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Quick-action couplings with shut-off valve for welding, cutting and allied processes

*Raccords rapides à obturation pour équipements pour soudage, coupage
et techniques connexes*



Reference number
ISO 7289:1990(E)

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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Introduction

Quick-action couplings with shut-off valve are used in equipment for gas welding, cutting and allied processes to connect the hoses used between the regulator and the torch, either to one another or to the regulators and the torches themselves.

These couplings are fitted with shut-off devices that interrupt the gas flow when the two elements are disconnected, so that coupling and uncoupling operations may be performed manually while the equipment is under pressure.

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Quick-action couplings with shut-off valve for welding, cutting and allied processes

1 Scope

This International Standard defines the specifications and the type tests for quick-action couplings with shut-off valve. It applies to quick-action couplings used between the regulator and the torch in equipment for gas welding, cutting and allied processes.

This International Standard applies to cases where these couplings are used with hoses according to ISO 3821 or threaded unions according to ISO 3253.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3253:1975, *Hose connections for equipment for welding, cutting and related processes.*

ISO 3821:1977, *Welding — Flexible hoses for gas welding and allied processes.*

ISO 5175:1987, *Equipment used in gas welding, cutting and allied processes — Safety devices for fuel gases and oxygen or compressed air — General specifications, requirements and tests.*

ISO 6150:1988, *Pneumatic fluid power — Cylindrical quick-action couplings for maximum working pressures of 10 bar, 16 bar and 25 bar (1 MPa, 1,6 MPa,*

and 2,5 MPa) — Plug connecting dimensions, specifications, application guidelines and testing.

ISO 9090:1989, *Gas tightness of equipment for gas welding and allied processes.*

ISO 9539:1988, *Materials for equipment used in gas welding, cutting and allied processes.*

3 Definition

For the purposes of this International Standard, the following definition applies.

quick-action coupling with shut-off valve: Device enabling a rapid coupling or uncoupling under pressure of equipment and/or hoses, and preventing the mutual connection of two lines containing incompatible gases (e.g. oxygen and fuel gas).

This device comprises two elements: a male and a female element, of which the female element is fitted with an automatic shut-off system which prevents gas leakage when the two elements are uncoupled.

4 Types of couplings

This International Standard deals with three types of quick-action couplings with shut-off valve, according to the gases for which they are intended.

These three types are the following:

- a) type O — oxygen;
- b) type F — fuel gas;
- c) type N — other gases specific for welding processes.

5 Installation

The quick-action couplings with shut-off valve shall be installed so that the element with the shut-off device is located upstream in terms of the gas flow from the source.

6 Design requirements

6.1 Dimensions, non-interchangeability and interchangeability

To ensure that

- a) elements of different types, and
- b) elements of different types and couplings for compressed air (according to ISO 6150)

are not interchangeable, quick-action couplings with shut-off valve according to this International Standard shall have the dimensions specified in figure 1 and table 1 for couplings of types O, F and N.

The dimensions and fabrication details not specified in figure 1 and table 1 are left to the discretion of the manufacturer, with the proviso that quick-action couplings with shut-off valve of the same type shall be interchangeable, regardless of their manufacturer.

Table 1 — Dimensions of male element
Dimensions in millimetres

Gas	Type	A h10	B h10	C ¹⁾ Js13
Oxygen	O	6,8	12,8	4,5
Fuel gas	F	7,3	12,3	5
Other gases specific for welding processes	N	6,3	13,3	4

1) Diameter C shall be observed over a length of 20 mm.

6.2 Configuration

The shut-off system shall be located in the female element of the quick-action coupling.

6.3 Coupling and uncoupling

The choice of the coupling and uncoupling means is left to the discretion of the manufacturer.

Coupling and uncoupling shall be achieved with ease and shall not require the use of tools. It shall not be possible to disengage the two elements

- a) by a simple rotation of one element against the other, or
- b) by the application of a longitudinal traction force of less than 1 kN.

Under normal service conditions, as defined by the manufacturer, no undesired unlocking shall occur.

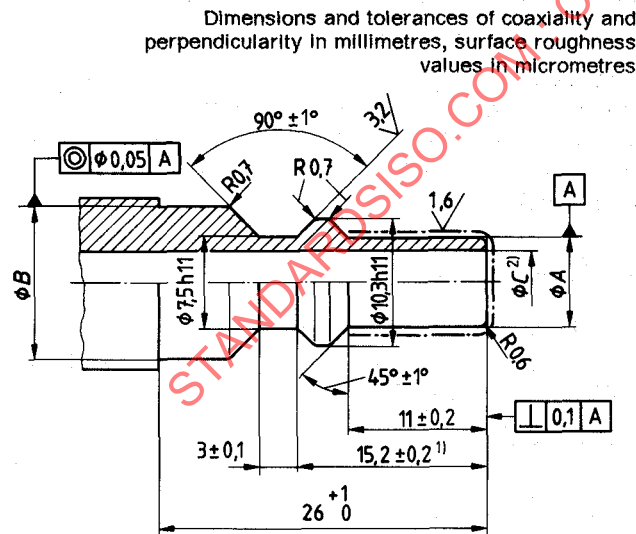
In addition, the opening and closure of the shut-off system shall occur automatically.

6.4 Connections

The outside-threaded connections shall conform with the specifications given in ISO 3253; a right-hand thread shall be used for couplings of types O and N and a left-hand thread shall be used for couplings of type F.

6.5 Materials

The materials used for the construction of these couplings shall conform with the requirements given in ISO 9539.



- 1) The minimum hardness of the male element surface is 40 HRC for the minimum length of 15,2 mm.
- 2) The internal diameter C shall be for a minimum length of 20 mm.

Figure 1 — Dimensions of male element

6.6 Surface protection of male element

Unless otherwise protected from external damage by mechanical means, the male element shall be constructed from material of surface hardness not less than 40 HRC (this specification refers to the surface hardness of the standardized external profile over a length of 15,2 mm).

7 Working requirements

7.1 Pressure resistance

Quick-action couplings with shut-off valve shall be designed for a maximum working pressure of 20 bar¹⁾. When tested under the conditions given in 9.2, they shall withstand

- a) a test pressure of 40 bar without permanent deformation, and
- b) a test pressure of 60 bar without rupture.

7.2 Gas tightness

7.2.1 General requirements

The general requirements for gas tightness given in ISO 9090 shall be fulfilled.

7.2.2 Specific requirements

During tests performed according to 9.3, the measured leakage rate, in both the coupled and the uncoupled position, shall not exceed $10 \text{ cm}^3/\text{h}^2$.

7.3 Pressure drop

At the nominal pressure p_n and the nominal flow rate q_{Vn} specified by the manufacturer, the pressure loss introduced by the quick-action coupling with shut-off valve shall not exceed 10 % of the maximum value of p_n specified.

7.4 Resistance to flame flash-back

After having been submitted to one flame flash-back in accordance with the conditions specified in 9.4, quick-action couplings with shut-off valve shall continue to conform with the test requirements specified in clause 8.

7.5 Resistance to tensile load

When tested under the conditions indicated in 9.5, the quick-action couplings with shut-off valve shall

- a) remain suitable for normal service and fulfil the test requirements specified in this International Standard, after having been submitted to an axial load of 600 N, and
- b) remain coupled and gas tight after having been submitted to an axial load of 1 kN.

7.6 Resistance to radial loads

When tested under the conditions indicated in 9.6, the quick-action couplings with shut-off valve shall

- a) remain suitable for normal service and fulfil the test requirements specified in this International Standard, after having been submitted to a radial load of 1 kN, and
- b) remain coupled and gas tight after having been submitted to a radial load of 2 kN.

7.7 Endurance

When tested under the conditions specified in 9.7, quick-action couplings with shut-off valve shall remain gas tight after they have been submitted to a minimum of 1000 coupling/uncoupling cycles at the maximum working pressure (see 7.1).

7.8 Other functions

In cases where a quick-action coupling with shut-off valve is associated with any other function than those specified in this International Standard, it shall comply with the requirements of clauses 6 and 7 and shall then be tested in accordance with clauses 8 and 9 after it has met the requirements necessary to perform the other function.

8 General test conditions

8.1 General

The test described hereunder are type tests.

Unless otherwise specified, they shall be performed at an ambient temperature of $20 \text{ °C} \pm 2 \text{ °C}$ using oil-free air or in nitrogen. The pressure resistance test shall be performed under hydraulic pressure.

Eight samples of the quick-action couplings with shut-off valve shall be tested. The two elements of each of these samples shall be carefully marked to ensure that all tests are performed using the same pair.

1) $1 \text{ bar} = 10^5 \text{ Pa}$

2) $1 \text{ cm}^3/\text{h} = 0,28 \times 10^{-9} \text{ m}^3/\text{s}$

Figure 2 to figure 4 show the principle of the tensile load test and examples of the test rigs for gas tightness and resistance to radial loads.

8.2 Test sequence

Each of the eight samples shall be submitted to some of the tests described in clause 9, as indicated by the crosses in table 2. The tests shall be performed in the sequence shown in table 2 with the test series being performed in alphabetical order; one sample shall be used for each test series A, B and C and five samples shall be used for test series D.

8.3 Test for interchangeability

The test for interchangeability shall be performed on the sample used for test series B as follows:

- a) Check that the two coupling elements conform with the specifications given in figure 1 and table 1.
- b) Connect the female element of the coupling to a male reference element, machined to the maximum dimensions shown in figure 1. Perform the following tests.
 - 1) Check that the shut-off device functions properly.
 - 2) Perform a tensile load test, with an axial load of 1 kN, according to 7.5 b) and 9.5.
 - 3) Perform a gas tightness test according to 7.2 and 9.3.
- c) Then connect the female element of the coupling to a male reference element, machined to the minimum dimensions shown in figure 1. Repeat tests 1), 2) and 3) as specified in b) above.

9 Test procedures

9.1 Examination of dimensions

Check the dimensions of the elements of the quick-action coupling with shut-off valve against those shown in figure 1 and table 1.

9.2 Pressure resistance

Connect the female element of a quick-action coupling with shut-off valve to a hydraulic pressure source and plug the opening of the male element.

Increase the pressure inside the device to 40 bar over a period of not less than 20 s and maintain this pressure for 1 min. Check for any permanent deformation of the coupling (see 7.1).

Increase the pressure inside the device to 60 bar over a period of not less than 30 s and maintain this pressure for a minimum of 1 min. Check that no rupture of the coupling has occurred (see 7.1).

9.3 Gas tightness tests

For these tests, measure the leakage rates

- a) in the uncoupled position (on the female element only), and
- b) in the coupled position, with an exterior load applied to the male element, the female element being clamped in a rigid position.

These tests shall be performed successively at pressures of 20 bar and 2 bar.

9.3.1 Basic method and test device

The general arrangements for performing these tests shall be in accordance with the specifications given in ISO 9090.

Table 2 — Test sequence and test series

Test sequence	Subclauses	Test	Test series			
	Requirements		A	B	C	D
Pressure resistance	7.1	9.2	x			
Interchangeability	6.1	8.3		x		
Gas tightness	7.2	9.3		x	x	
Pressure drop	7.3					x
Flame flash-back	7.4	9.4				x
Tensile load						
600 N	7.5 a)	9.5				x
1 kN	7.5 b)	9.5		x		
Radial load						
1 kN	7.6 a)	9.6				x
2 kN	7.6 b)	9.6			x	
Endurance	7.7	9.7				x
Gas tightness	7.2	9.3		x	x	x

9.3.2 Particular specifications

9.3.2.1 Test in the uncoupled position

Test the female element alone according to ISO 9090.

9.3.2.2 Test in the coupled position

Test the complete and coupled quick-action coupling with shut-off valve in accordance with ISO 9090, with the female element secured in a device which clamps it over the greatest possible width, as close as possible to the centreline of the locking device. Fasten a rod to the male element so that a load of 40 N can be applied at a distance of 120 mm from the centreline of the locking device (see figure 2).

9.4 Flame flash-back test

For this test the device shall be tested in the coupled condition, with the gas flow entering through the male element. The device shall be tested to withstand a flame flash-back in a flowing gas mixture in

accordance with the test procedure given for class 1 flame arrestors, acetylene type, in ISO 5175.

9.5 Resistance to tensile load

Secure the coupled quick-action coupling to be tested in an appropriate test rig, enabling the application of a tensile load to the entire device (see figure 3), and submit it to a test pressure of 20 bar.

Apply a tensile load F to the device as specified in 7.5 a) or 7.5 b) for test series D or test series B respectively.

9.6 Resistance to radial loads

Secure the quick-action coupling with shut-off valve to be tested in a test rig as shown in figure 4 and submit it to a test pressure of 20 bar.

Load the device, without inertial effect and for 1 min, using the forces specified in 7.6 a) or 7.6 b) for test series D or test series C respectively. Rotate the quick-action coupling with shut-off valve by 45° and repeat the test.

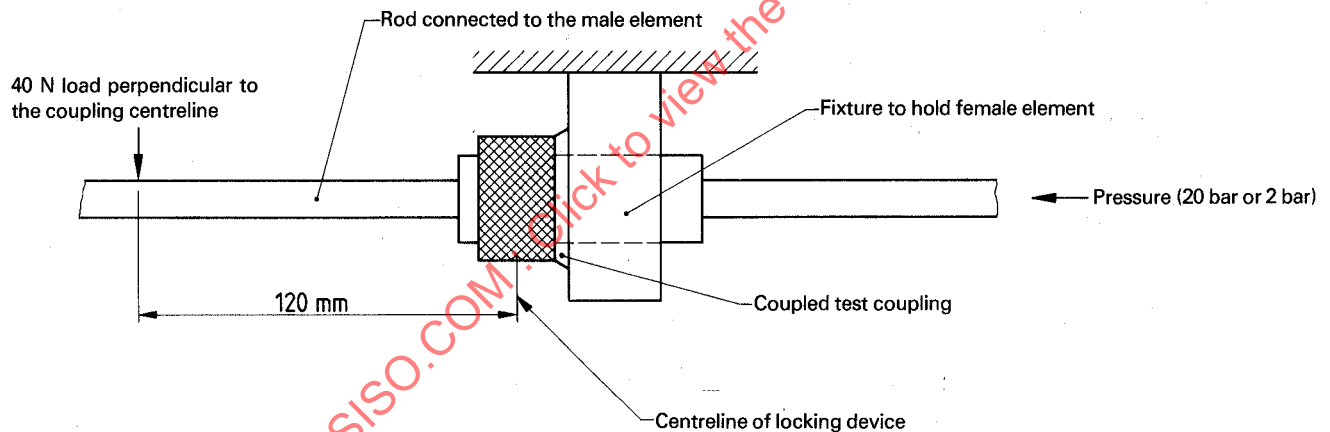


Figure 2 — Test rig for the gas tightness test in the coupled position

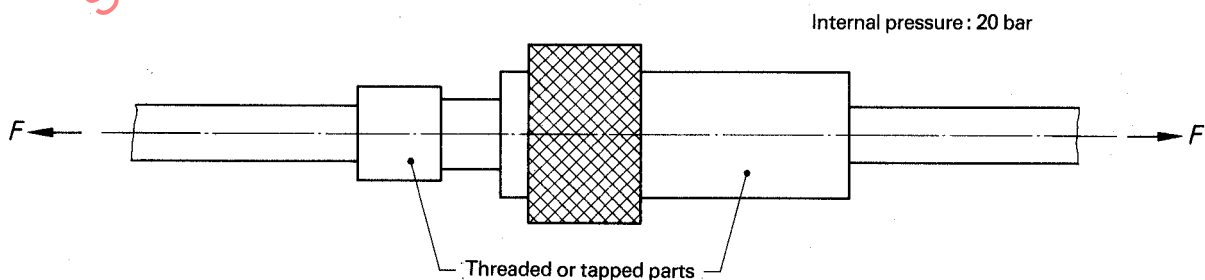


Figure 3 — Principle of the tensile load test