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Hydraulic fluid power — Test methods for couplings actuated with or without tools

Transmissions hydrauliques — Méthodes d'essai pour les raccords actionné avec ou sans outils

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Contents

Page

Foreword

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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 4, *Connectors and similar products and components*.

This first edition of ISO 18869 cancels and replaces ISO 7241-2:2000, which has been technically revised with the following changes:

— the title has been changed;

— the scope has been expanded.

Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Couplings are used to join or quickly separate fluid conductors. Quick-action couplings, as defined in ISO 5598, can be connected and disconnected without the use of tools. Other types of couplings require the use of tools for connection and disconnection.

Hydraulic fluid power — Test methods for couplings actuated with or without tools

1 Scope

This document specifies methods for testing and evaluating the performance of quick-action couplings for use in hydraulic fluid power applications. This document does not apply to the testing of tube connections, stud ends for ports and flange connections, which are covered by ISO 19879.

Test methods covered in this document are independent of each other and outline the method to follow for each test. See the respective connector standard for which tests to conduct and for performance requirements. It is not intended that all tests be carried out for every application; it is up to the user of this document to select the applicable tests.

For qualification of the coupling, the minimum number of samples specified in this document is to be tested, unless otherwise specified in the relevant coupling standard or as agreed upon by the manufacturer and the user.

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 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

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

ISO 3601-3, *Fluid power systems — O-rings — Part 3: Quality acceptance criteria*

ISO 4411, *Hydraulic fluid power — Valves — Determination of pressure differential/flow characteristics*

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

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

ISO 6802, *Rubber and plastics hoses and hose assemblies with wire reinforcements — Hydraulic impulse test with flexing*

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

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598 and the following apply.

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

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

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

3.1
quick-action coupling
connector that can be connected and disconnected multiple times and relatively quickly

EXAMPLE Within 1 s to 30 s either with or without the use of tools.

Note 1 to entry: This connector can contain one or two automatic shut-off valves.

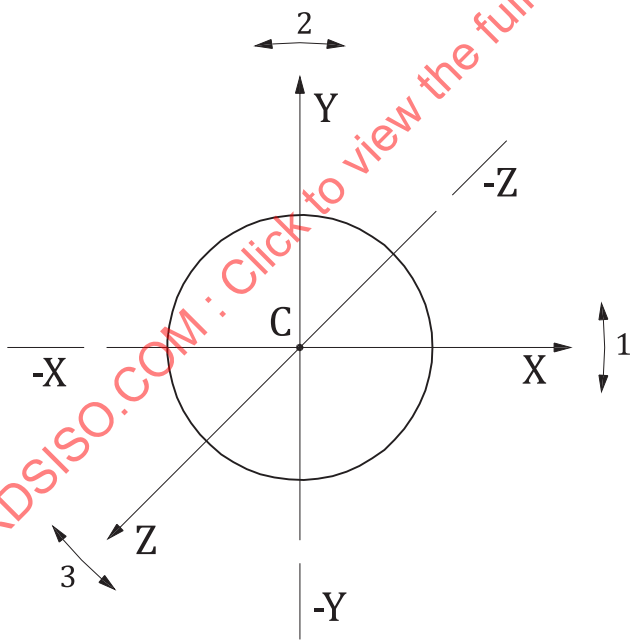
3.2
screw-to-connect coupling
coupling that is designed to be connected and disconnected by more than one turn of one swivel element relatively to the other

3.3
coupling half
uncoupled part of a *quick-action coupling* (3.1)

Note 1 to entry: The terms "female half" and "male half" can be used to describe the two parts of the coupling.

3.4
misalignment
maximum error in the space allowed between the axes of the two coupling halves, indicated in three dimensions and angles of rotation

Note 1 to entry: See Figure 1.



Key
1 misalignment around C respect the X-axis
2 misalignment around C respect the Y-axis
3 misalignment around C respect the Z-axis

Figure 1 — Illustration of indication of misalignment

3.5
side load
load applied perpendicular to the axes of the coupling halves in the disconnected positions, as agreed by the supplier and purchaser

Note 1 to entry: See Figure B.1.

Note 2 to entry: The value of the side load is expressed in Newton (N).

3.6
rated connect force
force required to achieve complete engagement of the connection

3.7
rated disconnect force
force required to achieve complete disengagement of the connection

3.8
rated connect torque
torque required to achieve complete engagement of the connection

3.9
rated disconnect torque
torque required to achieve complete disengagement of the connection

4 Selection of test assemblies

4.1 Test assemblies (coupling assemblies to be tested) shall be selected to constitute a representative sample of a production lot in all respects: design, material, surface treatment, process, etc. All managerial controls necessary to maintain substantial similarity between test and production couplings shall be used.

4.2 For qualification testing, the number of test samples shall be taken from Table 1.

NOTE The coupling size is based on the nominal hose size, in accordance with ISO 4397.

Table 1 — Number of test sample

Coupling nominal size	Number of samples
5	5
6,3	5
10	5
12,5	5
16	5
19 (20)	5
20	5
25	4
31,5	2
38 (40)	2
51 (50)	2

5 General test conditions

5.1 Safety considerations

5.1.1 The following recommendations are not all inclusive and other pertinent regulations and considerations may apply.

5.1.2 Some of the tests described in this document are considered hazardous. It is therefore essential that, in conducting these tests, all appropriate safety precautions be strictly applied. In particular, attention is drawn to the following situations:

a) bursting of the coupling or hose;

b) fine jets, which can penetrate the skin;

c) energy release caused by expanding gases;

d) handling of objects at high and low temperatures;

e) movement of actuators and metallic parts when attachments and the endurance test machine are used.

5.1.3 Tests shall be set up and performed by properly trained personnel.

5.1.4 To reduce the hazard of fluid injection, test assemblies shall be protected with adequate safeguards.

5.1.5 To reduce the hazard of energy release, air shall be bled from test assemblies before applying pressure.

5.1.6 To reduce the hazard of burns, test assemblies shall be handled with the appropriate tools.

5.1.7 To reduce the risk of injury to personnel, test equipment and test assemblies shall be protected with adequate safeguards, and moving automatic mechanisms shall not be operated manually.

5.1.8 Appropriate personal protective equipment shall be used at all times during testing.

5.2 Thread lubrication

For all tests on connectors made of carbon steel and for testing only, threads and contact surfaces shall be lubricated prior to application of torque with hydraulic fluid with a viscosity of ISO VG 32 in accordance with ISO 3448. For connectors made of materials other than carbon steel, the manufacturer's recommendation for thread lubrication shall be followed.

5.3 Torque

For all tests, connectors used in the test bench shall be assembled using the torque of the respective standard.

5.4 Test fluid and temperature

The test fluid shall have a viscosity of ISO VG 32, in accordance with ISO 3448, unless otherwise specified. For all tests, the temperature of the test fluid shall be between 15 °C and 80 °C.

5.5 Test pressure

The test pressure shall be as specified in the respective connector standard.

5.6 Test report

Test conditions and results shall be reported using the test data form given in Annex A.

NOTE ISO/TR 11340 provides a method for reporting leakage.

6 Test apparatus

6.1 Test blocks (used in impulse, burst, sliding-impulse and overtightening tests).

Test blocks shall be unpainted and have hardness between 35 HRC and 45 HRC in accordance with ISO 6508-1. If a test block has multiple ports, the distance between the centrelines of test ports shall be a minimum of 1,5 times the port diameter. The distance between the port centreline and the edge of the test block shall be a minimum of 1 times the port diameter.

6.2 Test seals.

For all tests except for the overtightening test and unless otherwise specified, seals used in the ports shall be made from nitrile (NBR) rubber with a hardness of 90 IRHD ± 5 IRHD when measured in accordance with ISO 48. Seals shall conform to their respective dimensional requirements, and O-rings shall meet or exceed the quality requirements for grade N (general purpose) of ISO 3601-3.

6.3 Measuring instruments.

Measuring instruments used shall provide the accuracy given in Table 2.

Table 2 — Required accuracy of instruments used to measure data

Parameter	Unit	Data accuracy (percentage of maximum measured value)
Flow rate	l/min	±3 %
Force	N	±3 %
Pressure and pressure drop	MPa	±3 %
Torque	N·m	±3 %
Volume (leakage)	mL	±1 %
Temperature	°C	±3 °C

7 Connect force or torque test

7.1 The instructions in Annex B on how to conduct this test shall be followed when internal pressure is present in the coupling

7.2 The coupling interfaces of the test assembly shall be lubricated with the test fluid. Insert the test assembly in a test fixture. Maintain the internal test pressure as specified in the respective connector

standard or as agreed by the supplier and purchaser. Conduct the test using the parameters and procedures given in Table 3.

Table 3 — Parameters and procedures for connect force and disconnect force test

Test parameter	Value of parameter and procedure
Test medium	As specified in Clause 5
Test pressure and temperature	As specified in Clause 5 or as specified in the respective connector standard or as agreed by the supplier and purchaser
Test ambient conditions	As specified in the respective connector standard or as agreed by the supplier and purchaser
Pass/fail criteria	Any mechanical damages compromising the capability to connect and disconnect shall be considered a test failure. Acceptable fluid loss and air inclusion should be as specified in the respective connector standard or as agreed by the supplier and purchaser. Any deviation shall be considered a test failure.

7.3 Apply a linear force or torque to the coupling half until complete connection occurs. During this operation, the locking mechanism may be operated manually, if necessary, to permit normal coupling of the halves.

7.4 Measure the connect force or connect torque or both, as appropriate.

7.5 Repeat the test for a total of five times on the same test assembly. Average the results of the five tests to determine the connect force or torque. Report the average in the test report. This value is the rated connect force or rated connect torque.

7.6 Report any failures identified in Table 3 (e.g. damage, malfunction, leakage) in the test report.

8 Disconnect force or torque test

8.1 The instructions in Annex B on how to conduct this test shall be followed when internal pressure is present in the coupling

8.2 Lubricate the coupling interfaces of the test assembly with the test fluid. Insert the test assembly in a test fixture. Maintain the internal test pressure either as specified in the respective connector standard or as agreed by the supplier and purchaser or in accordance with the prevailing flow conditions. Conduct the test using the parameters and procedures given in Table 3.

8.3 Apply linear force or torque to the retaining mechanism of the coupling until disconnection occurs.

8.4 Measure the disconnect force or torque, as appropriate.

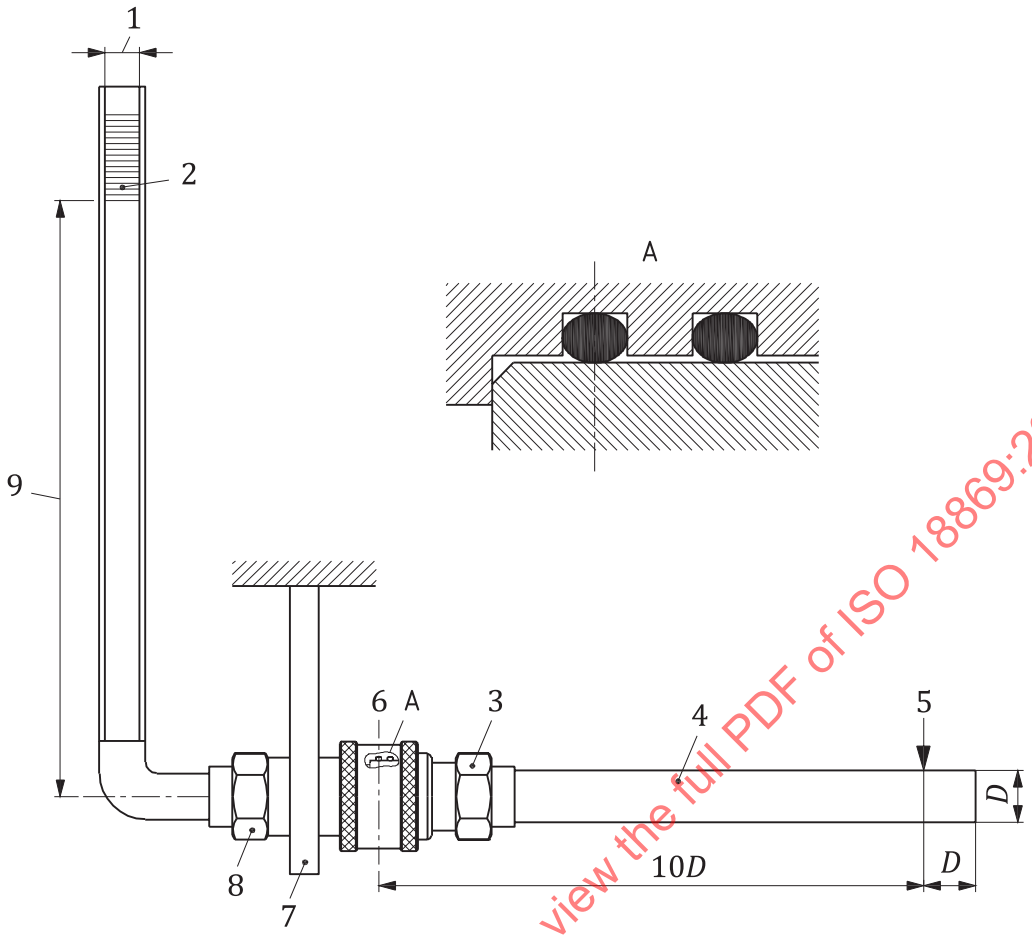
8.5 Repeat the test for a total of five disconnections on the same test assembly. Average the test results of the five tests to determine the disconnect force or torque. Report the average in the test report. This value is the rated disconnect force or the rated disconnect torque.

8.6 Report any failures identified in Table 3 (e.g. damage, malfunction, leakage) in the test report.

9 Leakage test

9.1 Low pressure, coupled

9.1.1 Insert the test assembly in a test apparatus, as shown in Figure 2. Fill the test apparatus with test fluid (see 5.4) to a fluid column height of 750 mm. Apply a 50 N load perpendicular to the coupling centreline at a distance of 10*D* from the centreline of the main interface seal, where *D* is the nominal coupling size, in millimetres.



Key

1 inside diameter, maximum 13 mm
2 column with top portion graduated for measurement
3 male coupling half
4 steel rod connected to the male coupling half not held in the fixture
5 50 N load perpendicular to centreline of the coupling
6 centreline of the main interface seal (see detail)
7 fixture to hold the female coupling half
8 female coupling half
9 head fluid column
A section detail: first sealing element
D nominal size of the coupling

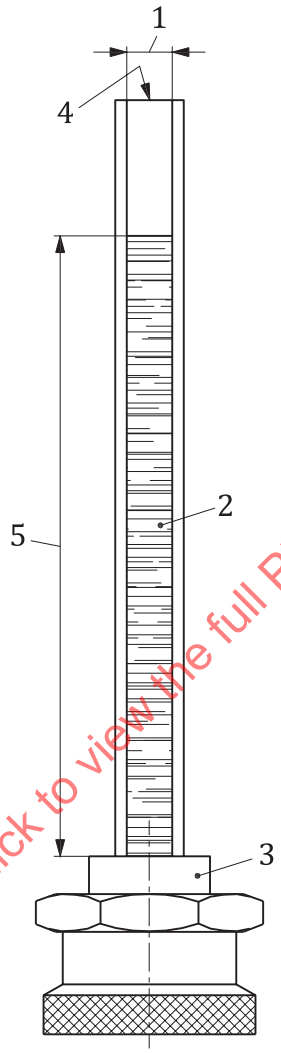
Figure 2 — Test apparatus for the low pressure leakage test, coupled

9.1.2 Measure the drop in column height over a minimum test period of 30 min. Calculate the leakage rate in millilitres per hour.

9.1.3 Report the leakage rate in the test report.

9.2 Low–pressure, uncoupled (valved only)

9.2.1 Insert each coupling half into the test apparatus, as shown in Figure 3. Fill the test apparatus with test fluid (see 5.4) to a fluid column height of 750 mm.



Key

1 inside diameter, maximum 13 mm
2 column with top portion graduated for measurement
3 coupling half (male or female) under test
4 top of column open to atmosphere
5 head fluid column

Figure 3 — Test apparatus for the low pressure leakage test, uncoupled

9.2.2 Measure the drop in column height over a test period of 30 min. Calculate the leakage rate in millilitres per hour.

9.2.3 Report the leakage rate in the test report.

9.3 Maximum working pressure, coupled

9.3.1 Purge internal air from the circuit. Pressurize the coupling assembly with the test fluid at the maximum working pressure specified in the respective connector standard or as agreed by the supplier and purchaser, and maintain this pressure level for a test period of 30 min.

9.3.2 During the test period, observe any leakage and collect and measure it in a graduated measuring flask. Calculate the leakage rate in millilitres per hour.

9.3.3 Report the leakage rate in the test report.

9.4 Maximum working pressure, uncoupled (valved only)

9.4.1 Purge internal air from the circuit. Pressurize the coupling half with the test fluid at the maximum working pressure specified in the respective connector standard or as agreed by the supplier and purchaser, and maintain this pressure level for a test period of 30 min.

9.4.2 During the test period, observe any leakage from each coupling half and collect and measure it in a graduated measuring flask. Calculate the leakage rate in millilitres per hour.

9.4.3 Report the leakage rate in the test report.

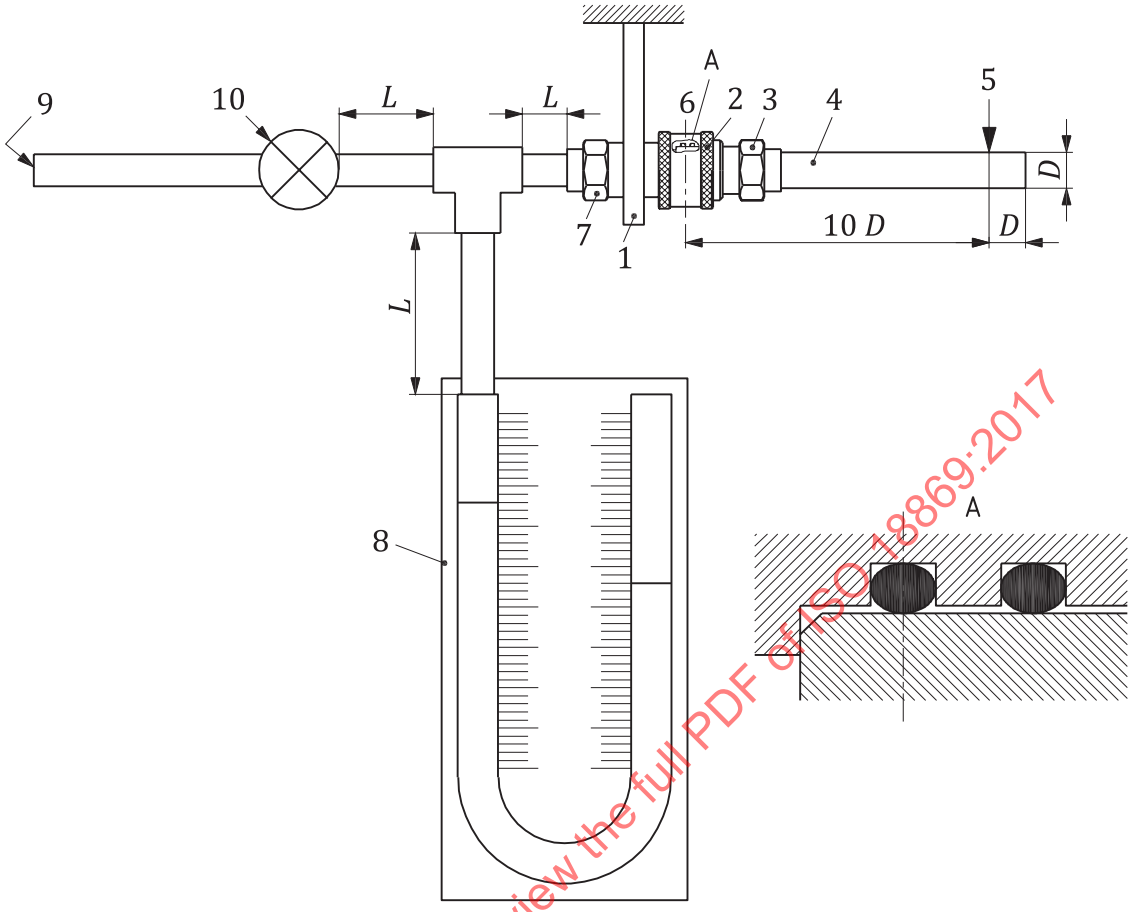
10 Vacuum test

10.1 General

This procedure is recommended only for vacuum tests for which measurement of a leakage rate is not required.

10.2 Coupled test

10.2.1 Insert the coupling assembly in a test apparatus as shown in Figure 4.



Key

1	fixture to hold female coupling half	9	vacuum pump
2	coupling or coupling half under test	10	valve
3	male coupling half	A	section detail: first sealing element
4	steel rod connected to male coupling half not held in the fixture	*D*	the nominal size of the coupling
5	50 N load perpendicular to the centreline of the coupling under test	*L*	maximum 15*D*
6	centreline of the main interface seal		
7	female coupling half		
8	manometer		

NOTE Side load is applied only during the coupled test.

Figure 4 — Apparatus for vacuum test

10.2.2 Apply the side load to the coupling assembly, as shown in Figure 4.

10.2.3 Start the vacuum pump and create a vacuum to the value specified in the respective connector standard or as agreed by the supplier and purchaser.

10.2.4 Close the valve and allow 10 min for stabilization.

10.2.5 Observe the vacuum gauge for any loss of vacuum.

10.2.6 Report the gauge reading in the test report.

10.3 Uncoupled test (valved only)

10.3.1 Insert each coupling half in a test apparatus as shown in Figure 4.

10.3.2 Start the vacuum pump and create a vacuum to the value specified in the respective connector standard or as agreed by the supplier and purchaser.

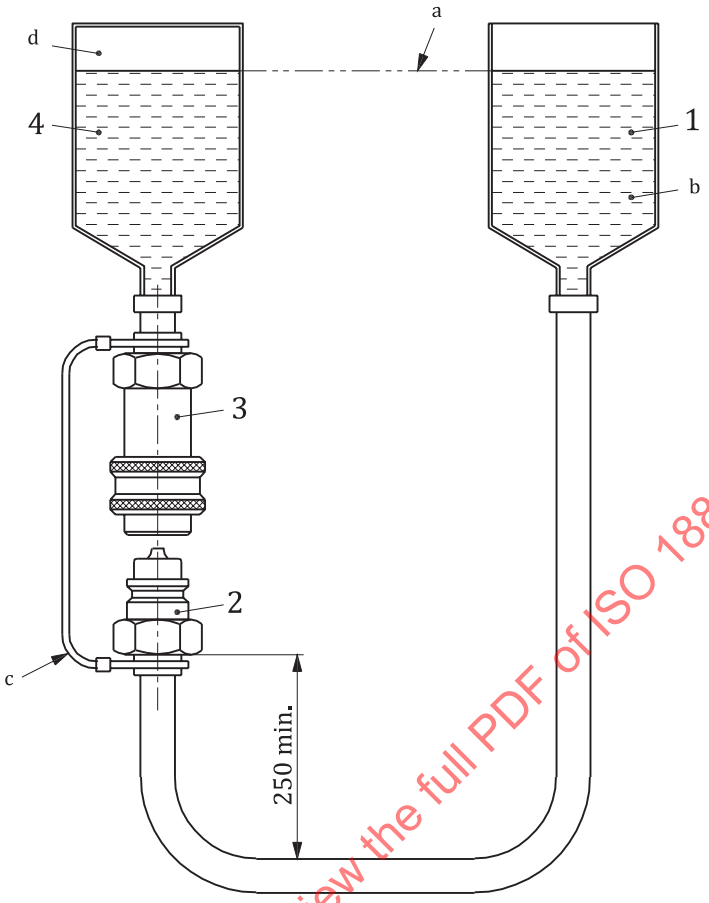
10.3.3 Close the valve and allow 10 min for stabilization.

10.3.4 Observe the vacuum gauge for any loss of vacuum.

10.3.5 Report the gauge reading in the test report.

11 Air inclusion test

11.1 Insert the coupling assembly in a test apparatus as shown in Figure 5. Record the fluid level of the closed graduated cylinder, with the coupling connected and the fluid levels coincident.



Key

1 open-top vessel with fluid
2 mating coupling half
3 fixed coupling half
4 closed graduated vessel with test fluid
a Reading shall be taken when fluid levels are coincident.
b If an air bubble appears in this vessel, the test shall be rerun, because the air has come from air trapped in the coupling.
c A lanyard may be used to prevent accidental dropping of the male half below the 250 mm minimum requirement.
d Difference in the volume of entrapped air represents the total air inclusion.

Figure 5 — Apparatus for the air inclusion test

11.2 Uncouple and couple the coupling assembly and allow lost fluid to drain after uncoupling. After each uncoupling/coupling cycle, tap the coupling assembly to clear all air bubbles from the interior of the assembly.

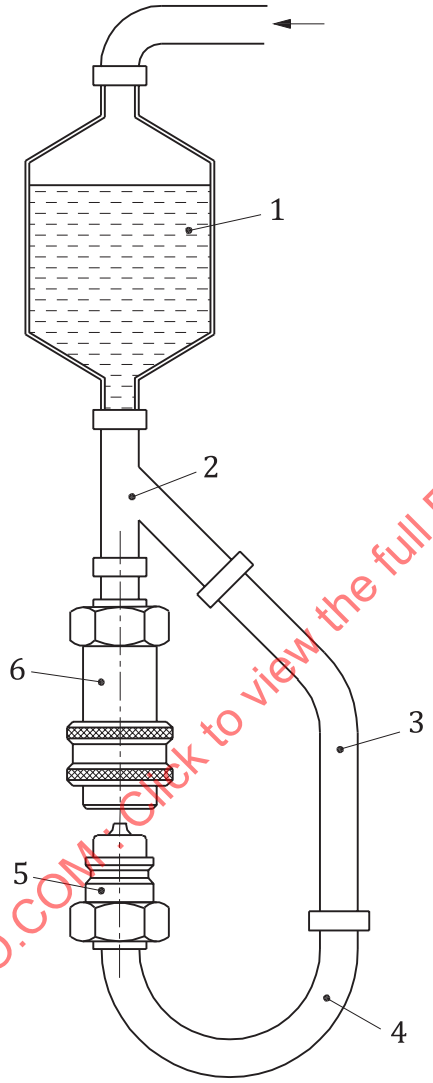
11.3 Repeat the procedures specified in 11.2 until the fluid displaced by air in the graduated cylinder exceeds 10 minor divisions on the graduated scale. With the coupling coupled, adjust the open-top vessel vertically so that the fluid levels are coincident. Record the fluid level of the graduated cylinder.

11.4 Subtract the fluid level value recorded in 11.3 from the value recorded in 11.1 and divide the difference by the number of coupling/uncoupling cycles.

11.5 Report the air inclusion in millilitres per coupling/uncoupling cycle in the test report.

12 Fluid loss test

12.1 Insert the coupling assembly in a test apparatus as shown in Figure 6. Maintain a fluid pressure of 0,1 MPa (1 bar) in the graduated vessel with test fluid. If the viscosity of the test fluid prevents prompt clearing of bubbles, use a fluid with a lower viscosity and record the fluid type used. Record the fluid level of the graduated vessel.



Key

1 graduated vessel with test fluid
2 Y connector
3 rigid tubing
4 polytetrafluorethylene (PTFE) tubing
5 mating coupling half
6 fixed coupling half

Figure 6 — Apparatus for the fluid loss test

12.2 Couple and uncouple the assembly. After each uncoupling, allow the fluid loss to drain from the assembly. After each coupling, tap the assembly to clear all air bubbles from the interior of the coupling.

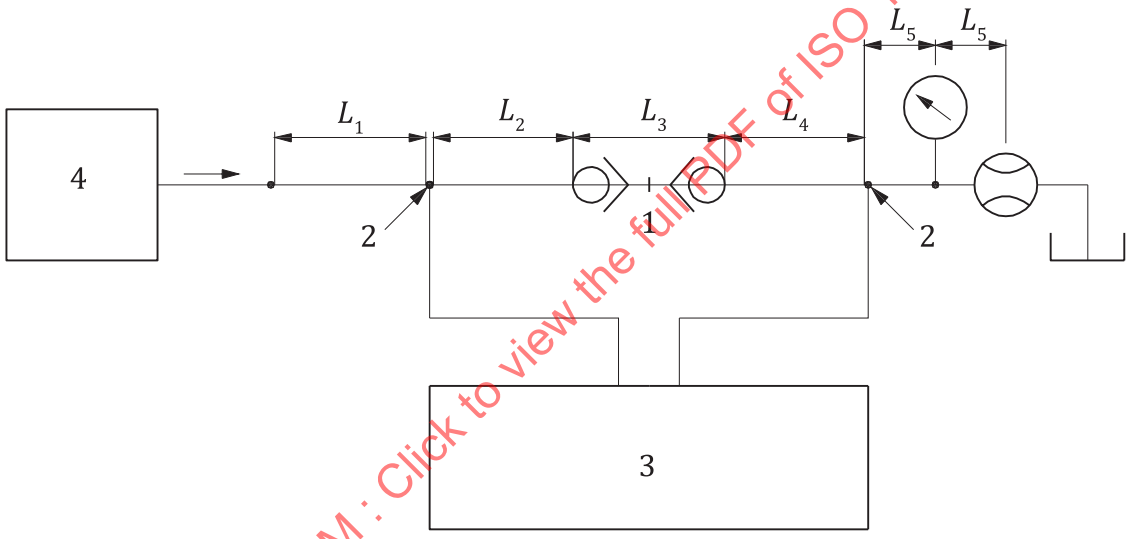
12.3 Repeat the procedures in 12.2 until the fluid level of the graduated vessel has dropped a minimum of 10 minor divisions on the scale. Record the fluid level of the graduated vessel.

12.4 Subtract the fluid level value recorded in 12.3 from the value recorded in 12.1 and divide the difference by the number of coupling/uncoupling cycles.

12.5 Report the value calculated in 12.4 as the fluid loss in millilitres per coupling/uncoupling cycle in the test report (S_{nc}).

13 Pressure drop (Δp) test

13.1 Insert the test coupling in a test apparatus as shown in Figure 7; the pressure tap shall be in accordance with ISO 4411, classes of measurement accuracy B and C. Select at least six flow rates from 25 % to 150 % of the rated flow, including 100 % of rated flow. If the rated flow is not specified in the respective connector standard, use the values given in Table 4.



Key

1 coupling under test
2 pressure tap
3 differential pressure measuring device
4 controlled fluid supply

NOTE Dimensions L_1 to L_5 are minimum lengths:

L_1 = 10 times the inside diameter of the coupling tube or pipe;
L_2 = 5 times the inside diameter of the coupling tube or pipe;
L_3 = length of the coupling plus end fittings;
L_4 = 10 times the inside diameter of the coupling tube or pipe;
L_5 = 5 times the inside diameter of the coupling tube or pipe.

Figure 7 — Apparatus for the pressure drop test

Table 4 — Typical rated flows

Coupling size (nominal hose size) mm	**Rated flow** Q_R l/min
5	3
6,3	12
10	23
12,5	45
16	74
19 (20)	100 (106)
25	189
31,5	288
38 (40)	342...(379)
51 (50)	788...(757)

13.2 Determine and record the pressure drop of the test coupling in male-half-to-female-half and female-half-to-male-half directions, at the flow rates selected in 13.1.

13.3 Remove the test coupling from the test apparatus and connect the tubes or pipes using an appropriate connector of the corresponding size. Determine and record the pressure drop at the same flow rates selected in 13.1.

13.4 Maintain the viscosity of the test fluid at 28,8 mm^2/s to 35,2 mm^2/s throughout the test. Record the fluid type and temperature.

13.5 Subtract the pressure drop values obtained in 13.3 from those obtained in 13.2. The difference is the net pressure drop of the test coupling. Graphically plot the net pressure drop for each flow direction. Full logarithmic graphing is recommended in order to obtain a straight line. It is not necessary for the line to pass through the points, but it should represent common values between the points.

13.6 If the pressure drop values in any one flow rate in one direction of flow through the coupling differ by less than 10 % from the pressure drop in the other direction of flow through the coupling, the higher of the two values shall be used.

13.7 Attach the plot to the test report.

14 Static pressure test

14.1 Coupled

14.1.1 Pressurize the coupling to specified static pressure for a minimum of 5 min.

14.1.2 Determine the leakage rate in accordance with 9.1 and 9.3.

14.1.3 Connect and disconnect the coupling five times at zero pressure.

14.1.4 Record any evidence of binding or malfunction.

14.1.5 Report the leakage rate in the test report.

14.2 Uncoupled (valved type only)

14.2.1 Pressurize the uncoupled halves to the specified static pressure for a minimum of 5 min.

14.2.2 Determine the leakage rate in accordance with 9.2 and 9.4.

14.2.3 Record any evidence of binding or malfunction.

14.2.4 Report the leakage rate in the test report.

15 Specific temperature test

15.1 Maximum working temperature exposure

15.1.1 General

These tests shall be conducted at the maximum working temperature.

The tests specified in 15.1.2 and 15.1.3 might require specific and dedicated

a) safety instructions to prevent injury to persons and damage to the environment, and

b) ambient and environmental conditions.

Any precautions shall be taken for testing conducted in both the coupled and uncoupled position.

15.1.2 Coupled

15.1.2.1 Fill the coupling assembly with test fluid and subject the assembly to the maximum working temperature for a minimum of 6 h. The coupling shall be internally vented to atmosphere during the temperature adjustment.

15.1.2.2 Allow the coupling to cool to ambient temperature. Disconnect and reconnect the coupling. Determine the leakage rate in accordance with 9.1 and 9.3. If it is necessary that the connecting and disconnecting take place at a certain temperature, this temperature should be agreed by the supplier and purchaser.

15.1.2.3 Report the leakage rate in the test report.

15.1.3 Uncoupled (valved only)

15.1.3.1 Fill the coupling halves with test fluid and subject the halves to the maximum working temperature for a minimum of 6 h.

15.1.3.2 Allow the coupling to cool to ambient temperature and actuate the valves manually five times to separate the valve seal from the sealing surface. Determine the leakage rate in accordance with 9.2 and 9.4.

15.1.3.3 Report the leakage rate in the test report.

15.2 Maximum working temperature service

15.2.1 Coupled

15.2.1.1 Fill the coupling assembly with test fluid and subject the assembly to the maximum working temperature for a minimum of 6 h. The coupling shall be internally vented to atmosphere during the temperature adjustment.

15.2.1.2 Determine the leakage rate in accordance with 9.1 and 9.3.

15.2.1.3 Report the leakage rate in the test report.

15.2.2 Uncoupled (valved only)

15.2.2.1 Fill the coupling halves with test fluid and subject the halves to the maximum working temperature for a minimum of 6 h.

15.2.2.2 Determine the leakage rate in accordance with 9.2 and 9.4.

15.2.2.3 Report the leakage rate in the test report.

15.3 Minimum working temperature

15.3.1 Coupled

15.3.1.1 Fill the coupling assembly with test fluid and subject the assembly to the minimum working temperature for a minimum of 4 h.

15.3.1.2 Determine the leakage rate in accordance with 9.1 and 9.3.

15.3.1.3 Report the leakage rate in the test report.

15.3.2 Uncoupled (valved only)

15.3.2.1 Fill the coupling halves with test fluid and subject the halves to the minimum working temperature for a minimum of 4 h.

15.3.2.2 Actuate the valves manually five times to separate the valve seal from the sealing surface. Determine the leakage rate in accordance with 9.2 and 9.4.

15.3.2.3 Report the leakage rate in the test report.

16 Endurance test

NOTE See Annex B for instructions on how to conduct this test when internal pressure is present in the coupling.

16.1 Couplings other than screw-to-connect types

16.1.1 Because the endurance test is a destructive test, a new coupling shall be used for testing. Afterwards, the coupling shall not be used for any further testing or returned to stock.

16.1.2 Connect the coupling assembly to a pressure source that is capable of providing an internal pressure of 100 kPa (1 bar). Record the type of test medium used.

16.1.3 Connect and disconnect the assembly for the number of cycles indicated in the respective connector standard or as agreed by the supplier and purchaser. The frequency of the single connect/disconnect cycle test shall not exceed 1 800 connect/disconnect cycles per hour on couplings of sizes up to and including 12,5 mm, and 600 connect/disconnect cycles per hour on couplings of sizes larger than 12,5 mm.

16.1.4 Record any evidence of binding or malfunction.

16.1.5 Determine the leakage rate in accordance with Clause 9.

16.1.6 Report the leakage rate in the test report.

16.2 Screw-to-connect couplings

16.2.1 Principle

Unless otherwise specified in the respective screw-to-connect coupling standard, coupling assemblies shall be tested to confirm that they are capable of meeting the necessary requirements after being uncoupled and recoupled several times using the torques determined in Clause 7 and Clause 8.

16.2.2 Procedure

16.2.2.1 Assemble the coupling half with the swivel element to a test block, as indicated in Figure 8.

16.2.2.2 Assemble the other coupling half to a hose.

16.2.2.3 Rotate the swivel element until it reaches the indicated stop shoulder. The maximum overtorque allowed to ensure that the swivel is against the stop shoulder is 20 % of the rated connect torque. Ensure that the swivel is at the end of its stroke.

16.2.2.4 Uncouple the two halves.

16.2.2.5 Repeat the operation until the number of coupling/uncoupling cycles agreed by the supplier and purchaser has been achieved.

16.2.2.6 Test equipment is allowed to facilitate operation.

16.2.2.7 Test parameters are specified in Table 5.

Table 5 — Parameters and procedures for endurance test for screw-to-connect couplings

Test parameter	Value of parameter and procedure
Test medium	As specified in Clause 5
Test pressure and temperature	As specified in Clause 5 or as specified in the respective connector standard or as agreed by the supplier and purchaser
Test ambient conditions	As specified in the respective connector standard or as agreed by the supplier and purchaser
Test duration	As specified in the respective connector standard or as agreed by the supplier and purchaser
Pass/fail criteria	Any mechanical damage that compromises the capability to screw and unscrew shall be considered test failures. Fluid loss and air inclusion values should be as specified in the respective connector standard or as agreed by the supplier and purchaser. Any deviation shall be considered test failure.

16.2.3 Re-use of components

Parts that pass this test at the minimum specified assembly torque or number of turns may be used for burst or cycle impulse tests. Such parts shall not be used for actual service or returned to stock.

17 Overtightening test for screw-to-connect couplings only

17.1 Principle

Unless otherwise specified in the respective connector standard, a number of coupling assemblies in accordance with Table 1 for each size shall be tested to confirm that they are capable of withstanding the overtightening qualification test when tested to the overtightening (overtorque) values or number of turns given in the respective connector standard or as agreed by the supplier and purchaser.

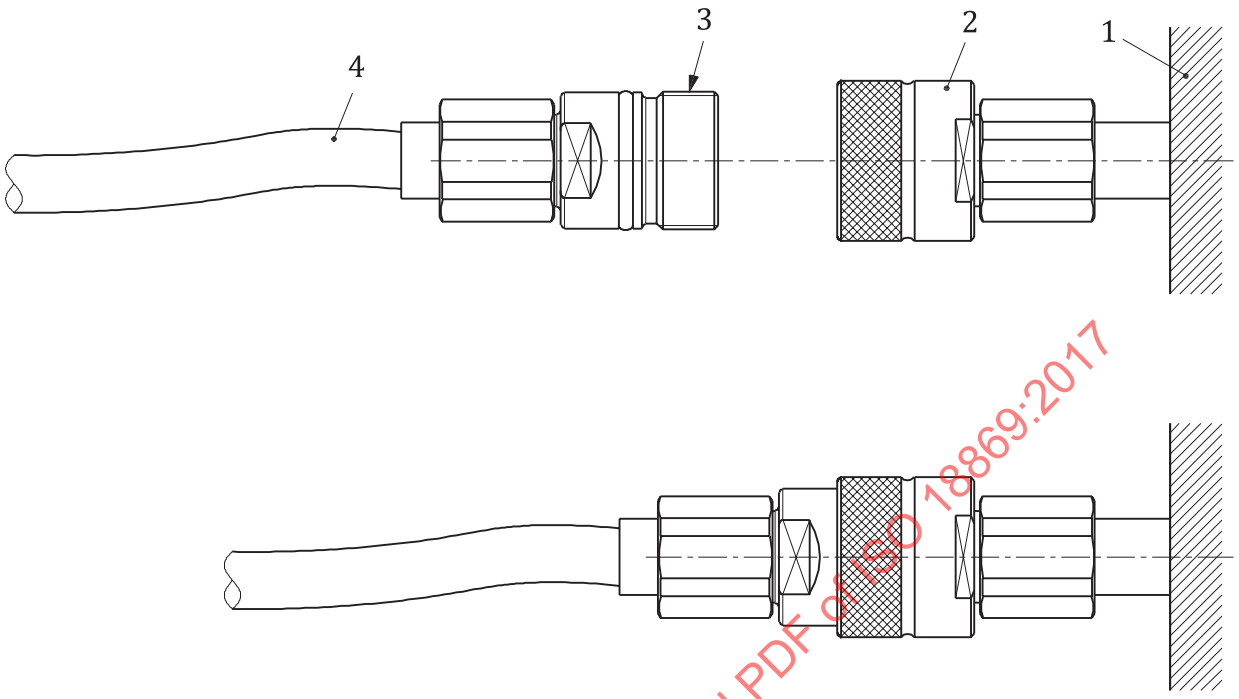
17.2 Test equipment

Unless otherwise specified, use the same equipment specified in Clause 16.

17.3 Procedure

17.3.1 Assemble the coupling half that has the swivel device element to a test block.

17.3.2 Assemble the other coupling half to a hose assembly, as shown in Figure 8.



Key

1 test block
2 fixed coupling half with the swivel device element
3 mating coupling half
4 hose assembly

Figure 8 — Apparatus for endurance test for screw-to-connect couplings

17.3.3 Rotate the swivel element until it reaches the indicated stop shoulder. The maximum overtorque allowed to ensure that the swivel is against the stop shoulder is 20 % of the rated connect torque. Ensure that the swivel is at the end of its stroke, then apply the overtorque value specified in the respective connector standard or as agreed by the supplier and purchaser.

17.3.4 Uncouple the two halves and record the overtorque value of the uncoupling action.

17.3.5 Repeat the operation until the number of coupling/uncoupling cycles specified in the connector standard or agreed by the supplier and purchaser has been achieved.

17.3.6 Test equipment is allowed to facilitate operation.

17.3.7 Test parameters are specified in Table 6.

Table 6 — Parameters and procedures for overtightening test

Test parameter	Value of parameter and procedure
Test duration	Continue to apply overtorque to the swivel until the specified torque has been achieved. The number of test cycles shall be as specified in the respective connector standard or as agreed by the supplier and purchaser. Unless otherwise specified in the connector standard, the overtightening torque force shall be agreed by the supplier and purchaser.
Pass/fail criteria	The coupling shall be considered to have failed if a) there is any mechanical damage that compromises the capability to screw and unscrew the coupling, or b) fluid loss or air inclusion deviates from the levels specified in the respective connector standard or as agreed by the supplier and purchaser.

17.4 Re-use of components

Couplings that pass this test shall not be tested further, used for actual service or returned to stock.

18 Burst test

18.1 Safety precautions

The safety precautions specified in 5.1 shall be applied.

18.2 Burst pressure, uncoupled (valved only)

18.2.1 Purge internal air from the circuit. Pressurize the coupling halves at a rate not exceeding 100 MPa/min (1 000 bar/min).

18.2.2 Report the burst pressure in the test report.

18.3 Burst pressure, coupled

18.3.1 Purge internal air from the circuit. Pressurize the coupling assembly at a rate not exceeding 100 MPa/min (1 000 bar/min).

18.3.2 Report the burst pressure in the test report.

19 Pressure impulse test in accordance with ISO 6803

19.1 General

Because the pressure impulse test is a destructive test, only couplings that have passed the tests specified in Clause 7 to Clause 15 or new couplings shall be subjected to the pressure impulse test. Afterwards, the couplings shall not be used for any further testing.

19.2 Coupled

19.2.1 Connect the coupling assembly to a test apparatus capable of producing the pressure impulse waveform specified in ISO 6803. Adjust the test pressure to 133 % of the rated pressure and adjust the test temperature to 80 °C ± 5 °C, unless otherwise agreed by the supplier and purchaser. The hose assembly or tubing to be used shall be chosen by the test laboratory, unless otherwise agreed by the supplier and purchaser.

19.2.2 Adjust the test apparatus so that a pressure-time cycle corresponding to the curve shown within the shaded area of the test waveform specified in ISO 6803 is obtained.

19.2.3 Subject the coupling assembly to the specified number of pressure impulse cycles at a uniform cycle rate of 0,5 Hz to 1 Hz.

19.2.4 To check that the coupling assembly is functioning correctly, the impulse cycle shall be stopped and the assembly uncoupled and recoupled a minimum of one time at the interval specified in the respective connector standard or as agreed by the supplier and purchaser. If no interval is indicated, a number equal to 10 % of the total number of cycles should be used (for example, if the total number of cycles equals 10^6, the coupling shall be uncoupled and recoupled at intervals of 10^5 cycles).

19.2.5 Record any evidence of binding or malfunction.

19.2.6 Determine the leakage rate in accordance with 9.1 and 9.3.

19.2.7 Report the leakage rate and the number of test cycles in the test report.

19.3 Uncoupled (valved only)

19.3.1 Connect each coupling half to a test apparatus capable of producing the pressure impulse waveform specified in ISO 6803. Adjust the test pressure to 133 % of the rated pressure and adjust the test temperature to 80 °C ± 5 °C, unless otherwise agreed by the supplier and purchaser.

19.3.2 Adjust the test apparatus so that a pressure-time cycle corresponding to the curve shown within the shaded area of the test waveform specified in ISO 6803 is obtained.

19.3.3 Subject the coupling halves to the specified number of pressure impulse cycles.

19.3.4 To check that the coupling half is functioning correctly, the impulse cycle shall be stopped and the coupling half under test shall be coupled and uncoupled with another coupling half a minimum of one time at the interval is specified in the respective connector standard or as agreed by the supplier and purchaser. If no interval is specified, a number equal to 10 % of the total number of cycles should be used (for example, if the total number of cycles equals 10^6, the coupling shall be uncoupled and recoupled at intervals of 10^5 cycles).

19.3.5 Record any evidence of binding or malfunction.

19.3.6 Determine the leakage rate in accordance with 9.2 and 9.4.

19.3.7 Report the leakage rate and the number of test cycles in the test report.

20 Pressure impulse test in accordance with ISO 6802 (for coupling assemblies only)

20.1 General

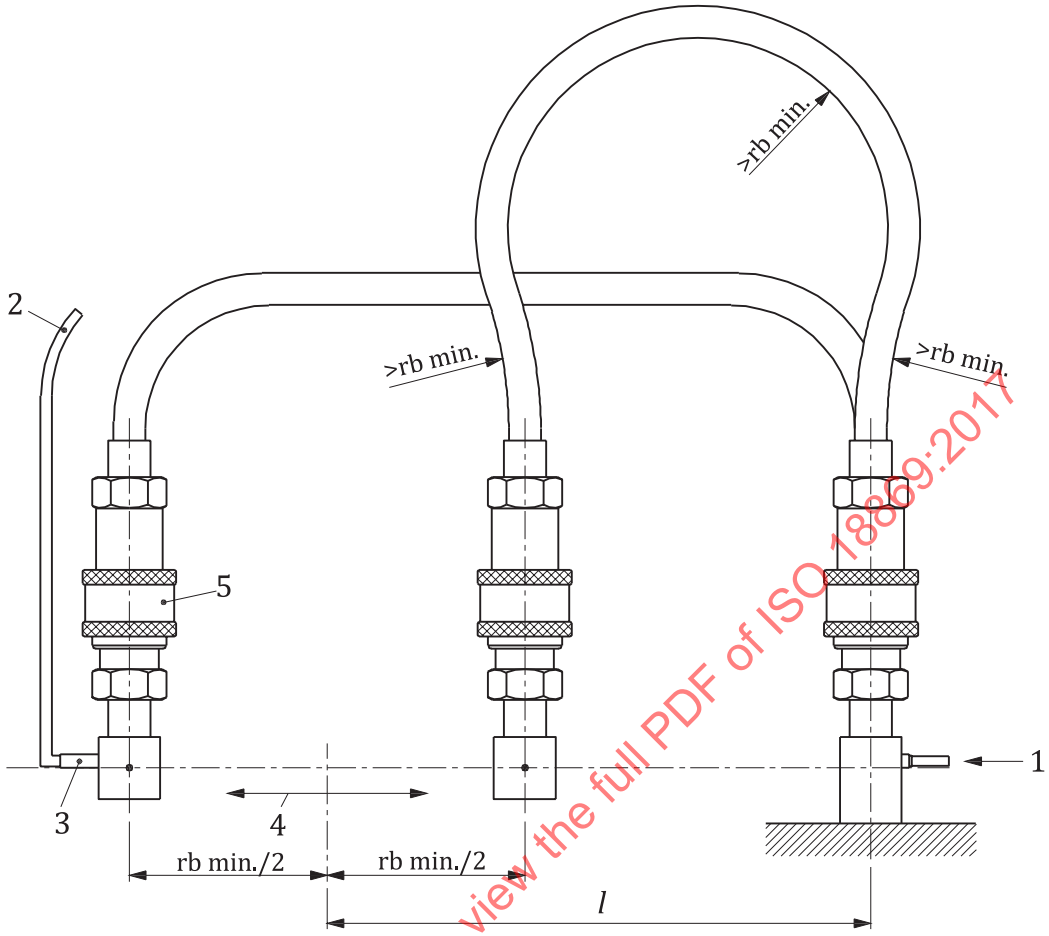
This test applies to coupling assemblies only. Because the pressure impulse test is a destructive test, only couplings that have passed the tests specified in Clause 7 to Clause 15 or new coupling shall be subjected to the pressure impulse test. Afterwards, the couplings shall not be used for any further testing.

20.2 Test apparatus

Use the test apparatus specified in ISO 6802.

20.3 Positioning of the test item

The coupling assembly to be tested shall be assembled between the test block and the hose adapter in line with the hose. The size of the hose should be the same as the nominal diameter of the coupling. The working pressure of the hose should be equal to or exceed the rated pressure of the coupling under test. The bend radius of the hose shall be equal to or exceed the minimum specified for the size in the respective hose standard. The type of the hose shall be agreed by the supplier and purchaser. See Figure 9 for an illustration of the rotating and sliding test apparatus.



Key

1 test pressure inlet
2 fluid circulation line
3 check valve
4 horizontal reciprocating motion
5 connected couplings

Figure 9 — Apparatus for hydraulic impulse test with flexing using a horizontally reciprocating manifold

20.4 Procedure

20.4.1 Connect the coupling assembly to a test apparatus capable of producing the pressure impulse waveform specified in ISO 6802. Adjust the test pressure to 133 % of the rated pressure and adjust the test temperature to 80 °C ± 5 °C, unless otherwise agreed by the supplier and purchaser.

20.4.2 Adjust the test apparatus so that a pressure-time cycle corresponding to the curve shown within the shaded area of the test waveform specified in ISO 6802 is obtained.

20.4.3 Subject the coupling assembly to the specified number of pressure impulse cycles at a uniform cycle rate of 0,5 Hz to 1 Hz.

20.4.4 To check that the coupling assembly is functioning correctly, the impulse cycle shall be stopped and the assembly uncoupled and recoupled a minimum of one time at the interval specified in the respective connector standard or as agreed by the supplier and purchaser. If no interval is indicated, a

number equal to 10 % of the total number of cycles should be used (for example, if the total number of cycles equals 10^6, the coupling shall be uncoupled and recoupled at intervals of 10^5 cycles).

20.4.5 Record any evidence of binding or malfunction.

20.4.6 Determine the leakage rate in accordance with 9.1 and 9.3.

20.4.7 Report the leakage rate and the number of impulse pressure test cycles in the test report.

21 Rotating impulse test

21.1 General

This test applies to coupling assemblies only. Because the pressure impulse test is a destructive test, only couplings that have passed the tests specified in Clause 7 to Clause 15 or new couplings shall be subjected to the pressure impulse test. Afterwards, the couplings shall not be used for any further testing.

21.2 Procedure

21.2.1 Connect the coupling assembly to a test apparatus capable of producing the pressure impulse waveform specified ISO 6803. Adjust the test apparatus so that a pressure-time cycle corresponding to the curve shown within the shaded area of the test waveform specified in ISO 6803 is obtained.

21.2.2 Install the coupling in a test fixture that can rotate the male half a minimum of 5° relative to the female half, between each pressure impulse cycle, while the pressure is below 1 000 kPa (10 bar).

21.2.3 Subject the coupling assembly to the specified number of pressure impulse cycles at a uniform cycle rate of 0,5 Hz to 1 Hz.

21.2.4 To check that the coupling assembly is functioning correctly, the impulse cycle shall be stopped and the assembly uncoupled and recoupled a minimum of one time at specified intervals.

21.2.5 Record any evidence of binding.

21.2.6 Determine the leakage rate in accordance with 9.1 and 9.3.

21.2.7 Report the leakage rate and the number of test cycles in the test report.

22 Surge flow test — Long duration

22.1 Table 7 specifies the parameters, symbols and units used in this clause and Clause 23.

Table 7 — Parameters, symbols and units used in surge flow tests

Parameter	Symbol	Unit	Specification
Rated flow	Q_R	l/min	In accordance with Table 4, unless otherwise specified in the respective connector standard.
Pressure drop at rated flow Q_R	Δp_R	MPa (bar)	Determined in accordance with the pressure drop test specified in Clause 13.
Surge flow	Q_S	l/min	As specified in the respective connector standard.
Surge flow ratio	S_C	—	Ratio Q_S/Q_R as specified in the respective connector standard (e.g. S_C = 3 in ISO 16028 or S_C = 5 in severe applications).
Pressure setting of test equipment	p_{SF}	MPa (bar)	For the short duration surge flow test only.

22.2 Subject the coupling to the leakage test in accordance with Clause 9.

22.3 Determine the pressure drop of the coupling in accordance with Clause 13.

22.4 Subject the coupling to the specified surge flow rate (Q_S) for a minimum of 5 s in each direction of flow. If the surge flow rate is not specified in the respective connector standard, use Table 4 to select a Q_R that is appropriate for the size of the coupling and calculate Q_S using Formula (1):

$$Qs = Q_R \times S_C \quad (1)$$

22.5 Repeat the cycle specified in 22.4 for a total of 100 cycles in each direction of flow. Repetition of the cycle can be accomplished by running 100 cycles in one direction, followed by 100 cycles in the opposite direction.

22.6 Subject the coupling to the leakage test in accordance with Clause 9.

22.7 Determine the pressure drop of the coupling in accordance with Clause 13.

22.8 Record the following results in the test report:

a) leakage before and after the surge flow cycles;

b) pressure drop before and after the surge flow cycles;

c) any visual signs of damage caused by the surge flow cycles.

23 Surge flow test — Short duration

CAUTION — This procedure involves high fluid velocities. Precautions shall be exercised in setting up and conducting the test and in selecting and using test equipment to avoid exposing personnel to hazards and damaging equipment.

23.1 Subject the coupling to the leakage test in accordance with Clause 9.

23.2 Determine the pressure drop of the coupling in accordance with Clause 13.

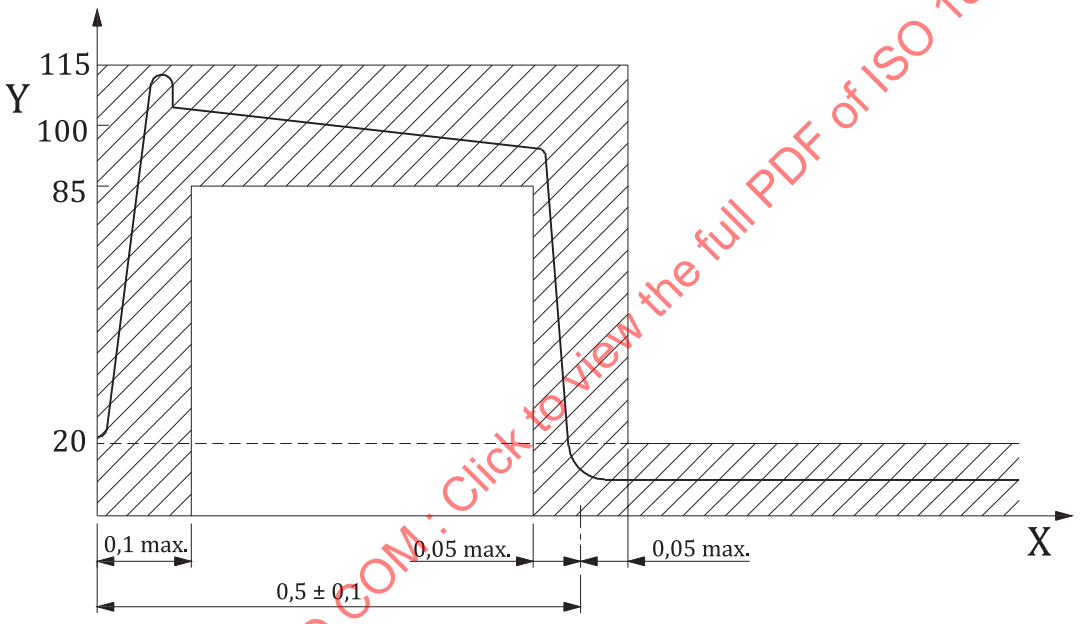
23.3 Calculate the test pressure, p_{SF}, in megapascals using Formula (2):

$$p_{SF} = \Delta p_R \times (S_C)^2 \quad (2)$$

If the rated flow, Q_R, is not specified, use the rated flow given in Table 4 which is appropriate for the size of the coupling.

23.4 Install the coupling in a test circuit as shown in Figure 7; however, the flow meter may be removed from the circuit.

23.5 Adjust the fluid supply discharge characteristics to produce a curve that is within the shaded area around the pressure-time curve shown in Figure 10. The differential pressure between the upstream and downstream pressure measuring points shall equal the test pressure calculated in 23.3. One fluid discharge shall equal one cycle. A copy of the actual pressure-time curve used shall be included in the test report.



Key

X time, in s

Y percentage of surge test pressure, in MPa

Figure 10 — Pressure/time curve for the surge flow test — Short duration

23.6 Subject the coupling to 100 cycles.

23.7 Reverse the coupling in the circuit. Adjust the fluid discharge characteristics, if necessary, to meet the requirements of 23.3 and 23.5. Such adjustment is necessary only if the pressure drop of the coupling differs by more than 10 % between directions of flow at the rated flow.

23.8 Subject the coupling to 100 cycles in the new direction of flow.

23.9 Subject the coupling to the leakage test in accordance with Clause 9.

23.10 Determine the pressure drop of the coupling in accordance with Clause 13.

23.11 Record the following results in the test report:

a) leakage before and after the surge flow cycles;

b) pressure drop before and after the surge flow cycles;

c) any visual signs of damage caused by the surge flow cycles.

24 Corrosion resistance test

Corrosion resistance shall be determined in accordance with ISO 9227. The pass/fail criteria shall be in accordance with the respective connector standard or as otherwise agreed by the supplier and purchaser.

25 Test report and data presentation

Test conditions and results shall be reported on the test data form given in Annex A.

26 Summary of information to be reported

The following information shall be reported:

a) rated flow, Q_R;

b) rated pressure, P_R;

c) rated static pressure, P_{RS};

d) surge flow ratio, S_C;

e) maximum working pressure, P_{MAX};

f) maximum working temperature, T_{MAX};

g) minimum working temperature, T_{MIN};

h) vacuum pressure;

j) fluid loss;

k) air inclusion.

27 Identification statement (reference to this document)

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

"Method of obtaining and presenting test data conforms to ISO 18869."

Annex A
(normative)

Test data form

Coupling manufacturer:	
Coupling product number:	**Serial or identification number:**
Test fluid:	**Ambient temperature:**
Date tested:	**Test by:**

Type of test	**Test results**	**Remarks**
Connect force		
Force	N	Test pressure:
Torque	N · m	
Disconnect force		
Force	N	Test pressure:
Torque	N · m	Test flow:
Leakage rate at		
low pressure, coupled	ml/h	
low pressure, uncoupled, male	ml/h	
low pressure, uncoupled, female	ml/h	
maximum working pressure, coupled	ml/h	Test pressure:
maximum working pressure, uncoupled male	ml/h	Test pressure:
maximum working pressure, uncoupled female	ml/h	Test pressure:
Vacuum	Leakage?	Gauge reading:
Coupled	Yes _____ No _____	before _____ after _____
Uncoupled, male	Yes _____ No _____	before _____ after _____
Uncoupled, female	Yes _____ No _____	before _____ after _____
Air inclusion	ml per couple/uncouple cycle	Test fluid:
Fluid loss	ml per couple/uncouple cycle	Test fluid:
Pressure drop	Attach graph	
Static pressure		
Coupled		
Leakage, low pressure	ml/h	Rated static pressure: MPa (bar)
Leakage, working pressure	ml/h	
Uncoupled, male half		
Leakage, low pressure	ml/h	Rated static pressure: MPa (bar)
Leakage, working pressure	ml/h	
Uncoupled, female half		
Leakage, low pressure	ml/h	Rated static pressure: MPa (bar)
Leakage, working pressure	ml/h	