INTERNATIONAL STANDARD

ISO 7169

Fourth edition
2007-02-01

Aerospace — Separable tube fittings for fluid systems, for 24° cones, for pressures up to 3 000 psi or 21 000 kPa — Procurement specification, inch/metric

Aéronautique et espace — Raccordements séparables de tubes à cône de 24° pour circuits de fluides jusqu'à 3 000 psi ou 21 000 kPa — Spécification d'approvisionnement, inch/métrique

Reference number
ISO 7169:2007(E)

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Published in Switzerland

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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 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 7169 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 10, *Aerospace fluid systems and components*.

This fourth edition cancels and replaces the third edition (ISO 7169:1998), which has been technically revised. Criteria for imperial dimension (inch-based) tube fittings, as used for commercial aviation, have been introduced.

Introduction

This International Standard establishes the basic performance and quality criteria for screw-together tube fitting assemblies and port connectors used in aerospace fluid systems.

The test requirements are intended to satisfy the most strenuous demands encountered in a high-performance aircraft hydraulic system. The procurement requirements are intended to ensure that fittings, which are procured in accordance with this specification, are of the same quality as the fittings used during the original qualification testing. Compliance with these test and procurement requirements is necessary for fittings that are used in control systems where a malfunction would affect the safety of flight.

Aerospace — Separable tube fittings for fluid systems, for 24° cones, for pressures up to 3 000 psi or 21 000 kPa — Procurement specification, inch/metric

1 Scope

This International Standard specifies performance and quality requirements for the qualification and manufacture of standard 24° cone fittings and manufacture of 24° cone fittings to ensure reliable performance or equivalent inch-dimensioned fitting ends to ensure reliable performance in aircraft hydraulic systems.

This International Standard specifies baseline criteria for the design and manufacture of system fittings that are qualification-tested on engines.

This International Standard covers fittings of the temperature types and pressure classes specified in ISO 6771.

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 3161, *Aerospace — UNJ threads — General requirements and limit dimensions*

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

ISO 6771, *Aerospace — Fluid systems and components — Pressure and temperature classifications*

ISO 6772, *Aerospace — Fluid systems — Impulse testing of hydraulic hose, tubing, and fitting assemblies*

ISO 7257, *Aircraft — Hydraulic tubing joints and fittings — Rotary flexure test*

ISO 8574:1990, *Aerospace — Hydraulic system tubing — Qualification tests*

ISO 9538, *Aerospace — Hydraulic tubing joints and fittings — Planar flexure test*

ISO 10583:1993, *Aerospace fluid systems — Test methods for tube/fitting assemblies*

3 Classification

Fittings furnished under this International Standard shall be classified as follows:

Type A — 3 000 psi (20 684 kPa) Pressure System

Type B — 21 000 kPa (3046 psi) Pressure System

When no classification is specified Type B shall apply.

4 Requirements

4.1 Qualification

Fittings claiming conformity with this International Standard shall be representative of products which have successfully met the requirements and have passed the tests in this International Standard.

4.1.1 Manufacturer qualification

Manufacturer approval shall be granted by an outside agency procedure (see Annex A, Table A.2, procedure No. 1).

4.1.2 Product qualification

Product approval shall be granted by an outside agency procedure (see Annex A, Table A.2, procedure No. 2).

4.2 Materials

4.2.1 Fittings

The fitting parts shall be manufactured from materials as given in Table 1 or equivalents passing the specified tests. The various materials shall be used according to the pressure and temperature requirements of the system, as shown in Tables 2 to 5.

4.2.2 Tubing

The tubing used with the fittings shall be in accordance with the relevant specification or equivalent tubing passing the specified qualification tests.

Table 1 — Materials for fittings

Part	Material	Type [a]	Material code [b]	Starting stock	Material No. [c]
Straight fittings and nuts	Aluminium alloy	I	D [d]	Bar, rod	1
			W		2
Shape fittings	Aluminium alloy	I	D [d]	Bar and forgings	3
			W		2
Straight and shape fittings	Carbon steel	II	F [f]	Bar, rod, forgings	4
	Corrosion-resistant steel	I, II, III	J	Bar and forgings	5
		I, II, III	K		7
		I, II, III, IV	R		6
		I, II, III I, II, II, IV	P V		11 11
	Titanium alloy	I, II, III	T	Bar and forgings	8
Sleeves (bite type)	Carbon steel	II	F [e]	Bar	9
Sleeves (swaged, brazed)	Corrosion-resistant steel	I, II, II I, II, II, IV	P V	Bar	11 11
Sleeves (welded)	Corrosion-resistant steel	I, II, III, IV	V	Bar	11
	Titanium alloy	I, II, III, IV	T		8

[a] Temperature types and system pressure classes are defined in ISO 6771.
[b] See Table 7.
[c] See also Annex A, Table A.1.
[d] Inactive for new design, superseded by W.
[e] Inactive for new design, no replacement.
[f] Inactive for new design, superseded by V.

Table 2 — Test requirements, 3 000 psi steel or titanium fittings on steel or titanium tubing

Fitting and tube		Nominal pressure		Proof pressure		Burst pressure		Flexure test, bending stress 0 % to 10 %	
Metric	Inch								
Size [a]	Size [a]	kPa	(psi)	kPa	(psi)	kPa	(psi)	kPa	(psi)
—	–02	20 684	(3 000)	41 368	(6 000)	82 740	(12 000)	135 000	(20 000)
DN05	–03								
DN06	–04								
DN08	–05								
DN10	–06								
DN12	–08								
DN14	—								
DN16	–10								
DN20	–12							108 000	(16 000)
DN25	–16								
DN32	–20								
DN40	–24							108 000 [b]	(16 000 [b])
—	–32								

[a] Dash size in 1/16 in, example: –05 = 5/16 in diameter; DN size in millimetres, example: DN05: 5 mm.

[b] No data available to support this value.

Table 3 — Test requirements, 21 000 kPa steel or titanium fittings on steel or titanium tubing

Fitting and tube		Nominal pressure		Proof pressure		Burst pressure		Flexure test, bending stress 0 % to 10 %	
Metric	Inch								
Size [a]	Size [a]	kPa	(psi)	kPa	(psi)	kPa	(psi)	kPa	(psi)
—	–02	21 000	(3 046)	42 000	(6 091)	84 000	(12 183)	135 000	(20 000)
DN05	–03								
DN06	–04								
DN08	–05								
DN10	–06								
DN12	–08								
DN14	—								
DN16	–10								
DN20	–12							108 000	(16 000)
DN25	–16								
DN32	–20								
DN40	–24							108 000 [b]	(16 000 [b])
—	–32								

[a] Dash size in 1/16 in, example: –05 = 5/16 in diameter; DN size in millimetres, example: DN05: 5 mm.

[b] No data available to support this value.

Table 4 — Test requirements, return line aluminium fittings, up to 1 500 psi, on aluminium

Fitting and tube		Nominal pressure		Proof pressure		Burst pressure		Flexure test, bending stress 0 % to 10 %	
Metric	Inch								
Size [a]	Size [a]	kPa	(psi)	kPa	(psi)	kPa	(psi)	kPa	(psi)
—	–02	10 342	(1 500)	20 684	(3 000)	41 368	(6 000)	41 368	(6 000)
DN05	–03								
DN06	–04								
DN08	–05								
DN10	–06								
DN12	–08							37 922	(5 500)
DN14	—								
DN16	–10	6 845	(1 000)	13 790	(2 000)	27 579	(4 000)		
DN20	–12	6 206	(900)	12 411	(1 800)	24 824	(3 600)	34 474	(5 000)
DN25	–16							27 579	(4 000)
DN32	–20	4 137	(600)	8 274	(1 200)	16 548	(2 400)		
DN40	–24							27 579 [b]	(4 000 [b])
—	–32								

[a] Dash size in 1/16 in, example: –05 = 5/16 in diameter; DN size in millimetres, example: DN05: 5 mm.
[b] No data available to support this value.

Table 5 — Test requirements, return line aluminium fittings, 10 500 kPa, on aluminium tubing

Fitting and tube		Nominal pressure		Proof pressure		Burst pressure		Flexure test, bending stress 0 % to 10 %	
Metric	Inch								
Size [a]	Size [a]	kPa	(psi)	kPa	(psi)	kPa	(psi)	kPa	(psi)
—	–02	10 500	(1 522)	21 000	(3 046)	42 000	(6 091)	41 368	(6 000)
DN05	–03								
DN06	–04								
DN08	–05								
DN10	–06								
DN12	–08							37 922	(5 500)
DN14	—								
DN16	–10								
DN20	–12							34 474	(5 000)
DN25	–16							27 579	(4 000)
DN32	–20								
DN40	–24							27 579 [b]	(4 000 [b])
—	–32								

[a] Dash size in 1/16 in, example: –05 = 5/16 in diameter; DN size in millimetres, example: DN05: 5 mm.
[b] No data available to support this value.

4.3 Design and manufacture

4.3.1 Threads

All threads shall be in accordance with ISO 3161 for inch-size tube fittings, and with ISO 5855-3 for SI-metric tube fittings.

Threads may be cut, rolled or, except for titanium, ground. The external threads of fittings should be rolled and, if machined, shall have an arithmetical mean deviation, R_a, of the profile of 3,2 µm (0,125 µin) or smoother.

Rolled threads shall be free of laps, cracks, surface irregularities and seams on any part of the pressure thread flank, in the thread-root, or on the non-pressure thread flank. Laps and seams whose depths are within the limits of Table 6 are acceptable on the crest and the non-pressure thread flank above the pitch diameter.

Table 6 — Maximum depth of laps, seams and surface irregularities in rolled threads

Fitting size		Depth	
Metric	Inch		
Size	Size [a]	mm	(in)
—	–02	0,15	(0,006)
DN05	–03	0,15	(0,006)
DN06	–04	0,18	(0,007)
DN08	–05	0,18	(0,007)
DN10	–06	0,20	(0,008)
DN12	–08	0,22	(0,009)
DN14	—	0,25	(0,01)
DN16	–10	0,25	(0,01)
DN20	–12	0,25	(0,01)
DN25	–20	0,25	(0,01)
DN32	–16	0,25	(0,01)
DN40	–24	0,25	(0,01)
—	–32	0,25	(0,01)

[a] Dash size in 1/16 in, example: –05 = 5/16 in diameter; DN size in millimetres, example: DN05 = 5 mm.

4.3.2 Fluid passages

On fittings where the fluid passage is drilled from each end, the offset between the drilled holes at the meeting point shall not exceed 0,4 mm (0,015 in). It shall be possible to pass through the fitting passage a ball whose diameter is 0,5 mm (0,020 in) less than the minimum diameter specified for the passage.

4.4 Surface protection and colour identification

4.4.1 Surface protection

The surfaces of fitting parts shall be protected in the following manner.

a) Aluminium alloy fittings: by sulfuric acid anodizing, then dyeing and dichromate or nickel acetate sealing (process No. 18 in Table A.1).

b) Carbon steel fittings and sleeves: by cadmium plating 0,007 mm to 0,012 mm (0,000 30 in to 0,000 50 in) thick, followed by a chromate post-plate treatment (process No. 19 in Table A.1).

Note Cadmium plating is not to be used in new designs.