INTERNATIONAL STANDARD

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Aerospace — Hydraulic system tubing — Qualification tests for bent tubes

Aéronautique et espace — Tubes pour circuits hydrauliques — Essais de qualification pour tubes coudés

Reference number
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Foreword

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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 8574 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 8574:1990), which constitutes a minor revision by adding inch-dimensioned tubing and by deleting flexure fatigue testing.

Aerospace — Hydraulic system tubing — Qualification tests for bent tubes

1 Scope

This International Standard specifies pressure impulse and burst test procedures for determining and classifying the impulse fatigue strengths of bent tubes used in aerospace hydraulic systems. The procedures are intended for qualification purposes of high- and low-pressure system tubing or for the evaluation of new materials for hydraulic system tubing.

NOTE Requirements for tubing used in aerospace hydraulic systems are given in ISO 8575.

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
proof pressure
static pressure for testing hydraulic system tubing, a prescribed multiple of the nominal system or sub-system pressure

3.2
tube failure
leakage or rupture of the tube itself during test

NOTE See 6.1.2.

4 Test equipment

4.1 Pressure impulse equipment

The test equipment shall be capable of producing the pressure impulse curve specified in ISO 6772 (see 6.3).

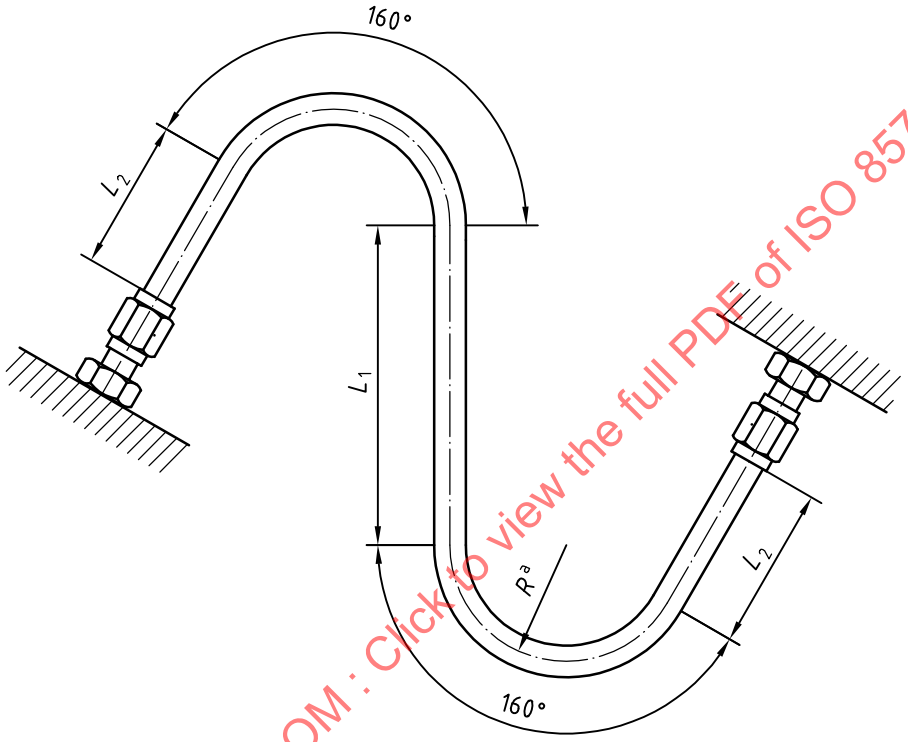
4.2 Burst pressure equipment

The test equipment shall be capable of producing the pressure requirements specified in 6.4.

5 Test specimens

5.1 Configuration

The test specimens shall consist of bent lengths of the relevant tubing of dimensions as specified in Figure 1 and Table 1 (with inch-dimensioned tubing given in Table 2), according to the case, manufactured using production techniques and requirements, in addition to test fittings and adaptors where required. Except where otherwise specified, the bend radius (R) of the specimens shall be three times the nominal tube diameter.



[a] $R = 3\times$ nominal tubing diameter.

Figure 1 — Test specimen (S-tube) for the impulse test

Table 1 — Test specimen lengths for impulse testing — metric-size tubing (see Figure 1)

Dimensions in millimetres

Nominal tube size		L_1	L_2	Total tube length
DN size[a] designation	Nominal diameter	$^{+13}_{0}$	$^{+6}_{0}$	$^{+25}_{0}$
DN6	6	65	30	300
DN10	10	65	30	300
DN12	12	90	30	400
DN16	16	140	30	510
DN20	20	140	30	570
DN25	25	140	30	670

[a] DN size is the nominal diameter expressed in millimetres.

Table 2 — Alternate test specimen lengths for impulse testing — inch-size tubing (see Figure 1)

Dimensions in inches

Tube size		L_1	L_2	Total tube length
Dash size[a] designation	Nominal diameter	$^{+0,5}_{0}$	$^{+0,25}_{0}$	$^{+1}_{0}$
−0,4	0,25	2,5	1,25	12
−0,6	0,375	2,5	1,25	12
−0,8	0,5	3,5	1,25	16
−10	0,625	5,5	1,25	20
−12	0,75	5,5	1,25	22
−16	1	5,5	1,25	26

[a] Dash size is the nominal diameter expressed in 1/16 inch.

5.2 Pre-test checks

5.2.1 The outside diameter and wall thickness of the tubing shall be measured and recorded, together with the ovality of the bend.

5.2.2 Three straight samples of the test tubing shall also be checked to determine the basic material properties, i.e. yield tensile strength (0,2 % proof strength), ultimate tensile strength and elongation.

6 Testing

6.1 General

6.1.1 Temperature

Unless otherwise specified [e.g. when testing to ISO 6772 (see 6.3)], testing shall be carried out at ambient temperature unless the fatigue characteristics of the material in question are significantly affected by the extreme temperature limit envisaged. In this case, the temperature spectrum shall be as defined by the particular aerospace requirements.

6.1.2 Fitting failures

Failure of a tube fitting or at the fitting sleeve interface shall not constitute a tube failure. In the event of a failure during testing of a tube fitting or at the fitting sleeve interface, the fitting(s) shall be replaced and the tests continued, or a new tube specimen shall be tested.

6.2 Proof pressure test

Prior to commencement of testing, all specimen tube assemblies shall be subjected to a proof pressure which, unless otherwise specified, shall be twice the system nominal operating pressure.

6.3 Pressure impulse test

A minimum of six specimens for each size required to be tested, mounted as specified in Figure 1 and Table 1, shall be subjected to pressure impulsing in accordance with ISO 6772.

6.4 Burst test

At least two specimens of each size required to be tested, mounted as specified in Figure 1, shall be subjected to hydraulic pressure. The pressure shall be increased at a rate of $(150\,000 \pm 37\,500)$ kPa/min [$(20\,000 \pm 5\,000)$ psi/min] until the tube bursts.

Expansion of the tube before burst is permissible.

6.5 Dimensional check

On completion of pressure impulse and burst tests, the specimens shall be sectioned and the wall thickness around the bend(s) checked.

7 Requirements

7.1 Pressure impulse test

The required use is dependent on the life of the aerospace vehicle, but as a minimum requirement the results shall demonstrate a life of 200 000 cycles when the specimens are subjected to maximum impulse pressures as specified for the system.

7.2 Burst test

As a minimum requirement, each tube shall withstand, without failure, a burst pressure related to the system operating pressure in addition to any safety factor required for the particular application.