INTERNATIONAL STANDARD

ISO 10583

First edition
1993-05-15

Aerospace fluid systems — Test methods for tube/fitting assemblies

Circuits de fluides pour l'aérospatiale — Méthodes d'essai des assemblages tube/raccordement

Reference number
ISO 10583:1993(E)

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.

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.

International Standard ISO 10583 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Sub-Committee SC 10, *Aerospace fluid systems and components*.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Introduction

This International Standard has been prepared to standardize the test methods for the qualification of tube/fitting assemblies used in aircraft fluid systems. The tests are intended to simulate the most strenuous demands encountered in aircraft. Compliance with these test methods is necessary for fitting assemblies which are used in systems where a malfunction would affect the safety of flight.

This page intentionally left blank

Aerospace fluid systems — Test methods for tube/fitting assemblies

1 Scope

This International Standard specifies test methods for fitting assemblies used in aircraft fluid systems in the pressure and temperature ranges covered by pressure classes B, D and E, and temperature types I, II and III of ISO 6771.

It applies each time that it is referred to in a procurement specification or other definition document which contain the pass/fail criteria for these tests.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2685:1992, *Aircraft — Environmental conditions and test procedures for airborne equipment — Resistance to fire in designated fire zones.*

ISO 6771:1987, *Aerospace — Fluid systems and components — Pressure and temperature classifications.*

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

ISO 6773:—[1], *Aerospace — Fluid systems — Thermal shock testing of piping and fittings.*

ISO 7137:1992, *Aircraft — Environmental conditions and test procedures for airborne equipment (Endorsement of EUROCAE/ED-14C and RTCA/DO-160C).*

ISO 7257:1983, *Aircraft — Hydraulic tubing joints and fittings — Rotary flexure test.*

ISO 9538:—[2], *Aerospace — Hydraulic tubing joints and fittings — Planar flexure test.*

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 ambient temperature: Temperature in the test laboratory between 15 °C and 35 °C.

4 Quality conformance inspection procedures

Fitting components and assemblies shall be inspected using the normal tools and procedures.

5 Qualification test procedures

5.1 Proof pressure test

This test is intended to verify the structural integrity of the fitting assembly prior to its use for other tests or in the production of tube or duct assemblies.

WARNING — Conduct pneumatic tests in a special device to protect the operator.

1) To be published. (Revision of ISO 6773:1982)

2) To be published.

Connect test assemblies to a source of pressure with one end free to move. Bleed all air from the system before any pressure is applied. Proof pressure test at a value as specified by the procurement specification for a minimum period of 3 min. The rate of pressure rise for system pressures of 10,5 MPa and over shall be 150 MPa ± 37,5 MPa (1 500 bar ± 375 bar) per minute. For system pressures up to 10,5 MPa, the rate shall be 30 MPa ± 7,5 MPa (300 bar ± 75 bar) per minute. The test shall be conducted at ambient temperature.

5.2 Pneumatic pressure test

This test is intended to verify that the fitting assembly will perform without leakage in pneumatic applications. This test is often used at the start and completion of other tests.

Solvent clean and air dry test fittings prior to testing. Assemble fittings using a separate lubricant or compound on the thread and sleeve/nut shoulder (unless they have a solid film lubrication) and tighten to the torques specified in the procurement specification. Pressurize with nitrogen. Maintain the pressure for 3 min while the specimens are immersed in water or suitable oil. Specimens may be pressure tested at ambient temperature.

5.3 Impulse test

This test is intended to verify the service life of a fitting assembly when exposed to hydraulic pressure cycling or pressure surging.

Impulse test the assemblies in accordance with ISO 6772. Test type I specimens at ambient temperature and types II and III at the temperatures and in the sequence specified in ISO 6772.

5.4 Hydrostatic burst pressure test

This test is intended to verify that a specified overpressure safety factor is being met, also to establish the failure mode under overpressure.

WARNING — Conduct the test in a special device to protect the operator.

Connect the test assembly to a source of pressure with one end free to move. Bleed all air from the system before any pressure is applied. Increase the pressure at a rate of 150 MPa ± 37,5 MPa (1 500 bar ± 375 bar) per minute until the assembly bursts. Specimens shall be tested at ambient temperature.

Specimens from impulse or corrosion testing may be used for the burst test.

5.5 Flexure test

This test is intended to verify the service life of a fitting assembly when exposed to cyclic bending stresses while the assembly is under system pressure.

Unless otherwise specified by the purchaser, conduct the test in accordance with either ISO 7257 or ISO 9538. Determine the bending stress in the flexure test specimen prior to the application of internal pressure.

5.6 Stress corrosion test

This test is intended to verify that the tube-to-fitting joining process did not adversely affect the resistance to stress corrosion in the joining area.

Install the test assembly in a test apparatus (see figure 1) which imposes a bending stress level equal to (85 ± 5) % of the specified tubing yield strength (0,2 % proof stress) minimum at the tubing/fitting assembly interface. Apply an internal pressure equal to the nominal system pressure without removing the bending stress. Then subject the assembly to test procedure ISO 7137 - 1.9 (salt spray test). After exposure, subject the assembly to the burst pressure test at ambient temperature. Clean, section and metallurgically examine the tube/fitting joint for intergranular or stress corrosion cracking.

5.7 Re-use capability

5.7.1 Port connections

This test is intended to verify that port connections can be repeatedly assembled and disassembled during installation and in service.

Screw together and unscrew specimens eight times. Each of the eight cycles shall include the complete removal of the fitting from the port and of the tube ends from the fitting. Install new elastomeric port seals, unless the re-use of seals is specified. Following the first, fourth and eighth installations, conduct further proof tests. Specimens shall pass gaseous pressure testing after the eighth installation. The specimens may be used for subsequent impulse and burst tests.

NOTE 1 It is not necessary to perform this test on semi-permanent port connections.

Dimensions in millimetres

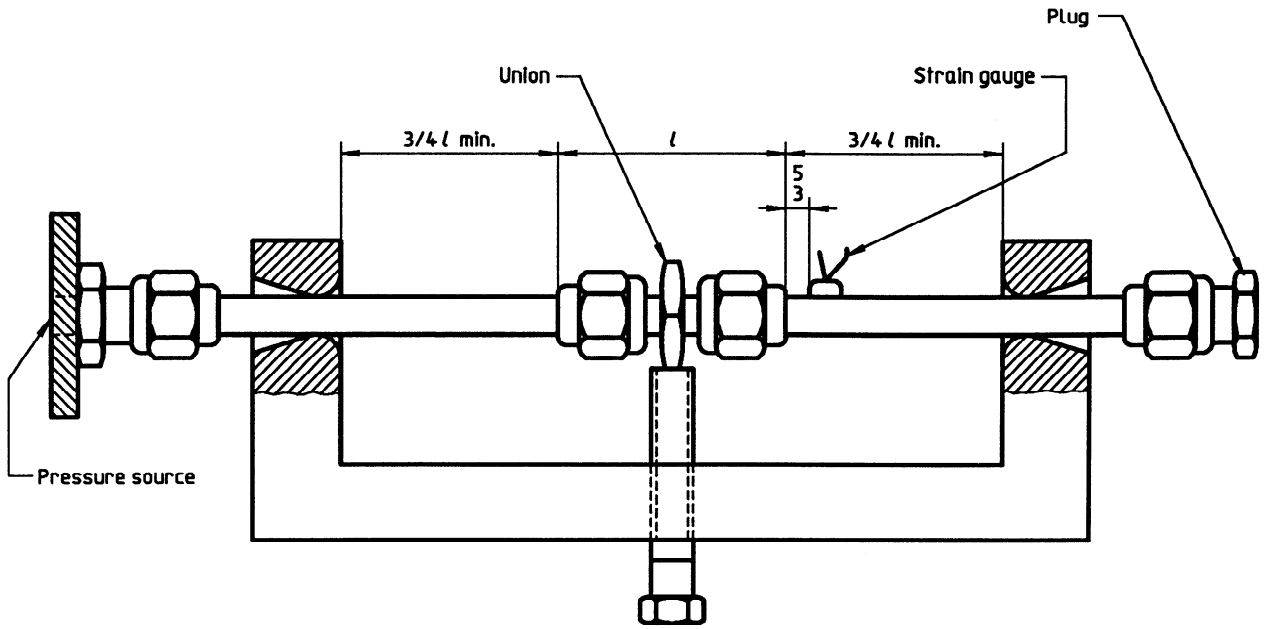

Figure 1 — Schematic diagram of stress corrosion test assembly

5.7.2 Tube fittings

This test is intended to verify that fitting components can be repeatedly assembled and disassembled in service.

Test the tube fittings to the tightening torques specified in the procurement specification, one half of the fitting connections using the minimum, the other half using the maximum tightening nut torques. Do not mix the two groups. Following the first, fourth and eighth installations, conduct further proof tests. Specimens shall pass gaseous pressure testing after the eighth installation. The specimens may be used for subsequent impulse and burst tests.

5.8 Tensile test

This test is intended to verify that the fitting assembly may be exposed to axial loads in service.

Mount assembled specimens in a tensile machine and strain to rupture at a speed of 4 mm/min ± 0,3 mm/min. Fittings may be tensile tested while system pressure is maintained in the specimen, using adequate safety precautions.

Rupture of 24° cone fittings is defined as breakage of the tube or separation of the tube from the sleeve during the tensile test. Other designs shall withstand, as a minimum requirement, axial loads equivalent to those as generated in the fitting by four times the nominal pressure.

5.9 Thermal shock test

This test is intended to verify that the fitting or coupling assembly will not leak if the temperature of the fluid flowing through the fitting or coupling changes between extremes, as can occur, for example, in certain fuel system applications.

Mount and test the test assemblies in accordance with ISO 6773.

5.10 Fire test

This test is intended to verify that the fitting assembly will not leak if exposed to an intense fire.

Mount and test the assembly in accordance with ISO 2685 or the purchaser's instructions.

6 Test specimens and test fluid

6.1 Test specimens

Unless otherwise specified by the buyer, the tube specimen lengths for the various tests shall be as shown in table 1.

Table 1 — Test specimens, free tube length between sleeves

Dimensions in millimetres

Size DN	Gaseous pressure Impulse Burst Re-use Thermal shock	Flexure[1)]	Stress corrosion	Tensile	Fire
04	150	—	200	100	250
05	150	—	200	100	250
06	150	155	200	100	250
08	150	180	200	100	250
10	150	195	200	100	250
12	200	230	250	150	250
14	200	—	250	150	250
16	200	255	250	150	250
20	200	295	250	150	250
25	200	320	250	150	250
32	250	360	250	150	250
40	250	385	250	150	250

1) For flexure testing, see ISO 7257 for specimen length to be measured.

6.2 Test fluid

Unless otherwise specified, tests shall be conducted using a petroleum base or synthetic hydraulic fluid for types I and II and a silicate ester base hydraulic fluid for type III system fittings (see ISO 6771). Water may be used, whenever practical, for proof, burst, stress corrosion and repeated assembly (reuse) testing. Air or nitrogen shall be used for the pneumatic tests. Leakage and proof tests for pneumatic system applications shall be conducted with air or nitrogen.

This page intentionally left blank