INTERNATIONAL STANDARD

ISO 6772

Third edition
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Aerospace — Fluid systems — Impulse testing of hydraulic hose, tubing and fitting assemblies

Aéronautique et espace — Systèmes de fluides — Essai d'impulsion des tuyauteries flexibles, tubes et raccords

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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 6772 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 6772:1988), which has been technically revised. The main changes are as follows:

— 3.2: definition has been modified;

— Clause 5: new paragraph has been added;

— Tables 1, 2 and 3 have been modified to cover additional classes J and K.

Introduction

In hydraulic systems, power is transmitted through the hydraulic fluid under pressure with a network of tubing and hoses, and their attendant fitting assemblies. In order to demonstrate that these transmission elements are fit for purpose in terms of the prevention of premature failures due to fatigue, it is necessary to conduct appropriate impulse pressure testing.

This document provides the overall requirements for pressure impulse testing of hydraulic system distribution elements.

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

1 Scope

This International Standard specifies the requirements and the procedures for impulse testing of hose, tubing, and fitting assemblies for use in aerospace hydraulic systems. Requirements may apply, when appropriate, to components used in other aerospace fluid systems.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 8575, *Aerospace — Fluid systems — Hydraulic system tubing*

3 Terms and definitions

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

3.1
rate of pressure rise
slope of the pressure/time curve in the straight portion of the pressure increase portion

NOTE For the purpose of this definition, the rate of rise is determined between 10 % of the total rise above back-pressure and 10 % of the total rise below peak pressure.

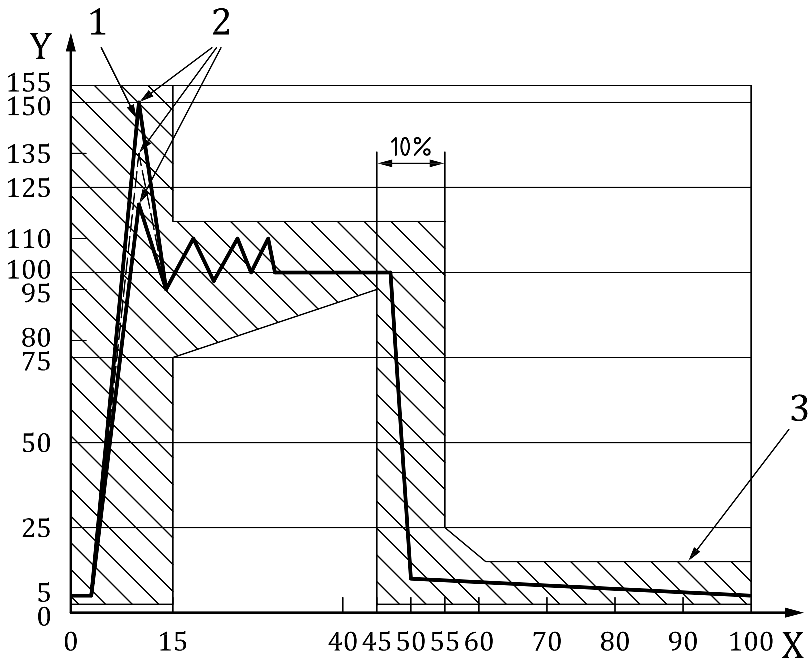
3.2
peak pressure
maximum value for an operating pressure of short duration

[ISO 8625-1:1993, 1.25]

4 Requirements

4.1 Shape of impulse trace

When observed on an oscilloscope, the impulse traces show as approximate pressure/time cycles. It is mandatory that these pressure/time curves be confined to the shaded area indicated in Figure 1. The dynamic impulse trace produced by the test machine shall be in conformity with the trace illustrated in Figure 1.



Key

X Percent of one cycle

Y Percentage of nominal pressure ± 5 %

1 The slope of this portion of curve, between 10 % and 90 % of peak pressure, gives the rate of rise (see 4.2)

2 Peak pressure (see Table 1 or 2). Only one pressure peak is allowed above 110 % of operating pressure and it must be within the first 15 % of cycle

3 Back pressure in pressure classes B, D, E: (345 ± 170) kPa / (50 ± 25) psi
Back pressure in pressure classes J, K: (700 ± 350) kPa / (100 ± 50) psi

Figure 1 — Impulse trace

4.2 Calculation of pressure rise

The rate of pressure rise shall be calculated using the following formula:

$$\text{Rate of pressure rise} = \frac{0{,}9\,p - 0{,}1\,p}{t \text{ at } 0{,}9\,p - t \text{ at } 0{,}1\,p}$$

where

p is the peak pressure, in kilopascals;

t at 0,9 p is the time, in seconds, at 0,9 p;

t at 0,1 p is the time, in seconds, at 0,1 p.

4.3 Preparation of specimens

The preparation of test specimens shall be defined in the detail design specification of the component. Specimens shall be subjected to the relevant treatments and production test requirements of the component specification.

4.4 Test fluid

The test fluid shall be the specified aircraft system fluid or another hydraulic fluid which is compatible with the item being tested.

5 Principle of test

This method of testing is intended to determine the ability of flexible hose assemblies, tubing and fitting assemblies to withstand hydraulic impulse for qualification testing under simulated conditions.

6 Test method

For testing of hose, tubing and fitting assemblies, including boss or port fittings, the cycle rate shall be (70 ± 5) cycles/min. Unless otherwise specified, the peak pressure and the rate of pressure rise shall be as specified in Tables 1 and 2. Unless otherwise specified, the assembly shall be tested in the sequence shown in Table 3.

The sweep rate on the oscilloscope or recorder shall be adjusted so that the slope of the pressure rise shall take advantage of the full size of the screen. The trace and photographs of the impulse cycle shall be an accurate record of the impulse cycle and show a grid or other means to permit accurate checking. The end-to-end accuracy and sampling rate of the data acquisition system and sensors should ensure that the impulse measurement uncertainty is within the pressure waveform specifications of this document. The accuracy of the measurements shall be traceable to international standards.

Unless otherwise specified in the detail or procurement specification, the total number of cycles shall be 200 000.

After the temperature has stabilized at the maximum or minimum, as specified in Table 3, a minimum soak time of 1 h is required before that portion of the test sequence is begun. If temperature control is required by the procurement specification, the fluid temperature shall be measured at the test manifold and the ambient temperature shall be measured approximately 150 mm from the test specimens. The peak pressure shall be measured at the test manifold.

Table 1 — Peak pressure and rate of pressure rise

SI-metric units of measure

Hoses, tubing and fitting assemblies		**Peak pressure**	**Minimum rate of pressure rise**	**Maximum rate of pressure rise**
Pressure class [a]	**Nominal outside diameter** [b]			
kPa		%	kPa/s	kPa/s
B 10 500	DN14 and smaller	125	126 000	700 000
	DN16 to DN25 (incl.)			520 000
	DN32			340 000
	DN40 and over			280 000
D 21 000	All diameters	150	315 000	2 100 000
E 28 000			420 000	
J 35 000			525 000	
K 55 000		135	525 000	4 590 000

[a] Pressure classes in accordance with ISO 6771.

[b] Nominal outside diameters in accordance with ISO 8575. DN = nominal outside diameter in mm, example: DN16 = nominal outside diameter of 16 mm.

Table 2 — Peak pressure and rate of pressure rise

Imperial units of measure

Hoses, tubing and fitting assemblies		Peak pressure	Minimum rate of pressure rise	Maximum rate of pressure rise
Pressure class [a]	Nominal outside diameter [b]			
psi		%	psi/s	psi/s
B 1 500	−08 and smaller	125	18 000	100 000
	−10 through −12			75 000
	−20			50 000
	−24 and over			40 000
D 3 000	All diameters	150	45 000	300 000
E 4 000			60 000	
J 5 000			75 000	
K 8 000		135	75 000	650 000

[a] Pressure classes in accordance with ISO 6771.

[b] Nominal outside diameters in accordance with ISO 8575. – Dash size is the equivalent of the diameter in 1/16 inch, example: - 06 = 6/16 inch diameter.

Table 3 — Sequence and duration of impulse testing at temperature [a]

Sequence No.	Number of cycles as a percentage of the total number of cycles	Temperature (ambient and fluid)
1	50	Maximum
2	24	From 15 °C to 35 °C/60 °F to 95 °F
3	1	Minimum
4	5	Maximum
5	20	Ambient and fluid: any of the above. These cycles may be added to any one sequence or divided among them.

[a] Unless otherwise specified in the detail or procurement specification.

7 Intended use

7.1 Standard

This test is intended to promote standardization of impulse test requirements, procedures and equipment for the standard qualification and evaluation impulse testing of hydraulic hose assemblies, tubing and fittings.

7.2 Reference

If reference is made to this International Standard in a specification as part of the requirements, the following additional requirements shall be specified:

a) nominal pressure;

b) operating temperature limits;

c) design of specimens.

Bibliography

[1] ISO 8625-1:1993, *Aerospace — Fluid systems — Vocabulary — Part 1: General terms and definitions related to pressure*

[2] SAE AIR 1228, *Standard Impulse Machine Equipment and Operation*

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