International Standard 6605

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Hydraulic fluid power — Hose assemblies — Method of test

Transmissions hydrauliques — Flexibles de raccordement — Méthode d'essai

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Descriptors: hydraulic fluid power, hydraulic equipment, hoses, tests, performance evaluation.

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6605 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Hydraulic fluid power — Hose assemblies — Method of test

0 Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Hose assemblies are flexible fluid conductors.

1 Scope and field of application

1.1 This International Standard gives methods for testing and evaluating performance of hose assemblies (hose and attached end fittings) used in hydraulic fluid power systems.

1.2 Specific tests and performance criteria for evaluating hose assemblies used in hydraulic service are in accordance with the requirements for hose in ISO 1436, ISO 3862, ISO 3949 and ISO 4079.

1.3 This International Standard further establishes a uniform means of testing and evaluating performance of hydraulic hose assemblies.

2 References

ISO 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing.*

ISO 1436, *Rubber products — Hoses and hose assemblies — Wire reinforced hydraulic type.*

ISO 3862, *Rubber hoses and hose assemblies — Rubber-covered, spiral wire reinforced, hydraulic type.*

ISO 3949, *Plastics hoses and hose assemblies — Thermoplastics, textile-reinforced, hydraulic type.*

ISO 4079, *Rubber products — Hoses and hose assemblies, textile-reinforced, for hydraulic purposes.*

ISO 4671, *Rubber and plastics hose and hose assemblies — Methods of measurement of dimensions.*

ISO 5598, *Fluid power systems and components — Vocabulary.*

ISO 6743/4, *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems).*

ISO 7751, *Rubber and plastics hoses and hose assemblies — Ratios of proof and burst pressure to design working pressure.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5598 apply.

4 Standard tests

4.1 Dimensional check test

4.1.1 The hose shall be inspected for conformity with all dimensions tabulated in applicable specifications.

4.1.2 Determine finished outside diameters and reinforcement diameters, where required, by calculation from measurement of the respective circumference.

4.1.3 As an alternative to 4.1.2, use a flexible tape graduated to read the diameters directly.

4.1.4 Measure the inside diameter by means of a suitable expanding ball or telescoping gauge in accordance with ISO 4671 (Method 2).

4.1.5 Measure concentricity over both the reinforcement and the finished outside diameters using either a dial indicator gauge or a micrometer.

4.1.6 Round the foot of the measuring instrument to conform to the inside diameter of the hose.

4.1.7 Take readings at 90° (1,57 rad) intervals around the hose.

NOTE — Acceptability is based on the total variation between the high and low readings.

4.1.8 Take inside and outside diameter measurements at a minimum of 25 mm from the hose ends and concentricity measurements at a minimum of 13 mm from the hose ends.

4.2 Proof test

4.2.1 Test the hose assemblies hydrostatically to the specified proof pressure in accordance with ISO 7751 for a period of not less than 60 s in accordance with ISO 1402.

4.2.2 Reject assemblies indicating failure or leakage.

4.3 Change-in-length test

4.3.1 Conduct measurements for the determination of elongation or contraction on a previously untested, unaged hose assembly having at least 300 mm free length between couplings, in accordance with ISO 1402.

4.3.2 Attach the hose assembly to the pressure source and pressurize to the specified operating pressure for a period of 30 s; then release the pressure.

4.3.3 Place accurate reference marks 250 mm apart on the outer cover of the hose, midway between couplings, after allowing the hose assembly to restabilize for a period of 30 s following pressure release.

4.3.4 Repressurize the hose assembly to the specified operating pressure for a period of 30 s.

4.3.5 Measure the final length while the hose is pressurized: the final length is the distance between reference marks while the hose is pressurized.

4.3.6 Complete the determination of the change in length using the following formula in accordance with ISO 1402:

$$V_L = \frac{L_1 - L_0}{L_0} \times 100$$

where

L_0 is the distance between the reference marks when the hose was not pressurized following the initial pressurization;

L_1 is the distance between the reference marks under pressure;

V_L is the percentage change in length, which will be positive (+) in the case of an increase in length and negative (−) in the case of a decrease in length.

4.4 Burst test

NOTE — This is a destructive test. Assemblies which have been subjected to this test should be destroyed.

4.4.1 Subject unaged hose assemblies, on which the end fittings have been attached for not more than 30 days, to a hydrostatic pressure, increased at a constant rate in accordance with ISO 1402.

4.4.2 Reject assemblies showing leakage, hose burst or indication of failure below the specified minimum burst pressure.

4.5 Cold bend test

NOTE — This is a destructive test. Assemblies which have been subjected to this test should be destroyed.

4.5.1 Subject hose assemblies to a temperature of −40 ± 3 °C in a straight position for 24 h.

4.5.2 Then, while still at −40 °C, bend the samples once, taking a time of 8 to 12 s, over a mandrel having a diameter equal to twice the specified minimum bend radius.

In the case of hose sizes up to and including 22 mm nominal inside diameter, bend them through 180° over the mandrel; in the case of hose sizes larger than 22 mm nominal inside diameter, bend them through 90° over the mandrel.

4.5.3 After flexing, allow the sample to warm to room temperature and visually examine it for cover cracks; subject it to a proof test (see 4.2).

4.5.4 Reject any samples with visible cracks or leakage.

4.6 Impulse test

NOTE — This is a destructive test. Assemblies which have been subjected to this test should be destroyed.

4.6.1 Test four unaged hose assemblies with end fittings which have been attached for not more than 30 days.

4.6.2 Apply a pulsating pressure internally to the hose assemblies at a rate between 0,5 and 1,25 Hz; record the frequency used.

4.6.3 The pressure cycle shall fall within the shaded area of figure 1 and conform as closely as possible to the curve as shown.

NOTE — It is desirable that the rate of pressure rise during the first part of the pressure impulse cycle be between 1 000 and 3 500 bar/s (100 000 and 350 000 kPa [1]/s).

4.6.4 Select a test fluid which complies with the following requirements and circulate it at a rate sufficient to maintain a uniform fluid temperature of 93 ± 3 °C within the hose assemblies.

Use, as the test fluid, a fully fortified hydraulic mineral oil [2], type HM [3], having the following characteristics:

viscosity at 100 °C:	4,0 to 9,0 mm^2/s [4]
viscosity at 40 °C:	32,0 to 76,0 mm^2/s [4]
pour point, maximum:	−28 °C
flash point, closed, minimum:	190 °C
aniline point:	100 ± 10°C

1) 1 bar = 100 kPa = 10^5 Pa; 1 Pa = 1 N/m^2

2) Other oils may be used by agreement between interested parties.

3) Refer to ISO 6743/4.

4) 1 mm^2/s = 10^{-6} m^2/s = 1 cSt

4.6.5 Calculate the full (exposed) length of hose under test as follows:

a) hose sizes up to and including 22 mm nominal inside diameter:

— 180° bend exposed length = [3,14 × (hose minimum bend radius)] + [2 × (hose outside diameter)];

b) hose sizes larger than 22 mm nominal inside diameter:

— 90° bend exposed length =

$$\left[\frac{3{,}14 \times (\text{hose minimum bend radius})}{2}\right] +$$

+ [2 × (hose outside diameter)].

4.6.6 Connect the test assemblies to the apparatus; in the case of hose sizes up to and including 22 mm nominal inside diameter, bend them through 180°; in the case of hose sizes larger than 22 mm nominal inside diameter, bend them through 90° at the hose minimum bend radius, as illustrated in figure 2.

4.6.7 Test the hose at either 125 or 133 % of working pressure or as otherwise indicated in the individual specification.

4.6.8 Determine the duration of the impulse test in total number of impulse cycles by the individual standard for the hose assemblies.

4.7 Leakage test

NOTE — This is a destructive test. Assemblies which have been subjected to this test should be destroyed.

4.7.1 Subject unaged hose assemblies, on which the end fittings have been attached for not more than 30 days, to a hydrostatic pressure of 70 % of the specified minimum burst pressure for a period of between 5,0 and 5,5 min.

4.7.2 Reduce the fluid pressure to 0 bar (0 kPa) gauge.

4.7.3 Re-apply the 70 % of minimum burst hydrostatic pressure for another 5,0 to 5,5 min period.

4.7.4 Reject assemblies showing leakage or failure.

5 Visual examination of product

Assemblies shall be visually inspected to determine that the correct fittings are properly installed.

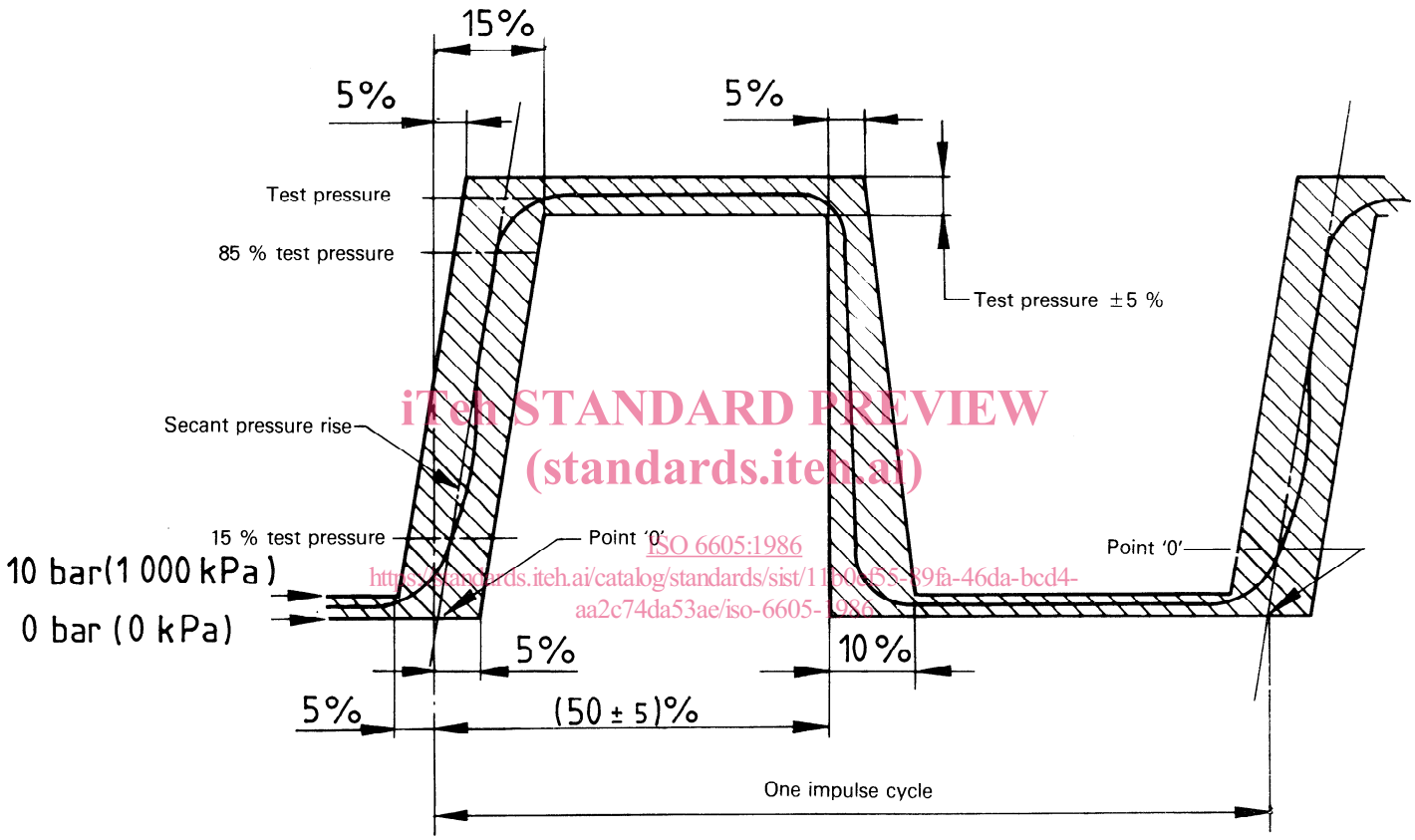
6 Criteria for acceptance

Satisfactory compliance with all of the applicable requirements of this International Standard is required for acceptance of the hose assembly.

7 Identification statement (Reference to this International Standard)

Use the following statement in test reports, catalogues and sales literature when electing to comply with this International Standard:

"Test requirements for hose assemblies in accordance with ISO 6605, *Hydraulic fluid power — Hose assemblies — Method of test.*"



NOTES

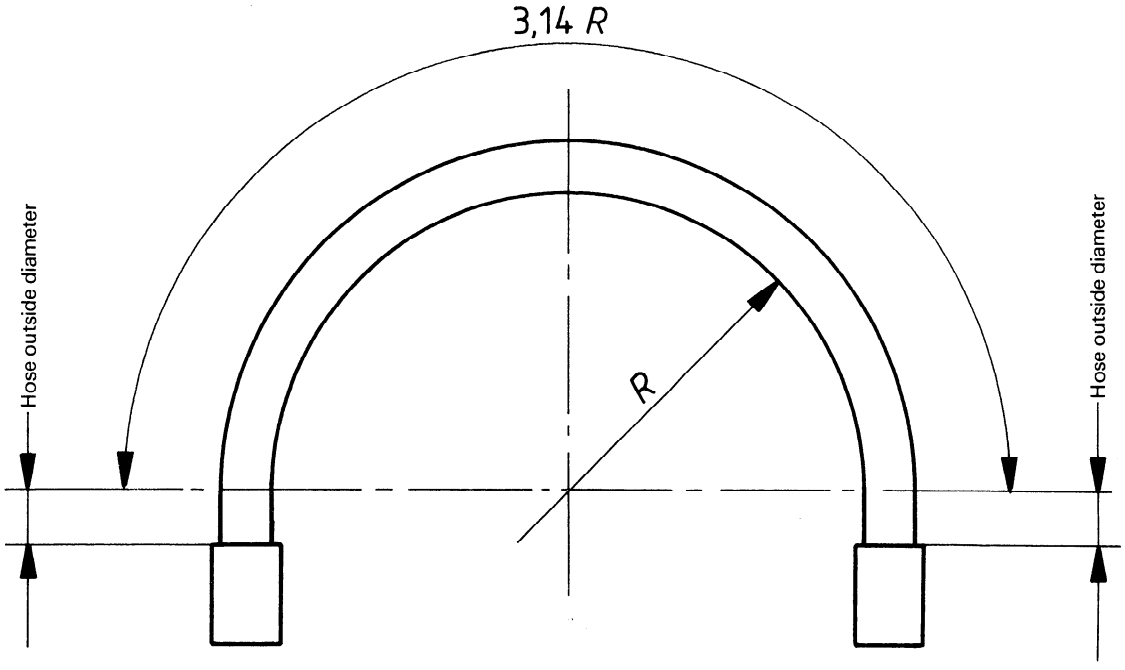
1 Secant pressure rise is the straight line drawn through two points on the pressure rise curve ; one point at 15 % of the test pressure and the other at 85 % of the test pressure.

2 Point '0' is the intersection of the secant pressure rise with 0 pressure.

3 Pressure rise rate is the slope of the secant pressure rise expressed in bars per second (kilopascals per second).

4 Cycle rate shall be uniform at 0,5 to 1,25 Hz.

Figure 1 — Pressure-impulse cycle

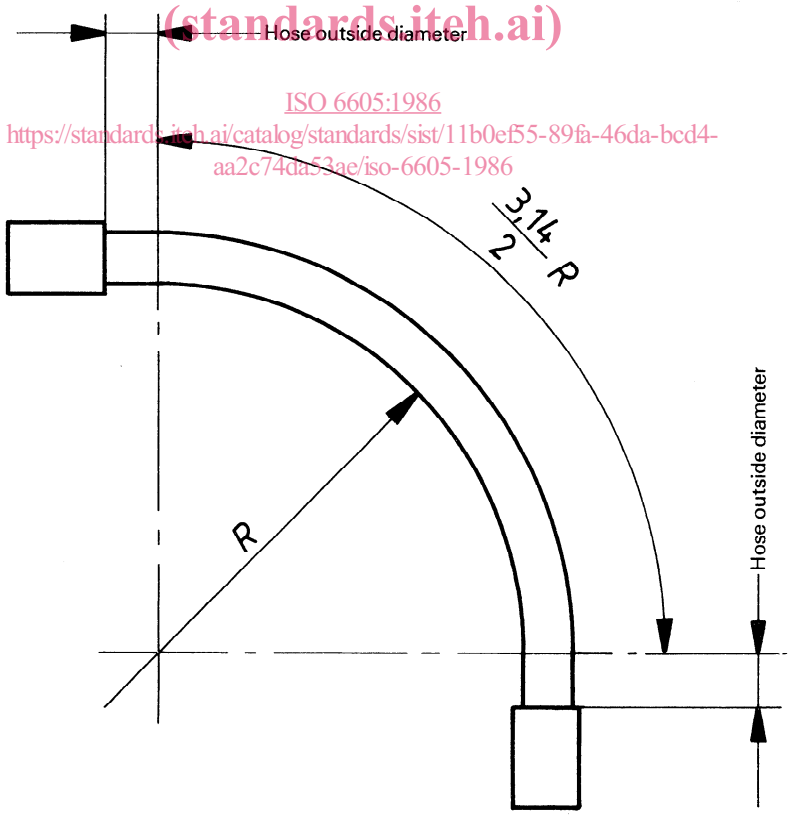


NOTES

R = Minimum bend radius

Hose free length = 3,14R + (2 × outside diameter)

a) Hose sizes up to and including 22 mm nominal inside diameter



NOTES

R = Minimum bend radius

Hose free length = $\left(\frac{3,14}{2} R\right)$ + (2 × outside diameter)

b) Hose sizes larger than 22 mm nominal inside diameter

Figure 2 — Test specimen for pressure-impulse test

Bibliography

The following documents served as a reference in the preparation of ISO 6605 and will be helpful in the utilization of the standard:

ISO 37, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units.*

ISO 1817, *Vulcanized rubbers — Resistance to liquids — Methods of test.*

ISO 3448, *Industrial liquid lubricants — ISO viscosity classification.*

The following documents will also be of use in the application of ISO 6605:

ISO 4672, *Rubber hoses — Sub-ambient temperature flexibility tests.* [1)]

ISO 6803, *Rubber or plastics hoses and hose assemblies — Hydraulic pressure impulse test without flexing.*

1) At present at the stage of draft. (Revision of ISO 4672-1978.)