

Hydraulic fluid power quick-action couplings —

Part 2: Methods of test

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Machinery and Components Standards Policy Committee (MCE/-) to Technical Committee MCE/18, upon which the following bodies were represented:

- Advanced Manufacturing Technology Research Institute
- Association of British Mining Equipment Companies
- Bath University Library
- British Compressed Air Society
- British Fluid Power Association
- British Hydromechanics Research Association
- British Steel Industry
- British Telecommunications plc
- Department of Trade and Industry (National Engineering Laboratory)
- Electricity Supply Industry in England and Wales
- Federation of Manufacturers of Construction Equipment and Cranes
- Institution of Mechanical Engineers
- Ministry of Defence

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Industrial Truck Association
- British Rubber Manufacturers' Association
- Engineering Equipment and Materials Users' Association

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National foreword

This Part of BS 7198 has been prepared under the direction of the Machinery and Components Standards Policy Committee and is the first of a two Part standard for hydraulic fluid power quick-action couplings. It is identical with ISO 7241-2:1986 “*Hydraulic fluid power — Quick-action couplings. Part 2: Test methods*” published by the International Organization for Standardization (ISO). The other Part of the standard is BS 7198-1, “*Specification for dimensions and performance*” (implementing ISO 7241-1:1987).

Cross-references

International Standard	Corresponding British Standard
ISO 3448:1975	BS 4231:1982 <i>Classification for viscosity grades of industrial liquid lubricants</i> (Identical)
ISO 7241-1:1987	BS 7198 <i>Hydraulic fluid power quick-action couplings</i> Part 1:1989 <i>Specification for dimensions and performance</i> (Identical)

The Technical Committee has reviewed the provisions of ISO 4411:1986 to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. The related British Standard is BS 4062-1:1982 “*Valves for hydraulic fluid power systems. Part 1: Methods for determining pressure differential/flow characteristics*”.

There is no corresponding British Standard for ISO 5598.

Additional information. For the purposes of this British Standard, the identification statement specified in clause 23 should read as follows.
“The method of obtaining and presenting the coupling performance data complies with BS 7198-2:1989.”

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.
This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

0 Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Quick-action couplings are used to join or separate quickly fluid conducting lines, without the use of tools or special devices.

1 Scope and field of application

This part of ISO 7241 specifies different test methods which could be applied to quick-action couplings.

This part of ISO 7241 applies to male and female coupling halves, complete couplings, couplings with and without sealing means when uncoupled, and couplings that are connected and disconnected by a linear and/or rotational motion.

The user of this part of ISO 7241 may select only the tests applicable to his needs. It is not intended that all tests be carried out for every application.

2 References

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

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

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

ISO 7241-1, *Hydraulic fluid power — Quick-action couplings — Part 1: Dimensions and requirements*.

3 Definitions

For the purposes of this part of ISO 7241, the definitions given in ISO 5598 apply.

4 Selection and examination of test samples

Coupling assemblies selected shall constitute a representative sample of a production lot in all respects: design, material, surface treatment, process, etc.

5 Test apparatus

5.1 The apparatus shown in Figure 1 to Figure 7 shall be used.

5.2 Apparatus capable of providing test result data accuracy in accordance with clause 19 shall be used.

6 Test conditions

6.1 Tests shall be carried out at an ambient temperature of 20 to 35 °C, unless otherwise specified.

6.2 Tests shall be carried out using a fluid of ISO VG 32, in accordance with ISO 3448 (28,8 to 35,2 mm²/s viscosity at 40 °C).

7 Connect force test

Lubricate the coupling interfaces with the test fluid. Insert the coupling in a test fixture. Maintain the internal test pressure, i.e. the maximum internal pressure as specified in ISO 7241-1.

Apply a linear force and/or torque to the coupling half until complete connection occurs.

NOTE During this operation, the locking mechanism may be operated manually, if necessary, to permit normal coupling of the halves.

Measure the connecting force and/or torque, as appropriate.

Repeat the test a total of five times on the same test coupling. Average the results of the five tests to determine the connect force or torque. Report the average connect force or torque in the test report (see clause 20).

Report any conditions of damage or malfunction in the test report (see clause 20).

8 Disconnect force test

Lubricate the coupling interfaces with the test fluid. Insert the coupling in a test fixture. Maintain the internal test pressure, i.e. the maximum operating pressure specified in ISO 7241-1, and/or the prevailing flow conditions.

Apply a linear force and/or torque to the retaining mechanism of the coupling, until disconnection occurs. Measure the disconnect force and/or torque.

Repeat the test for five disconnections on the same test coupling. Average the test results of the five tests to determine the disconnect force and/or torque. Report the average results in the test report (see clause 20).

Report any condition of damage or malfunction in the test report (see clause 20).

9 Leakage test

9.1 Low pressure, coupled

Insert the coupling assembly in a test apparatus. Fill the test apparatus with test fluid (see 6.2) 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 axis of the gauge balls of the locking device (see Figure 1).

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

Report the leakage rate in the test report (see clause 20).

9.2 Low pressure, uncoupled (valved only)

Insert each coupling half in a test apparatus. Fill the test apparatus with test fluid (see 6.2) to a fluid column height of 750 mm (see Figure 2).

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

Report the leakage rate in the test report (see clause 20).

9.3 Maximum operating pressure, coupled

Purge internal air from the circuit. Pressurize the coupling assembly, with the test fluid, at maximum operating pressure as specified in ISO 7241-1.

Observe leakage over a test period of 30 min, while maintaining maximum operating pressure. Collect and measure the leakage in a graduated measuring flask. Calculate the leakage rate, in millilitres per hour.

Report the leakage rate in the test report (see clause 20).

9.4 Maximum operating pressure, uncoupled (valved only)

Purge internal air from the circuit. Pressurize each coupling half, with the test fluid, at maximum operating pressure as specified in ISO 7241-1.

Observe leakage over a test period of 30 min, while maintaining maximum operating pressure. Collect and measure the leakage for each coupling half in a graduated measuring flask. Calculate the leakage rate, in millilitres per hour.

Report the leakage rate in the test report (see clause 20).

10 Extreme temperature test**10.1 Maximum operating temperature exposure, coupled**

Fill the coupling assembly with test fluid and subject the assembly to the maximum operating temperature for at least 6 h.

The coupling shall be internally vented to atmosphere during temperature adjustment.

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.

Report the leakage rate in the test report (see clause 20).

10.2 Maximum operating temperature exposure, uncoupled (valved only)

Fill the coupling halves with test fluid and subject the halves to the maximum operating temperature for at least 6 h.

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

Report the leakage rate in the test report (see clause 20).

10.3 Maximum operating temperature service, coupled¹⁾

Fill the coupling assembly with test fluid and subject the assembly to the maximum operating temperature for at least 6 h.

The coupling shall be internally vented to atmosphere during temperature adjustment.

Determine the leakage rate at maximum operating temperature in accordance with 9.1 and 9.3.

Report the leakage rate in the test report (see clause 20).

10.4 Maximum operating temperature service, uncoupled (valved only)¹⁾

Fill the coupling halves with test fluid and subject the halves to the maximum operating temperature for at least 6 h.

Determine the leakage rate at maximum operating temperature in accordance with 9.2 and 9.4.

Report the leakage rate in the test report (see clause 20).

10.5 Minimum operating temperature, coupled

Fill the coupling assembly with test fluid and subject the assembly to the minimum operating temperature for at least 4 h.

Determine the leakage rate at minimum operating temperature in accordance with 9.1 and 9.3.

Report the leakage rate in the test report (see clause 20).

10.6 Minimum operating temperature, uncoupled (valved only)

Fill the coupling halves with the test fluid and subject the halves to the minimum operating temperature for at least 4 h.

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

¹⁾ This procedure requires testing at the maximum operating temperatures.

Report the leakage rate in the test report (see clause 20).

11 Pressure impulse test

As the pressure impulse test is a destructive test, a new coupling shall be used; the coupling tested shall not be used for any further testing.

11.1 Coupled test

Connect the coupling assembly to a test apparatus capable of producing pressure impulses, as shown in Figure 3. Adjust the test apparatus so that a pressure-time cycle corresponding to the curve shown within the shaded area of Figure 3 is obtained. Conduct the specified number of test cycles at a uniform cycle rate of 0,5 to 1,0 Hz. Uncouple and couple the test coupling assembly 10 times at intervals of 10 000 cycles throughout the test. Record any evidence of binding or malfunction. Determine the leakage rate in accordance with 9.1 and 9.3.

Report the leakage rate and the number of test cycles in the test report (see clause 20).

11.2 Uncoupled test (valved only)

Connect each coupling half to a test apparatus, capable of producing pressure impulses, as shown in Figure 3. Adjust the test apparatus so that a pressure-time cycle corresponding to the curve shown within the shaded area of Figure 3 is obtained. Conduct the specified number of pressure impulse cycles. Determine the leakage rate in accordance with 9.2 and 9.4.

Report the leakage rate and the number of test cycles in the test report (see clause 20).

12 Endurance test

As the endurance test is a destructive test, a new coupling shall be used; the coupling tested shall not be used for any further testing.

Connect the coupling assembly to a pressure source, capable of providing 1 bar (100 kPa)²⁾ internal pressure.

NOTE Lubricated compressed air may be used.

Record the type of test medium used. Couple and uncouple the assembly for the specified number of cycles. A coupling rate of 1 800 connect/disconnects per hour shall not be exceeded on coupling sizes up to and including 12,5 mm, and 600 per hour on sizes greater than 12,5 mm. Record any evidence of binding or malfunction. Determine the leakage rate in accordance with clause 9.

Report the leakage rate in the test report (see clause 20).

13 Pressure drop test

13.1 Insert the coupling assembly in a test apparatus, as shown in Figure 4. Select at least six flow rates from 25 % to 150 % of the rated flow, including 100 % of the rated flow.

NOTE If the rated flow is not specified, use 5 m/s fluid velocity in an equivalent tube or pipe size as the rated flow.

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

13.2 Remove the coupling assembly from the test apparatus and connect the tubes or pipes, using an appropriate fitting of the corresponding size. Determine and record the pressure drop at the same flow rates as used in 13.1.

13.3 Maintain a fluid viscosity of 28,8 to 35,2 mm²/s throughout the pressure drop test. Record the fluid type and temperature.

13.4 Subtract the pressure drop values obtained in 13.2 from those obtained in 13.1. (The difference is the net pressure drop of the coupling assembly.) Plot the net pressure drop on graph paper for each flow direction.

NOTE Full logarithmic graph paper is recommended in order to obtain a straight line. The line may well not pass through the points, but it should represent a common value between the points.

If the pressure drop values at 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.

14 Vacuum test

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

14.1 Coupled test

Insert the coupling in a test apparatus, as shown in Figure 5. Apply side load to the coupling assembly, as shown. Start the vacuum pump and create a vacuum to a specified value. Close the valve. Allow 10 min for stabilization. Observe the vacuum gauge for any loss of vacuum.

Report the gauge reading in the test report (see clause 20).

²⁾ 1 bar = 100 kPa = 10⁵ Pa = 0,1 MPa; 1 Pa = 1 N/m²