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# Technical product documentation — Representation of splines and serrations

*Documentation technique de produits — Représentation des cannelures et des dentelures*



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# Foreword

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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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This document was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 6, *Mechanical engineering documentation*.

This second edition cancels and replaces the first edition (ISO 6413:1988), which has been technically revised. The following changes have been made:

— title changed from *Technical drawings — Representation of splines and serrations* to *Technical product documentation — Representation of splines and serrations*;

— Introduction added;

— normative references reviewed;

— figures improved and titles added.

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

The representations of splines in technical product documentation are different from those used in mechanical drawings. In mechanical drawings, the drawings of spline teeth are complicated.

This document improves the efficiency of drawing.

# Technical product documentation — Representation of splines and serrations

## 1 Scope

This document specifies the rules and graphical symbols for the representations of splines and serrations in technical product documentation.

Two methods of representation are specified:

a) complete representation;

b) simplified representation.

The rules and graphical symbols specified in this document are applicable to detail drawings of parts (shafts and hubs) and to assembly drawings of joints.

NOTE For uniformity, all the figures in this document have been drawn in the first-angle orthographic projection. A third-angle orthographic projection could equally have been used without prejudice to principles established.



## 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 128-24:2014, *Technical drawings — General principles of presentation — Part 24: Lines on mechanical engineering drawings*

ISO 3098-2, *Technical product documentation — Lettering — Part 2: Latin alphabet, numerals and marks*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

**3.1**
**spline joint**
connecting, coaxial elements that transmit torque through the simultaneous engagement of equally spaced teeth situated around the periphery of a cylindrical external member with similar spaced mating spaces situated around the inner surface of the related cylindrical internal member

[SOURCE: ISO 4156-1:2005, 3.1]

**3.2**
**involute spline**
member of a spline joint having teeth or spaces that have involute flank profiles

[SOURCE: ISO 4156-1:2005, 3.2]

**3.3**
**straight-sided spline**
member of a spline joint with teeth or spaces that have straight-sided flank profiles

**3.4**
**serration**
member of a spline joint with teeth or spaces

Note 1 to entry: Serrations generally have flank profiles of 60° pressure angle.

# 4 Designation

## 4.1 Graphical symbols

The type of spline joint is indicated by graphical symbols: for the straight-sided spline as shown in Figure 1 and for the involute spline and serrations as shown in Figure 2.

**Figure 1 — Straight-sided spline**

**Figure 2 — Involute spline and serrations**

Apply the rules for the proportions and dimensions of graphical symbols as specified in Annex A.

## 4.2 Method for indication designation

The designation should be indicated near the feature. Always connect it to the contour of the spline joint by a leader line (see Figure 3).

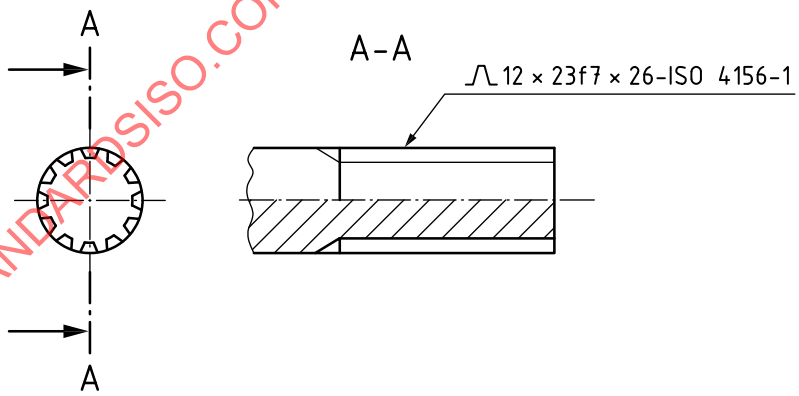



**Figure 3 — Examples of indication**

Where a spline joint is not in accordance with this document as mentioned above, or where the requirement is modified, the necessary data shall be tabulated on the drawing or any other associated document and shall be cross-referenced by a leader line and graphical symbol to the applicable contour.

# 5 Complete representation of spline joints

A complete representation of spline joints showing all details with their true dimensions is generally not necessary in technical product documentation and should be avoided.

When such a representation has to be made, the drawing rules laid down in ISO 128-24 shall be applied.

If necessary, a designation of the spline joint in accordance with Clause 4 may be added.

Figure 4 shows an example of a complete representation of a straight-sided spline joint.

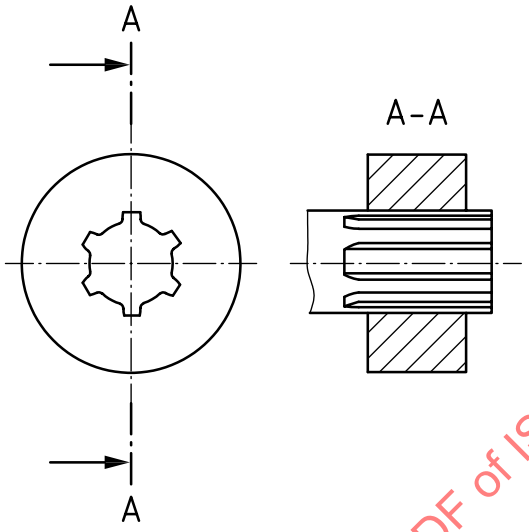



**Figure 4 — Example of a complete representation of a straight-sided spline joint**

Figure 5 shows an example of a complete representation of an involute spline joint.

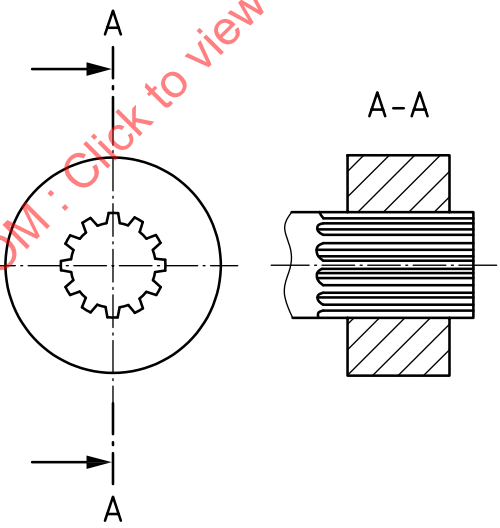



**Figure 5 — Example of a complete representation of an involute spline joint**

Figure 6 shows an example of a complete representation of a serration.

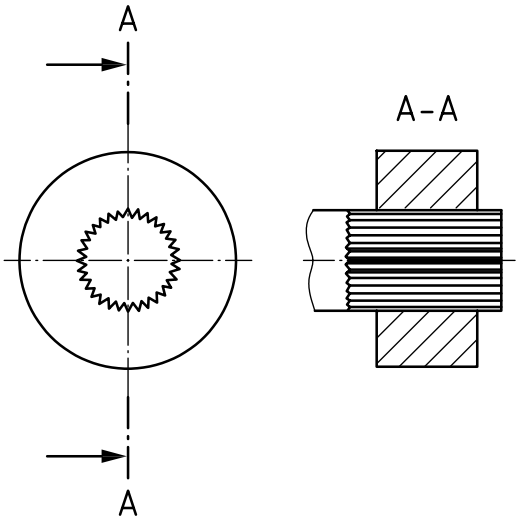


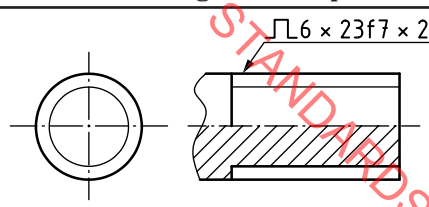
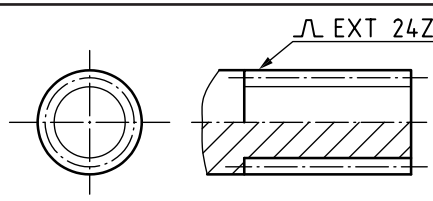
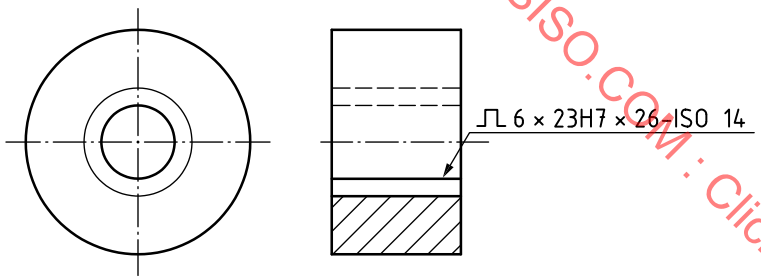
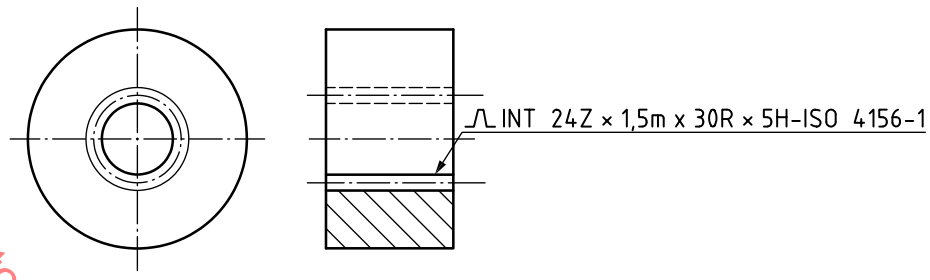
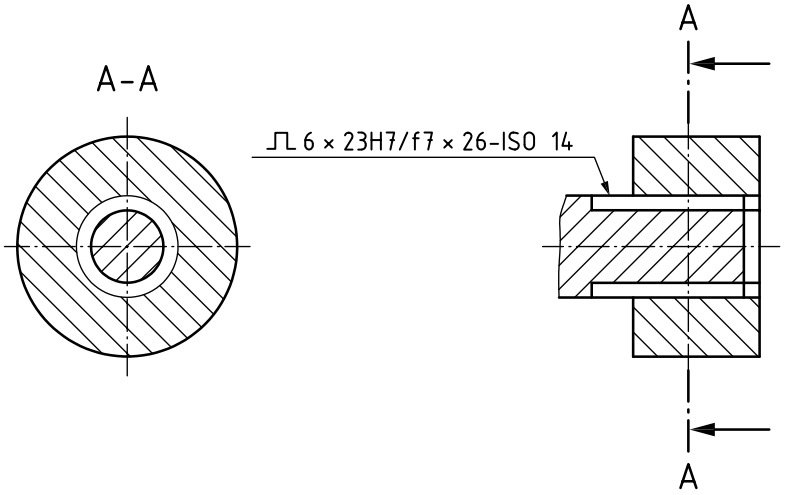
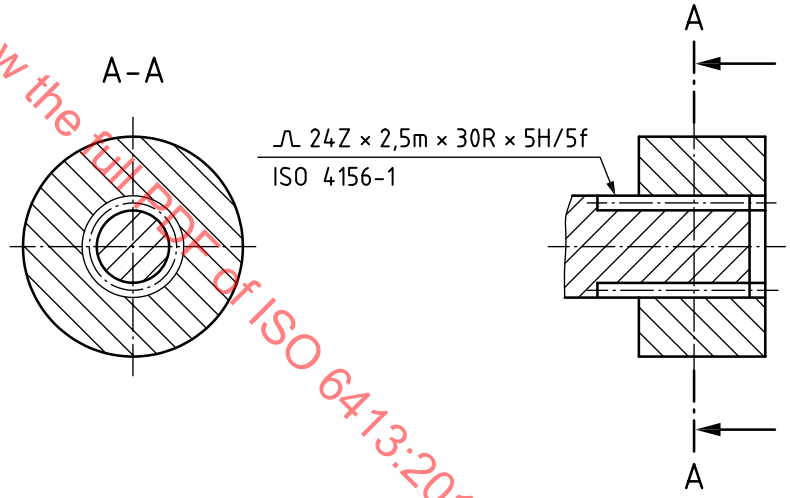

**Figure 6 — Example of a complete representation of a serration**

## 6 Simplified representation

### 6.1 General

A simplified representation for straight-sided splines and for involute splines as shown in Table 1 is usually adequate to convey all the necessary information.

**Table 1 — Simplified representation**

| | Straight-sided splines | Involute splines and serrations |
|---|---|---|
| Shaft |  |  |
| Hub |  |  |
| Spline joint[a] |  |  |

[a] If necessary, the designation of the spline joint in accordance with Clause 4 shall be added (for example, see Figures 13 and 14).

## 6.2 Representation of details (shafts and hubs)

### 6.2.1 General

As a fundamental principle, the parts of a spline joint shall be represented as a solid part without teeth, but with the addition of the root surface in a continuous narrow line according to ISO 128-24, line type 01.1, or the pitch surface in a long-dashed dotted narrow line according to ISO 128-24, line type 04.1.

### 6.2.2 Contours and edges

The contours and edges of a shaft (e.g. an external spline) or a hub (e.g. an internal spline) shall be drawn as if they were

— in an unsectioned view, solid parts (without teeth) bounded by a cylinder representing the tip surface (outside diameter, for example, of an external spline or inside diameter, for example, of an internal spline;

— in an axial section, a shaft or hub with two diametrically opposed teeth (shown unsectioned), regardless of tooth spacing.

### 6.2.3 Root surface

For straight-sided splines, the root surface (minor diameter of external splined part, major diameter of internal spline) shall be drawn with a continuous narrow line according to ISO 128-24, line type 01.1.

In the axial section of a splined shaft or hub, however, the root surface shall be drawn with a continuous wide line according to ISO 128-24, line type 01.2, in accordance with Table 1.

### 6.2.4 Pitch surface

The pitch surface (pitch diameter) shall be drawn with a long-dashed dotted narrow line according to ISO 128-24, line type 04.1, for involute splines and serrations.

### 6.2.5 Usable length

The usable length of the splined part shall be represented with a continuous wide line according to ISO 128-24, line type 01.2 (see Figure 7).

Usually, only the usable length of a splined part shall be drawn.

### 6.2.6 Tool run-out

If necessary, the tool run-out may be represented by an oblique line or a radius with the same line as used for the root surface (see Figures 7 and 8).

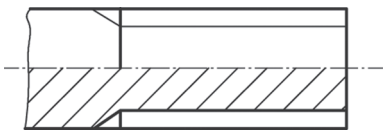


**Figure 7 — Representation of the tool run-out with an oblique line**



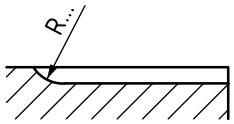



**Figure 8 — Representation of the tool run-out with a radius with the same line**

### 6.2.7 Position of teeth

If it is essential to indicate the position of the teeth in relation to a given axial plane, one or two teeth may be drawn with a continuous wide line according to ISO 128-24, line type 01.2 (see Figure 9).

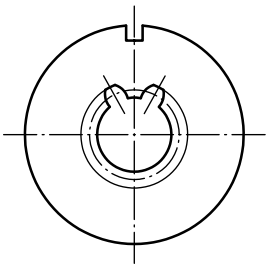


**Figure 9 — Position of the teeth**

### 6.2.8 Detailed drawing of tooth profile

If the designation is not sufficiently clear, a detailed drawing of the tooth profile should be added (see Figure 10).

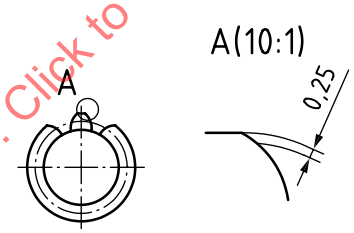



**Figure 10 — Example of a detailed drawing of the tooth profile**

### 6.2.9 Flanks

If it is necessary to specify the surface texture of the flanks (excluding root and tip diameter), the graphical symbol, the designation and the drawing indications used for surface texture should be indicated on a common leader line as shown in Figure 11.

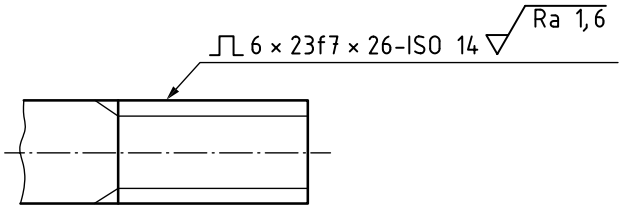



**Figure 11 — Example of indication of surface texture**

## 7 Assembly drawings

In assembly drawings, when a section or sectional view represents a splint joint, the joint part should be drawn as male splines. The rules specified for the representation of details are also applicable to assembly drawings (see Figure 12).

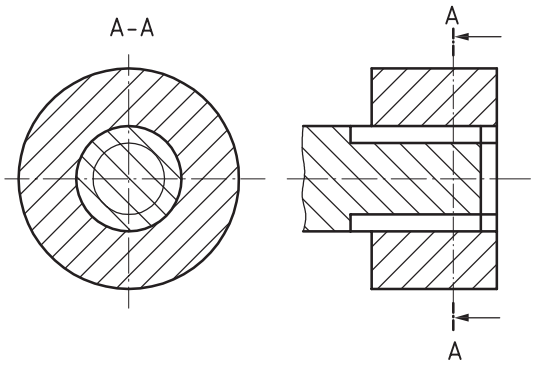



**Figure 12 — Representation of assembly drawings**

In assembly drawings, the designations of both parts (hub and shaft) shall be combined as shown in Figures 13 and 14.

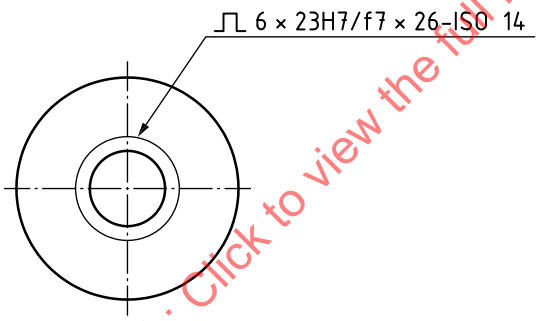



**Figure 13 — Example of indication to assembly drawings of straight-sided spline**

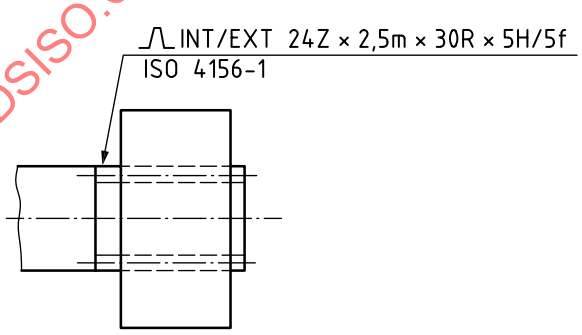



**Figure 14 — Example of indication to assembly drawings of serration**