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

**Part 2:  
Pressure regulators**

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*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
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vii</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
3.1 Pressure regulators.....	2
3.2 Pressures.....	2
3.3 Flow rates.....	4
3.4 Component parts.....	4
3.5 Performance.....	5
<b>4 Classification</b> .....	<b>6</b>
4.1 Classes of control.....	6
4.2 Groups of controls.....	6
4.3 Types of DC supplied controls.....	6
<b>5 Test conditions</b> .....	<b>7</b>
<b>6 Construction</b> .....	<b>7</b>
6.1 General.....	7
6.2 Construction requirements.....	7
6.2.1 Appearance.....	7
6.2.2 Holes.....	7
6.2.3 Breather holes.....	7
6.2.4 Vent limiters.....	7
6.2.5 Screwed fastenings.....	7
6.2.6 Moving parts.....	7
6.2.7 Sealing caps.....	7
6.2.8 Disassembling and assembling for servicing and/or adjustment.....	7
6.2.9 Auxiliary channels and orifices.....	7
6.2.10 Pre-setting device.....	7
6.2.11 Adjustments.....	8
6.2.12 Resistance to pressure.....	8
6.2.13 Blockage of canals and orifices.....	8
6.2.14 Signal tube connections.....	8
6.3 Materials.....	8
6.3.1 General material requirements.....	8
6.3.2 Housing.....	8
6.3.3 Springs providing closing force and sealing force.....	9
6.3.4 Resistance to corrosion and surface protection.....	9
6.3.5 Impregnation.....	9
6.3.6 Seals for glands for moving parts.....	9
6.3.7 Jointing.....	9
6.4 Connections.....	9
6.4.1 General.....	9
6.4.2 Connection sizes.....	9
6.4.3 Connection types.....	9
6.4.4 Threads.....	9
6.4.5 Union joints.....	9
6.4.6 Flanges.....	9
6.4.7 Compression fittings.....	9
6.4.8 Flare connections.....	9
6.4.9 Nipples for pressure test.....	9
6.4.10 Strainers.....	10
6.4.11 Gas connections by GQC.....	10

6.5	Gas controls employing electrical components in the gas way	10
<b>7</b>	<b>Performance</b>	<b>10</b>
7.1	General	10
7.2	Leak-tightness	10
7.2.1	General	10
7.2.2	Requirements	10
7.2.3	Test	10
7.3	Torsion and bending	11
7.4	Rated flow rate	11
7.4.1	General	11
7.4.2	Requirements	11
7.4.3	Test	11
7.5	Durability	11
7.6	Functional requirements	11
7.7	Endurance	11
7.8	Vibration test	12
7.9	Putting the regulator out of action	12
7.9.1	Requirement	12
7.9.2	Test putting the regulator out of action	12
7.10	Endurance	12
7.11	Lock-up pressure	12
7.11.1	Requirement	12
7.11.2	Lock-up pressure test	12
7.12	Optional EP-rating	13
7.12.1	General	13
7.12.2	External leakage resistance	13
7.12.3	Internal flow resistance	13
<b>8</b>	<b>Electrical requirements</b>	<b>13</b>
<b>9</b>	<b>Electromagnetic compatibility (EMC)</b>	<b>14</b>
<b>10</b>	<b>Marking, installation and operating instructions</b>	<b>14</b>
10.1	Marking	14
10.2	Installation and operating instructions	14
10.3	Warning notice	15
<b>Annex A (informative) Leak-tightness test — Volumetric method</b>		<b>16</b>
<b>Annex B (informative) Leak-tightness test — Pressure-loss method</b>		<b>17</b>
<b>Annex C (normative) Conversion of pressure loss into leakage rate</b>		<b>18</b>
<b>Annex D (normative) Gas quick connector (GQC)</b>		<b>19</b>
<b>Annex E (normative) Elastomers/requirements resistance to lubricants and gas</b>		<b>20</b>
<b>Annex F (normative) Specific regional requirements in European countries</b>		<b>21</b>
<b>Annex G (normative) Specific regional requirements in Canada and USA</b>		<b>22</b>
<b>Annex H (normative) Specific regional requirements in Japan</b>		<b>23</b>
<b>Annex I (informative) Regulator application examples</b>		<b>24</b>
<b>Annex J (normative) Functional requirements and regulator performance testing — Method A</b>		<b>27</b>
<b>Annex K (normative) Functional requirements and regulator performance testing — Method B</b>		<b>39</b>
<b>Annex L (normative) Pneumatic gas/air ratio pressure regulator performance</b>		<b>53</b>
<b>Annex M (informative) Typical pressure regulators and pressure regulator parts</b>		<b>60</b>
<b>Bibliography</b>		<b>62</b>

## 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.

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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 161, *Controls and protective devices for gas and/or oil*.

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](http://www.iso.org/members.html).

This second edition cancels and replaces the first edition (ISO 23551-2:2006), which has been technically revised. The main changes compared to the previous edition are as follows:

- a) this document has been aligned with the structure of ISO 23550:2018;
- b) the following have been merged into one document:
  - pressure regulators (ISO 23551-2),
  - zero pressure regulators (new functions), and
  - gas/air ratio controls, pneumatic types (ISO 23551-3);
- c) the Introduction has been rewritten;
- d) [Clause 1](#) now extends to pressure regulators and pneumatic gas/air ratio pressure regulators at inlet pressures up to and including 500 kPa; auxiliary energy may be used to change the set point;
- e) [Clause 2](#) has been updated;
- f) [Clause 3](#) has been updated and new definitions have been updated;
- g) in [Clause 4](#), new regulator class D has been added for supply situations with low fluctuations;
- h) [Clause 5](#) now refers to Annexes including the new [Annex L](#) for gas/air ratio pressure regulators;
- i) requirements for breather holes have been moved from Clause 6 to ISO 23550:2018;

## ISO 23551-2:2018(E)

- k) [Clause 7](#) has been structured into “General”, “Requirements” and “Test”;
- l) [Clause 8](#) has been added without reflecting structure and requirements as in ISO 23550:2018;
- m) [Clause 9](#) has been renumbered;
- n) [Clause 10](#) has been renumbered and amended to cover the additional regulator types;
- o) new [Annex I](#) has been added;
- p) former [Annex B](#) has been updated and renumbered into [Annex J](#);
- q) former [Annex C](#) has been updated and renumbered into [Annex K](#);
- r) new [Annex L](#) has been added;
- s) former [Annex E](#) has been updated and renumbered into [Annex M](#);
- t) new [Annexes E, G](#) and [H](#) have been added for regional requirements.

A list of all the parts in the ISO 23551 series can be found on the ISO website.

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## Introduction

This document is designed to be used in combination with ISO 23550. Together with ISO 23550, this document establishes the full requirements as they apply to the product covered by this document.

Where needed, this document adapts ISO 23550 by stating in the corresponding clause:

- “with the following modification”;
- “with the following addition”;
- “is replaced by the following”; or
- “is not applicable”.

In order to identify specific requirements that are particular to this document, that are not already covered by ISO 23550, this document may contain clauses or subclauses that are additional to the structure of ISO 23550. These subclauses are indicated by the introductory sentence: “Subclause (or Annex) specific to this document.”

To ensure global relevance of this document, the differing requirements resulting from practical experience and installation practices in various regions of the world have been taken into account. The variations in basic infrastructure associated with gas and/or oil controls and appliances have also been recognized, some of which are addressed in [Annexes F, G and H](#). This document intends to provide a basic framework of requirements that recognize these differences.

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

## Part 2: Pressure regulators

### 1 Scope

This document specifies safety, construction, performance and testing requirements for pressure regulators and pneumatic gas/air ratio pressure regulators intended for use with gas burners and gas-burning appliances.

This document applies to pressure regulators and pneumatic gas/air ratio pressure regulators of nominal connection size up to and including DN 250 at inlet pressures up to and including 500 kPa, for use with natural gas, manufactured gas or liquefied petroleum gas (LPG). It is not applicable to corrosive and waste gases.

This document is specifically applicable to:

- positive, zero and negative pressure regulators which can use auxiliary energy to change the outlet pressure setting;
- pneumatic gas/air ratio pressure regulators, which function by controlling a gas outlet pressure in response to an air signal pressure, air signal differential pressure, and/or to a combustion chamber pressure signal;
- gas/air ratio pressure regulators, which function by controlling an air outlet pressure in response to a gas signal pressure or a gas signal differential pressure.

This document does not cover:

- pressure regulators connected directly to gas distribution network or to a container that maintains a standard distribution pressure;
- pressure regulators intended to be installed in the open air and exposed to the environment;
- mechanically linked gas/air ratio controls;
- electronic pressure regulators and gas/air ratio regulators, which are contained in ISO 23552-1.

This document covers type testing only.

NOTE [Annexes A to H](#) reference the relevant annexes of ISO 23550, general requirements and are applicable where required.

### 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 23550, *Safety and control devices for gas burners and gas-burning appliances — General requirements*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 23550 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 Pressure 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

Note 1 to entry: For examples refer to [Annex I](#).

##### 3.1.2

##### **adjustable pressure regulator**

*pressure regulator* (3.1.1) provided with means for changing the outlet pressure setting

##### 3.1.3

##### **pneumatic gas**

##### **air ratio pressure regulator**

*pressure regulator* (3.1.1) which supplies gas at specified pressure at its outlet in response to control pressure

##### 3.1.4

##### **zero pressure regulator**

*pressure regulator* (3.1.1) which maintains the outlet pressure constant at or below atmospheric pressure

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#### 3.2 Pressures

##### 3.2.1

##### **test pressure**

pressure to be applied during a test

##### 3.2.2

##### **pressure drop**

differential pressure with the control member 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**

difference between the minimum and the maximum values of the inlet pressure

**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**

difference between the minimum and the maximum values of the outlet pressure

**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 1 to entry: The respective pressures and flow rate are termed *inlet setting pressure* (3.2.10), *outlet setting pressure* (3.2.11) and setting flow rate.

**3.2.10****inlet setting pressure** $p_{1s}$ 

inlet pressure at which the *pressure regulator* (3.1.1) is set for test purposes

**3.2.11****outlet setting pressure** $p_{2s}$ 

outlet pressure at which the *pressure regulator* (3.1.1) is set for test purposes

**3.2.12****signal pressure** $p_3$ 

pressure, differential pressure or a combination of both applied to the regulator in order to provide the specified outlet pressure

**3.2.13****load determining pressure** $p_4$ 

negative pressure as a result of an air flow, e.g. produced by a sucking fan, through a restriction

**3.2.14****combustion chamber pressure** $p_{sc}$ 

pressure of combustion gases from the combustion chamber connected to the *pressure regulator* (3.1.1)

**3.2.15****gas/air ratio**

slope of a straight line relationship between the outlet pressure,  $p_2$ , and *signal pressure* (3.2.12),  $p_3$

**3.2.16****withstand pressure**

pressure that is withstood without degraded characteristic after returning to or below the *maximum inlet pressure* (3.2.3)

### 3.2.17

#### excessive pressure

##### EP

optional rating for a regulator that is leak and flow resistant to abnormally high inlet pressures

Note 1 to entry: Regulators may be EP rated according to the tests herein.

## 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<sup>3</sup>/h of air at standard conditions

Note 1 to entry: 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<sup>3</sup>/h of air at standard conditions

Note 1 to entry: 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 value

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## 3.4 Component parts

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### 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 control member

### 3.4.3

#### diaphragm plate

stiffening plate fitted to the *diaphragm* (3.4.2)

### 3.4.4

#### valve

device which varies the gas flow directly

### 3.4.5

#### signal chamber

part of the regulator to which the air *signal pressure* (3.2.12), gas pressure, or *combustion chamber pressure* (3.2.14) signal is connected

### 3.5 Performance

#### 3.5.1

#### lock-up pressure

$p_{2f}$

outlet pressure at which a regulator closes when the outlet of the regulator is sealed

Note 1 to entry: The increase in outlet pressure is expressed either in kilopascals or as a percentage.

#### 3.5.2

#### put out of action, verb

deactivate a regulator by putting the regulator to the full open position thereby ensuring that this setting does not undergo any changes

#### 3.5.3

#### offset

outlet pressure shift at *pneumatic gas/air ratio pressure regulators* (3.1.3) independent of signal or load determining pressure(s) (3.2.13)

Note 1 to entry: Typically, this is achieved by means of a spring.

#### 3.5.4

#### steady state value

outlet pressure measured after step response (control signal remains constant)

#### 3.5.5

#### settling tolerance

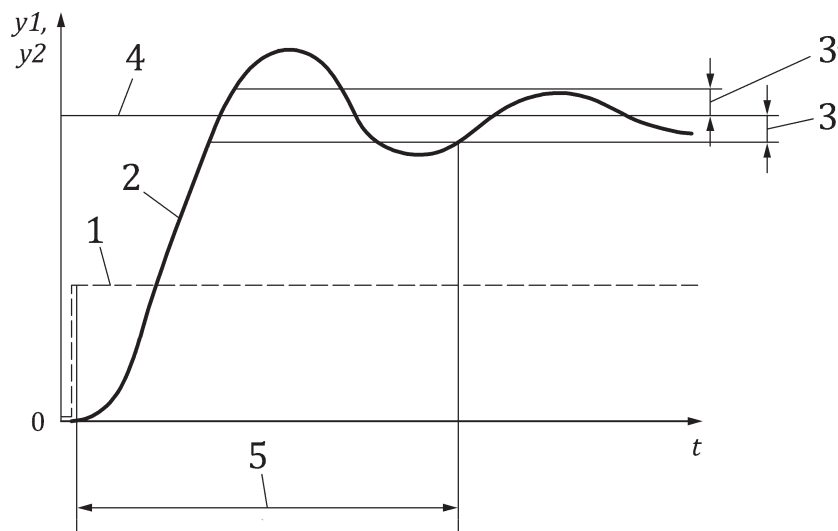
maximum difference between the current outlet pressure and its steady state value (3.5.4)

#### 3.5.6

#### settling time

time counted from start of the step change of the signal pressure (3.2.12) or load determining pressure (3.2.13) until the outlet pressure remains in the settling tolerance (3.5.5)

Note 1 to entry: For further information refer to Figure 1.



#### Key

- |   |                         |     |               |
|---|-------------------------|-----|---------------|
| 1 | step change ( $y_1$ )   | 4   | state value   |
| 2 | step response ( $y_2$ ) | 5   | settling time |
| 3 | settling tolerance      | $t$ | time          |

Figure 1 — Settling time after a step change

## 4 Classification

### 4.1 Classes of control

Shall be according to ISO 23550:2018, 4.1 with the following addition:

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

Regulators may be classified as types for industrial use.

Regulators may be classified as circle "P" ⊙ or triangle "P" ▽ when the range of regulation capacity also includes pilot load (see [Annex K](#)). This classification does not apply to modulating regulators.

Regulators may be classified as EP when tested in accordance with [7.12](#).

Gas/air ratio pressure regulators are not classified.

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

**Table 1 — Deviation of outlet pressure from outlet setting pressure**

Class of regulators		Maximum outlet pressure deviation <sup>a</sup>		
		Manufactured gas	Natural gas	Liquefied petroleum gas
<b>Class A:</b>	$q_{\max}$ to $q_{\min}$ and $p_{1\max}$ to $p_{1\min}$ standard use	+15 or ±0,1 kPa	±15 or ±0,1 kPa	±15 or ±0,1 kPa
	industrial use	±20 or ±0,2 kPa	±20 or ±0,2 kPa	±20 or ±0,2 kPa
<b>Class B:</b>	by variation of the inlet pressure for each of the flow rates	+15 -20 or ±0,1 kPa	+10 -15 or ±0,1 kPa	±10 or ±0,1 kPa
	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
<b>Class C:</b>	at constant $q$ (within the flow rate range)	+15 -20 or ±0,1 kPa	+10 -15 or ±0,1 kPa	±10 or ±0,1 kPa
<b>Class D:</b>	at constant $q$ (within the flow rate range) and a fixed setting of $p_{2s}$	±15 or ±0,1 kPa	±15 or ±0,1 kPa	±15 or ±0,1 kPa

NOTE For the classification of fuel gases, see ISO 23550.  
<sup>a</sup> See ISO 23550.

### 4.2 Groups of controls

Shall be according to ISO 23550:2018, 4.2 with the following modification:

Replace “control” by “regulator”.

### 4.3 Types of DC supplied controls

Shall be according to ISO 23550:2018, 4.3.

## 5 Test conditions

Shall be according to ISO 23550:2018, Clause 5, with the following addition:

NOTE Specific requirements for testing are given in [Annexes J, K and L](#).

## 6 Construction

### 6.1 General

Shall be according to ISO 23550:2018, 6.1, with the following addition:

NOTE For examples of typical pressure regulators and pressure regulator parts, refer to [Annex M](#).

### 6.2 Construction requirements

#### 6.2.1 Appearance

Shall be according to ISO 23550:2018; 6.2.1.

#### 6.2.2 Holes

Shall be according to ISO 23550:2018; 6.2.2.

#### 6.2.3 Breather holes

Shall be according to ISO 23550:2018, 6.2.3.

#### 6.2.4 Vent limiters

Shall be according to ISO 23550:2018, 6.2.4.

#### 6.2.5 Screwed fastenings

Shall be according to ISO 23550:2018, 6.2.5.

#### 6.2.6 Moving parts

Shall be according to ISO 23550:2018, 6.2.6.

#### 6.2.7 Sealing caps

Shall be according to ISO 23550:2018, 6.2.7.

#### 6.2.8 Disassembling and assembling for servicing and/or adjustment

Shall be according to ISO 23550:2018, 6.2.8.

#### 6.2.9 Auxiliary channels and orifices

Shall be according to ISO 23550:2018, 6.2.9.

#### 6.2.10 Pre-setting device

Shall be according to ISO 23550:2018, 6.2.10.