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Gas welding equipment — Acetylene manifold systems for welding, cutting and allied processes — General requirements

Matériel de soudage aux gaz — Centrales de détente pour la distribution d'acétylène pour le soudage, le coupage et les techniques connexes — Exigences générales

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

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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).

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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 44, *Welding and allied processes*, Subcommittee SC 8, *Equipment for gas welding, cutting and allied processes*.

This third edition cancels and replaces the second edition (ISO 14114:2014), which has been technically revised with the following changes:

a) Clause 3 has been restructured;

b) 4.1 has been revised;

c) 5.3 has been revised;

d) Clause 6 has been revised;

e) Clause 7 has been revised;

f) Table A.1 has been revised;

g) Figures A.2 and A.4 have been revised and Figure A.5 has been deleted;

h) the title of Annex B has been modified.

Requests for official interpretations of any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 8 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Gas welding equipment — Acetylene manifold systems for welding, cutting and allied processes — General requirements

1 Scope

This document applies to acetylene cylinder manifold systems extending from the cylinder valve or the bundle outlet connections to the outlet connection of the main shut-off valve. It specifies requirements for design, materials and testing of cylinder manifold systems for the supply of acetylene for use in welding, cutting and allied processes.

This document applies to acetylene cylinder manifold systems in which acetylene single cylinders or acetylene bundles are coupled for collective gas withdrawal.

NOTE National regulations exist regarding limitation of the amount of single cylinders/bundles of acetylene on a single location (e.g. in warehouse or connected to a manifold system).

This document also covers a test procedure for decomposition blockers.

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 (all parts), *Gas welding equipment — Safety devices*

ISO 7291:2010, *Gas welding equipment — Pressure regulators for manifold systems used in welding, cutting and allied processes up to 30 MPa (300 bar).* Amended by ISO 7291:2010/Amd 1:2015

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 10961, *Gas cylinders — Cylinder bundles — Design, manufacture, testing and inspection*

ISO 14113, *Gas welding equipment — Rubber and plastics hose and hose assemblies for use with industrial gases up to 450 bar (45 MPa)*

ISO 15296, *Gas welding equipment — Vocabulary — Terms used for gas welding equipment*

ISO 15615:2013, *Gas welding equipment — Acetylene manifold systems for welding, cutting and allied processes — Safety requirements in high-pressure devices*

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
acetylene manifold systems
assembly of devices generally linking one or more gas sources coupled to a user pipeline system, delivering a regulated pressure under specified safe conditions

Note 1 to entry: A manifold includes, for example, components like collectors, safety devices, and pressure regulators.

3.2
acetylene cylinder bundle
acetylene cylinder pack
assembly of cylinders fastened together, interconnected by a manifold for collective filling and gas withdrawal, and intended to be transported as a single unit

3.3
manifold high pressure pipework
pipework system extending from the outlet connection of acetylene cylinders or bundles at full charging pressure to the inlet of the pressure regulator, including as required hose assemblies or coiled metal pipes, piping and high pressure valves

3.4
flame arrestor
device which extinguishes a flame front

[SOURCE: ISO 15296:2017, 3.4.3.]

3.5 Low pressure valves

NOTE Low pressure is considered as $P \leq 1{,}5$ bar (0,15 MPa), given as gauge pressure.

3.5.1
temperature-sensitive cut-off valve
device that stops the gas flow when a predetermined temperature is reached

[SOURCE: ISO 15296:2017, 3.4.5, modified — “reached” has replaced “exceeded”.]

3.5.2
pressure-sensitive cut-off valve
device that stops the gas flow when the downstream pressure is higher than the upstream pressure by more than a predetermined value

[SOURCE: ISO 15296:2017, 3.4.6.]

3.5.3
main shut-off valve
main valve downstream of the manifold system

3.5.4
pressure limiting device
device which limits the pressure downstream of the manifold regulator in the event of regulator failure or malfunction

3.5.5
low pressure non-return valve
device which prevents passage of gas in the direction opposite to normal flow

[SOURCE: ISO 15615:2013, 3.1, modified — “low pressure” has been added to the term and “normal” to the definition.]

3.6 High pressure valves

NOTE High pressure is considered as P > 1,5 bar (0,15 MPa) up to 25 bar (2,5 MPa), given as gauge pressure.

3.6.1
automatic quick-acting shut-off device
self-acting device which closes quickly

Note 1 to entry: For example, when triggered by acetylene decomposition in the high pressure manifold pipework.

[SOURCE: ISO 15296:2017, 3.4.10, modified — the example has been transferred to a note to entry.]

3.6.2
high pressure stop valve
device to prevent, when closed, the flow of gas on the high pressure side

3.6.3
three-way valve
device composed of two upstream inlets of flow and one downstream outlet which allows flow from one upstream side to the downstream side, while isolating the other upstream side

Note 1 to entry: This definition differs from that of ISO 15615:2013, 3.6.

3.6.4
high pressure non-return valve
device which prevents passage of gas in the direction opposite to normal flow

[SOURCE: ISO 15615:2013, 3.1, modified — "high pressure" has been added to the term and "normal" to the definition.]

3.6.5
high pressure purge valve
device which enables a pipework system to reach atmospheric pressure or eliminate undesirable gases or residues by flushing

3.6.6
automatic pressure-actuated shut-off valve
device which automatically stops the gas supply to the regulator when the downstream pressure rises above the maximum operating pressure

[SOURCE: ISO 15615:2013, 3.5]

3.7
change-over unit
device in a two-sided system allowing switching the supply of gas to the system from either of its bank of cylinders or bundles without interrupting supply

Note 1 to entry: The switching action can be manually or automatically actuated.

3.8
pressure regulator for manifold systems
device for regulating a generally variable inlet pressure to as constant as possible an outlet pressure when controlling the output of a manifold of cylinders

[SOURCE: ISO 7291:2010, 3.1, modified — the note to entry has been deleted.]

3.9
decomposition blocker
safety device which stops acetylene decomposition incorporating a *temperature-* or *pressure-sensitive cut-off device* (3.5.1, 3.5.2)

3.10
high pressure filter
device to retain particles with a size of 100 µm or greater

4 Design and materials

4.1 Requirements for the manifold system and its components

Acetylene cylinder manifold systems shall be equipped with the following system components:

a) high pressure non-return valve (3.6.4) according to ISO 15615, to avoid reverse flows and to prevent air and moisture contamination of the manifold system, located immediately downstream of the cylinder or bundle outlet. The following options may also be used:

   1) combination of an individual purge valve (*stop valve*) according to ISO 15615 and an individual non-return valve according to ISO 15615 located downstream of the coiled metal pipe or high pressure hose;

   2) single unit comprising a combination of the above-mentioned components fulfilling the requirements of ISO 15615;

b) high pressure pipework or coiled metal pipe with pipe wall thicknesses determined according to the methods in ISO 10961 and/or high pressure hoses according to ISO 14113 to connect the cylinder or bundle outlet to the manifold inlet;

c) automatic quick acting shut-off device according to ISO 15615, upstream of the manifold regulator;

d) high pressure stop valve according to ISO 15615 for one-sided systems. For two-sided systems, a three-way valve according to ISO 15615 may be used instead of two high pressure stop valves according to ISO 15615;

e) pressure regulators for manifold systems and for change-over units according to ISO 7291;

f) pressure-relief valve of the pressure regulator, integrated or not, according to ISO 5175-2. As an alternative to the pressure-relief valve, an automatic pressure-actuated shut-off valve according to ISO 15615 may be installed.

g) low pressure pipework downstream of the pressure regulator;

h) Safety devices as defined in ISO 5175 (all parts) at the low pressure outlet of the manifold system, including, as appropriate, a single device or combination of devices for non-return flow (optional), flame arresting, and a temperature-sensitive cut-off valve (3.5.1) or pressure-sensitive cut-off valve (3.5.2). A non-return valve according to ISO 5175-2, upstream of the flame arrestor (3.4) according to ISO 5175-1, is mandatory in the absence of such a non-return valve in the pipework downstream.

   As an alternative to the above-mentioned safety devices, a decomposition blocker (3.9) according to ISO 14114, together with a non-return valve according to ISO 5175-2, combined with a flame arrestor (3.4) according to ISO 5175-1, and a temperature-sensitive cut-off valve (3.5.1) or pressure-sensitive cut-off valve (3.5.2), both according to ISO 5175-1, downstream of the decomposition blocker may be installed;

i) all high pressure gauges shall be in accordance with ISO 15615 except for

   1) gauges that are part of pressure regulators and change-over units covered by ISO 7291, and

   2) gauges that are part of a combination of devices which are distributed as a single unit which has already been tested to the procedures and requirements defined in ISO 15615;

j) main shut off valve.

Combinations of devices which are distributed as single units for the high pressure part, except pressure regulators and high pressure hoses, shall fulfil the requirements of ISO 15615.

Annex A gives examples for the configuration of the manifold systems. If there are more gas sources (cylinders/bundles) in the manifold system, the setup shall be analogue to the setups given in the drawings of Annex A.

4.2 Materials of construction

The materials shall be resistant to acetylene, acetone and dimethylformamide (DMF), as well as to the mechanical, chemical and thermal loads which occur under operating conditions in accordance with ISO 9539 unless a specific standard for specific components of the system exists.

5 Tests

5.1 Strength test

All high pressure and low pressure manifold components shall be tested for their resistance to the pressures likely to be encountered in acetylene service.

For the high pressure part, all components shall withstand an hydraulic test of 315 bar (31,5 MPa) for five minutes unless individual standards covering them require higher pressures. After pressurization, there shall be no visible permanent deformation. Additionally, high pressure pipework design minimum wall thicknesses should allow for acetylene decomposition overpressures.

For the low pressure parts, unless individual standards require higher pressures or hydraulic testing, all components shall withstand a pneumatic test of minimum 24 bar (2,4 MPa). After pressurization, there shall be no visible external permanent deformation.

NOTE Design recommendations for high pressure pipework are given in documents such as IGC 123/13 or equivalent.

System components which have been pressure tested according to other standards for acetylene service shall be removed or otherwise protected before the strength test, e.g. pressure gauges, relief valves, regulators.

5.2 External gas tightness test

The manifold system shall be tested for leaks at commissioning on site by the installer. No visible leakage shall be detected when tested as specified below.

Two tightness tests shall be performed on the high pressure part:

a) a test at low pressure at 1 bar (0,1 MPa);

b) a test at high pressure at least at 18 bar (1,8 MPa).

The low pressure part [between the regulator outlet and the outlet connection of the main shut-off valve (see 16 in Table A.1)] shall be tested at the maximum outlet pressure of the regulator.

5.3 Decomposition blocker

The decomposition blocker shall stop acetylene decomposition, when tested in accordance with Annex B.

When the decomposition blocker is subjected to acetylene decomposition, there shall be no visible permanent deformation or part ejection when tested on the gas outlet side at an initial gauge pressure of 1,5 bar (0,15 MPa).

The flame detector shall not detect a flame.

The general requirements for external gas tightness of decomposition blockers shall be tested on three samples and the test procedures shall be in accordance with ISO 9090 before and after the decomposition test. The same samples may be used for external gas tightness test and decomposition test.

The decomposition blocker shall resist a pressure of 60 bar (6,0 MPa). One sample shall be tested. When the device is tested, no visible permanent deformation of the pressure retaining components shall occur