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Gas welding equipment —

Part 1:
Line pressure regulators and line pressure regulators with flow-metering devices for gas distribution pipelines up to 6 MPa (60 bar)

Matériel de soudage au gaz —

Partie 1: Détendeurs de canalisation et détendeurs de canalisation à débitmètre intégré pour les canalisations de distribution du gaz jusqu'à 6 MPa (60 bar)

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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*.

A list of all parts in the ISO 22073 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html. Official interpretations of ISO/TC 44 documents, where they exist, are available from this page: https://committee.iso.org/sites/tc44/home/interpretation.html.

Gas welding equipment —

Part 1: Line pressure regulators and line pressure regulators with flow-metering devices for gas distribution pipelines up to 6 MPa (60 bar)

1 Scope

This document specifies requirements for line pressure regulators and line pressure regulators with flow-metering devices to be connected to industrial gas distribution pipelines of:

— compressed gases and carbon dioxide up to 6 MPa (60 bar);

— acetylene up to 150 kPa (1,5 bar);

— liquefied petroleum gases (LPG);

— methylacetylene-propadiene mixtures (MPS);

for use in welding, cutting and allied processes.

This document does not apply to pressure regulators intended for direct use on cylinders or bundles, such regulators are addressed in ISO 2503 or ISO 7291, respectively.

NOTE Where there is no risk of ambiguity, both line pressure regulators and line pressure regulators with flow-metering devices are addressed with the collective term 'pressure regulators'.

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 5171, *Gas welding equipment — Pressure gauges used in welding, cutting and allied processes*

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*

ISO 10225, *Gas welding equipment — Marking for equipment used for gas welding, cutting and allied processes*

ISO 11114-6, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 6: Oxygen pressure surge testing*

ISO 2503, *Gas welding equipment — Pressure regulators and pressure regulators with flow-metering devices for gas cylinders used in welding, cutting and allied processes up to 300 bar (30 MPa)*

ISO 7291, *Gas welding equipment — Pressure regulators for manifold systems used in welding, cutting and allied processes up to 30 MPa (300 bar)*

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 terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
accuracy of a flow-metering device
classification based on the *permissible error of the flow indication* (3.5) of the device

3.2
line pressure regulator
device for regulating a generally stable inlet pressure of a pipeline gas distribution system to an outlet pressure that is as constant as possible

3.2.1
adjustable line pressure regulator
line pressure regulator that is provided with a means of operator adjustment of the outlet pressure

3.2.2
preset line pressure regulator
line pressure regulator that is not provided with a means of operator adjustment of the outlet pressure

3.3
flow-metering device
device that measures and indicates the flow of a specific gas or gas mixture

3.4
indicated flow(s)
flow(s) indicated on the measuring device of a *line pressure regulator with flow-metering devices* (3.7)

3.5
permissible error of the flow indication
difference between the *indicated flow* (3.4) and the true flow, as a percentage of the *indicated flow* (3.4)

3.6
pressure gauge
device that measures and indicates pressure

3.7
line pressure regulator with flow-metering devices
device for regulating a generally stable inlet pressure of a pipeline gas distribution system to an outlet pressure that is as constant as possible, ensuring in addition a selected gas flow

Note 1 to entry: The device is generally a pressure regulator equipped with flow-adjusting and measuring devices which are not intended to be separated from the regulating device by the operator.

3.8
true flow
flow measured with a calibrated measuring device

4 Symbols and abbreviated terms

The symbols used in this document are given in Table 1.

Table 1 — Symbols and definitions

Symbol	Definition
p_1	Maximum inlet pressure specified by the manufacturer
p_2	Nominal outlet pressure at the nominal discharge Q_n specified by the manufacturer
p_4	Closing outlet pressure measured 1 min after stopping the nominal discharge Q_n, at p_2 and p_1
q_f	Maximum allowable internal leakage
Q_n	Nominal discharge at p_2 and p_1, specified by the manufacturer
R	Coefficient of pressure increase upon closure defined by the Formula: $R = \frac{p_4 - p_2}{p_2}$

5 Design requirements

5.1 Materials

Materials for pressure regulators shall conform to the requirements of ISO 9539.

5.2 Design and construction

5.2.1 Oxygen pressure regulators

All components and accessories used on pressure regulators for oxygen shall be thoroughly cleaned and degreased before assembly.

The materials which come in contact with oxygen in normal condition shall be resistant to corrosion and compatible with oxygen.

If lubricants are used, they shall be compatible with oxygen. They shall be resistant to ignition up to the pressure they are intended to be exposed to under operating condition.

Pressure regulators for oxygen with a maximum inlet pressure equal or greater than 3 MPa (30 bar) shall not ignite or show evidence of burning when submitted to the ignition test in 9.7.4.

5.2.2 Acetylene pressure regulators

If any of the connections' internal diameter is greater than 25 mm, an acetylene pressure regulator shall withstand a decomposition test according to 9.7.5.

5.2.3 Connections

5.2.3.1 Inlet connection

The inlet connection shall be different from the ones used for cylinder regulators.

5.2.3.2 Outlet connection

In the absence of applicable national or regional regulations, it is recommended that the connection conform with ISO/TR 28821.

5.2.4 Filter

A particle filter shall be fitted upstream of the pressure-regulator valve either inside or outside the pressure regulator.

The filter shall retain particles greater or equal to 150 µm.

5.2.5 Pressure-adjusting device

This device shall be designed in such a way that it is not possible for the pressure-regulator valve to be held in the open position, for example, as a consequence of the spring being compressed fully (to its solid length).

If prevention of the spring becoming fully compressed depends on the dimensions of the pressure-adjusting screw, then the screw shall be not removable.

5.2.6 Flow-control valve

A pressure regulator with flow-metering devices may be fitted with a flow-control valve. The flow-control knob and the valve spindle shall be captive such that they cannot be dismantled without the use of a tool.

5.2.7 Pressure gauges

If pressure gauges with a Bourdon-tube are used, they shall conform to ISO 5171.

5.2.8 Pressure relief valve

If a pressure relief valve is fitted, it shall conform to ISO 2503.

NOTE A pressure relief valve is intended to protect the line pressure regulator itself and not the downstream pipeline.

5.2.9 Leakage

5.2.9.1 External leakage

Pressure regulators and pressure regulators with flow-metering devices shall be externally gas tight at p_1 and p_2. Regulators shall not have a leakage rate greater than 170 Pa · l/min (10 cm^3/h).

This requirement is given in ISO 9090, together with suitable test methods.

5.2.9.2 Internal leakage

The test for internal leakage shall be performed according to 9.7.3.2. The maximum leakage rate allowed q_f is 200 Pa · l/min (12 cm^3/h) for test 9.7.3.2 a) Q_n up to 50 m^3/h. For greater Q_n expressed in m^3/h, the maximum permissible internal leakage expressed in cm^3/h is specified by:

$$q_f = < 0{,}24 \times Q_n$$

5.2.10 Mechanical resistance

5.2.10.1 Resistance to internal pressure

Pressure regulators and pressure regulators with flow-metering devices shall be designed and constructed in such a way that the application of a pressure equal to 2,25 × p_1 or 6 MPa (60 bar) whichever is greater for 5 min in the high-pressure and low-pressure side chambers does not lead to permanent deformation.

Pressure regulators and pressure regulators with flow-metering devices shall comply with the test in 9.7.2.1.

5.2.10.2 Pressure retention of the low-pressure side of the pressure regulator

Pressure regulators shall be designed and constructed so that, if the low-pressure chamber of the pressure regulator is in direct communication with the pipeline upstream pressure, for example, if the regulator pressure valve is held in the open position and the outlet connection is closed by an attached stop valve or a blind plug, the high-pressure gas shall either be safely retained or vented to a safe location.

Pressure regulators and pressure regulators with flow-metering devices shall comply with the test in 9.7.2.2.