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Aerospace — 'P' (loop style) clamps — Procurement specification

Aéronautique et espace — Colliers en 'P' (en boucle) — Spécification d'approvisionnement

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

Foreword ... iv

Introduction ... v

1 Scope ... 1

2 Normative references ... 1

3 Terms and definitions ... 1

4 Requirements ... 2
4.1 Qualification ... 2
4.2 Materials ... 3
4.3 Configuration ... 3
4.4 Dimensional requirements ... 3
4.5 Mass ... 3
4.6 Surface appearance ... 3
4.7 Surface treatment ... 3
4.8 Marking ... 3
4.9 Vibration and transmissibility ... 3
4.10 Retention ... 3
4.11 Titanium compatibility ... 4
4.12 Flame resistance ... 4
4.13 Ozone resistance ... 4
4.14 Ultraviolet resistance ... 4
4.15 Insulation properties ... 4

5 Quality assurance ... 4
5.1 Responsibility for inspection ... 4
5.2 Classification of inspection ... 4
5.3 Qualification inspection ... 4
5.4 Acceptance inspection ... 7

6 Packaging ... 7

7 Certification ... 7

Annex A (normative) **Equivalent national qualification procedure** ... 8

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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12319 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 10, *Aerospace fluid systems and components*.

Introduction

This International Standard establishes the basic performance and quality requirements for ‘P’ (loop style) clamps for use in aerospace fluid systems.

The procurement requirements are intended to ensure that clamps which are procured in accordance with this specification are of the same quality as the clamps used during the original qualification testing. Compliance with these test and procurement requirements is necessary for clamps that are used in fluid systems where a malfunction would affect the safety of flight.

Aerospace — 'P' (loop style) clamps — Procurement specification

1 Scope

This International Standard specifies the requirements for the procurement and quality assurance of 'P' (loop style) clamps used in the installation of aerospace fluid systems.

2 Normative references

The following referenced documents are indispensable for the application 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 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 2951, *Vulcanized rubber — Determination of insulation resistance*

ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 9679, *Aerospace — Clamps for fluid systems — Test methods*

EN 9100, *Aerospace series — Quality management systems — Requirements (based on ISO 9001:2000) and quality systems — Model for quality assurance in design, development, production, installation and servicing (based on ISO 9001:1994)*

EN 9133, *Aerospace series — Quality management systems — Qualification procedure for aerospace standard parts*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
inspection lot
clamps from a single production batch having the same number of definition document

3.2
definition document
document specifying directly all the requirements for clamps

NOTE The definition document may be an International Standard, an in-house standard or a drawing.

3.3
acceptance quality level
AQL
maximum percent defective (or the maximum number of defects per hundred units) that, for the purpose of sampling inspection, can be considered satisfactory as a process average

NOTE It can also be the quality level which in a sampling plan corresponds to a specified but relatively high probability of acceptance.

3.4
burr
raised sharp edge, frequently with a wane on the opposite side

[ISO 8785:1998]

3.5
foreign material
extraneous matter on the surface of the clamp or in the surface of the cushion

EXAMPLES Contamination, dirt, slivers.

3.6
simple random sampling
sampling of n items from a population of N items in such a way that all possible combinations of n items have the same probability of being chosen

3.7
major defect
defect, other than critical, that is likely to result in a failure or to reduce materially the usability of the considered product for its intended purpose

3.8
minor defect
defect that is not likely to reduce materially the usability of the considered product for its intended purpose, or that represents a departure from established specification having little bearing on the effective use or operation of this product

4 Requirements

4.1 Qualification

4.1.1 General

Clamps supplied in accordance with this International Standard shall be representative of products which have been subjected to and which have successfully passed the requirements and tests specified in this International Standard.

4.1.2 Manufacturer qualification

Manufacturer approval shall be granted by outside agency procedure (see Table A.1, Procedure 1).

4.1.3 Product qualification

Product approval shall be granted by outside agency procedure (see Table A.1, Procedure 2).

4.2 Materials

The clamp materials shall be as described in the definition document.

4.3 Configuration

The clamps shall be installed on a mandrel having a diameter within ± 0,025 mm of the specified diameter. With a shim placed between the clamp feet, as specified in the part standard, having the same dimensions ± 0,025 mm thick, all dimensions shall be within those specified in the part standard. Mounting hole alignment shall be within 0,254 mm.

4.4 Dimensional requirements

The clamp dimensional requirements shall be as described in the definition document.

4.5 Mass

The clamp masses shall be as described in the definition document.

4.6 Surface appearance

Workmanship shall be of a sufficiently high grade to ensure that the clamps are of uniform quality, free from burrs, slivers, sharp edges or other defects which would affect their services.

4.7 Surface treatment

The clamp surface treatment shall be as described in the definition document.

4.8 Marking

Verify that each clamp is identified according to the part standard with the standard number, size and manufacturer's name or trademark.

4.9 Vibration and transmissibility

When the clamps are tested in accordance with ISO 9679, they shall not exhibit any evidence of deterioration of the sheathing or cushion, nor cracking or separation of metal components, and shall maintain minimum retention values.

4.10 Retention

When the clamps are tested in accordance with ISO 9679, the minimum retention values shall be according to Table 1.

Table 1 — Minimum retention values

	Tube diameter	Minimum axial force kg
Fixed type clamps	12 mm (0,5 in)	7,0
	19 mm (0,75 in)	12,0
	25 mm (1 in)	16,0
Sliding type clamps	If the device is required to permit tube movement, a force of between 0,46 kg and 4,5 kg should be recorded.	

4.11 Titanium compatibility

When the clamps are tested in accordance with ISO 9679, there shall be no evidence of cracking, pitting or abrasion of the titanium tube when clamps are subject to this requirement.

4.12 Flame resistance

For non-metallic clamps using non-metallic components, ISO 9679 applies.

4.13 Ozone resistance

Ozone resistance is required for clamps utilizing elastomer sheathing or cushion (except EPDM elastomer due to its inherent ozone-resistant properties). When the clamps are tested in accordance with ISO 9679, they shall be resistant to a volume fraction of ozone of 6×10^{-6} under an 80 % strain.

4.14 Ultraviolet resistance

If required, determine resistance to ultraviolet attack of non-metallics, such as some plastics and elastomers, in accordance with ISO 4892-3.

4.15 Insulation properties

If required, determine the electrical insulation properties of the electrical sheathing or cushion in accordance with ISO 2951.

5 Quality assurance

5.1 Responsibility for inspection

Unless otherwise specified in the contract, or purchase order, the contractor is responsible for the performance of all inspection requirements as specified in this International Standard.

5.2 Classification of inspection

The examining and testing of clamps shall be classified as follows:

— qualification inspection (see 5.3);

— acceptance inspection (see 5.4).

5.3 Qualification inspection

5.3.1 Samples

See Table 2.

Unless otherwise specified by the test specification, samples for qualification testing shall consist of 12 clamps each per part standard of the following sizes.

— Metric sizes: 06, 10, 14, 16, 20, 28, 32 and 38

— Inch sizes: -4, -6, -8, -10, -12, -16, -24 and -32.

Table 2 — Qualification test sequence and number of test specimens in sample

Characteristic	Defined in	Clamp sample number												Remarks
		1	2	3	4	5	6	7	8	9	10	11	12	
Configuration	4.3	×	×	×	×	×	×	×	×	×	×	×	×	
Dimensions	4.4	×	×	×	×	×	×	×	×	×	×	×	×	
Mass	4.5	×	×	×	×	×	×	×	×	×	×	×	×	
Surface appearance	4.6	×	×	×	×	×	×	×	×	×	×	×	×	
Surface treatment	4.7	×	×	×	×	×	×	×	×	×	×	×	×	
Marking	4.8	×	×	×	×	×	×	×	×	×	×	×	×	
Vibration and transmissibility	4.9	×	×	×										For tube diameters 12 mm (0,5 in), 19 mm (0,75 in), 25 mm (1 in) only
Retention	4.10	×	×	×										For tube diameters 12 mm (0,5 in), 19 mm (0,75 in), 25 mm (1 in) only
Titanium compatibility	4.11	×	×	×	×	×								For tube diameter 25 mm (1 in) only
Flame resistance	4.12	×	×	×	×	×	×	×	×	×	×	×	×	
Ozone resistance	4.13	×	×	×	×	×	×	×	×	×	×	×	×	
Ultraviolet resistance (if required)	4.14	×	×	×	×	×	×	×	×	×	×	×	×	
Insulation properties (if required)	4.15	×	×	×	×	×	×	×	×	×	×	×	×	

5.3.2 Retention of qualification

To retain qualification, the contractor shall forward samples for testing at intervals of not more than two years. The qualifying activity shall establish the initial reporting date. The qualifying activity shall specify who will perform the following tests:

a) examination of the product in accordance with 4.3 to 4.15;

b) physical properties test in accordance with the applicable material specification;

c) vibration and transmissibility test in accordance with 4.9.

5.3.3 Sampling

A simple random sampling shall be selected from each inspection lot in accordance with ISO 2859-1. The inspection level and acceptance quality level (AQL) shall be as specified in Table 3. Cushion-material test specimens, if applicable, shall be cut from clamp cushions and shall be of sufficient size to be tested in accordance with the test methods of the applicable material specification sheet. Tensile and elongation cushion-material test specimens may be cut from larger size clamp cushions of the same inspection lot and shall be provided by the manufacturer.

Table 3 — Classification of defects

Class of defect	AQL	Nonconformity on
Clamp cushion		
Major	1,0	— material thickness — inside width — colour
Minor A	4,0	— workmanship — marking
Clamp band		
Major	1,0	— material thickness — width
Minor A	A	— bolt hole diameter — workmanship — marking
Clamp assembly		
Major	1,0	— loop diameter [a], d_1 — position tolerance from d_1 to d_2 [b]
Minor	4,0	— workmanship — marking
[a] Nominal diameter for which a clamp is intended for use. [b] d_2 is the mounting hole diameter.		

5.3.4 Identification of samples

Samples of each size shall be packaged separately and forwarded to the testing facility specified by the qualifying agency. Samples shall be clearly identified by securely attached durable tags marked with the following information:

— the text “sample for qualification test”;

— specification “ISO XXXX”;

— the text “CLAMP, LOOP”;

— part standard sheet part number;

— manufacturer’s part number;

— name of manufacturer;

— the text “submitted (date) under authorization”.

5.3.5 Test report

The contractor shall provide the agency responsible for qualification with a certified test report, in duplicate, showing quantitative results for tests required by this International Standard. This report shall designate the part number of the clamps submitted. The report shall also include the manufacturer’s drawing specifying the dimensions of the clamp in both the open and closed positions and the manufacturer of the cushion material, if applicable.