^{+0,1}_{0}$ | max. | | max. | max. | | | | Thread | H13 | | max. | |
| 63 | 7 | 8 | 19,5 | $20\,^{+1}_{0}$ | 1,5 | 0,5 | 0,2 | 0,001 5 | 60,1 | M8 | 9 | 0,5 | 80 | 10 |
| 80 | | | | | | | 0,25 | | 72,8 | | | | 100 | |
| 100 | 9 | 10 | 24,5 | $25\,^{+1}_{0}$ | 2 | 1,6 | 0,3 | | 88,4 | M10 | 11 | | 125 | 16 |
| 125 | | | 31,5 | $32\,^{+1}_{0}$ | | | 0,35 | 0,002 | 113,2 | M12 | 13,5 | 0,75 | 150 | 18 |
| 140 [a] | | | | | | | | | 127,3 | | | | 170 | |
| 160 | | | 39,5 | $40\,^{+1}_{0}$ | | | | | 141,4 | M16 | 17,5 | | 190 | 22 |
| 180 [a] | | | | | | | | | 158,4 | | | 1 | 212 | |
| 200 | | | 49,5 | $50\,^{+1,2}_{0}$ | | | | | 176,8 | M20 | 22 | | 236 | 24 |
| 224 [a] | | | | | | | 0,4 | | 198 | | | | 266 | |
| 250 | | | | | | | | | 222,8 | M24 | 26 | | 301 | 2 |

NOTE For tolerance values, see ISO 286-2.

[a] Non-preferred size.

[b] Tolerances stated are for the unloaded condition. (Rigid couplings may require tighter tolerances.)

Dimensions in millimetres,
surface roughness values in micrometres




a Slots or threaded holes may be used instead of holes.

b Circular envelope.

**Figure 3 — Basic layout of polygonal mounting flanges**

## Table 6 — Dimensions of polygonal mounting flanges

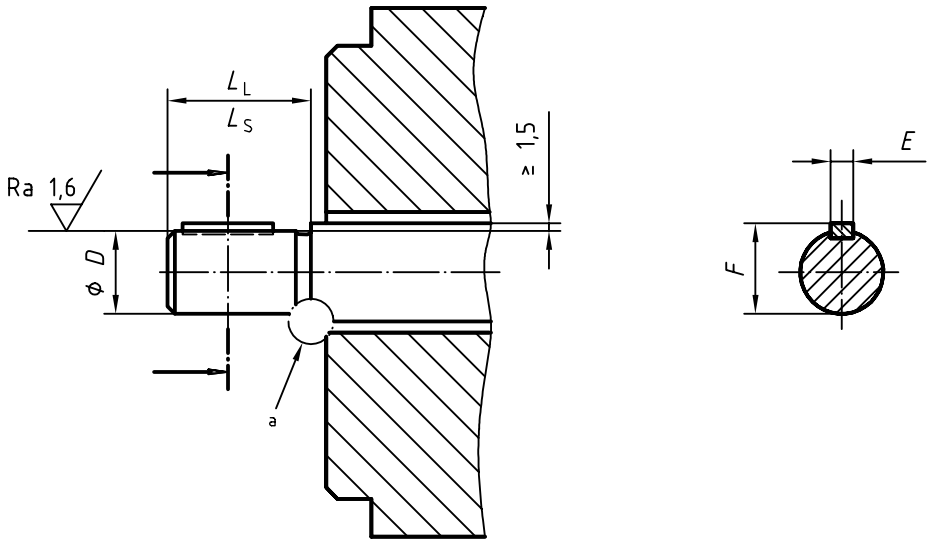
Dimensions in millimetres

| Pilot dimensions | | | | | | | Flange dimensions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $A$ | $W$ | $M$ | $C$ | $r_1$ | $Y$ [a] | $Z$ [a] | $K$ | $D$ | | | $X$ | $T$ |
| | | | | | | | | Bolts | | Clear holes | | |
| h8 | | | max. | | | mm/mm | | Quantity | Thread | H13 | | max. |
| 80 | $7^{+0,5}_{0}$ | $20 \pm 0,8$ | 2 | 0,5 | 0,25 | 0,001 5 | 103 | 5, 6 7 or 8 | M8 | 9 | 0,5 | 125 |
| 100 | | | | 1,6 | 0,3 | | 125 | | M10 | 11 | | 160 |
| 125 | $9^{+0,5}_{0}$ | $25 \pm 0,8$ | | | 0,35 | 0,002 | 160 | | M12 | 13,5 | | 200 |
| 160 | | | | | | | 200 | | M16 | 17,5 | 1 | 250 |
| 180 | | $40 \pm 0,8$ | | | | | 224 | | | | | 280 |
| 200 | | | | | | | 250 | | M20 | 22 | | 300 |
| 224 | | | | | | | 280 | | | | | 335 |
| 250 | | $50 \pm 1$ | | | | | 300 | | | | | 355 |
| 280 | $16^{+1}_{0}$ | | 3 | | | | 320 | | | | | 375 |
| 315 | | | | | | | 360 | | | | | 425 |
| 355 | | | | | | | 400 | | | | | 465 |
| 400 | | | | | | | 450 | | | | | 515 |
| 450 | | $60 \pm 1,5$ | 5 | | | | 510 | 5, 7 8, 10 12 or 14 | M24 | 26 | | 585 |
| 500 | $20^{+1}_{0}$ | | | | | | 560 | | | | | 635 |
| 560 | | | | | | | 630 | | | | | 710 |
| 630 | | | | | | | 710 | | M30 | 33 | 1,5 | 800 |
| 710 | | | | | | | 800 | | | | | 900 |
| 800 | | | | | | | 900 | | | | | 1 000 |
| 900 | | | | | | | 1 000 | | | | | 1 100 |
| 1 000 | | | | | | | 1 100 | | | | | 1 200 |

NOTE For tolerance values, see ISO 286-2.

[a] Tolerances stated are for the unloaded condition. (Rigid couplings may require tighter tolerances.)

Dimensions in millimetres,
surface roughness values in micrometres




a At the option of the manufacturer.

**Figure 4 — Basic layout of cylindrical keyed shaft ends without internal thread**

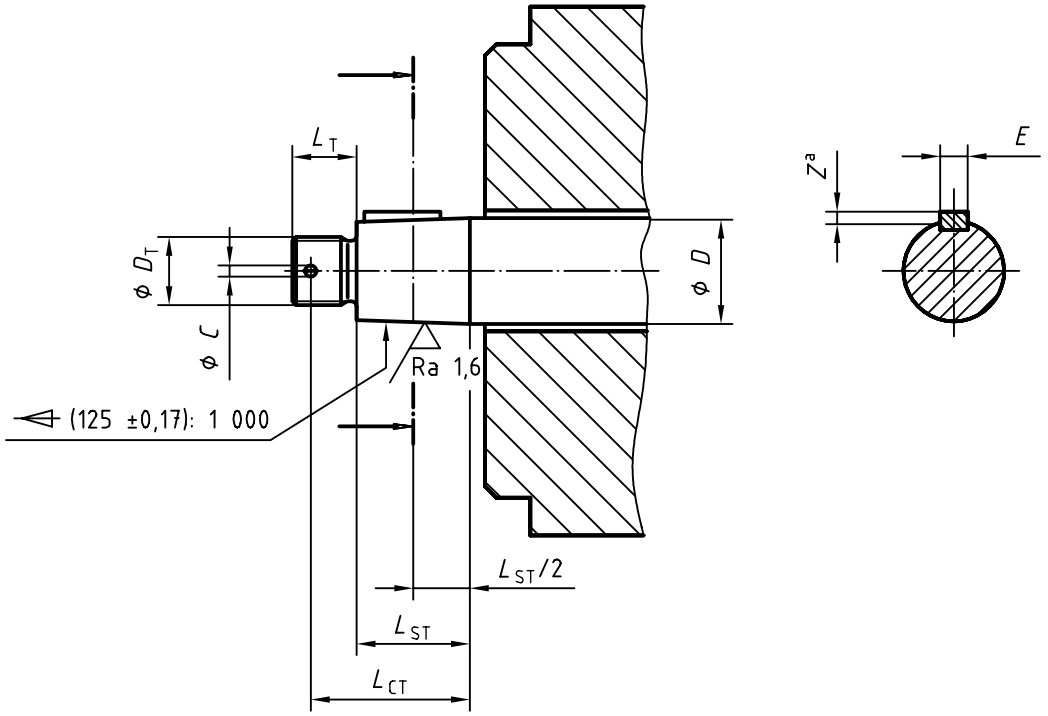
**Table 7 — Dimensions of cylindrical keyed shaft ends without internal thread**

Dimensions in millimetres

| $D$ | | $E$ | $F$ | $L_L$ | $L_S$ |
|---|---|---|---|---|---|
| nom. | tol. | Key width h9 | | Long | Short |
| 10 | j7 | 3 | 11,2 | 23 | 20 |
| 12 | | 4 | 13,5 | 30 | 25 |
| 16 | | 5 | 18 | 40 | 28 |
| 20 | | 6 | 22,5 | 50 | 36 |
| 25 | | 8 | 28 | 60 | 42 |
| 32 | k7 | 10 | 35 | 80 | 58 |
| 40 | | 12 | 43 | 110 | 82 |
| 50 | | 14 | 53,5 | 110 | 82 |
| 63 | m7 | 18 | 67 | 140 | 105 |
| 70 | | 20 | 74,5 | 140 | 105 |
| 80 | | 22 | 85 | 170 | 130 |
| 90 | | 25 | 95 | 170 | 130 |
| 110 | | 28 | 116 | 210 | 165 |
| 125 | | 32 | 132 | 210 | 165 |
| 140 | | 36 | 148 | 250 | 200 |
| 160 | | 40 | 169 | 300 | 240 |
| 180 | | 45 | 190 | 300 | 240 |
| 200 | | 45 | 210 | 350 | 280 |

NOTE For tolerance values, see ISO 286-2.

Dimensions in millimetres,
surface roughness values in micrometres




[a] Dimension $Z$ is normal to the key and at the large end of the taper.

**Figure 5 — Basic layout of conical keyed shaft ends with external thread**

**Table 8 — Dimensions of conical keyed shaft ends with external thread**

Dimensions in millimetres

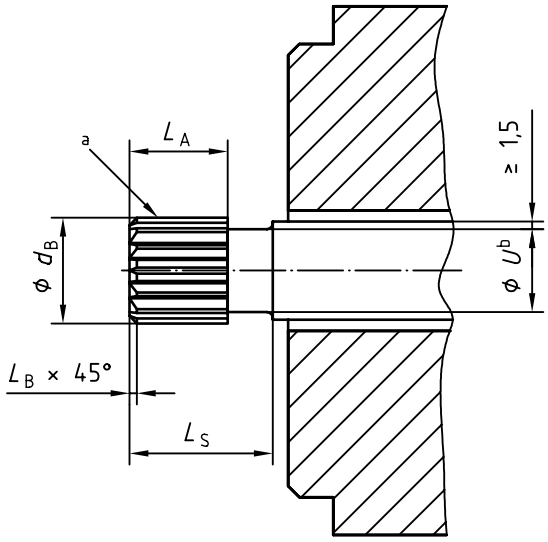
| $D$ | $L_{CT}$ | | $L_{ST}$ | | $L_T$ | $C$ | $D_T$ [a] | $E$ | $Z$ |
|---|---|---|---|---|---|---|---|---|---|
| | Shaft end | | | | | | | Key width | |
| | short | long | short | long | | + 0,13<br>− 0,08 | | h9 | |
| 10 | — | 20 | — | 15 | 8 [b] | 1,6 | M6 [b] | — | — |
| 12 | — | 24,5 | — | 18 | 12 [b] | 2 | M8 × 1 [b] | 2 | $0{,}8^{+1}_{0}$ |
| 16 | 24 | 36 | 16 | 28 | 12 | 2,5 | M10 × 1,25 | 3 | $1{,}2^{+1}_{0}$ |
| 20 | 32 | 46 | 22 | 36 | 14 | 3,2 | M12 × 1,25 | 4 | $1{,}5^{+1}_{0}$ |
| 25 | 37 | 55 | 24 | 42 | 18 | 4 | M16 × 1,5 | 5 | $2^{+2}_{0}$ |
| 32 | 52 | 74 | 36 | 58 | 22 | 4 | M20 × 1,5 | 6 | $2{,}5^{+2}_{0}$ |
| 40 | 73 | 101 | 54 | 82 | 28 | 5 | M24 × 2 | 10 | $3^{+2}_{0}$ |
| 50 | — | — | 54 | 82 | 28 | — | M36 × 3 | 12 | $3^{+2}_{0}$ |
| 63 | — | — | 70 | 105 | 35 | — | M42 × 3 | 16 | $4^{+2}_{0}$ |
| 70 | — | — | 70 | 105 | 35 | — | M48 × 3 | 18 | $4^{+2}_{0}$ |
| 80 | — | — | 90 | 130 | 40 | — | M56 × 4 | 20 | $4{,}5^{+2}_{0}$ |
| 90 | — | — | 90 | 130 | 40 | — | M64 × 4 | 22 | $5^{+2}_{0}$ |
| 110 | — | — | 120 | 165 | 45 | — | M80 × 4 | 25 | $5^{+2}_{0}$ |
| 125 | — | — | 120 | 165 | 45 | — | M90 × 4 | 28 | $6^{+2}_{0}$ |
| 140 | — | — | 150 | 200 | 50 | — | M100 × 4 | 32 | $7^{+3}_{0}$ |
| 160 | — | — | 180 | 240 | 60 | — | M125 × 4 | 36 | $8^{+3}_{0}$ |
| 180 | — | — | 180 | 240 | 60 | — | M140 × 6 | 40 | $9^{+3}_{0}$ |
| 200 | — | — | 210 | 280 | 70 | — | M160 × 6 | 40 | $9^{+3}_{0}$ |

NOTE For tolerance values, see ISO 286-2.

a Threads in accordance with ISO 261.

b For long version only.

Dimensions in millimetres




a Spline.

b See Table 3.

**Figure 6 — Basic layout of metric involute spline shaft end**

**Table 9 — Dimensions of metric involute spline shaft ends**

Dimensions in millimetres

| $d_B$ | $L_A$ min. | $L_B$ | $L_S$ |
|---|---|---|---|
| 10 | 5 | 1 | 18 |
| 12 | 6 | | 20 |
| 16 | 8 | 1,5 | 25 |
| 20 | 10 | | 28 |
| 25 | 12,5 | | 32 |
| 32 | 16 | 2 | 36 |
| 40 | 20 | | 45 |
| 50 | 25 | | 55 |
| 60 | 30 | | 70 |
| 70 | 35 | 3 | 80 |
| 80 | 40 | | 90 |
| 90 | 45 | | 105 |
| 110 | 55 | | 125 |
| 120 | 60 | | 135 |
| 140 | 70 | | 155 |
| 160 | 80 | 5 | 175 |
| 180 | 90 | | 195 |
| 200 | 100 | | 215 |

# Annex A
(informative)

## Examples of methods of sealing between a mounting flange and its housing

In order to achieve a low-pressure, fluid-tight joint between the mounting flange and its housing, one of the following methods can be used.

a) Introduction of a suitable gasket between the flange and housing.

b) Introduction of an O-ring into a suitably machined annular recess in the housing. Spigot lengths allow for, at minimum, the following O-ring cross-selection diameters:

   — 2,65 mm for spigot diameters up to and including 100 mm;

   — 3,55 mm for spigot diameters above 100 mm and up to and including 200 mm.

   It is envisaged that this form of sealing will not be required where the spigot diameter, $A$, exceeds 200 mm.

c) Introduction of an O-ring in the annular triangular section formed by the flange face, spigot and a suitable chamfer, machined on the corner of the housing mounting face and spigot bore. In this case the O-ring dimensions and other details will be agreed between the supplier and purchaser.

# Bibliography

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[4] DIN 5480-4:1991, *Involute spline joints; 30° pressure angle; basic dimensions and test dimensions for module 1,25.*

[5] DIN 5480-6:1991, *Involute spline joints; 30° pressure angle; basic dimensions and test dimensions for module 2*.

[6] DIN 5480-8:1991, *Involute spline joints; 30° pressure angle; basic dimensions and test dimensions for module 3*.

[7] DIN 5480-10:1991, *Involute spline joints; 30° pressure angle; basic dimensions and test dimensions for module 5*.

[8] DIN 5480 Berichtigung 1:1995, Corrigenda to DIN 5480, Parts 3, 4, 5, 7, 10, 11, 12 and 13,1991.

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