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

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

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Foreword

ISO (the International Organization for Standardization) is a world wide 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 23550 was prepared by Technical Committee ISO/TC 161, *Control and protective devices for gas and oil burners and gas and oil burning appliances*.

Introduction

This International Standard 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 ISO 23553 series for specific types of controls, or for controls for specific applications.

This International Standard may 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 may be necessary.

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

Controls and safety devices for gas burners and gas burning appliances using fuel gases 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 gas depending on its source/region of origin, certain differences in regulations exist at present in differing regions, some of which are presented in Annexes E, F and G. This International Standard intends to provide a basic framework of requirements until these differences can be harmonized.

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

1 Scope

This International Standard specifies safety, constructional and performance requirements and testing of safety control or regulating devices and sub-assemblies or fittings (hereafter referred to as controls) for burners and gas-burning appliances using fuel gases as natural gas, manufactured gas or liquefied petroleum gas (LPG). It is not applicable to corrosive and waste gases.

This International Standard is applicable to the following controls:

— automatic shut-off valves;

— burner controls;

— flame supervision devices;

— gas/air ratio controls;

— pressure governors;

— manual taps;

— mechanical thermostats;

— multifunctional controls;

— pressure-sensing devices;

— valve-proving systems;

— zero governors.

The methods of test given in this International Standard are intended for product type testing. Tests intended for production testing are not specifically included.

NOTE This International Standard is intended to be used in conjunction with the specific control standards of the ISO 23551 series.

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

ISO 65, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1*

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 301, *Zinc alloy ingots intended for casting*

ISO 1817:1999, *Rubber, vulcanized — Determination of the effect of liquids*

ISO 7005 (all parts) *Metallic flanges*

IEC 60730-1:1999, *Automatic electrical controls for household and similar use — Part 1: General requirements*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measuring techniques — Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measuring techniques — Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4-4: Testing and measuring techniques — Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) — Part 4-5: Testing and measuring techniques — Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) — Part 4-6: Testing and measuring techniques — Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) — Part 4-11: Testing and measuring techniques — Voltage dips, short interruptions and voltage variations immunity tests*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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 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 gas 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 (in the closed position) sealing a gas-carrying compartment with respect to another compartment or to the outlet of the control

3.6
inlet pressure
pressure at the inlet of the control

3.7
outlet pressure
pressure at the outlet of the control

3.8
pressure difference
difference between the inlet and outlet pressures

3.9
maximum working pressure
highest inlet pressure declared by the manufacturer at which the control may be operated

3.10
minimum working pressure
lowest inlet pressure declared by the manufacturer at which the control may be operated

3.11
flow rate
volume flowing through the control divided by time

3.12
rated flow rate
air flow rate 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 may be operated

3.14
minimum ambient temperature
lowest temperature of the surrounding air declared by the manufacturer at which the control may be operated

3.15
mounting position
position declared by the manufacturer for mounting the control

NOTE 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;

— multipoise: any position on a horizontal, vertical or intermediate axis with respect to the inlet connection.

3.16
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 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 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.

NOTE 3 Adapted from ISO 6708:1995.

4 Classification

4.1 Classes of control

Where appropriate, controls are classified by application (e.g. sealing force, 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 4):

a) **Group 1 controls** — Controls for use in an appliance or installation where they are not subjected to bending stresses imposed by installation pipe work (e.g. by the use of rigid adjacent supports).

NOTE In USA and Canada, 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 Controls which meet the requirements of a group 2 control also meet the requirements of a group 1 control.

5 Test conditions

If no specific methods of test are given, conformity with these requirements shall be verified by inspection and/or measurement.

Tests shall be carried out with air at (20 ± 5) °C and at an ambient temperature of (20 ± 5) °C, unless otherwise specified.

All measured values shall be corrected to the standard conditions of 15 °C and 101,325 kPa, dry.

Controls which can be converted for use with another gas family by exchanging components are additionally tested with the conversion components.

Tests shall be carried out in the mounting position declared by the manufacturer. If there are several mounting positions, tests shall be carried out in the least favourable position.

Where possible, those tests already covered by other standards (e.g. the IEC 60730 series) shall be combined.

NOTE These tests are specified in the specific control standard.

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 manufacturer's 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 this International Standard is verified by the test methods given herein or in the specific control standard, or by using the construction materials specified by the requirements. Alternative materials may be used if they provide performance at least equivalent to the materials specified.

6.2 Construction requirements

6.2.1 Appearance

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

6.2.2 Holes

Holes for screws, pins, etc., used for the assembly of parts of the control or for mounting, shall not penetrate gasways. The wall thickness between these holes and gasways shall be at least 1 mm.

Holes necessary during manufacture which connect gasways to atmosphere but which do not affect the operation of the control shall be permanently sealed by metallic means. Suitable jointing compounds may additionally be used.

6.2.3 Breather holes

6.2.3.1 Design

Breather holes shall be so designed that, when the diaphragm is damaged, either

a) the air flow rate through the hole does not exceed 70 $dm^3 \cdot h^{-1}$ at the maximum inlet pressure,

or

b) they shall have a connection for a suitable vent pipe, in which case the installation and operation instructions shall state that the breather is to be vented safely.

For maximum working pressures up to 3 kPa, requirement a) above shall be deemed to be met with a breather hole of diameter not greater than 0,7 mm.

If compliance with a) above is by the use of a leakage-rate limiter, this shall be able to withstand a pressure equal to three times the maximum working pressure. If a safety diaphragm is used as a leakage-rate limiter, it shall not take the place of the working diaphragm in case of a fault.

Breather holes shall be protected against blockage or they shall be located such that they do not easily become blocked. They shall be positioned or protected in such a way that the diaphragm cannot be damaged by a sharp device inserted through the breather hole.

Conformity shall be verified by the method given in 6.2.3.2.

NOTE Specific regional requirements are given in F.6.2.3.1.

6.2.3.2 Test for leakage of breather holes

Rupture the dynamic part of the working diaphragm. Ensure all closure members of the control, if any, are in the open position. Pressurize all gas-carrying compartments to the maximum working pressure and measure the leakage rate.

6.2.4 Screwed fastenings

Screwed fastenings which may be removed for servicing or adjustment shall have metric threads in accordance with ISO 262 unless a different thread is essential for the correct operation or adjustment of the control.

Self-tapping screws which cut a thread and produce swarf (metal residue) shall not be used for connecting gas-carrying parts or parts which may be removed for servicing.

Self-tapping screws which form a thread and do not produce swarf may be used provided that they can be replaced by metric machine screws conforming to ISO 262.

NOTE Specific regional requirements are given in F.6.2.4.

6.2.5 Jointing

Jointing compounds for permanent assemblies shall remain effective under all declared operating conditions.

Soldering or other processes where the jointing material has a melting point below 450 °C after application shall not be used for connecting gas-carrying parts except for additional sealing.

NOTE Specific regional requirements are given in F.6.2.5.

6.2.6 Moving parts

The operation of moving parts (e.g. diaphragms, drive shafts) shall not be impaired by other parts. There shall be no exposed moving parts which could adversely affect the operation of controls.

6.2.7 Sealing caps

Sealing caps shall be capable of being removed and replaced with commonly available tools and sealed (e.g. by lacquer). A sealing cap shall not hinder adjustment within the whole range declared by the manufacturer.

6.2.8 Dismantling and reassembling for servicing and/or adjustment

Parts which are intended to be dismantled for servicing or adjustment shall be capable of being dismantled and reassembled using commonly available tools. They shall be constructed or marked in such a way that incorrect assembly is impossible when following the manufacturer's instructions.

Closure parts, including those of measuring and test points, which may be dismantled for servicing or adjustment shall be constructed such that leak-tightness is achieved by mechanical means (e.g. metal-to-metal joints, O-rings) without using jointing compounds such as liquids, pastes or tapes.

Closure parts not intended to be dismantled shall be either sealed by means which will show evidence of interference (e.g. lacquer), or fixed by fasteners requiring tools that are not commonly available.

6.2.9 Auxiliary channels

Blockage of auxilliary channels and orifices shall not adversely affect the operation of the control, otherwise they shall be protected against blockage by suitable means.

6.3 Materials

6.3.1 General material requirements

The quality of materials, the dimensions used and the method of assembling the various parts shall be such that construction and performance characteristics are safe. Performance characteristics shall not alter significantly during a reasonable lifetime when installed and used according to the manufacturer's instructions. Under these circumstances, all components shall withstand any mechanical, chemical and thermal conditions to which they may be subjected during service.

NOTE Specific regional requirements are given in F.6.3.1.

6.3.2 Housing

6.3.2.1 Housing design

Parts of the housing which directly or indirectly separate a gas-carrying compartment from atmosphere shall either:

— be made from metallic materials,

or

— on removal or fracture of non-metallic parts other than O-rings, gaskets, seals and the sealing part of diaphragms, allow no more than 30 $dm^3.h^{-1}$ of air to escape at the maximum working pressure when tested in accordance with 6.3.2.2.

NOTE Specific regional requirements are given in E.6.3.2.1, F.6.3.2.1 and G.6.3.2.1.

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

Remove all non-metallic parts of the housing which separate a gas-carrying compartment from atmosphere, excluding O-rings, seals, gaskets and the sealing part of diaphragms. Any breather holes shall be blocked. Pressurize the inlet and outlet(s) of the control to the maximum working pressure and measure the leakage rate.

6.3.3 Springs

6.3.3.1 Closure springs

Springs providing the sealing force for any closure member of the control shall be made of corrosion-resistant materials and shall be designed to be fatigue-resistant.

6.3.3.2 Springs providing closing force and sealing force

Springs providing the closing and sealing force shall be designed for oscillating loads and for fatigue resistance.

Springs with wire diameters up to and including 2,5 mm shall be made from corrosion-resistant materials.

Springs with wire diameters above 2,5 mm shall either be made from corrosion-resistant materials or shall be protected against corrosion.