

**Aramid reinforced
lightweight
polytetrafluoroethylene
(PTFE) hose
assemblies,
classification
135 °C/20 684 kPa
(275 °F/3 000 psi)
and 135 °C/21 000 kPa
(275 °F/3 046 psi) —
Procurement
specification**

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National foreword

This British Standard reproduces verbatim ISO 23933:2006 and implements it as the UK national standard.

The UK participation in its preparation was entrusted to Technical Committee ACE/69, Aerospace hydraulic systems, fluids and components, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

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INTERNATIONAL STANDARD

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polytétrafluoroéthylène (PTFE) renforcement aramide, série légère,
classification 135 °C/20 684 kPa (275 °F/3 000 psi) et
135 °C/21 000 kPa (275 °F/3 046 psi) — Spécification
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Documents

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Contents

Page

Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Classification.....	2
4 Requirements	2
4.1 Limits of application	2
4.2 Qualification	2
4.3 Materials	2
4.4 Construction.....	3
4.5 Inner tube requirements.....	4
4.6 Hose assembly	5
4.7 Fitting threads	6
4.8 Part numbering of interchangeable parts	7
4.9 Identification of products.....	7
4.10 Workmanship	7
4.11 Hose assembly — Test and performance requirements	8
5 Quality assurance.....	12
5.1 Responsibility for inspection	12
5.2 Classification of inspections	12
5.3 Qualification inspections	12
5.4 Quality conformance inspections.....	15
5.5 Test conditions	16
5.6 Inspection methods	17
6 Preparation for delivery	18
6.1 Storage and packaging	18
6.2 Marking	18
7 Ordering data	18
Annex A (informative) Equivalent materials	19
Annex B (informative) Qualification procedures and fire resistance specifications	21
Bibliography	22

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 23933 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 10, *Aerospace fluid systems and components*.

Aerospace — Aramid reinforced lightweight polytetrafluoroethylene (PTFE) hose assemblies, classification 135 °C/20 684 kPa (275 °F/3 000 psi) and 135 °C/21 000 kPa (275 °F/3 046 psi) — Procurement specification

1 Scope

This International Standard specifies requirements for aramid reinforced lightweight polytetrafluoroethylene (PTFE) hose assemblies for use in aircraft hydraulic, oil and fuel systems at temperatures between – 55 °C and 135 °C (– 65 °F and 275 °F) and at a nominal pressure of 21 000 kPa (210 bar) (3 046 psi) or 20 684 kPa (3 000 psi). The hose assemblies are also suitable for use within the same temperature and pressure limitations in aircraft pneumatic systems where some gaseous diffusion through the wall of the PTFE liner may be tolerated.

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 2685:1998, *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 3161:1999, *Aerospace — UNJ threads — General requirements and limit dimensions*

ISO 5855-3:1990, *Aerospace — MJ threads — Part 3: Limit dimensions for fittings for fluid systems*

ISO 6772:1988, *Aerospace — Fluid systems — Impulse testing of hydraulic hose, tubing and fitting assemblies*

ISO 7258:1984, *Polytetrafluoroethylene (PTFE) tubing for aerospace applications — Methods for the determination of the density and relative density*

ISO 8829-2, *Aerospace — Test methods for polytetrafluoroethylene (PTFE) innertube hose assemblies — Part 2: Non-metallic braid*

SAE AS 150, *Hose assembly, type classifications of, basic performance and fire resistance*

SAE AS 1055, *Fire testing of flexible hose, tube assemblies, coils, fittings and similar system components*

SAE AS 1241, *Fire resistant phosphate ester hydraulic fluid for aircraft*

3 Classification

Hose assemblies furnished under this International Standard shall be classified as follows:

- Type A: 20 684 kPa (3 000 psi) nominal pressure;
- Type B: 21 000 kPa (210 bar) (3 046 psi) nominal pressure.

When no classification is specified by reference to this standard, type B shall apply.

4 Requirements

4.1 Limits of application

The use of these hose assemblies in high-pressure pneumatic storage systems is not recommended. In addition, 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, shall be subject to the approval of the purchaser.

4.2 Qualification

4.2.1 General

Hose assemblies 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.

4.2.2 Manufacturer qualification

Manufacturer approval shall be granted by outside agency procedure (see Table B.1, Procedure no. 1).

4.2.3 Product qualification

Product approval shall be granted by outside agency procedure (see Table B.1, Procedure no. 2).

4.3 Materials

4.3.1 General

The hose assembly materials shall be as described in this International Standard. All materials not specifically described in this International Standard shall be of the highest quality and suitable for the purpose intended.

4.3.2 Metals

Metals used in the fittings shall conform to the applicable specifications described in Table 1 (or equivalent specifications; see Annex A). Welded and redrawn tubing shall not be used. Material no. 1 shall not be used for welded assemblies.

Table 1 — Metals to be used 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, stabilized, corrosion-resistant steel	2 and 3
	Precipitation-hardening, corrosion-resistant steel	4, 5 and 6
	Titanium 6Al-4V	7
Tubing	CPTi	8
	Austenitic, seamless or welded, annealed, corrosion-resistant steel	9
	Austenitic, seamless or welded, stabilized, corrosion-resistant steel	10 and 11
	Cold-worked, stress-relieved titanium alloy	12

4.4 Construction

4.4.1 General

To meet the construction and performance requirements laid down in this International Standard and as required for its intended use, the hose assembly shall consist of:

- a seamless PTFE inner tube (see 4.4.2);
- treated para-aramid reinforcement (see 4.4.3);
- outer cover or braid protection to meet qualification and usability requirements;
- corrosion-resistant steel and/or titanium end-fittings (see 4.4.4).

4.4.2 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 with no more than 3 % of such additives being retained in the mixture.

4.4.3 Reinforcement

The reinforcement shall consist of a treated para-aramid braid and an outer braid or other coverage to protect the para-aramid.

The reinforcement shall be arranged on the outside surface of the inner tube so as to provide sufficient strength to ensure compliance with the requirements laid down in this International Standard. Broken, damaged, slack or missing reinforcement yarn shall be cause for rejection.

The outer cover, or braid, shall provide 100 % coverage to protect the para-aramid reinforcement from exposure to ultraviolet light when bending to minimum radius specified in Table 4.

A continuous lay line which can be interrupted with hose manufacturer's name or trademark, shall be permanently marked in contrasting colour along the hose length.