
**Aerospace — Lead and runout
threads —**

**Part 1:
Rolled external threads**

*Aéronautique et espace — Filets incomplets, débuts et fins de filets —
Partie 1: Filetages extérieurs roulés*



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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles* Subcommittee SC 4, *Aerospace fastener systems*.

This second edition cancels and replaces the first edition (ISO 3353-1:2002), of which it constitutes a minor revision.

The main changes compared to the previous edition are as follows:

- update of the term “lead threads”;
- editorially revised.

A list of all parts in the ISO 3353 series can be found on the ISO website.

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.

Aerospace — Lead and runout threads —

Part 1: Rolled external threads

1 Scope

This document specifies the lead and runout requirements for rolled external threads for aerospace construction, and the inspection method to be used in case of dispute.

It is applicable whenever it is referenced in a definition document.

2 Normative references

There are no normative references in this document.

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

lead thread

portion of the incomplete thread that is fully formed at the root but not at the crest which occurs at the beginning end of either external or internal threads

3.2

runout thread

part of the screw thread in which is located the thread incompletely formed during rolling, between the completely formed threads and the part which has not been rolled

3.3

completely formed thread

thread, the profile of which (ABC) is located, over an axial distance of $1P$, within the limits specified in the definition document for the thread

Note 1 to entry: See [Figure 1](#).



4 Symbols for threads

d_2 the pitch diameter of the thread

d_3 the minor diameter of the thread

P the thread pitch

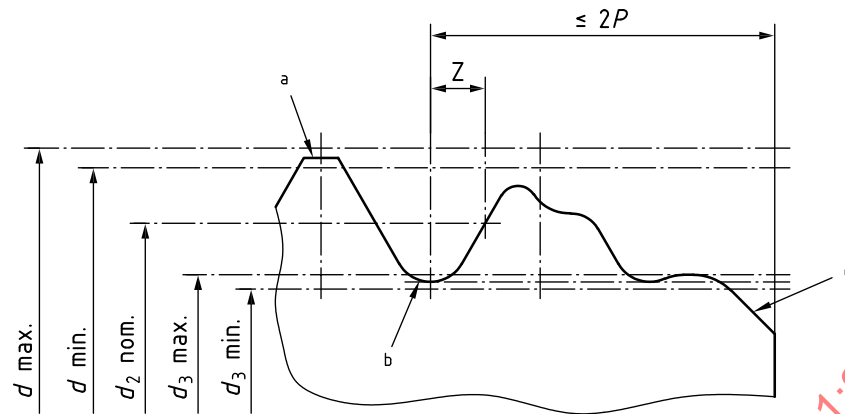
5 Requirements

5.1 General requirements

The flanks at the root of the incompletely formed threads shall be joined by a radius or by two radii and a flat, that are smooth and devoid of abrupt tool marks. This radius, or these radii and the radius r (see [Figure 3](#) to [Figure 9](#)) shall be greater than or equal to the minimum root radius specified for the complete threads in the definition document for the thread.

5.2 Lead threads

See [Figure 2](#).



Over the area Z , the thread shall lie within the limits specified in the definition document for the thread.

- a Crest of first completely formed thread.
- b Root of first completely formed thread.
- c Chamfer.

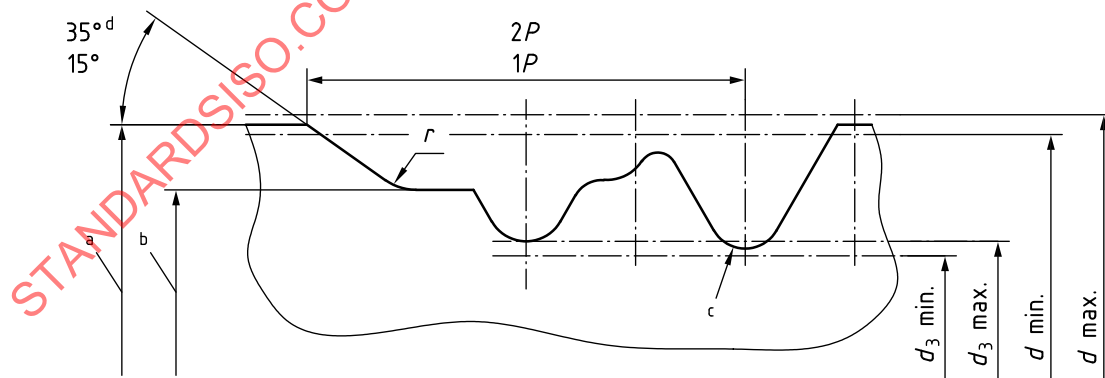
Figure 2 — Lead threads

The possible profile projection comparator inspection shall be carried out using a chart drawn in accordance with [Figure 10](#).

5.3 Runout threads

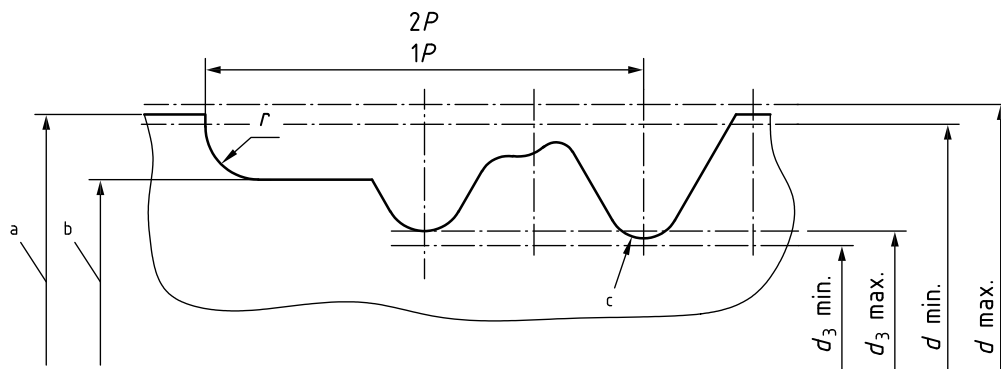
5.3.1 Normal shank

See [Figure 3](#) and [Figure 4](#).



- a Shank diameter having a nominal value equal to the nominal diameter of the thread $= \delta$.
- b Blank diameter.
- c Root of last completely formed thread.
- d Angle before rolling. The shape is optional within these limits.

Figure 3 — Normal shank



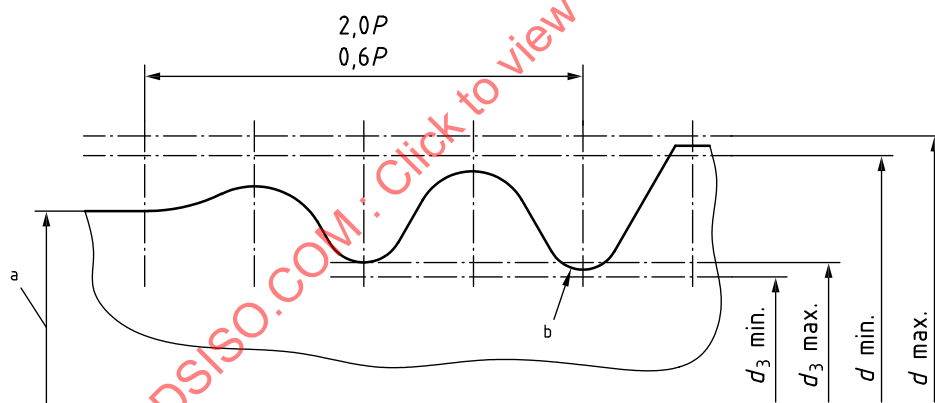
- a Shank diameter having a nominal value equal to the nominal diameter of the thread = δ .
- b Blank diameter.
- c Root of last completely formed thread.

Figure 4 — Normal shank

The possible profile projection comparator inspection shall be carried out using a chart drawn in accordance with [Figure 11](#).

5.3.2 Pitch diameter shank

See [Figure 5](#).



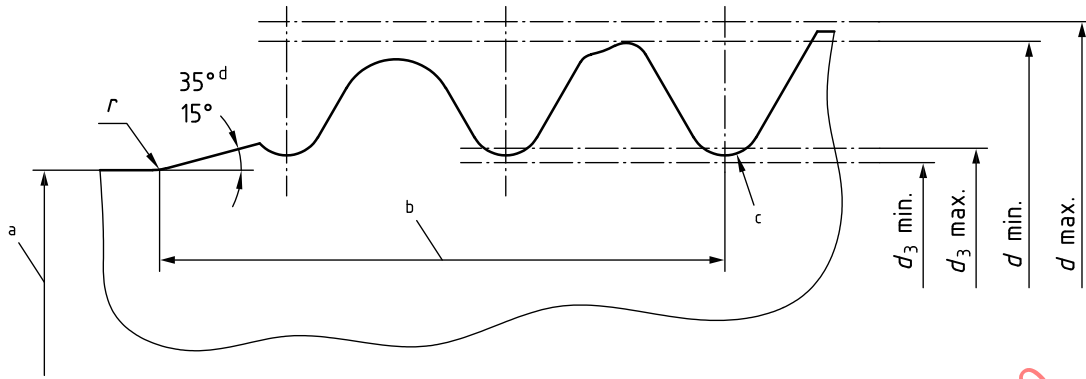
- a Shank diameter having a nominal value equal to the maximum pitch diameter = δ .
- b Root of last completely formed thread.

Figure 5 — Pitch diameter shank

The possible profile projection comparator inspection shall be carried out using a chart drawn in accordance with [Figure 12](#).

5.3.3 Stepped shank

See [Figure 6](#).



a Diameter of stepped shank, having a nominal value equal to $d_3 \text{ min.} - 0,1 \text{ mm} = \delta$.

b $\left[1P + \frac{(d \text{ max.} - \delta \text{ nom.})}{2 \tan 35^\circ} \right]$ to $\left[2P + \frac{(d \text{ max.} - \delta \text{ nom.})}{2 \tan 15^\circ} \right]$.

c Root of last completely formed thread.

d Angle before rolling. The shape is optional within these limits.

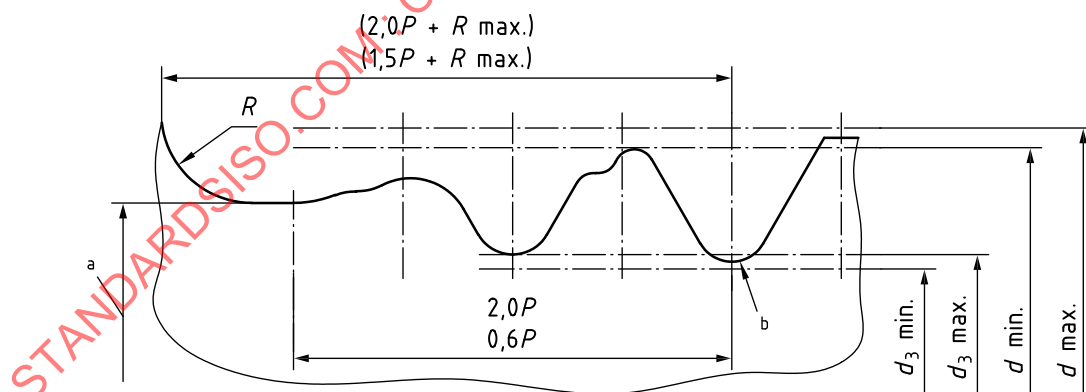
Figure 6 — Stepped shank

The possible profile projection comparator inspection shall be carried out using a chart drawn in accordance with [Figure 13](#).

5.3.4 Screws threaded to the head and bolts threaded to a shoulder

5.3.4.1 Protruding head

See [Figure 7](#).



The beginning of the first thread shall not encroach on the radius R .

a Blank diameter.

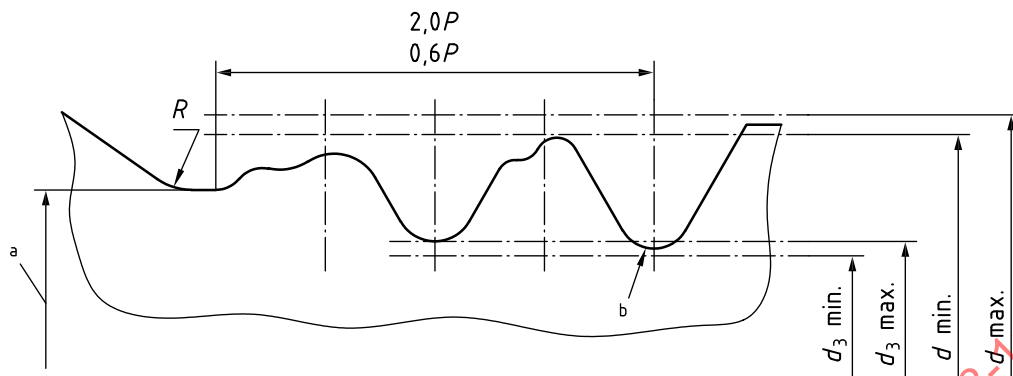
b Root of last completely formed thread.

Figure 7 — Protruding head

The possible profile projection comparator inspection shall be carried out using a chart drawn in accordance with [Figure 12](#).

5.3.4.2 Flush head

See [Figure 8](#).



The beginning of the first thread shall not encroach on the radius R .

- a Blank diameter.
- b Root of last completely formed thread.

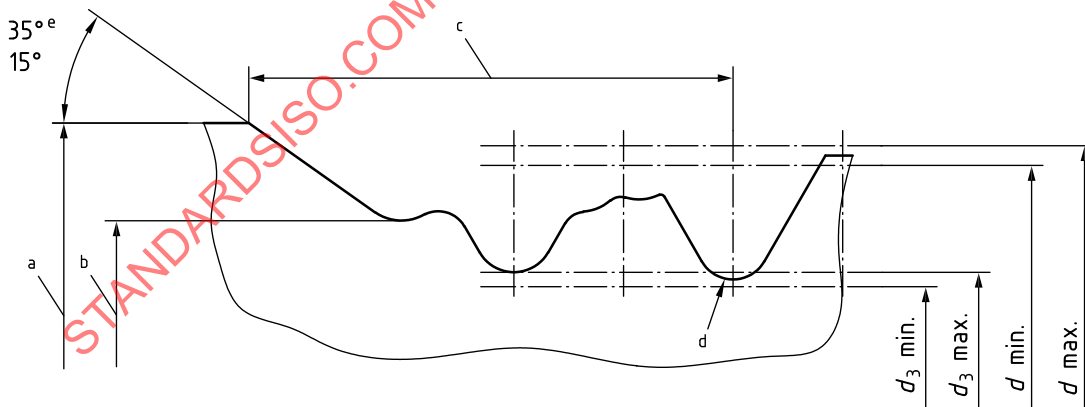
Figure 8 — Flush head

The possible profile projection comparator inspection shall be carried out using a chart drawn in accordance with [Figure 12](#).

5.3.5 Oversized bolts

EXAMPLE Bolts for repairs.

See [Figure 9](#).



- a Diameter of oversized shank = δ .
- b Blank diameter.
- c $\left[1P + \frac{(\delta \text{ nom.} - d \text{ max.})}{2 \tan 35^\circ} \right]$ to $\left[2P + \frac{(\delta \text{ nom.} - d \text{ max.})}{2 \tan 15^\circ} \right]$.
- d Root of last completely formed thread.
- e Angle before rolling. The shape is optional within these limits.

Figure 9 — Oversized bolts

The possible profile projection comparator inspection shall be carried out using a chart drawn in accordance with [Figure 14](#).

6 Inspection method

6.1 General

The method is left to the discretion of the manufacturer, provided that it ensures conformity with the requirements given in [Clause 5](#).

In case of dispute, the method by optical projection, defined hereafter, shall be used. See comments in [Annex A](#).

6.2 Use of the charts

The charts shall be used in conjunction with a profile projection comparator having a magnifying power equal to or greater than $\times 20$.

6.3 Procedure

6.3.1 For lead threads

The inspection shall be carried out using a chart drawn in accordance with [Figure 10](#).

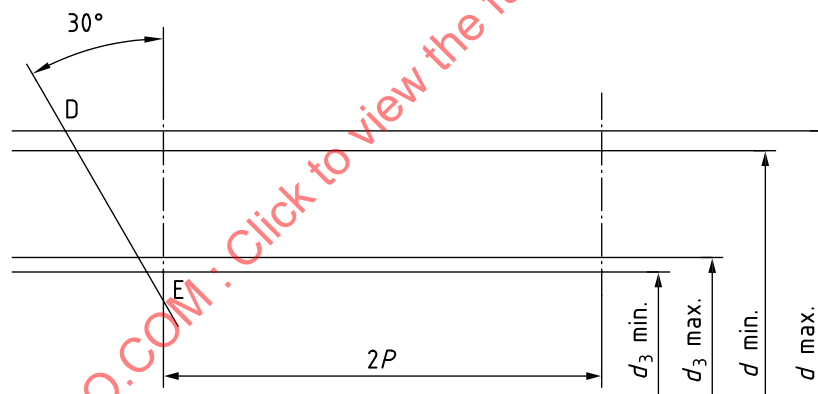


Figure 10 — Lead threads

Rotate the bolt to find the first complete thread (see [Figure 1](#)) nearest to the end of the shank which has the thread crest and root not extending beyond the limits defined by the horizontal lines.

Then move the bolt horizontally until the right flank of the above thread coincides with line DE.

6.3.2 For runout threads

The inspection shall be carried out using a chart drawn in accordance with [Figure 11](#) to [Figure 14](#).

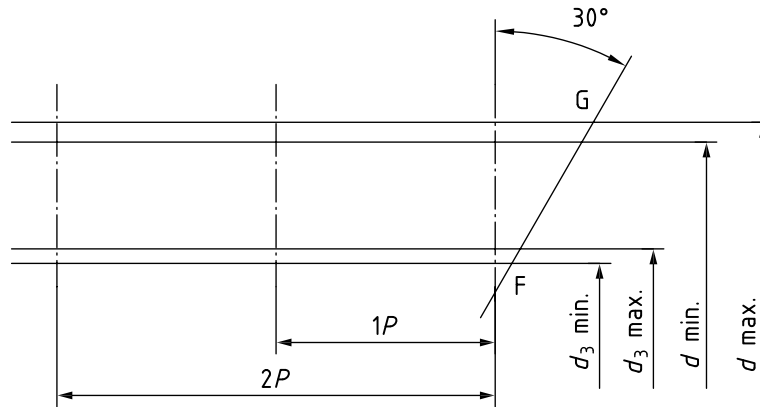


Figure 11 — Runout threads

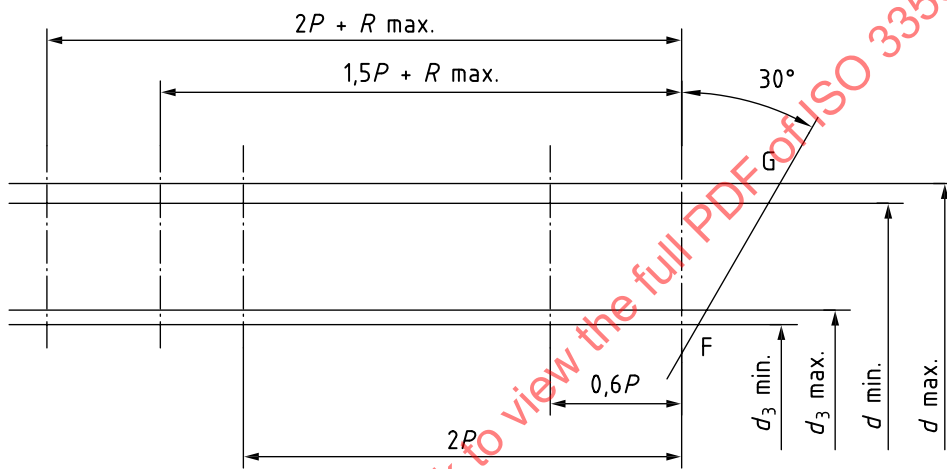
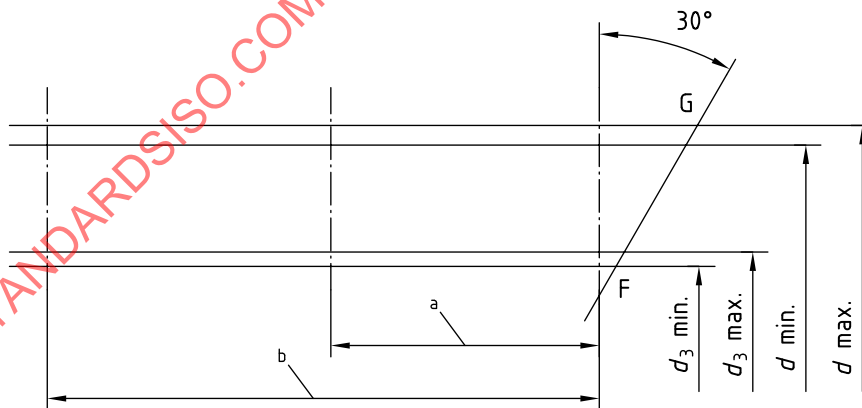


Figure 12 — Runout threads



$$a = \left[1P + \frac{(d \text{ max.} - \delta \text{ nom.})}{2 \tan 35^\circ} \right]$$

$$b = \left[2P + \frac{(d \text{ max.} - \delta \text{ nom.})}{2 \tan 15^\circ} \right]$$

Figure 13 — Runout threads