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Aerospace — Polytetrafluoroethylene (PTFE) hose assemblies, classification 204 °C/28 000 kPa — Procurement specification

Aéronautique et espace — Tuyauteries flexibles en polytétrafluoroéthylène (PTFE), classification 204 °C/28 000 kPa — Spécification d'approvisionnement

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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 9938:1994), which has been technically revised.

The main changes are as follows:

— Clause 2 was updated;

— references in the whole document were updated;

— column "Material No." was added to Table 1;

— NOTE in 4.4.4.1 was deleted;

— Annex A now only contains the equivalent components.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Aerospace — Polytetrafluoroethylene (PTFE) hose assemblies, classification 204 °C/28 000 kPa — Procurement specification

1 Scope

This document specifies requirements for polytetrafluoroethylene (PTFE) hose assemblies for use in aircraft hydraulic systems at temperatures between –55 °C and +204 °C and at a nominal pressure up to 28 000 kPa (280 bar). 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 documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 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*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Requirements

4.1 General

The use of these hose assemblies in high pressure pneumatic storage systems is not recommended. ln addition, installations in which the limits specified in this document are exceeded, or in which the application is not covered specifically by this document, for example for oxygen, shall be subject to the approval of the purchaser.

4.2 Qualification

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

4.3 Materials

4.3.1 General

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

4.3.2 Metals

Metals used in the hose and fittings shall be corrosion-resistant or titanium and shall conform to the applicable specifications described in Table 1.

Table 1 — Metals to be used in hose assemblies

Form	Metal	Material No.
Bars and forgings	Austenitic, annealed or as-rolled, corrosion-resistant steel	AMS 5639 (304)
	Austenitic, annealed or as-rolled, stabilized, corrosion-resistant steel	AMS 5645 (321), AMS 5646 (347)
	Precipitation-hardening, corrosion-resistant steel	AMS 5643 (17-4), AMS 5644, AMS 5743
	Titanium 6Al - 4V	AMS 4928 (6-4)
Tubing	Austenitic, seamless or welded, annealed, corrosion-resistant steel Steel, corrosion-resistant, seamless or welded hydraulic tubing, 19 Cr - 10 Ni, solution heat treated	MIL-T-8504 (304), AMS 5567 (304)
	Austenitic, seamless or welded, stabilized, corrosion-resistant steel Steel, corrosion and heat-resistant, seamless or welded hydraulic tubing, 18,5 Cr - 10,5 Ni - 0,40 Ti, solution heat treated	MIL-T-8808 (321), MIL-T-8808 (321), AMS 5557 (321)
	Cold-worked, stress-relieved titanium alloy	AMS 4945
Wire	Austenitic, cold-drawn, corrosion-resistant steel	AMS 5689, AMS 5690, AMS 5697
	Steel, corrosion-resistant, wire, 18 Cr - 9,0 Ni, spring temper	AMS 5688 (302)

4.4 Construction

4.4.1 General

The hose assembly shall consist of

— a seamless PTFE inner tube (see 4.4.2),

— corrosion-resistant steel-wire reinforcement (see 4.4.3), and

— corrosion-resistant steel and/or titanium end-fittings (see 4.4.4),

as required to meet the construction and performance requirements laid down in this document and as required for its intended use.

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 2 % of such additives being retained in the mixture.

4.4.3 Reinforcement

The reinforcement shall consist of corrosion-resistant steel wire conforming to the applicable specifications given in 4.3.2. The wires shall be arranged on the outside surface of the inner tube so as to provide sufficient strength to ensure conformity to the requirements laid down in this document.

Broken or missing reinforcing wires or buckled wires more than 1,5 mm above the outside diameter surface shall be cause for rejection. Overlapping or crossed-over reinforcing wires shall not be cause for rejection of the flexible hose assembly.

4.4.4 Fittings

4.4.4.1 General

It shall be proven that all fittings conform to the requirements laid down in this document. Unless otherwise specified by the purchaser, the hose assemblies shall have flareless fittings (24° cone coupling).

4.4.4.2 Insert fittings

Insert fittings shall be manufactured in one piece wherever possible. Those made of other than one-piece construction shall be butt-welded, unless otherwise agreed by the purchaser, fabricated from corrosion-resistant steel tubing or titanium. Welded and redrawn tubing (materials No. 8 and No. 9) may be used for corrosion-resistant steel.

4.5 Inner tube requirements

4.5.1 Density and relative density

The relative density of the hose inner tube shall not exceed 2,155, when tested in accordance with ISO 7258, either method A or method B (as specified in ISO 8829-1). The density shall not exceed 2,204 g/cm^3, when tested in accordance with ISO 7258, method C (as specified in ISO 8829-1).

4.5.2 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/mm^2[1)].

When tested in accordance with ISO 8829-1:2009, 4.2, the transverse tensile strength for sizes DN16 and larger shall be at least 12,4 N/mm^2; for sizes under DN16, the transverse strength doesn't need to be tested.

4.5.3 Elongation

When tested in accordance with ISO 8829-1:2009, 4.2, the elongation shall be at least 200 %.

1) 1 N/mm^2 = 1 MPa.

4.5.4 Tube roll

The tube shall not leak, split, burst or show any signs of malfunction, when tested through the sequence as specified in ISO 8829-1:2009, 4.3.2.

4.5.5 Tube proof-pressure

After being subjected to the tube roll test sequence (see 4.5.4), the tube, without reinforcing wires, shall not leak, burst or show any signs of malfunction, when tested as specified in ISO 8829-1:2009, 4.3.3.

4.5.6 Electrical conductivity

When tested in accordance with ISO 8829-1:2009, 4.4, the electrical current shall be equal to or greater than:

a) 10 µA for sizes DN06 to DN12 (inclusive);

b) 20 µA for sizes DN16 and over.

4.6 Hose

4.6.1 Dimensional requirements

The hose assembly dimensions, except for length, shall be as specified in Figure 1 and Table 2.

4.6.2 Physical requirements

Hose assemblies shall conform to the physical and linear density (weight) requirements specified in Table 3.

4.6.3 Bore check

When bent to the appropriate minimum bend radius as specified in Table 3, the hose assembly shall permit the free passage of a solid rigid sphere throughout its length. The diameter of the sphere shall be 90 % of the appropriate minimum internal diameter of the end fittings as specified in Table 2. For elbow fittings, see footnote [a] in Table 2.

4.7 Screw threads

Unless otherwise specified (see 4.4.4), fitting threads shall be in accordance with ISO 5855-3. A 10 % increase in the tolerance of the fitting thread of the nut following proof testing shall not be cause for rejection of the hose assembly.

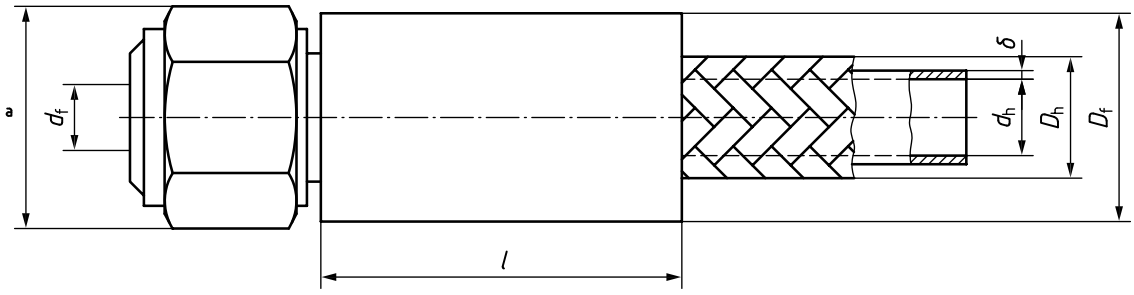
4.8 Part numbering of interchangeable parts

All parts conforming to this document and having the same manufacturers or standard part number shall be functionally and dimensionally interchangeable.

4.9 Identification of products

4.9.1 General

The hose assembly and its component parts shall be permanently marked.



Key

[a] See footnote [b] in Table 2.

Figure 1 — Hose and fitting dimensions

Table 2 — Hose and fitting dimensions (see Figure 1)

Dimensions in millimetres

Hose size (nom.)	Hose (braided)			Fitting		Attachment length	Wall thickness of inner tube
	Inside diameter	Outside diameter		Inside diameter[a]	Outside diameter[b]		
	d_h	D_h		d_f	D_f	l	δ
	min.	min.	max.	min.	max.	max.	min.
DN06	5,4	10,1	12,6	3,4	23	58	0,9
DN10	7,6	14,0	15,8	6,1	26	64	
DN12	9,9	17,0	20,9	8,6	31	70	1
DN16	12,3	21,6	24,6	10,4	36	76	1,1
DN20	15,3	25,1	30,5	12,9	43	83	
DN25	21,6	30,7	38,1	19,3	51	96	

[a] Minimum inside diameter through the elbow area may be 85 % of the values given for d_f.

[b] Width across corners of nut and socket hexagon may exceed the values given for D_f.

Table 3 — Physical requirements of hose assemblies and linear density (weight) of hose

Hose size	Hose weight[a]	Operating pressure	Proof pressure	Burst pressure		Bend radius at inside of bend	Volumetric expansion
				Room temperature	High temperature		
	max.			min.	min.	min.	max.
	kg/m	kPa	kPa	kPa	kPa	mm	ml/m
DN06	0,4	28 000	56 000	112 000	84 000	76	3,2
DN10	0,66					127	4,7
DN12	0,81					146	6,7
DN16	1,25					165	10,8
DN20	1,7					197	14,8
DN25	2,86					245	37

[a] Hose weight shall be determined on a minimum length of 300 mm.

4.9.2 Fittings

The manufacturer's name or trademark shall be permanently marked on one element of all end fittings.

4.9.3 Hose assembly

A permanent marking shall be applied on a fitting or on a permanent band or bands securely attached to the hose. Bands shall be no wider than 25 mm and shall not impair the flexibility or the performance of the hose. Unless otherwise specified, the marking on the fitting or band shall include the following information:

a) the assembly manufacturer's name or trademark, and the number of this document;

b) the complete hose assembly part number;

c) the nominal pressure “28 000 kPa”, as applicable;

d) the operating temperature, “204 °C”, if required;

e) the pressure test symbol, “PT”;

f) the date of hose assembly manufacture, expressed in terms of month and year, or batch number.

4.10 Workmanship

4.10.1 General

Workmanship shall be of such quality as to assure that hose assemblies furnished under this document are free of defects that compromise, limit or reduce performance or intended use.

Hose assemblies shall be free of burrs, scratches, sharp edges, loose components, chips or foreign materials.

4.10.2 Dimensions and tolerances

All pertinent dimensions and tolerances, where interchangeability, operation or performance of the hose assembly may be affected, shall be specified on all drawings.

4.10.3 Cleaning

All hose assemblies shall be free from oil, grease, dirt or other foreign materials, both internally and externally.

4.11 Hose assembly — Test and performance requirements

4.11.1 Proof pressure

When tested in accordance with ISO 8829-1:2009, 5.8, each hose assembly shall withstand the proof pressure specified in Table 3 without malfunction or leakage.

4.11.2 Elongation and contraction

When two test specimens of the sample hose assemblies are tested in accordance with ISO 8829-1:2009, 5.5, there shall be no change in length by more than ±2 % in a 250 mm gauge length.

4.11.3 Volumetric expansion

When two test specimens of the sample hose assemblies are tested in accordance with ISO 8829-1:2009, 5.6, the volumetric expansion shall not exceed the limits specified in Table 3.

4.11.4 Leakage

When two test specimens of the sample hose assemblies are tested in accordance with ISO 8829-1:2009, 5.7, there shall be no leakage.

4.11.5 Thermal shock

4.11.5.1 Preconditioning

Two test specimens of the sample hose assemblies shall be tested: one test specimen shall be air-aged and the other shall be unaged (see 5.5.6).

4.11.5.2 Requirement

When tested in accordance with ISO 8829-1:2009, 5.17, the test specimens shall neither leak nor show any signs of malfunction during the proof pressure phase of the test; during the burst pressure phase of the test, if leakage or signs of malfunction occur below the minimum burst pressure at the high temperature specified in Table 3, the samples shall be deemed to have failed.

4.11.6 Impulse

4.11.6.1 Preconditioning

Six sample hose assemblies having a 90° elbow fitting on one end of the hose and a straight fitting on the other end of the hose shall be tested.

Two test specimens shall be oil-aged, two air-aged, and two unaged (see 5.5.6).

After this initial preconditioning, subject the test specimens at room temperature to the proof pressure specified in Table 3 for at least 5 min. Then pressurize the test specimens to 28 000 kPa. While maintaining this pressure at room temperature, immerse the test specimens in a (35 ± 1) g/l sodium chloride solution — the sodium chloride solution shall contain a dry basis of not more than 0,1 % sodium iodide (mass fraction) and 0,5 % total impurities (mass fraction) — for 8 min to 10 min. Allow to dry in air for the remainder of 1 h. Repeat this subsequent immersion and air-drying process no fewer than 50 times.

4.11.6.2 Requirement

When tested for 100 000 cycles in accordance with ISO 8829-1:2009, 5.10, the sample hose assemblies shall conform to the test requirements without any signs of leakage [see also item h) in Clause 6].

4.11.7 Assembly flexibility

When two test specimens of the sample hose assemblies are flexure-tested in accordance with ISO 8829-1:2009, 5.11, they shall not leak or show any other signs of malfunction. The test specimens shall be mounted in a test setup, shown in Figure 2, having the dimensions specified in Table 4.

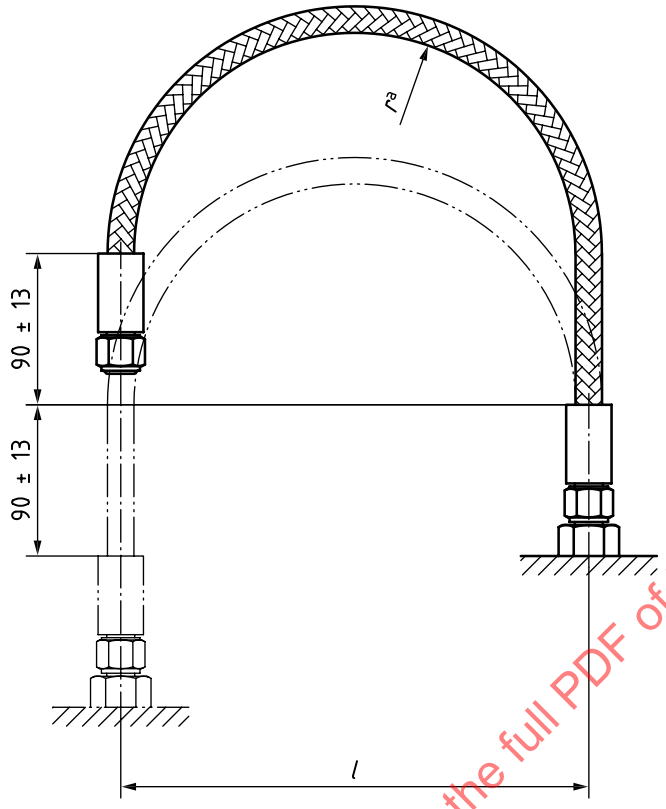
4.11.8 Stress degradation

When two test specimens of the sample hose assemblies are tested in accordance with ISO 8829-1:2009, 5.1, they shall not exceed an average rate of effusion of 80 ml/min per metre of hose length for any size.

4.11.9 Pneumatic surge

When two test specimens of the sample hose assemblies are tested in accordance with ISO 8829-1:2009, 5.16, the inner tubes of the test specimens shall not collapse or show signs of degradation.

Dimensions in millimetres



Key

[a] Inside bend radius.

Figure 2 — Test setup for flexure test

Table 4 — Flexure test dimensions

Dimensions in millimetres

Hose size	*r* ±10 %	*l* (approx.)
DN 06	76	163
DN 10	127	270
DN 12	146	310
DN 16	165	355
DN 20	197	420
DN 25	245	530

4.11.10 Pneumatic effusion

When two test specimens of the sample hose assemblies are tested in accordance with ISO 8829-1:2009, 5.2, they shall not exceed a total rate of effusion of 26 ml per metre of hose length for any size.

4.11.11 Repeated installation

4.11.11.1 Procedure

Two test specimens of the sample hose assemblies shall be tested as follows. Screw end fittings on hose assemblies to appropriate union adaptors eight times using system fluid or an equivalent lubricant.

Each of the eight cycles shall include the complete removal of the hose fitting from the manifold union. Tighten fitting nuts to the torques specified; test one half of the sample to the minimum tightening torque and test the other half to the maximum tightening torque. Following the first, fourth and eighth installation, carry out proof pressure tests in accordance with 4.11.1. Following the eighth installation, pressure-test the hose fittings with air or nitrogen gas for 5 min at the nominal system pressure.

4.11.11.2 Requirement

The assembly end fittings shall show no signs of leakage, galling or other malfunction.

4.11.12 Burst pressure at room temperature

When two test specimens of the sample hose assemblies are tested in accordance with ISO 8829-1:2009, 5.9.3, they shall not leak or burst at any pressure below the burst pressure at the room temperature specified in Table 3.

4.11.13 Electrical conductivity

When one test specimen of the sample hose assembly is tested in accordance with ISO 8829-1:2009, 5.3, the electrical current conducted shall be equal to or greater than:

a) 6 µA for sizes DN06 to DN12 (inclusive);

b) 12 µA for sizes DN16 and over.

4.11.14 Fire resistance

4.11.14.1 General

If the hose assemblies are required to withstand a specified resistance to fire, two test specimens of the sample hose assemblies, which may be fitted with fire sleeves, shall be tested in accordance with ISO 2685.

On occasions, a test may not be valid because of failure to hold the flame temperature at the specified value; for this reason, it is advised to prepare four hose assemblies for this test.

4.11.14.2 Requirements

The test specimens shall withstand the effects of the flame without leakage for the following periods as appropriate:

— fire-resistant assemblies: 5 min;

— fireproof assemblies: 15 min.

NOTE Fire resistance or fire-proofing is normally accomplished by installing protective fire sleeves on the hose assemblies. The product drawing or standard then specifies a different number or code letter than that used for hose assemblies without sleeves.

5 Quality assurance

5.1 Responsibility for inspection

Unless otherwise specified in the contract or purchase order, the supplier is responsible for carrying out all inspections and tests in accordance with the requirements specified in this document. Unless otherwise specified, the supplier may use his own facilities or any commercial laboratory acceptable to the procuring activity. The purchaser reserves the right to perform any of the inspections set out in the

procurement specification (i.e. this document) where such inspections are deemed necessary to ensure that supplies and services conform to specified requirements.

5.2 Classification of inspections

The examining and testing of hose assemblies shall be classified as:

a) qualification inspections (see 5.3);

b) quality conformance inspections (see 5.4).

5.3 Qualification inspections

5.3.1 Qualification test samples

Test samples shall consist of the number of test specimens specified in Table 5 and the number and lengths of test specimens specified in Table 6.

5.3.2 Test report, test samples and data for the purchaser

If the tests are carried out at a location other than the laboratory of the purchaser, the following information shall be made available to the purchaser on request:

a) test report: three copies of a test report which shall include a report of all tests and outline description of the tests and conditions;

b) test sample: the sample which was tested, when requested by the purchaser;

c) list of sources of hose or hose components, including name of source and product identification for inner tube, hose and assembly.

Log sheets, containing required test data, shall remain on file at the source test facility and shall not be sent to the qualifying activity unless specifically requested.

Table 5 — Qualification test sequence and number of test specimens in sample

Relevant inspection/test		Inner tube	Sample hose assemblies																
			Test specimen No.																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4.4	General examination[a]	X	X																
4.5.1	Density and relative density[a]	X	X																
4.5.2	Tensile strength[a]	X	X																
4.5.3	Elongation[a]	X	X																
4.5.4	Tube roll[a]	X	X																
4.5.5	Proof pressure[a]	X	X																
4.5.6	Electrical conductivity[a]	X	X																
4.6 to 4.10	General examination		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Key

X one inspection/test

[a] Production lot records may be used to verify conformance to these tests if the PTFE tube or hose assembly being used is an established production item.

[b] These test specimens shall have a 90° elbow fitting on one end of the hose and a straight-type fitting on the other end of the hose. If approval is being sought for both the bent-tube and the forged-elbow configuration, then one-half of the sample (i.e. three test specimens) shall use the bent elbows, while the other half of the sample shall have the forged elbows.

Table 5 *(continued)*

Relevant inspection/test			Inner tube	Sample hose assemblies																
				Test specimen No.																
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4.11.1	Proof pressure			X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
4.11.2	Elongation and contraction			X	X															
4.11.3	Volumetric expansion					X	X													
4.11.4	Leakage							X	X											
4.11.5	Thermal shock and burst pressure at high temperature							X	X											
4.11.6	Impulse[b]	Unaged								X	X									
		Air-aged										X	X							
		Oil-aged												X	X					
4.11.7	Flexure			X	X															
4.11.8	Stress degradation															X	X			
4.11.9	Pneumatic surge															X	X			
4.11.10	Pneumatic effusion					X	X													
4.11.11	Repeated installation			X	X															
4.11.12	Burst pressure at room temperature					X	X													
4.11.13	Electrical conductivity																	X		
4.11.14	Fire resistance (when required)																		X	X

Key

X one inspection/test

[a] Production lot records may be used to verify conformance to these tests if the PTFE tube or hose assembly being used is an established production item.

[b] These test specimens shall have a 90° elbow fitting on one end of the hose and a straight-type fitting on the other end of the hose. If approval is being sought for both the bent-tube and the forged-elbow configuration, then one-half of the sample (i.e. three test specimens) shall use the bent elbows, while the other half of the sample shall have the forged elbows.

Table 6 — Length of test specimens

Dimensions in millimetres

Hose size	Length of test specimens				
	For impulse tests (4.11.6) (Six specimens, No. 7 to No. 12)	For flexure tests (4.11.7) (Two specimens, No. 1 and No. 2)	For electrical conductivity test (4.11.13) (One specimen, No. 15)	For fire resistance test (4.11.14) (Two specimens, No. 16 and No. 17)	For other tests (Six specimens, No. 3 to No. 6 and No. 13 and No. 14)
DN 06	400	500	One sample for each size with a specimen length as specified in ISO 8829-1	600	500
DN 10	600	700			
DN 12	700	800			
DN 16	800	900			
DN 20	1 000	1 000			
DN 25	1 200	1 200			

5.3.3 Qualification testing

Qualification testing shall consist of all the examinations and tests specified in 4.5 and 4.11; the test sequence shall be as shown in Table 5.

5.3.4 Criteria for requalification

a) Any change in a previously qualified hose-to-fitting joint and/or hose construction relative to design, material or method of attachment would require a full requalification.

b) Qualification approval of other types of end fitting connection designs, utilizing a previously qualified hose-to-fitting joint design, requires the following additional testing to be performed:

— proof pressure test (see 4.11.1);

— leakage test (see 4.11.4);

— repeated installation (see 4.11.11);

— room temperature burst (see 4.11.12).

c) If hose previously qualified is procured from a new manufacturing source, then complete requalification testing is required.

5.4 Quality conformance inspections

5.4.1 General

Quality conformance inspections shall be sampled in accordance with the procedure laid down in ISO 2859-1 and shall consist of the following tests:

a) individual tests — 100 % inspection (see 5.4.2);

b) sampling tests (see 5.4.3);

c) periodic control tests (see 5.4.4).

5.4.2 Individual tests

Each hose assembly shall be subjected to the following tests:

a) general examination of product (see 4.6 to 4.10);

b) proof pressure tests (see 4.11.1).

Production samples that are proof-pressure-tested with water shall be air-dried prior to capping (see cleaning requirements in 4.10.3).

5.4.3 Sampling tests

The following inspections or tests shall be carried out in the order indicated:

a) density and relative density (see 4.5.1);

b) internal cleanliness (see 4.10.3);

c) leakage tests (see 4.11.4);

d) burst pressure at room temperature (see 4.11.12).

The inspections or tests shall be carried out on eight hose assemblies, selected at random from each inspection lot. The inspection lot shall consist of not more than 3 000 hose assemblies, all of one size, manufactured under essentially the same conditions.

One hose assembly tested from each lot of 375 hose assemblies is also permitted.

5.4.4 Periodic control tests

5.4.4.1 General

The inspections and tests specified in 5.4.4.2 and 5.4.4.3 shall be carried out as indicated on ten hose assemblies manufactured from bulk hose length selected at random from each inspection lot. The inspection lot shall consist of not more than 6 000 m of hose, all of one size, manufactured under essentially the same conditions. The use of two hose assemblies manufactured and tested from each lot of 1 500 m of hose is also permitted.

5.4.4.2 Assembly and braid

Six hose assemblies from a lot of 6 000 m (or one hose assembly from a lot of 1 500 m) shall be subjected to the following tests in the order indicated:

a) elongation and contraction (see 4.11.2);

b) impulse (see 4.11.6).

5.4.4.3 Hose inner liner

Four hose assemblies from a lot of 6 000 m (or one hose assembly from a lot of 1 500 m) shall be subjected to the following tests in the order indicated:

a) stress degradation (see 4.11.8);

b) electrical conductivity (see 4.11.13).

5.4.5 Rejection and re-test

5.4.5.1 Rejection

If one or more items selected from a lot fail to meet the requirements of this document, the lot shall be rejected.

5.4.5.2 Resubmitted lots

Once a lot (or part of a lot) has been rejected by the purchaser, it may be resubmitted for tests after the manufacturer, in writing, has supplied full particulars concerning the cause of previous rejection and the action taken to correct the defects in the lot.

5.4.6 Changes in inspection procedures

Changes in inspection severity levels (e.g. from normal to tightened inspection) shall be in accordance with ISO 2859-1. All inspection plans shall be single sampling plans with an acceptable quality level (AQL) of 1 %.

5.4.7 Destructive test sample

Prior to testing, a letter "D" shall be impression-stamped on each end fitting of those assemblies used for destructive tests (see 5.4.3 and 5.4.4).