SLOVENSKI STANDARD
SIST ISO 7241-2:1997

01-februar-1997

Fluidna tehnika - Hidravlika - Hitre cevne spojke - 2. del: Preskusne metode

Hydraulic fluid power -- Quick-action couplings -- Part 2: Test methods

Transmissions hydrauliques -- Raccords rapides -- Partie 2: Méthodes d'essai

Ta slovenski standard je istoveten z: **ISO 7241-2:1986**

ICS:

23.100.40 Cevna napeljava in sklopke Piping and couplings

SIST ISO 7241-2:1997 **en**

International Standard 7241/2

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

Hydraulic fluid power — Quick-action couplings — Part 2 : Test methods

Transmissions hydrauliques — Raccords rapides — Partie 2 : Méthodes d'essai

First edition — 1986-12-15

UDC 62-578.4 Ref. No. ISO 7241/2-1986 (E)

Descriptors : hydraulic fluid power, couplings, tests, drop tests.

Price based on 15 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

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

International Standard ISO 7241/2 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

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

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Hydraulic fluid power — Quick-action couplings — Part 2 : Test methods

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 figures 1 to 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 mm^2/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, coupled[1)]

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).

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

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.

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 mm^2/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

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

2) 1 bar = 100 kPa = 10^5 Pa = 0,1 MPa; 1 Pa = 1 N/m^2

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).

14.2 Uncoupled test (valved only)

Insert each coupling half in a test apparatus, as shown in figure 5. 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).

15 Air inclusion test

15.1 Insert the coupling assembly in a test apparatus, as shown in figure 6. Record the fluid level of the closed graduated cylinder, with the coupling connected and the fluid levels coincident.

15.2 Uncouple and couple the coupling assembly (allow spillage to drain after uncoupling). After each uncouple/couple cycle, tap the coupling assembly to clear all air bubbles from the interior of the assembly.

15.3 Repeat the procedures given in 15.2, 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 the fluid levels are coincident. Record the fluid level of the graduated cylinder.

15.4 Subtract the fluid level value recorded in 15.3 from the value recorded in 15.1; divide the difference by the number of uncouple/couple cycles.

Report the air inclusion in standard millilitres per uncouple/couple cycle in the test report (see clause 20).

16 Spillage test

16.1 Insert the coupling assembly in a test apparatus, as shown in figure 7. Maintain a fluid pressure of 1 bar (100 kPa). Record the fluid level of the graduated cylinder.

16.2 Couple and uncouple the assembly. After each uncouple, allow the spillage to drain from the assembly. After each couple, tap the assembly to clear all air bubbles from the coupling interior.

16.3 Repeat the procedures given in 16.2, until the fluid level of the graduated cylinder has dropped a minimum of 10 minor divisions on the scale.

Record the fluid level of the graduated cylinder.

16.4 Subtract the fluid level value recorded in 16.3 from the value recorded in 16.1; divide the difference by the number of couple/uncouple cycles.

Report the spillage in millilitres per couple/uncouple cycle in the test report (see clause 20).

NOTE — Use a low viscosity fluid, if the viscosity of the standard test fluid prevents the prompt clearing of bubbles. Record the fluid type, if a substitute fluid is used.

17 Static pressure test

17.1 Coupled

Pressurize the coupling to specified static pressure for 5 min minimum. Determine the leakage rate in accordance with 9.1 and 9.3. Connect and disconnect the coupling five times at zero pressure. Record any evidence of binding or malfunction.

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

17.2 Uncoupled (valved type only)

Pressurize the uncoupled halves to specified static pressure for 5 min minimum. Determine the leakage rate in accordance with 9.2 and 9.4. Record any evidence of binding or malfunction.

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

18 Burst test

18.1 Safety precautions

Staff shall be provided with suitable protection when conducting burst tests. All air shall be purged from the circuit before proceeding with burst tests.

18.2 Burst pressure, uncoupled (valved type only)

Pressurize the coupling halves at a rate not exceeding 1 000 bar/min (100 000 kPa/min).

Report the burst pressure in the test report (see clause 20).

18.3 Burst pressure, coupled

Pressurize the coupling assembly at a rate not exceeding 1 000 bar/min (100 000 kPa/min).

Report the burst pressure in the test report (see clause 20).

19 Data accuracy

The accuracy of test result data shall be in accordance with table 1.

Table 1 — Data accuracy

Quantity	Unit	Data accuracy
Flow rate	l/min	±3 % [1]
Force	N	±3 % [1]
Pressure	bar (kPa)	±3 % [1]
Pressure drop	bar (kPa)	±3 % [1]
Temperature	°C	±3 °C
Torque	N·m	±3 % [1]
Volume (leakage)	ml	±1 % [1]

1) Percentage of maximum measured value.

20 Test report and data presentation

A typical format for presenting data and test results is shown in table 2.

21 Summary of information to be supplied

When applying this part of ISO 7241 to a particular use, the following information shall be supplied:

a) rated flow;

b) rated pressure;

c) maximum operating pressure;

d) maximum operating temperature;

e) minimum operating temperature;

f) vacuum test;

g) rated static pressure.

22 Test/production similarity

All managerial controls necessary to maintain substantial similarity between test and production components or elements shall be used.

23 Identification statement (Reference to this International Standard)

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

"Method of obtaining and presenting performance data conforms to ISO 7241/2, *Hydraulic fluid power — Quick-action couplings — Part 2: Test methods.*"