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Safety and control devices for gas burners and gas-burning appliances — Particular requirements —

Part 2: Pressure regulators

Dispositifs de commande et de sécurité pour brûleurs à gaz et appareils à gaz — Exigences particulières —
Partie 2: Régulateurs de pression

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Contents

Page

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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 23551-2 was prepared by Technical Committee ISO/TC 161, *Control and protective devices for gas and oil burners and gas and oil burning appliances*.

ISO 23551 consists of the following parts, under the general title *Safety and control devices for gas burners and gas-burning appliances — Particular requirements*:

— *Part 1: Automatic valves*

— *Part 2: Pressure regulators*

— *Part 3: Gas/air ratio controls, pneumatic type*

— *Part 4: Valve-proving systems for automatic shut-off valves*

Introduction

This part of ISO 23551 is designed to be used in conjunction with ISO 23550:2004.

This part of ISO 23551 either references existing requirements of ISO 23550:2004 or indicates that there has been an “addition”, “modification” or “replacement” in the cited requirement of ISO 23550:2004.

Safety and control devices for gas burners and gas-burning appliances — Particular requirements —

Part 2: Pressure regulators

1 Scope

This part of ISO 23551 specifies safety, constructional and performance requirements for pressure regulators intended for use with gas burners and gas-burning appliances. It also describes the test procedures for checking compliance with these requirements and provides information necessary for the purchaser and user.

This part of ISO 23551 applies to pressure regulators for gas burners and gas-burning appliances of nominal connection size up to and including DN 250 that can be used and tested independently of these appliances. These regulators are suitable for fuel gases, such as natural gas, manufactured gas or liquefied petroleum gas (LPG) at inlet pressures up to and including 50 kPa.

This part of ISO 23551 covers type testing only.

This part of ISO 23551 does not cover

a) regulators connected directly to the mains pipe work or to a container that maintains a standard distribution pressure;

b) regulators installed outdoors and exposed to the environment;

c) regulators which use electrical auxiliary energy.

2 Normative references

The following referenced documents are indispensable for the application 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 23550:2004, *Safety and control devices for gas burners and gas-burning appliances — General requirements*

3 Terms, definitions and symbols

For the purpose of this document, the terms and definitions given in ISO 23550:2004 and the following apply.

3.1 Regulators

3.1.1
pressure regulator
device that maintains the outlet pressure constant within given limits, independently of the variations in inlet pressure and/or flow rate

3.1.2
adjustable pressure regulator
regulator provided with means for changing the outlet pressure setting

3.2 Pressures

3.2.1
test pressure
pressure to be applied during a test

3.2.2
pressure drop
differential pressure with valve open to its fullest extent

3.2.3
maximum inlet pressure

p_{1max}
highest inlet pressure at which tests have been conducted to determine that the regulator is able to control the outlet pressure within acceptable limits as declared by the manufacturer

3.2.4
minimum inlet pressure

p_{1min}
lowest inlet pressure at which tests have been conducted to determine that the regulator is able to control the outlet pressure within acceptable limits declared by the manufacturer

3.2.5
inlet pressure range
range of inlet pressure between the maximum and minimum values

3.2.6
maximum outlet pressure

p_{2max}
highest outlet pressure at which tests have been conducted to determine that the regulator is able to control the outlet pressure within acceptable limits declared by the manufacturer

3.2.7
minimum outlet pressure

p_{2min}
lowest outlet pressure at which tests have been conducted to determine that the regulator is able to control the outlet pressure within acceptable limits declared by the manufacturer

3.2.8
outlet pressure range
range of outlet pressure between the maximum and minimum values

3.2.9
setting point
inlet and outlet pressures declared by the manufacturer, at which the regulator is initially adjusted for test purposes at a declared flow rate

NOTE The respective pressures and flow rate are termed “inlet setting pressure”, “outlet setting pressure” and “setting flow rate”.

3.3 Flow rates

3.3.1
maximum flow rate
q_{max}
maximum rate, as a function of inlet and outlet pressures, declared by the manufacturer and expressed in $m^3 \cdot h^{-1}$ of air at standard conditions

NOTE For a non-adjustable regulator, there is only one maximum flow rate.

3.3.2
minimum flow rate
q_{min}
minimum rate, as a function of inlet and outlet pressures, declared by the manufacturer and expressed in $m^3 \cdot h^{-1}$ of air at standard conditions

NOTE For a non-adjustable regulator, there is only one minimum flow rate.

3.3.3
flow rate range
range of flow rate between the maximum and minimum values

3.4 Component parts

3.4.1
breather hole
orifice that allows atmospheric pressure to be maintained in a compartment of variable volume

3.4.2
diaphragm
flexible member which, under the influence of the forces arising from loading and pressure, operates the valve

3.4.3
diaphragm plate
stiffening plate fitted to the diaphragm

3.4.4
valve
device which varies the gas flow directly

3.5 Performance

3.5.1
lock-up pressure
outlet pressure at which a regulator closes when the outlet of the regulator is sealed

NOTE The increase in outlet pressure is expressed either in kilopascals or as a percentage.

3.5.2
put out of action
⟨verb⟩ inactivate a regulator, thereby ensuring that this setting does not undergo any changes

4 Classification

4.1 Classes of control

Pressure regulators are classified as class A, class B or class C, according to the appropriate inlet pressure and flow rate limits, as given in Table 1.

NOTE 1 In the USA, regulators are classified either for main burner load application or for main burner and pilot load application.

NOTE 2 In Japan, pressure regulators are not classified.

Table 1 — Deviation of outlet pressure from outlet setting pressure

Class of regulators		Maximum outlet pressure deviation [a] %		
		Manufactured gas	Natural gas	Liquefied petroleum gas
Class A:	q_{max} to q_{min} and p_{1max} to p_{1min}	± 15	± 15	± 15
Class B:	by variation of the inlet pressure for each of the flow rates	+ 15 − 20	+ 10 − 15	± 10
	by variation of flow rates from q_{max} to q_{min} (constant inlet pressure) for each of the inlet pressures	+ 40 0	+ 40 0	+ 40 0
Class C:	at constant q (within the flow rate range)	+ 15 − 20	+ 10 − 15	± 10
NOTE 1 Classification of fuel gases see Annex A.				
[a] See Annex A.				

4.2 Groups of controls

A regulator is classified as group 1 or group 2, according to the bending stresses that it is required to withstand in accordance with ISO 23550:2004, Table 3.

— Group 1 regulators: Regulator intended for use in an appliance and/or installation where it is not subjected to bending stresses imposed by the pipe work (e.g. by the use of rigid adjacent supports);

— Group 2 regulators: Regulator for use in any situation, either internal or external to the appliance, typically without support.

NOTE A regulator that complies with the requirements for group 2 can be deemed to comply also with the requirements for group 1 regulators.

5 Test conditions

ISO 23550:2004, Clause 5, shall apply.

NOTE Specific requirements for testing are given in Annexes B and C.

6 Construction

6.1 General

ISO 23550:2004, 6.1, shall apply.

6.2 Construction requirements

ISO 23550:2004, 6.2, shall apply, except as in 6.2.1 to 6.2.3:

6.2.1 Breather holes

ISO 23550:2004; 6.2.3, shall apply with the addition of 6.2.1.1 and 6.2.1.2:

6.2.1.1 Vent limiters

Vent limiters used with regulators shall limit the flow through the vent of the regulator as shown in Table 2 when tested at room temperature.

Table 2 — Maximum allowable vent limiter venting rate

Type of vent limiter	Specific gravity	Maximum allowable flow rate	
		cm^3/s	(ft^3/h)
Vent limiter for use only with natural, manufactured, mixed gases and LP gas-air mixtures	0,64	19,7	(2,5)
Vent limiter for use with liquefied petroleum gas	1,53	7,87	(1,0)

6.2.1.2 Separate vent limiters test

Separate vent limiters shall be installed in an upright position in a gas-tight piping system so that the test medium passes through the vent limiter. It shall then be determined that there is no leakage at the points other than through the vent limiter. The rate of flow through the test meter shall be determined at pressures from 498 Pa (2 in water column) up to and including the maximum working pressure of the regulator and corrected for a specific gravity of 1,53 for vent limiters for use with liquefied petroleum gases, and a specific gravity of 0,64 for vent limiters for use only with natural, manufactured, mixed gases and LP gas-air mixtures. The corrected flow rate shall not exceed the maximum allowable specified values. If the vent limiter is not a limiting orifice type and is designed for use in positions other than upright, additional test to determine the rate of flow shall be conducted when the vent limiter is installed in other positions.

When the vent limiter is an integral part of the regulator, the regulator diaphragm shall be substantially removed to permit the test medium to flow feely through the vent limiter. With the regulator installed in a gas-tight piping system in the manufacturer's specified upright position, the flow rate through the integral vent limiter shall be determined as described for separate vent limiters. The corrected flow rate shall not exceed the maximum allowable specified values. Additional tests to determine the rate of flow shall be conducted with the regulator in any other position for which compliance with this standard is desired.

6.2.2 Sealing caps

ISO 23550:2004, 6.2.7, shall be replaced with the following:

Sealing caps on field adjustable regulators shall be capable of being removed and replaced using standard tools and shall be capable of being sealed (e.g. by lacquer). A sealing cap shall not hinder adjustment with the outlet pressure range declared by the manufacturer.

ISO 23550:2004, 6.2, shall apply with the addition of 6.2.3.

6.2.3 Adjustment means

Adjustable type regulators and the adjustable stages of multi-stage regulators shall be provided with means for making any necessary adjustment of outlet pressure. The adjustment means of spring-type regulators shall be concealed. Suitable means for maintaining the positions of all adjustments shall be provided. Locknuts or adjusting nuts held by springs or compression are considered satisfactory, except when their adjustment can be accidentally disturbed. Factory adjustment means not intended for field adjustment shall be sealed by means suitable for both continuous and intermittent exposure at the manufacturer's specified minimum and maximum ambient temperatures.

Suitability of the sealing means shall be judged before and after completion of all tests specified in this standard. Mechanical sealing means shall require the use of special tools.

6.3 Materials

6.3.1 General material requirements

ISO 23550:2004, 6.3.1, shall apply.

6.3.2 Housing

6.3.2.1 Housing design

ISO 23550:2004, 6.3.2.1, shall apply with the following addition:

When a diaphragm inside a housing separates the gas-carrying compartment from atmosphere, then the gas-carrying compartment is considered to be indirectly separated.

6.3.2.2 Test for leakage of housing after removal of non-metallic parts

Carry out the test given in ISO 23550:2004, 6.3.2.2.

6.4 Gas connections

ISO 23550:2004, 6.4, shall apply.

7 Performance

7.1 General

ISO 23550:2004, 7.1, shall apply.

7.2 Leak-tightness

7.2.1 Criteria

ISO 23550:2004, 7.2.1, shall apply with the following modification of Table 2:

Internal leakage rates shall not apply.

Replace "controls" with "assembled regulators".

7.2.2 Test for leak-tightness

7.2.2.1 Performance of the test

Carry out the test given in ISO 23550:2004, 7.2.2.1, with the following modification:

The test shall be carried out using a pressure equal to 1,5 times the maximum inlet pressure, but at least 15 kPa.

NOTE Specific regional test conditions in Japan are given in D.1.

7.2.2.2 External leak-tightness

Replace ISO 23550:2004, 7.2.2.2, as follows:

The assembled regulator is to be mounted on the test equipment. It shall then be subjected to the test pressure given in 7.2.2.1; the inlet valve of the test equipment and the valve downstream of the sample shall be in the closed position.

If there are any signs of leakage of the sample, the leakage rate is to be measured.

Closure parts that are intended to be dismantled for servicing or adjustment shall be dismantled and reassembled five times, using standard tools according to the manufacturer's instructions, after which the leak tightness is to be checked.

NOTE Specific regional test conditions in Canada and USA are given in Annex C.

7.3 Torsion and bending

7.3.1 General

ISO 23550:2004, 7.3.1, shall apply, except that only the external leakage shall be applicable.

After testing, there shall be no permanent deformation, and the leakage shall not exceed that measured before the test.

7.3.2 Torsion

7.3.2.1 Torsion — Group 1 and group 2 regulators with threaded connections

The regulator shall be subjected to the torque specified in ISO 23550:2004, Table 4, and tested according to ISO 23550:2004, 7.3.4.2.

7.3.2.2 Torsion — Group 1 and group 2 regulators with compression fittings

The regulator shall be subjected to the torque specified in ISO 23550:2004, Table 4, and tested according to ISO 23550:2004, 7.3.4.3.

7.3.3 Bending — Group 1 and group 2 regulators

The regulator shall be subjected to the bending moment specified in ISO 23550:2004, Table 4, and tested according to ISO 23550:2004, 7.3.4.4. For group 1 devices, the test as described in ISO 23550:2004, 7.3.4.5, shall additionally be carried out.

7.3.4 Torsion and bending tests

Carry out the tests given in ISO 23550:2004, 7.3.4.