
**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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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).

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

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.

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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 18869:2017
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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

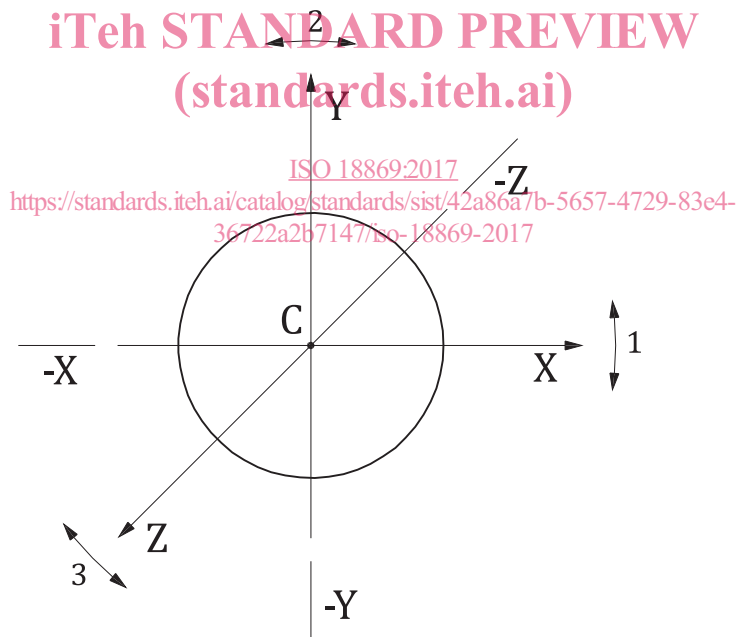
uncoupled part of a *quick-action coupling* (3.1)

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

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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.

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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 \pm 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.

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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 $10D$ from the centreline of the main interface seal, where D is the nominal coupling size, in millimetres.

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