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## Safety and control devices for gas and/or oil burners and appliances — General requirements

*Dispositifs de commande et de sécurité pour brûleurs à gaz et  
appareils à gaz — Exigences générales*

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CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

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## 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 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](http://www.iso.org/iso/foreword.html). (standards.itech.ai)

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This third edition cancels and replaces the second edition (ISO 23550:2011), which has been technically revised. The main changes compared to the previous edition are as follows:

- a new structure has been introduced with a clear separation between general statements, requirements and test;
- this document has been updated and aligned with the relevant parts of IEC 60730-1:2013;
- the Scope now specifies controls for use at maximum operating pressures up to and including 500 kPa;
- the Introduction and [Clauses 2](#) and [3](#) have been updated;
- the structure of [Clauses 4](#) to [10](#) have been modified;
- in [Formula \(2\)](#), the air flow rate at standard conditions has been corrected;
- [Annexes D](#) to [H](#) have been created;
- the Bibliography has been updated.

## Introduction

This document provides general requirements for controls and safety devices for gas burners and gas burning appliances, and is intended to be used in conjunction with the ISO 23551, ISO 23552 and the ISO 23553 series for specific types of controls, or for controls for specific applications.

This document can also be applied, so far as reasonable, to controls not mentioned in a specific standard and to controls designed on new principles, in which case additional requirements can be necessary.

Where no specific International Standard for a control exists, the control can be tested according to this document and further tests which take into account the intended use.

Controls and safety devices for gas burners and gas burning appliances using fuel need to withstand the type of gas which is specified. Other ISO Technical Committees, e.g. ISO/TC 28, *Petroleum products and lubricants* and ISO/TC 193, *Natural gas*, deal with the testing and properties of fuel gases.

Note that, due to the differing properties of fuel depending on its source/region of origin, certain differences in regulations exist at present in different regions, some of which are presented in [Annexes E, G and H](#). This document intends to provide a basic framework of requirements until these differences can be harmonized.

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# Safety and control devices for gas and/or oil burners and appliances — General requirements

## 1 Scope

This document specifies safety, construction, performance and testing requirements for controls for gas burners and gas burning appliances for use with natural gas, manufactured gas or liquefied petroleum gas (LPG).

This document applies to controls for use at maximum operating pressures up to and including 500 kPa. This document provides the general requirements that are intended to be the basis for the specific control standards found in the ISO 23551 and ISO 23552 series. These include the following:

- automatic and semi-automatic gas valves;
- gas thermoelectric flame supervision controls;
- gas and oil /air ratio controls;
- gas pressure regulators;
- manual gas valves;
- mechanical gas thermostats;
- multifunctional gas controls;
- air and gas pressure-sensing devices;
- gas vent valves;
- gas valve-proving systems.

This document covers type testing only.

This document is also applicable to Gas Quick Connectors (GQC) for use inside appliances with connections up to, and including DN 25, and a maximum operating pressure up to and including 100 kPa. GQCs include:

- tube to tube connections;
- tube to control connections; and
- tube to fitting connections.

This document does not apply to mechanical controls for use with liquid fuels. It is also not applicable to corrosive and waste gases.

## 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 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

- ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*
- ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*
- ISO 65, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1*
- ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*
- ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*
- ISO 262, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts*
- ISO 815, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*
- ISO 1400, *Vulcanized rubbers of high hardness (85 to 100 IRHD) — Determination of hardness*
- ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*
- ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*
- ISO 7005-1, *Pipe flanges — Part 1: Steel flanges for industrial and general service piping systems*
- ISO 7005-2, *Metallic flanges — Part 2: Cast iron flanges*
- IEC 60529, *Degrees of protection provided by enclosures (IP Code)*
- IEC 60730-1, *Automatic electrical controls — Part 1: General requirements*
- IEC 60079-11, *Explosive atmospheres — Part 11: Equipment protection by intrinsic safety "i"*
- IEC 61643-11, *Low-voltage surge protective devices — Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 <https://www.electropedia.org/>

#### 3.1

##### **breather hole**

orifice which allows atmospheric pressure to be maintained within a compartment of variable volume

#### 3.2

##### **closure member**

movable part of the *control* (3.3) which shuts off the gas flow

#### 3.3

##### **control**

device which directly or indirectly controls the gas flow and/or provides a safety function within a burner or gas-burning appliance

#### 3.4

##### **external leak-tightness**

leak-tightness of a gas-carrying compartment with respect to the atmosphere

**3.5****internal leak-tightness**

leak-tightness of the *closure member* (3.2) (in the closed position) sealing a gas-carrying compartment with respect to another compartment or to the outlet of the *control* (3.3)

**3.6****inlet pressure**

pressure at the inlet of the *control* (3.3)

**3.7****outlet pressure**

pressure at the outlet of the *control* (3.3)

**3.8****pressure difference**

difference between the *inlet pressure* (3.6) and the *outlet pressure* (3.7)

**3.9****operating pressure**

pressure at which the *control* (3.3) operates

**3.10****maximum operating pressure**

highest inlet pressure declared by the manufacturer at which the *control* (3.3) may be operated

**3.11****flow rate**

volume flowing through the *control* (3.3) divided by time

**3.12****rated flow rate**

air flow rate (3.11) at a specified pressure difference declared by the manufacturer, corrected to standard conditions

**3.13****maximum ambient temperature**

highest temperature of the surrounding air declared by the manufacturer at which the *control* (3.3) may be operated

**3.14****minimum ambient temperature**

lowest temperature of the surrounding air declared by the manufacturer at which the *control* (3.3) may be operated

**3.15****mounting position**

position declared by the manufacturer for mounting the *control* (3.3)

Note 1 to entry: Mounting positions are for example as follows:

- upright: single position on a horizontal axis with respect to the inlet connection, as specified by the manufacturer;
- horizontal: any position on a horizontal axis with respect to the inlet connection;
- vertical: any position on a vertical axis with respect to the inlet connection;
- limited horizontal: any position from upright to 90° (1,57 rad) from upright on a horizontal axis with respect to the inlet connection;
- multi-positional (multipoise): any position on a horizontal, vertical or intermediate axis with respect to the inlet connection.

**3.16**  
**diameter nominal**  
**DN**

**nominal size**

alphanumeric designation of size for components of a pipework system, which is used for reference purposes, comprising the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections

Note 1 to entry: The number following the letters DN does not represent a measurable value and should not be used for calculation purposes except where specified in the relevant standard.

Note 2 to entry: In those standards which use the DN designation system, any relationship between DN and component dimensions should be given, e.g. DN/OD or DN/ID.

[SOURCE: ISO 6708:1995, 2.1, modified — The two sentences have been merged into one.]

**3.17**  
**type testing**

conformity testing on the basis of one or more specimens of a product representative of the production

[SOURCE: ISO 8655-1:2002, 3.2.2]

**3.18**  
**main diaphragm**

flexible member which, under the influence of the forces arising from loading and pressure, operates the *control member*

**3.19**  
**gas quick connector**  
**GQC**

connector consisting of *fastener* (3.20), *socket* (3.21), *plug* (3.22) and *seal* (3.23)

Note 1 to entry: Specific requirements for GQCs are found in Annex D.  
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**3.20**  
**fastener**

clip retaining the connection of *plug* (3.22) and *socket* (3.21)

**3.21**  
**socket**

outside part of the *GQC* (3.19)

**3.22**  
**plug**

inside part of the *GQC* (3.19)

**3.23**  
**seal**

gas seal between the *socket* (3.21) and the *plug* (3.22)

**3.24**  
**sealing cap**

removable cover or device that allows access to make adjustments to the *control* (3.3)

**3.25**  
**auxiliary channel**

passageway that supports the intended function of the *control* (3.3)

**3.26**  
**vent limiter**

device to limit leakage to atmosphere

**3.27****pre-setting device**

device for adjusting an operating condition

**3.28****installation and operating instructions**

manufacturer's information to install, operate and maintain the control

**4 Classification****4.1 Classes of control**

Where appropriate, controls are classified for the application (for example, construction or performance characteristics, number of operations during their working life). For classification of controls, see the specific control standard.

**4.2 Groups of controls**

Controls are grouped according to the bending stresses which they are required to withstand (see [Table 7](#)):

- a) **Group 1 controls** — Controls with connection sizes up to and including DN 25, for use in an appliance where they are not subjected to bending stresses imposed by installation pipe work or in an installation if used with rigid adjacent supports.

NOTE 1 In Canada, Japan and the USA, group 1 controls are not used.

- b) **Group 2 controls** — Controls for use in any situation, either internal or external to the appliance, typically without support.

NOTE 2 Controls which meet the requirements of group 2 control also meet the requirements of group 1 control.

**4.3 Types of DC supplied controls**

DC supplied controls are classified in one of the three following types:

- Type A: Stand-alone battery systems;
- Type B: Battery systems for non-stationary applications (i.e. applications which are changing location or in motion);
- Type C: Systems which are intended to be connected to DC supply networks.

**4.4 Classes of control functions**

Classes of control functions are only applicable to functions consisting fully or partly out of electronics.

For the evaluation of protective measures for fault tolerance and avoidance of hazards, it is necessary to classify control functions with regard to their fault behaviour.

At the classification of control functions, their integration into the complete safety concept of the appliance shall be taken into account.

For the purpose of evaluating the design of a control function, the present requirements recognize three distinct classes according IEC 60730-1:2013, H.2.22, as follows:

- **Class A control function:** Control functions which are not intended to be relied upon for the safety of the application.

- **Class B control function:** Control functions which are intended to prevent an unsafe state of the appliance. Failure of the control function does not lead directly to a hazardous situation.
- **Class C control function:** Control functions which are intended to prevent special hazards such as explosion or whose failure can directly cause a hazard in the appliance.

This classification shall be specified in every product standard.

## 5 Test conditions and tolerances

### 5.1 Test conditions

Unless otherwise stated, the tests shall be carried out

- with air at  $(20 \pm 5) ^\circ\text{C}$ ; and
- at ambient temperature  $(20 \pm 5) ^\circ\text{C}$ .

All measured values shall be corrected to standard conditions:  $15 ^\circ\text{C}$ ,  $101,325 \text{ kPa}$  ( $1\,013,25 \text{ mbar}$ ) dry.

NOTE Specific regional requirements are given in [H.2.1](#).

All measurements shall be made after stable conditions have been reached.

Controls which can be converted to another gas type by exchanging components are additionally tested with the conversion components.

Tests shall be carried out in the mounting position as stated in the installation and operating instructions. When multiple mounting positions are specified, tests shall be conducted with the control in the least favourable position.

Where possible, the tests already covered by other standards (e.g. by relevant parts of IEC 60730-1) shall be combined with tests presented in this document.

### 5.2 Tolerances

Unless otherwise stated in specific clauses, measurements shall be carried out with the maximum tolerances indicated below:

- Absolute pressure  $\pm 4 \%$ ;
- Relative pressure  $\pm 2 \%$  of the measured value, whichever is greater (e.g. gauge pressures or differential pressures);
- Flow rate  $\pm 3 \%$  of the measured value;
- Leakage rate  $\pm 10 \text{ cm}^3/\text{h}$  (the apparatus shown schematically in [Annex B](#) or another device giving equivalent results is used.);
- Time  $\pm 0,1 \%$  or  $\pm 0,2 \text{ s}$ , whichever is greater;
- Temperatures  $\pm 1,5 \text{ K}$ ;
- Torque  $\pm 10 \%$ ;
- Force  $\pm 10 \%$ ;
- Current  $\pm 1 \%$ ;
- Voltage  $\pm 1 \%$ ;
- Electrical power  $\pm 2 \%$ ;

- Supply frequency  $\pm 0,1$  Hz.

The full range of the measuring apparatus is chosen to be suitable for maximum anticipated value.

For uncertainty of measurements, refer to ISO/IEC Guide 98-3.

## 6 Construction

### 6.1 General

Controls shall be designed, manufactured and assembled so that the various functions operate correctly when installed and used according to the installation and operating instructions.

All pressurized parts of a control shall withstand the mechanical and thermal stresses to which they are subjected without any deformation affecting safety.

In general, conformity with the requirements given in ISO/IEC International Standards is verified by:

- the test methods given therein or in the specific control standards; or
- the use of the construction materials specified in the requirements.

Depending on the class of control function in 4.4, the control shall be tested according to the electrical requirements of the relevant clauses of IEC 60730-1:2013, Annex H.

### 6.2 Construction requirements

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#### 6.2.1 Appearance

##### 6.2.1.1 General

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Controls shall be suitable for the intended use. Handling, installation and maintenance shall be possible without special equipment.

##### 6.2.1.2 Requirements

Controls shall be free from sharp edges and corners which can cause damage, injury or incorrect operation. All parts shall be clean internally and externally.

##### 6.2.1.3 Test

Compliance shall be verified by visual inspection.

#### 6.2.2 Holes

##### 6.2.2.1 General

Holes for screws, pins, etc., used for the assembly of parts of the control or for mounting, shall not penetrate gas ways.

##### 6.2.2.2 Requirements

The wall thickness between these holes and gas ways shall take into account the design, material selected and method of manufacturing and be at least 1 mm nominal for casted parts. Holes necessary during manufacture, which connect gas passageways to atmosphere but do not affect the operation of the control, shall be permanently sealed by metallic means. Suitable jointing compounds may additionally be used.