INTERNATIONAL STANDARD

ISO 7289

Fourth edition
2018-12

Gas welding equipment — Quick-action couplings with shut-off valves for welding, cutting and allied processes

Matériel de soudage aux gaz — Raccords rapides à obturation pour soudage, coupage et techniques connexes

Reference number
ISO 7289:2018(E)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 8, *Equipment for gas welding, cutting and allied processes.*

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This fourth edition cancels and replaces the third edition (ISO 7289:2010), which has been technically revised. The main changes compared to the previous edition are as follows:

a) normative references have been updated;

b) Subclause 6.2 has been updated;

c) in 6.5, requirements for coated material have been added;

d) in 8.1, accuracy of pressure and flow measurement have been added;

e) old Subclause 8.3 has been updated and incorporated in 9.1;

f) Subclause 9.4 has been updated;

g) Clause 10 has been updated.

Introduction

Quick-action couplings with shut-off valves 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 can be performed manually while the equipment is under pressure.

Gas welding equipment — Quick-action couplings with shut-off valves for welding, cutting and allied processes

1 Scope

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

This document applies to cases where these couplings are used with hoses in accordance with ISO 3821 or threaded unions in accordance with ISO/TR 28821.

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 5175-1:2017, *Gas welding equipment — Safety devices — Part 1: Devices incorporating a flame (flashback) arrestor*

ISO 6150, *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, *Gas tightness of equipment for gas welding and allied processes*

ISO 9539, *Gas welding equipment — Materials for equipment used in gas welding, cutting and allied processes*

ISO 15296, *Gas welding equipment — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15296 and the following 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 http://www.electropedia.org/

3.1
female element
part of the quick-action coupling which is fitted with an automatic shut-off system that prevents internal gas leakage in the uncoupled mode

3.2
male element
part of the quick-action coupling which is intended to couple into the *female element* (3.1) (see Figure 1)

4 Types of coupling

This document deals with three types of quick-action coupling with shut-off valves, 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 valves 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 requirement

6.1 Dimensions, non-interchangeability and interchangeability

Quick-action couplings with shut-off valves in accordance with this document shall have the dimensions specified in Figure 1 and Table 1 for couplings of types O, F and N, in order to ensure that the following are not interchangeable:

a) elements of different types; and

b) elements of different types and couplings for compressed air in accordance with ISO 6150.

Table 1 — Dimensions of male element

Dimensions in millimetres

Gas	Type	*A* **h10**	*B* **h10**	*C*[a] **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

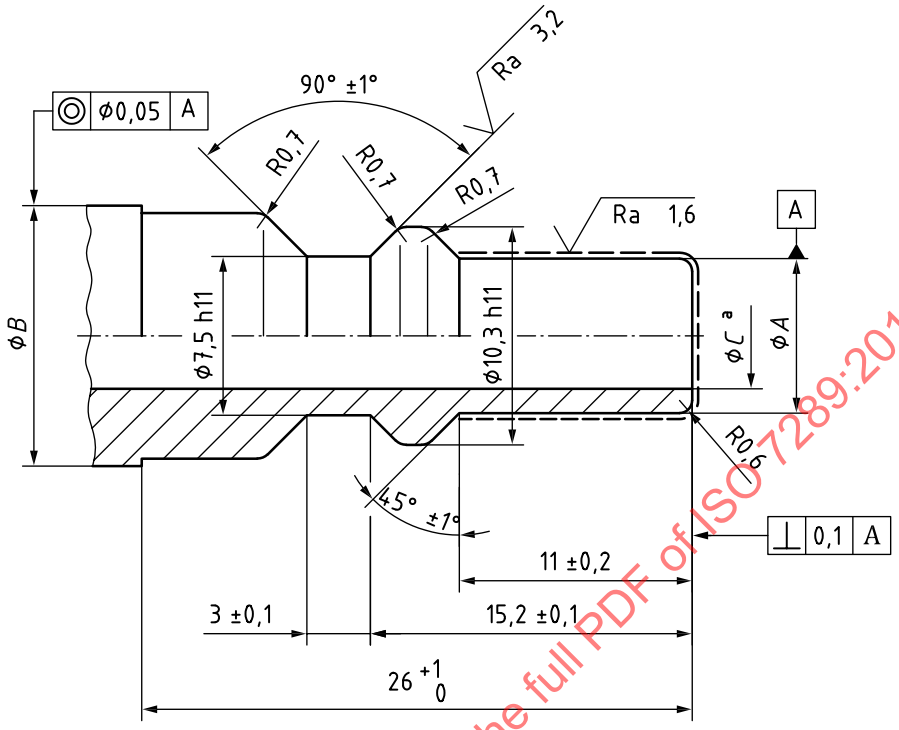
[a] Diameter *C* shall be observed over a length of 20 mm.

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 valves of the same type shall be interchangeable, regardless of their manufacturer.

6.2 Configuration

The shut-off system shall be located in the female element of the quick-action coupling. The gas tightness portion should be constituted on the cylindrical surface of the shaft of diameter *A*.

Dimensions and tolerances of coaxiality
and perpendicularity in millimetres,
surfaces roughness values in micrometers



Key

[a] The internal diameter *C* shall be for a minimum length of 20 mm.

Figure 1 — Male element

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 by:

a) a simple rotation of one element against the other; or

b) the application of a longitudinal traction force of less than 1 kN.

Under service conditions, as defined by the manufacturer, no undesired uncoupling shall occur. The opening and closing of the shut-off system shall occur automatically.

6.4 Connections

The outside-threaded connections should conform to the recommendations of ISO/TR 28821. 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 to the requirements given in ISO 9539.

The male element shall be constructed from uncoated material with a hardness of not less than 270HV10. For coated material for which HV10 is not applicable, the surface hardness requirement

shall not be less than 310HV0,2. (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 valves shall be designed for a maximum working pressure of 2 MPa (20 bar). When tested under the conditions given in 9.2, they shall withstand a test pressure of:

a) 4 MPa (40 bar) without visible permanent deformation;

b) 6 MPa (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 satisfied.

7.2.2 Specific requirements

During tests performed in accordance with 9.3, the measured leakage rate, in both the coupled and the uncoupled position, shall not exceed 10 cm^3/h.

7.3 Pressure drop

At the maximum operating pressure and the flow rate specified by the manufacturer, the pressure loss introduced by the quick-action couplings with shut-off valves shall not exceed 10 % of the specified maximum operating pressure.

7.4 Resistance to flashback

After having been submitted to one flashback in accordance with the conditions specified in 9.4, quick-action couplings with shut-off valves shall continue to conform to the requirements specified in 7.2.2 and shall have no visible permanent deformation.

7.5 Resistance to tensile load

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

a) remain suitable for normal service and fulfil the test requirements specified in this document, after having been submitted to an axial load of 600 N;

b) remain coupled and gas tight according to 7.2 after having been submitted to an axial load of 1 kN.

7.6 Resistance to radial loads

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

a) remain suitable for normal service and fulfil the test requirements specified in this document, after having been submitted to a radial load of 1 kN;

b) remain coupled and gas tight according to 7.2 after having been submitted to a radial load of 2 kN.

7.7 Endurance

When tested under the conditions specified in 9.7, the quick-action couplings with shut-off valves shall remain gas tight according to 7.2 after they have been submitted to a minimum of 1 000 coupling/uncoupling cycles at a maximum working pressure.

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 document, 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 tests described hereunder are the type tests.

Unless otherwise specified, they shall be performed at an ambient temperature of (23 ± 2) °C using oil-free air or in nitrogen.

The allowable total error of the measured values are as follows:

— flow: ±5 %;

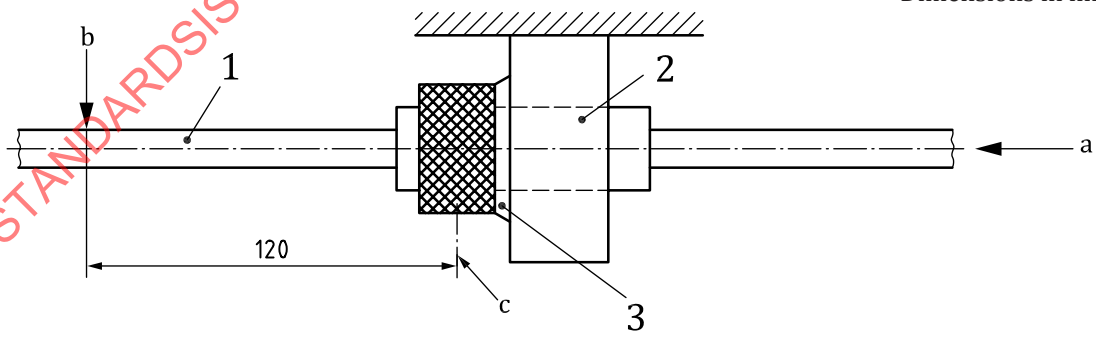
— pressure: ±1 %.

The pressure resistance test shall be performed under hydraulic pressure.

Eight samples of the quick-action couplings with shut-off valves 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 of elements.

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

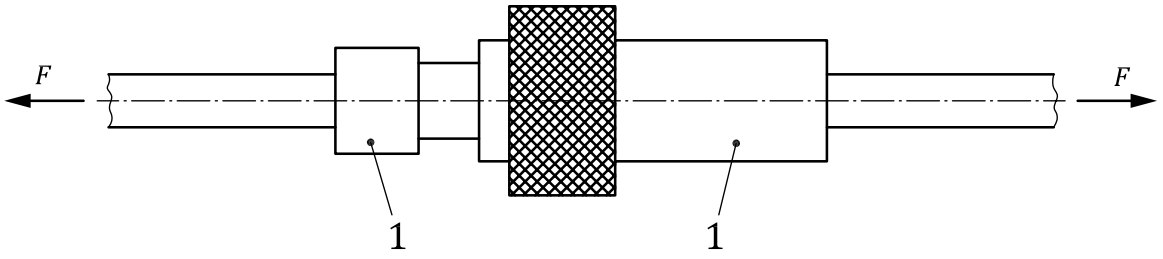
Dimensions in millimetres



Key

1 rod connected to the male element
2 fixture to hold female element
3 coupled test coupling
a Pressure [2 MPa (20 bar); 0,02 MPa (0,2 bar)].
b Load perpendicular to the coupling centreline (40 N).
c Centreline of locking device.

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



Key

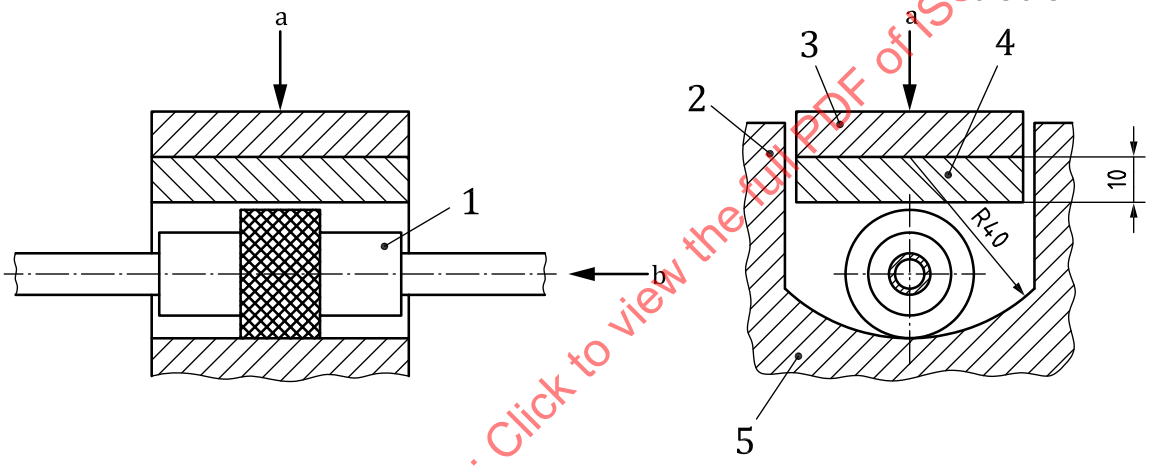
1 threaded or tapped parts

F tensile load

NOTE Internal pressure 2 MPa (20 bar).

Figure 3 — Principle of the tensile load test

Dimensions in millimetres



Key

1 coupling to be tested

2 support

3 loading counter plate

4 rubber plate (chlorophrene, Shore hardness 80 IRHD)

5 steel base of the support

a Load.

b Circulate gas at a pressure of 2 MPa (20 bar).

Figure 4 — Test rig for under radial loads

8.2 Test sequence

Each of the eight samples shall be submitted to 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.

Table 2 — Test sequence and test series

Test sequence	Subclause		Test series			
	Requirements	Test	A	B	C	D
Pressure resistance	7.1	9.2	x	—	—	—
Dimension, non-interchangeability and interchangeability	6.1	9.1	—	x	—	—
Gas tightness	7.2	9.3	—	x	x	x
Pressure drop	7.3		—	—	—	x
Flame flashback	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 Test procedure

9.1 Examination of dimensions and test of non-interchangeability and interchangeability

9.1.1 Dimensions

Check that at least one male sample is at the minimum and another at the maximum dimensions of the specification given in Figure 1 and Table 1.

9.1.2 Non-interchangeability between different gas types

a) Check the male element of the tested coupling to the other two gas types of the female element (for example fit the male element of gas type F with female element of gas types O and N). If the male element cannot be mechanically fitted to the female element, the test is passed.

b) Check the female element of the tested coupling to the other two gas types of the male element (for example fit the female element of gas type F with male element of gas types O and N). If the female element cannot be mechanically fitted to the male element, the test is passed.

9.1.3 Interchangeability within a single gas type

a) Connect the female element of the coupling to a male reference element, which shall be 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, in accordance with 7.5 b) and 9.5.

   3) Perform a gas tightness test in accordance with 7.2 and 9.3.

b) Connect the female element of the coupling to a male reference element which shall be machined to the minimum dimensions shown in Figure 1; repeat tests 1), 2) and 3) as specified in a).

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 4 MPa (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 6 MPa (60 bar) over a period of not less than 30 s and maintain this pressure for at least 1 min. Check that no rupture of the coupling has occurred (see 7.1).

9.3 Gas tightness test

9.3.1 General

For these tests, measure the leakage rate:

a) in the uncoupled position (on the female element only);

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 2 MPa (20 bar) and 0,02 MPa (0,2 bar).

9.3.2 Basic method and test device

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

9.3.3 Particular specifications

9.3.3.1 Test in the uncoupled position

Test the female element alone according to ISO 9090.

9.3.3.2 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 Flashback 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 with one flashback to the test procedure for flame arrestors, acetylene type, in accordance with ISO 5175-1:2017, 6.7.

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 2 MPa (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.