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Pneumatic fluid power — Cylindrical quick-action couplings for maximum working pressures of 1 MPa, 1,6 MPa, and 2,5 MPa (10 bar, 16 bar and 25 bar) — Plug connecting dimensions, specifications, application guidelines and testing

Transmissions pneumatiques — Raccords rapides cylindriques pour pressions maximales d'utilisation 1 MPa, 1,6 MPa et 2,5 MPa (10 bar, 16 bar et 25 bar) — Dimensions de raccordement de la partie mâle, spécifications, conseils d'utilisation et essais

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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.

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 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 second edition cancels and replaces the first edition (ISO 6150:1988), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the complete document was reformatted and updated with the most current information.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

In pneumatic fluid power systems, power is transmitted and controlled through gas under pressure within an enclosed circuit.

Cylindrical quick-action couplings conforming to this document are designed to join or separate fluid conducting lines quickly without the use of tools or special devices.

Pneumatic fluid power — Cylindrical quick-action couplings for maximum working pressures of 1 MPa, 1,6 MPa, and 2,5 MPa (10 bar, 16 bar and 25 bar) — Plug connecting dimensions, specifications, application guidelines and testing

1 Scope

This document specifies the dimensions and tolerances so as to ensure the interchangeability of pneumatic quick-action coupling plugs. It also provides specifications and application guidelines, and specifies the tests to be applied to the plugs together with sockets.

NOTE 1 The construction and dimensions of sockets are left to the manufacturer's option.

This document applies to cylindrical quick-action couplings for maximum working pressures of 1 MPa, 1,6 MPa and 2,5 MPa (10 bar, 16 bar and 25 bar) for use in pneumatic fluid power systems.

NOTE 2 Quick-action couplings with shut-off valves for equipment for welding, cutting and related processes are covered by ISO 7289.

This document applies only to the dimensional criteria of products manufactured in accordance with this document. It does not apply to their functional characteristics.

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 4414, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

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

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 definition apply.

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

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

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

3.1
maximum working pressure
maximum pressure at the coupling in a system

4 Dimensions and tolerances

4.1 Cylindrical quick-action couplings for pneumatic fluid power systems are classified according to their maximum working pressure into the following three different series:

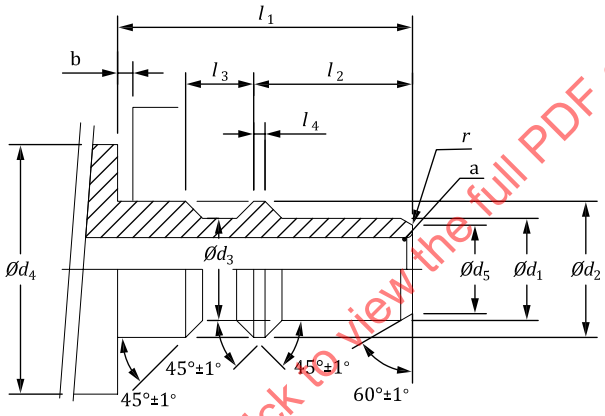
— Series A: Cylindrical quick-action couplings for a maximum working pressure of 1 MPa (10 bar).

— Series B: Cylindrical quick-action couplings for a maximum working pressure of 1,6 MPa (16 bar).

— Series C: Cylindrical quick-action couplings for a maximum working pressure of 2,5 MPa (25 bar).

4.2 Tables 1 to 3 and Figures 1 to 3 are only concerned with the dimensions and tolerances of the plug. The socket is left to the manufacturer's option; the same condition applies to the plug end for connection to either a component, or a pipe or hose.

4.2.1 The dimensions and tolerances for plugs on series A cylindrical quick-action couplings are shown in Figure 1 and given in Table 1.



a Inside diameter as large as possible.

b The distance between the shoulder of the plug and the end surface of the socket, when connected, shall not exceed 1 mm.

Figure 1 — Plug for 1 MPa (10 bar) maximum working pressure (series A)

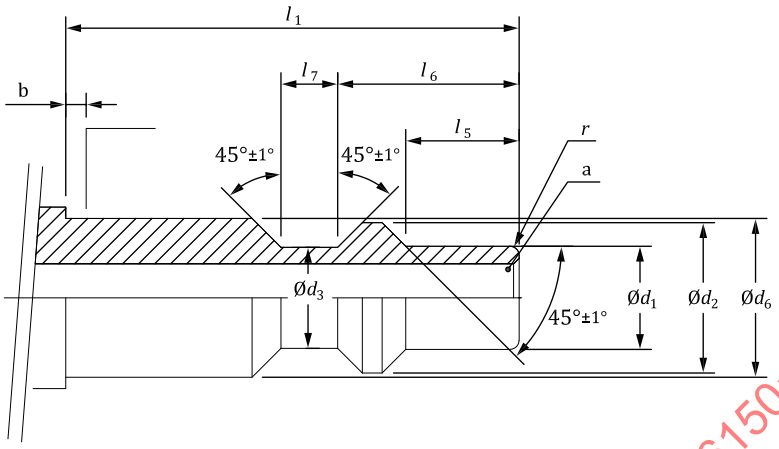
Table 1 — Dimensions for plug for 1 MPa (10 bar) maximum working pressure (series A)

Dimensions in millimetres

Nominal diameter	d_1 h$_{11}$	d_2 d$_{11}$	d_3	d_4[1] min.	d_5	l_1 +0,2/0	l_2	l_3	l_4	r
6	4,5	6	4,5	11	3,9	16	7 + 0,2/0	3 + 0,15/0	0,5	0,2 to 0,3
10	8	10	8	15	7	20	8,5 + 0,3/0	5,5 + 0,2/0	1	0,3 to 0,5
13	11	13	11	18	10	21				
16	13	16	13	20	12	24				
18	16	18	16	23	15	27				

1 Minimum actual diameter.

4.2.2 The dimensions and tolerances for plugs on series B cylindrical quick-action couplings are shown in Figure 2 and given in Table 2.



a Inside diameter as large as possible; break corner at 0,5 mm max. Test that the flow characteristics of the male part provide sufficient air flow and strength at the male part.

b The distance between the shoulder of the plug and the end surface of the socket, when connected, shall not exceed 1 mm.

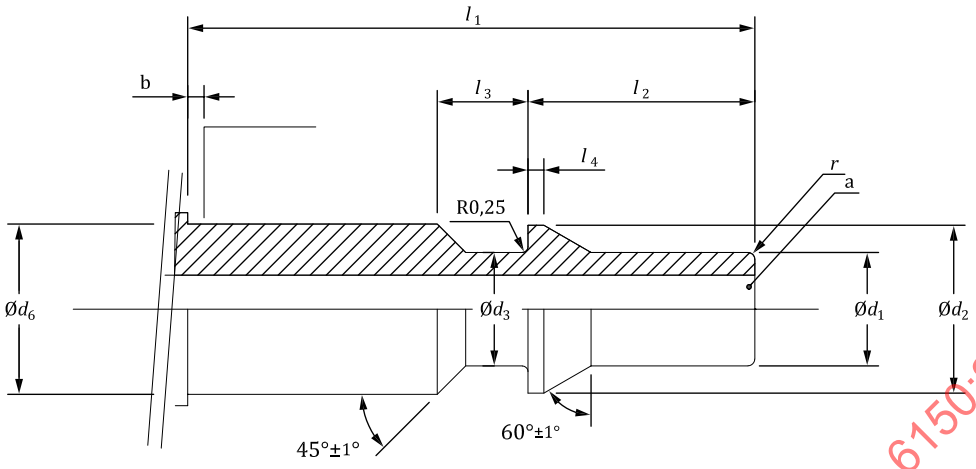
Figure 2 — Plug for 1,6 MPa (16 bar) maximum working pressure (series B)

Table 2 — Dimensions for plug for 1,6 MPa (16 bar) maximum working pressure (series B)

Dimensions in millimetres

Nominal diameter	d_1 −0,1/ −0,2	d_2 −0,1/ −0,2	d_3 −0,05/ −0,15	d_6 −0,1/ −0,2	l_1 min.	l_5 +0,10/ −0,15	l_6 +0,10/ −0,15	l_7 +0,10/ −0,15	r +0,10/ −0,15
7	4,55	6,5	4,45	7	20	5	8	2,5	0,4
12	8,2	11	7,9	11,9	23,6	5,4	9,4	2,8	
15	11	14,4	11,6	15,2	26,1	7,65	12,3	2,6	1
17	14,4	16,8	14,3	16,8	34,8	9,55	14,7	2,8	0,4
23	20,55	23	20,45	23	35	6,5	10,7	3	1

4.2.3 The dimensions and tolerances for plugs on series C cylindrical quick-action couplings are shown in Figure 3 and given in Table 3.



a Inside diameter as large as possible.

b The distance between the shoulder of the plug and the end surface of the socket, when connected, shall not exceed 1 mm.

Figure 3 — Plug for 2,5 MPa (25 bar) maximum working pressure (series C)

Table 3 — Dimensions for plug for 2,5 MPa (25 bar) maximum working pressure (series C)

Dimensions in millimetres

Nominal diameter	d_1 f8	d_2 js11	d_3 ±0,15	d_6 f8	l_1 min.	l_2 ±0,1	l_3 JS13	l_4 ±0,1	r max.
8	5	7,4	5	7,5	25	10	4,5	0,7	0,3
10	7,5	9,7	7,4	10	27,5	12	7	0,75	1
14	11	13,7	11	14	36,5	17	9,5	1,5	
17	14	16,7	14	17	41	18	12,5	2	
27	23	26,7	23	27	61	27	16	2,5	2

5 Designation

The designation for a quick-action coupling in accordance with this document shall include, in the order given, the following information:

a) identity block, i.e. the word "Coupling";

b) the reference to this document;

c) the letter standing for the series of coupling (i.e. A, B or C);

d) the nominal diameter.

EXAMPLE

A cylindrical quick-action coupling for maximum working pressure of 1,6 MPa (16 bar), i.e. series B, and having a nominal diameter of 15 mm shall be designated as follows:

Coupling ISO 6150-B-15

6 Requirements

6.1 Material

The choice of the material is left to the discretion of the manufacturer who shall take account of the intended application.

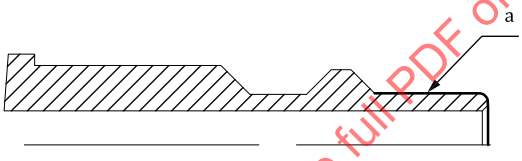
6.2 Hardness

The plug shall have a hardness suitable for applications as recommended by the manufacturer.

6.3 Surface finish

The surface finish of the plug shall be left to the manufacturer's option, but the surface roughness, R_a,of the sealing surface as defined In Figure 4 shall be 3,2 µm max.

The requirements for the surface finish of the coupling plug in contact with the seal are dependent on the application and the life-time requirements; any such requirements should be subject to agreement between the manufacturer and user.



Key

a Sealing surface.

Figure 4 — Definition of sealing surface

6.4 Corrosion protection

The quick-action coupling plug shall meet the requirements for the tests described in 8.4.

6.5 Number of couplings and uncouplings

After completing 5 000 coupling and uncoupling cycles at maximum working pressure, quick-action couplings shall still meet the requirements specified by the manufacturer.

6.6 Test pressures

6.6.1 Quick-action couplings shall be usable after they have been subjected to a pressure test, as described in 8.3, at 1,5 times the maximum working pressure.

6.6.2 Quick-action couplings shall be designed to withstand four times the maximum working pressure.

6.7 Tests at extreme working temperatures

6.7.1 Subject couplings, in accordance with the procedure described in 8.6.4, to the manufacturer's recommended constant extreme operating temperatures in both positions, coupled and uncoupled:

— for 6 h at maximum working temperature, in each position;

— for 4 h at minimum working temperature, in each position.

6.7.2 Record any signs of leakage, deformation or malfunction.

6.8 Limited rotation for self-alignment

The male plug and female socket shall be such that, when subjected to maximum working pressure, the downstream hose or tool may rotate for alignment to prevent torque loading of the hose or coupling.

6.9 Structural rigidity

Coupled quick-action couplings shall withstand:

a) a radial load of 2 200 N;

b) an axial load of 2 200 N.

For couplings made of plastic materials, the load should be limited to 400 N.

6.10 Leakage

The coupled quick-action coupling or the female socket only shall have leakage which does not exceed the value indicated by the manufacturer at maximum working pressure.

This requirement shall be verified in accordance with the procedure described in 8.6.3.

7 Application guidelines

7.1 Installation with vibrating tools

It is recommended that a minimum length of 300 mm of flexible hose for compressed air be inserted between a vibrating tool and the quick-action coupling.

7.2 Coupling and uncoupling safety considerations

Attention of the circuit designer and/or user is drawn to the fact that a decompression system shall be provided to increase safety when coupling or uncoupling (see ISO 4414), for example:

— to avoid the plug being forced out dangerously due to pressure;

— to avoid compressed air or particulate matter being expelled dangerously;

— to allow coupling and uncoupling at safe pressure levels.

8 Testing

The test procedures described in this clause apply to the quick-action coupling plug, manufactured in accordance with this document, together with the socket.

The test procedures described are intended for "type-testing" quick-action couplings.

The test methods and diagrams of the test set-ups as shown in Figures 6 to 11 are given for illustration purposes and do not form part of the requirements.

8.1 Accuracy of test equipment and instrumentation

The accuracy of the test equipment and instrumentation shall be selected, set and maintained within the limits specified in Table 4.

Table 4 — Accuracy of test equipment and instrumentation

Parameter	Unit	Accuracy
Temperature	°C	±5 °C
Leakage	mm^3	±2 %
Side load	N	±2 %
Pressure	MPa (bar)	±2 %
Flow rate	l/s	±2 %

8.2 Checking of compliance

8.2.1 Examine each type component carefully to see that it complies with the manufacturer's drawings, catalogue sheets and with Tables 1 to 3 of this document.

8.2.2 Mark each component permanently in a manner which will not interfere with its normal operation, but will enable it to be related to each appropriate test procedure and/or report.

8.2.3 Measure and record the actual sizes of the standardized dimensions of the components for possible use in a test report.

Carry out measurements at a temperature of 20 °C.

8.3 Hydraulic test

8.3.1 The quick-action coupling plug shall be matched and coupled with the corresponding socket.

8.3.2 Couple the female socket to a hydraulic pressure source.

8.3.3 Block the open end of the male plug.

8.3.4 Raise the pressure within the coupling assembly to four times the manufacturer's recommended working pressure.

No rupture or permanent deformation should occur after 1 min of test.

8.4 Corrosion test

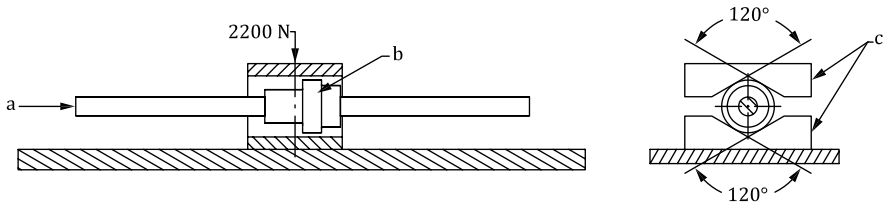
8.4.1 Only the plug of the coupling shall be subjected to this test which shall be performed in accordance with ISO 9227.

8.4.2 Carry out the tests for 24 h. The results of the tests shall be declared acceptable if, on completion of the test duration, no sign of corrosion is observed on outside surfaces after surface corrosion products have been removed.

8.5 Test for structural rigidity

8.5.1 Submit the coupled coupling to the radial load specified in 6.9, the load being applied to the actuating sleeve or main part of the coupling body in a test set-up as shown in Figure 5. After 1 min, no deformation or failure shall be noted.

NOTE This test is intended to simulate an accidental radial load, e.g. a truck running over a coupling.



a Pressure source.

b Coupling assembly to be tested.

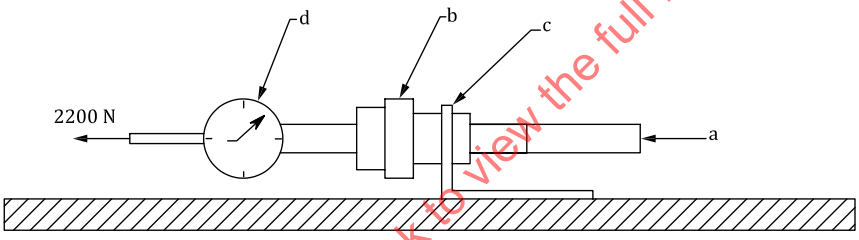
c Steel holders.

Figure 5 — Set-up for applying radial force in testing for structural rigidity

8.5.2 Submit the coupled coupling to the axial load specified in 6.9 b), the load being applied directly to the plug inserted in the socket as shown in Figure 6.

During testing, the plug or socket shall not uncouple, deform or fail.

Furthermore, after this test, the coupling shall be submitted to a leakage test as described in 8.6.3. No leak shall be observed.



a Pressure source.

b Coupling assembly to be tested.

c Fixture to hold coupling half firm.

d Force gauge.

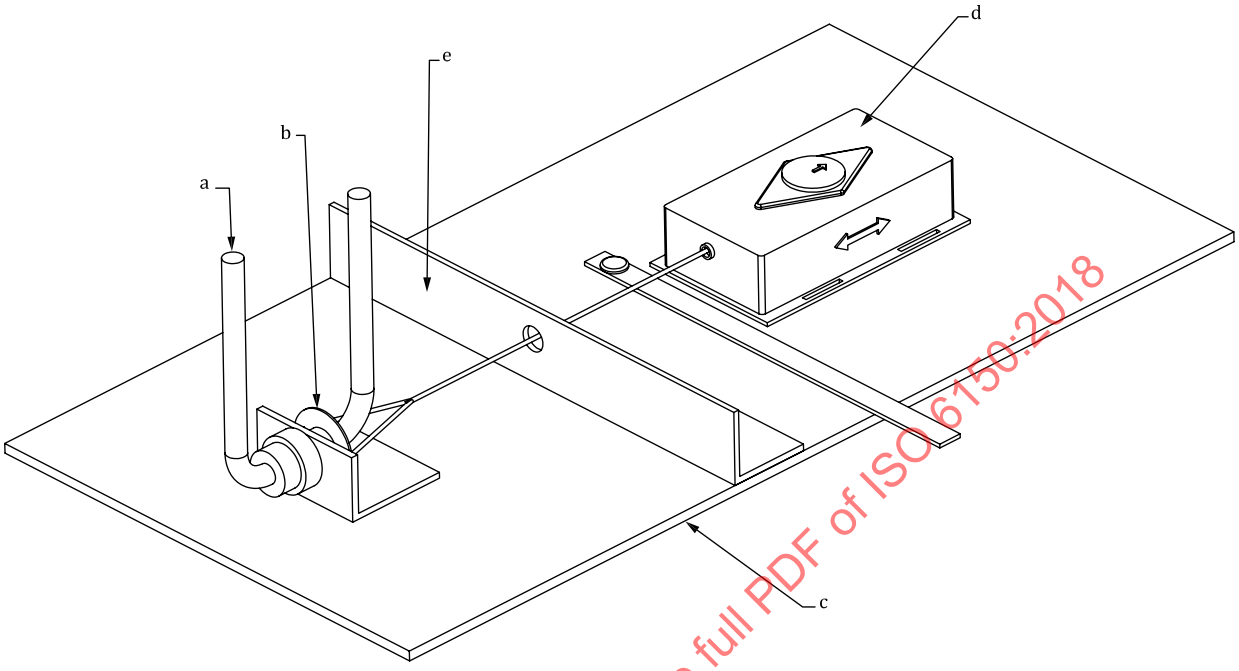
Figure 6 — Set-up for applying axial force in testing for structural rigidity

8.6 Operational tests

Carry out the test on quick-action couplings lightly lubricated with an approved lubricant compatible with the seal material.

8.6.1 Disconnect force

8.6.1.1 Insert the coupling assembly in an appropriate test fixture (see Figure 7).



a Pressure source.
b Suitable means for attaching force gauge to locking collar of male half.
c Basic fixture showing that function may be modified to fit the test component in the best way.
d Force gauge.
e Guard plate.

Figure 7 — Set-up for disconnect force test

8.6.1.2 Maintain the manufacturer's recommended working pressure as test pressure.

8.6.1.3 Apply a force and/or torque to the locking mechanism until the assembly disconnects.

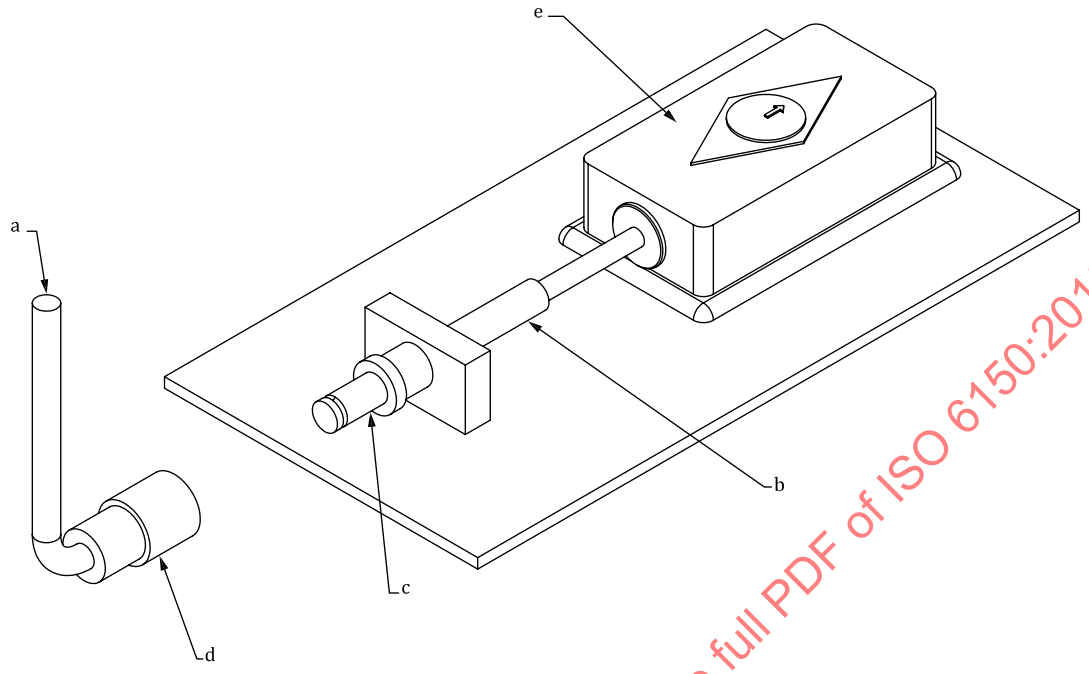
8.6.1.4 Measure the force and/or torque needed to disconnect the coupling assembly.

8.6.1.5 Repeat the test five times within a 10 min period. Leave coupled for 1 h, then disconnect, check and note the force and/or torque for this uncoupling and the average disconnect force for the first five tests.

8.6.1.6 Record any sign of flow blocking, damage or malfunction.

8.6.2 Connect force

8.6.2.1 Insert the coupling in an appropriate test fixture (see Figure 8).



a Pressure source.
b Sliding bar actuates force gauge and connects pressure source to male half.
c Male coupling half.
d Female coupling half.
e Force gauge.

Figure 8 — Set-up for connect force test

8.6.2.2 Maintain the manufacturer's recommended working pressure as test pressure.

8.6.2.3 Apply a force and/or torque to the plug until the plug is fully connected.

During this operation, the locking mechanism may be operated manually, if necessary, so that both halves can be coupled normally.

8.6.2.4 Measure the force and/or torque needed to connect the coupling assembly.

8.6.2.5 Repeat the test five times within a 10 min period.

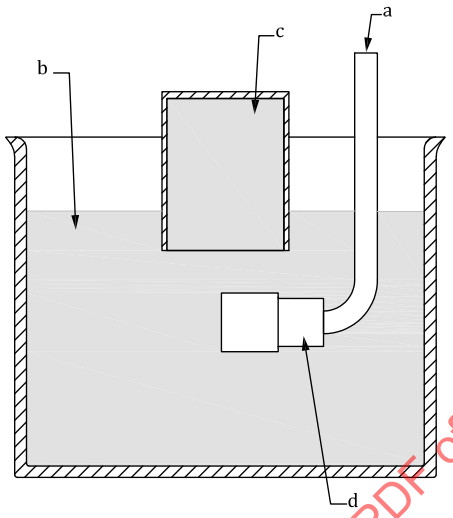
8.6.2.6 Average the results of the five tests to determine the connect force and/or torque.

8.6.2.7 Record any sign of flow blocking, damage or malfunction.

8.6.3 Measurement of leakage at maximum working pressure

8.6.3.1 Uncoupled

8.6.3.1.1 Install the valved socket in the test container as shown in Figure 9.



a Test pressure.

b Vessel filled with isopropyl alcohol or another appropriate fluid.

c Inverted graduated cylinder filled with bubble fluid.

d Coupling to be tested.

Figure 9 — Set-up for leakage test

8.6.3.1.2 Hold the inverted graduated cylinder over the coupling with the mouth below the surface.

8.6.3.1.3 Maintain the maximum working pressure as test pressure.

8.6.3.1.4 Measure and record leakage within the accuracy limits specified in Table 4 by collecting, for example, the escaped air with an inverted graduated cylinder.

8.6.3.1.5 Measure the volume of air when the fluid levels inside and outside the graduated container coincide.

8.6.3.2 Coupled

8.6.3.2.1 Install the coupling in the test container as shown in Figure 9.