

BS ISO 10502:2012



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Aerospace — Hose assemblies in polytetrafluoroethylene (PTFE) for use up to 232 °C and 10 500 kPa — Technical specifications and requirements

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National foreword

This British Standard is the UK implementation of ISO 10502:2012.

The UK participation in its preparation was entrusted to Technical Committee ACE/69, Aerospace hydraulic systems, fluids and components.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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**Aerospace — Hose assemblies in
polytetrafluoroethylene (PTFE) for use
up to 232 °C and 10 500 kPa — Technical
specifications and requirements**

*Aéronautique et espace — Tuyauteries flexibles en
polytétrafluoroéthylène (PTFE), pour utilisation jusqu'à 232 °C et
10 500 kPa — Spécifications techniques et exigences*





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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 10502 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 10, *Aerospace fluid systems and components*.

This second edition cancels and replaces the first edition (ISO 10502:1992), which has been technically revised as follows:

- a) requirements have been aligned to ISO 8829-1;
- b) units in inches have been added;
- c) in 3.4.1, the requirement relating to relative density has been updated;
- d) in 3.7, length tolerances have been added;
- e) in 3.9.3, a requirement has been added to include as a permanent marking on the hose assembly the fire resistance type according to ISO 2685;
- f) Annex A, dealing with equivalent materials and components, has been updated.

Aerospace — Hose assemblies in polytetrafluoroethylene (PTFE) for use up to 232 °C and 10 500 kPa — Technical specifications and requirements

1 Scope

This International Standard specifies requirements for polytetrafluoroethylene (PTFE) hose assemblies for use in aircraft hydraulic, fuel and lubricating oil systems at temperatures between –55 °C (–67 °F) and 232 °C (450 °F) for Class I assemblies and between –55 °C (–67 °F) and 135 °C (275 °F) for Class II assemblies, and at nominal pressures up to 10 500 kPa (1 523 psi) (105 bar¹⁾). The hose assemblies are also suitable for use within the same temperature and pressure limitations in aerospace pneumatic systems where some gaseous diffusion through the wall of the PTFE liner is tolerated.

This International Standard covers hose assemblies of the following classes:

- class I: hose assemblies with fitting of corrosion-resistant steel or titanium parts [232 °C (450 °F)];
- class II: hose assemblies with fitting of corrosion-resistant steel and aluminium parts [135 °C (275 °F)], DN12 and larger.

The hose assemblies specified in this International Standard are not intended for use in pneumatic storage systems. In addition, it is intended that installations in which the limits specified in this International Standard are exceeded, or in which the application is not covered specifically by this International Standard, for example for oxygen, be subject to the approval of the purchaser.

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 2685, *Aircraft — Environmental test procedure for airborne equipment — Resistance to fire in designated fire zones*

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

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

ISO 7258, *Polytetrafluoroethylene (PTFE) tubing for aerospace applications — Methods for the determination of the density and relative density*

ISO 8829-1:2009, *Aerospace — Test methods for polytetrafluoroethylene (PTFE) inner-tube hose assemblies — Part 1: Metallic (stainless steel) braid*

1) 1 bar = 100 kPa.

3 Requirements

3.1 Qualification

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

3.2 Materials

3.2.1 General

The hose assemblies shall be uniform in quality and free from defects in material as is consistent with good manufacturing practice. They shall conform to the applicable specifications and requirements of this International Standard.

3.2.2 Metals

Corrosion-resistant steel shall be used for the hose; fittings shall be of corrosion-resistant steel, titanium, or aluminium alloy suitably treated to resist corrosion when in storage or during normal service use. Metals shall conform to the applicable specifications given in Table 1 (or equivalent specifications; see Annex A).

Table 1 — Metals for use in hose assemblies

Form	Metal	Material No. (see Annex A)
Bars and forgings	Austenitic, annealed or as-rolled, corrosion-resistant steel	1
	Austenitic, annealed or as-rolled, heat-stabilized, corrosion-resistant steel	2 and 3
	Precipitation-hardening, corrosion-resistant steel; solution heat treated and in artificially aged condition	4, 5 and 6
	Titanium 6Al-4V	7 and 23
	Aluminium alloy 2014	17
	Aluminium alloy 2024	18
	Aluminium alloy 6061	19 and 20
Tubing	Austenitic, seamless or welded, annealed, corrosion-resistant steel	8
	Austenitic, seamless or welded, stabilized, corrosion-resistant steel	9 and 10
	Titanium 3Al-2,5V	11
	Titanium T40	24
	Aluminium alloy 5052	21
	Aluminium alloy 6061	22
Wire	Austenitic, cold-drawn, corrosion-resistant steel	12, 13 and 14

3.3 Construction

3.3.1 General

The hose assembly shall consist of

- a seamless PTFE inner tube (see 3.3.2),
- corrosion-resistant steel-wire reinforcement (see 3.3.3), and
- aluminium, corrosion-resistant steel or titanium end-fittings (see 3.3.4),

as required to meet the construction and performance requirements of this International Standard and as required for its intended use.

3.3.2 Inner tube

The inner tube shall be of a seamless construction of virgin PTFE resin of uniform gauge; it shall have a smooth bore and shall be free from pitting or projections on the inner surface. Additives may be included in the compound from which the tube is extruded.

3.3.3 Reinforcement

The reinforcement shall consist of corrosion-resistant steel wires conforming to the applicable specifications given in 3.2.2. The wires shall be arranged on the outside surface of the inner tube so as to provide sufficient strength to ensure compliance with the requirements of this International Standard.

Broken or missing reinforcing wires or buckled wires more than 1,5 mm (0.06 in) above the outside diameter surface shall be cause for rejection. Crossed-over reinforcing wires need not be cause for rejection of the hose assembly.

3.3.4 Fittings

3.3.4.1 General

It shall be proven that all fittings comply with the requirements of this International Standard. The hose attachment fitting may be of a permanent or of a reusable design.

Unless otherwise specified by the purchaser, the hose assembly end fittings shall have 24° cone fittings.

3.3.4.2 Insert fittings

Insert fittings shall be manufactured in one piece wherever possible. Those constructed of more than one piece shall have either welded joints using butt-weld or lap-weld design, or braze joints using lap-braze design, fabricated from annealed corrosion-resistant steel, titanium or aluminium alloy tubing. Welded and redrawn tubing (materials No. 8 and No. 9; see Annex A) may be used for corrosion-resistant steel.

3.4 Inner tube requirements

3.4.1 Density and relative density

The relative density of the hose inner tube shall not exceed 2,210 g/cm³ (0.079 8 lb/in³) when tested in accordance with ISO 7258, either method A or method B (as specified in ISO 8829-1). The density shall not exceed 2,155 g/cm³ (0.077 9 lb/in³) when tested in accordance with ISO 7258, method C (as specified in ISO 8829-1).

3.4.2 Tensile strength

When tested in accordance with ISO 8829-1:2009, 4.2, the longitudinal tensile strength for all sizes of tubes shall be at least 15,1 N/mm² (2 190 psi)²⁾.

When tested in accordance with ISO 8829-1, the transverse tensile strength for sizes DN16 and larger shall be at least 12,4 N/mm² (1 798 psi); for sizes under DN16, the transverse strength need not be tested.

3.4.3 Elongation

When tested in accordance with ISO 8829-1, the elongation shall be at least 200 %.

2) 1 N/mm² = 1 MPa.