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Aerospace — MJ threads — Gauging

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 4, *Aerospace fastener systems*.

This second edition cancels and replaces the first edition (ISO 10959:2000), which has been technically revised.

Introduction

The purpose of this International Standard, which differs from ISO 1502, is to take into account the basic characteristics of the ISO MJ threads (restricted form variation and increased root radius of the external thread) as well as the specific tolerances and to standardize the gauging principles for ISO MJ threads, intended for products for aerospace applications.

Aerospace — MJ threads — Gauging

1 Scope

This International Standard contains information for the gauging of ISO MJ threads in accordance with ISO 5855-1, ISO 5855-2, and ISO 5855-3.

Other methods of ensuring that the product is within the specified limits may be used provided correlation with the specified gauges is established [see 8.2, e)].

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1, *Geometrical Product Specifications (GPS) — Standard reference temperature for geometrical product specification and verification*

ISO 1502:1996, *ISO general-purpose metric screw threads — Gauges and gauging*

ISO 5408, *Screw threads — Vocabulary*

ISO 5855-1, *Aerospace — MJ threads — Part 1: General requirements*

ISO 5855-2, *Aerospace — MJ threads — Part 2: Limit dimensions for bolts and nuts*

ISO 5855-3, *Aerospace — MJ threads — Part 3: Limit dimensions for fittings for fluid systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5408 and the following apply.

3.1
best wire size
cylinder or sphere which has a radius so that it will contact the thread flanks at the pitch cylinder intersection

Note 1 to entry: The radius of the best wire or sphere is theoretically equal to 0,288 68 *P*.

3.2
indicating gauge
device having contacts which will precisely compare the size of a work piece thread to a setting standard of known dimensions

Note 1 to entry: The value for the indicated characteristic thus established is the dimensional value attributed to the work piece. An indicating gauge may have contacts designed to measure any thread characteristic. This International Standard specifies the characteristics and designs for ISO MJ threads.

3.3
simple pitch diameter
diameter of an imaginary cylinder intersecting an actual thread over the width of one groove where that width is equal to one half of the basic pitch

3.4
virtual pitch diameter
pitch diameter of the smallest (for external threads) or largest (for internal threads) perfect thread form with GO gauge profile which can engage the product threads for a distance equal to the GO gauge thread engagement

4 Types of gauges

4.1 Gauges and setting plugs for external product threads

	Gauge type	Reference
a)	GO screw ring gauges	6.1.2
b)	Setting plug for adjustable GO screw ring and indicating thread gauges	7.1
c)	Virtual pitch diameter indicating thread gauges	6.1.1
d)	Simple pitch diameter indicating thread gauges	6.1.3
e)	Flat contact gauges for major diameter	6.1.4
f)	Point contact indicating thread gauges for minor diameter	6.1.5
g)	Optical comparator for root radius and minor diameter	6.1.6

4.2 Gauges for internal product threads

	Gauge type	Reference
a)	GO screw plug gauges	6.2.1
b)	NOT GO screw plug gauges	6.2.2
c)	Plain gauges for minor diameter (plug gauge)	6.2.3
d)	GO full form screw plug gauges	6.2.3.2
e)	Virtual pitch diameter indicating thread gauges	6.2.4
f)	Simple pitch diameter indicating thread gauges	6.2.5

5 Reference temperature

In accordance with ISO 1, the dimensions of the gauge and the product shall be checked at the temperature of 20 °C.

If the product and the gauge have the same coefficients of linear expansion, the temperature may deviate from 20 °C, provided the temperature of the product and the gauge are the same.

If the product and the gauge have different coefficients of linear expansion, the temperature of both, at the time of gauging, shall be

a) 20 °C ± 2 °C for sizes MJ24 and smaller, and

b) 20 °C ± 1 °C for larger threads.

6 Function, design, and use of gauges

6.1 Gauges for external threads

6.1.1 Virtual pitch diameter indicating thread gauges

6.1.1.1 It measures, on two or three segments or rolls, the maximum material virtual pitch diameter, taking into account variations of form such as pitch variation, helix and flank variations, roundness, and taper which produces an enlargement of the virtual pitch diameter. In addition, virtual pitch diameter control ensures the flank angle contact is sufficient to ensure that the root radius does not exceed the maximum limit. Measurement of virtual pitch diameter with indicating gauges shall be obtained to calculate virtual-minus-simple pitch-diameter differential unless the simple pitch diameter limits, gauged in accordance with the measurements given in 6.1.3, are within the limits defined by the maximum pitch diameter and the form variation limits in ISO 5855-1.

6.1.1.2 Indicating gauges have two or three contacts at 180° or 120° respectively. Gauges with segments or rolls are designed with the length of the GO virtual maximum material gauging elements equal to the GO ring gauge length (see Table 1). For configuration and profile requirements, see Figure 1.

6.1.1.3 The minor diameter of the GO virtual maximum material thread segments and the diameter of the circle surrounded by the roll cluster of GO virtual maximum material rolls shall be equal to the pitch diameter of the product minus 0,375 H, less the T_{PL}, minus tolerance when assembled in the gauge frame, where T_{PL} is specified in ISO 1502. This corresponds to a flat width of 0,312 5 P on the minor crest for the thread. The crest shall be flat in an axial plane and parallel to the axis of the segments or rolls.

6.1.1.4 The major diameter of the GO virtual maximum material segments and the root of the GO virtual maximum material rolls shall be cleared beyond a 0,125 P flat, either by an extension of the flanks of the thread toward a sharp vee or by an undercut no greater than 0,125 P maximum width and approximately central. The root clearance shall be such that the major diameter of the full form section of the thread setting plug gauge is cleared after the assembled gauge has been properly set to size. Optional clearance specifications given in ISO 1502 may be used.

6.1.1.5 The simple pitch diameter cylinder axis of threaded segments and rolls shall be straight within the diameter tolerance zone equal to T_{PL} as specified in ISO 1502. The segment or roll thread profile, lead, pitch, and the half-angle variations shall be within the limits specified in ISO 1502.

6.1.2 Solid or adjustable GO screw ring gauges

To ensure the ease of assembly of product threads and conformance to the maximum material virtual pitch diameter limits, GO screw ring gauges with thread form as shown in Figure 1 and setting gauges in accordance with the details described in 6.1 may be used. Solid GO screw ring gauges shall not be permitted to exceed the product thread dimensional limits. The gauge thickness/length shall be standardized as shown in Table 1. The gauge tolerances, W_{GO}, shall be in accordance with ISO 1502.

6.1.3 Simple pitch diameter indicating thread gauges

The simple pitch diameter indicating gauge with cone and vee rolls or segments or rolls with the best wire size radius allows to ensure that the pitch diameter is greater than the minimum limit. The indicators are set to the GO threaded setting plug gauge. Readings indicate the position of the pitch diameter and the minimum measurement shall be no less than the minimum pitch diameter limit. The minimum measured pitch diameter shall be within the ISO 5855-1 form variation limit compared to the virtual pitch diameter measurement in accordance with the differential value given in 6.1.1.

The simple pitch diameter contacts have cone and vee rolls or segments which contact the product pitch cylinder. Other designs have two or three rolls with radii on annular ribs on rolls made to best

wire size. The product thread contacts is restricted to 1,5 pitch lengths. See Figures 2 and 3 for design and contact form.

6.1.4 Major diameter gauges

The maximum limit of the major diameter may be checked with a plain ring gauge, a plain GO calliper, or plain diameter measuring device (see Figure 4). The minimum limit of the major diameter shall be measured with a plain diameter measuring device set to a plain diameter plug with H_P tolerance in accordance with ISO 1502. Plain micrometer calliper may be used to measure the major diameter and may have standard gauge block settings.

6.1.5 Minor diameter gauges

It shall be set to the plain minor diameter setting plug with H_P tolerance, in accordance with ISO 1502. See Figure 5 for design and contact form.

6.1.6 Optical comparator checks

The optical comparator shall be used to verify the root radius by comparing the shadow contour to the radius charts. The minor diameter may also be measured with an optical comparator using appropriate measuring techniques.

6.2 Gauging for internal threads

6.2.1 GO screw plug gauges

To ensure ease of assembly of threads and conformance to the maximum material virtual pitch and major diameter limits, GO screw plug gauges specified in ISO 1502 or the full form GO screw plug gauge in accordance with the details described in 6.2.3.2 shall be used.

6.2.2 NOT GO screw plug gauges

To check that the minimum virtual pitch diameter is not greater than the maximum limit, NOT GO screw plug gauges specified in ISO 1502 shall be used.

6.2.3 Minor diameter gauges

6.2.3.1 The minimum minor diameter may be evaluated by a plain cylindrical GO plug gauge per ISO 1502 or a GO full form screw plug gauge in accordance with the details described in 6.2.3.2. The maximum minor diameter may be checked with a plain cylindrical NOT GO plug per ISO 1502. The diameters of the plain plugs shall be based on the minimum minor diameter specified in ISO 5855-1, ISO 5855-2, or ISO 5855-3 with gauge tolerance, H_1, specified in ISO 1502. Internal micrometer callipers may be used to measure the minor diameter.

6.2.3.2 The GO full form screw plug gauge shall be a modified GO screw plug gauge specified in ISO 1502 with a controlled root radius on the gauge, see Figure 6, equal to the maximum external thread root radius specified in ISO 5855-1, ISO 5855-2, or ISO 5855-3 with a radius tolerance in accordance with the values given in Table 2.

6.2.4 Virtual pitch diameter indicating thread gauges

6.2.4.1 It measures, on two or three segments or rolls, the maximum material virtual pitch diameter taking into account variations of form such as pitch variation, helix and flank variations, roundness, and taper which produces a decrease in the virtual pitch diameter. The virtual pitch diameter shall be measured using indicating gauges to calculate the virtual-minus-simple pitch-diameter differential

