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

Part 6: Thermoelectric flame supervision controls

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

Partie 6: Équipements thermoélectriques de surveillance de flamme

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web 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).

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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 161, *Control and protective devices for gas and/or oil burners and appliances*.

Introduction

This part of ISO 23551 is designed to be used in combination with ISO 23550. This part, together with ISO 23550, establishes the full requirements as they apply to the product covered by this International Standard. This part adapts ISO 23550, where needed, by stating "with the following modification", "with the following addition", "is replaced by the following", or "is not applicable", in the corresponding clause. In order to identify specific requirements that are particular to this part, that are not already covered by ISO 23550, this International Standard might contain clauses or subclauses that are additional to the structure of ISO 23550. These clauses are numbered starting from 101 or, in the case of an Annex, are designated AA, BB, CC etc.

In an attempt to develop a fully International Standard, it has been necessary to take into consideration the differing requirements resulting from practical experience and installation practices in various regions of the world and to recognize the variation in basic infrastructure associated with gas and/or oil controls and appliances, some of which are addressed in Annexes E, F, and G. This International Standard intends to provide a basic framework of requirements that recognize these differences.

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

Part 6: Thermoelectric flame supervision controls

1 Scope

This part of ISO 23551 specifies safety, constructional, and performance requirements for thermoelectric flame supervision controls, energized by a thermocouple, intended for use with gas burners and gas-burning appliances, hereafter referred to as "controls".

This part of ISO 23551 applies to thermoelectric flame supervision controls for gas burners and gas-burning appliances of nominal connection size up to, and including DN 50, that can be used and tested independently of these appliances.

These thermoelectric flame supervision controls 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 International Standard covers type testing only.

This International Standard is not applicable to

a) the thermocouple and

b) controls which use auxiliary energy (e.g. electrical energy supplied externally).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 23550:2011, *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.

3.101
thermocouple
thermoelectric flame sensing element that responds to the temperature of the supervised flame, resulting in an electromotive force (e.m.f.)

3.102
thermoelectric flame supervision control
control which, in response to the e.m.f. produced by the thermocouple, maintains the gas way to the main burner; or the main burner and the pilot burner open and which shuts off the gas way after extinction of the supervised flame

Note 1 to entry: For example, see Figure AA.1.

3.103
ignition interlock
part which prevents the igniter from operating as long as the main gas way is open

3.104
re-start interlock
mechanism which prevents the re-opening of the gas way to the main burner or to the main burner and the pilot burner until the armature plate has separated from the magnetic element

Note 1 to entry: For further reference, see Figure AA.1.

3.105
sealing force
force acting on the closure member when the closure member is in the closed position, independent of any force provided by fuel gas pressure

3.106
closed position
position of the closure member(s) in the absence of the thermoelectric energy

4 Classification

4.1 Classes of controls

ISO 23550:2011, 4.1 is replaced by the following:

Controls are classified according to the number of operations:

— 5 000 operations (e.g. central heating);

— 6 000 operations;

— 10 000 operations (e.g. space heaters);

— 40 000 operations (e.g. domestic cooking).

NOTE Specific regional requirements are given in Annexes F and G.

4.2 Groups of controls

Shall be according to ISO 23550:2011, 4.2.

NOTE Specific regional requirements are given in Annexes F and G.

5 Test conditions

Shall be according to ISO 23550:2011, Clause 5.

6 Construction

6.1 General

Shall be according to ISO 23550:2011, 6.1, with the following addition:

— Controls shall also be designed, so that during ignition, either the gas way to the main burner is open, if there is no pilot burner; or the gas way to the main burner is closed and that to the pilot burner is open.

— Controls shall also be designed so that the sealing force is not decreased by the gas inlet pressure.

6.2 Construction requirements

6.2.1 Appearance

Shall be according to ISO 23550:2011, 6.2.1.

6.2.2 Holes

Shall be according to ISO 23550:2011, 6.2.2.

6.2.3 Breather holes

ISO 23550:2011, 6.2.3 is not applicable.

6.2.4 Screwed fastenings

Shall be according to ISO 23550:2011, 6.2.4.

6.2.5 Jointing

Shall be according to ISO 23550:2011, 6.2.5.

6.2.6 Moving parts

Shall be according to ISO 23550:2011, 6.2.6.

6.2.7 Sealing caps

Shall be according to ISO 23550:2011, 6.2.7.

6.2.8 Dismantling and reassembling for servicing and/or adjustment

Shall be according to ISO 23550:2011, 6.2.8.

6.2.9 Auxiliary channels

Shall be according to ISO 23550:2011, 6.2.9.

6.3 Materials

6.3.1 General material requirements

Shall be according to ISO 23550:2011, 6.3.1.

6.3.2 Housing

6.3.2.1 Housing design

Shall be according to ISO 23550:2011, 6.3.2.1.

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

Shall be according to ISO 23550:2011, 6.3.2.2 with the following addition:

The test shall be performed in accordance with 7.2.2.2.

6.3.3 Springs

Shall be according to ISO 23550:2011, 6.3.3.

6.3.4 Resistance to corrosion and surface protection

Shall be according to ISO 23550:2011, 6.3.4.

6.3.5 Impregnation

Shall be according to ISO 23550:2011, 6.3.5.

6.3.6 Seals for glands for moving parts

Shall be according to ISO 23550:2011, 6.3.6.

6.4 Gas connections

6.4.1 Making connections

Shall be according to ISO 23550:2011, 6.4.1.

6.4.2 Connection sizes

Shall be according to ISO 23550:2011, 6.4.2.

6.4.3 Threads

Shall be according to ISO 23550:2011, 6.4.3.

6.4.4 Union joints

Shall be according to ISO 23550:2011, 6.4.4.

6.4.5 Flanges

Shall be according to ISO 23550:2011, 6.4.5.

6.4.6 Compression fittings

Shall be according to ISO 23550:2011, 6.4.6.

6.4.7 Nipples for pressure tests

Shall be according to ISO 23550:2011, 6.4.7.

6.4.8 Strainers

Shall be according to ISO 23550:2011, 6.4.8 with the following addition:

Strainers fitted to controls of DN 25 and above shall be accessible for cleaning or replacement without the need to remove the control body by dismantling threaded or welded pipe work.

7 Performance

7.1 General

Shall be according to ISO 23550:2011, 7.1.

7.2 Leak-tightness

7.2.1 Criteria

ISO 23550:2011, 7.2.1 is replaced by the following:

Controls shall be leak-tight in accordance with the leakage rates given in Table 1.

Table 1 — Maximum leakage rates

Gas connection nominal inlet size DN	**Maximum leakage rates of air** cm^3/h			
	Internal leak-tightness		External leak-tightness	
	Closed (de-energized) position	Ignition position	Operating and closed (de-energized) position	Ignition position
DN < 10	20	5 000	20	170
10 ≤ DN ≤ 25	40		40	190
25 < DN ≤ 50	60		60	210

Closure parts shall remain leak-tight after dismantling and reassembly.

NOTE Specific regional requirements are given in Annexes F and G.

7.2.2 Test for leak-tightness

7.2.2.1 General

Shall be according to ISO 23550:2011, 7.2.2.1.

7.2.2.2 External leak-tightness

Shall be according to ISO 23550:2011, 7.2.2.2 with the following addition:

Pressurize the inlet and outlet(s) of the control to the test pressures given in 7.2.2.1. Before the test, closure parts which can be dismantled in accordance with 6.2.8 shall be dismantled and reassembled five times to the manufacturer's instructions and the leakage rate for each of the mentioned conditions below is measured.

a) The control shall be operated such that all closure members in the control are in the open position. Any of the electrical sources can be used during the test. The inlet and outlet(s) of the control shall then be pressurized to the test pressure according to 7.2.2.1.

b) The test of a) shall then be carried out with the electrical source removed so that the main and pilot gas ways (for protected pilots) in the control are closed.

The test of a) shall then be repeated with any spindle moved during ignition and held in the ignition position.

7.2.2.3 Internal leak-tightness

ISO 23550:2011, 7.2.2.3 is replaced by the following:

Closed position

Test in the closed position the leakage of the de-energized control in the direction of gas flow, at the test pressures given in 7.2.2.1 and measure the leakage rate. If there is more than one closure member in the control, the test shall be repeated with each closure member in turn in the closed position, all the other closure members being fully open.

Ignition position

For controls equipped with a pilot burner outlet, this outlet shall be blocked. Test in the ignition position the leakage of the de-energized control in the direction of gas flow at the test pressures given in 7.2.2.1 and measure the leakage rate.

NOTE Specific regional requirements are given in Annexes F and G.

7.3 Torsion and bending

Shall be according to ISO 23550:2011, 7.3.

7.4 Rated flow rate

Shall be according to ISO 23550:2011, 7.4.

7.5 Durability

Shall be according to ISO 23550:2011, 7.5.

7.6 Functional requirements

7.6.101 Operating torque and force

7.6.101.1 Requirement

If a torque is required to operate the control, the torque shall not exceed the values given in Table 2.

Table 2 — Nominal sizes and operating torque

Gas connection nominal inlet size DN	Maximum operating torque N·m	
	Classes A and B	Class C
6	0,2	0,6
8	0,2	0,6
10	0,2	0,6
12	0,2	0,6
15	0,4	0,6
20	0,4	0,6
25	0,4	0,6
32	0,4	1,0
40	0,4	1,0
50	0,4	1,0

NOTE Specific regional requirements are given in Annex G.

If the manufacturer supplies a knob together with the control, the operating torque shall not exceed 0,017 N·m per mm of knob diameter.

The force or pressure required to operate a push-button directly by hand shall not exceed 30 N for nominal size of controls up to, and including DN 10, and 45 N for nominal size of controls exceeding DN 10, or 0,5 N/mm^2, whichever is smaller.

7.6.101.2 Test for operating torque and force

The operating torque is measured to check for compliance with 7.6.101.1.

Carry out the opening and closing movement with a constant angular velocity of approximately 1,5 rad/s.

The operating force is measured to check for compliance with 7.6.101.1.

7.6.102 Interlocks

7.6.102.1 Requirement

If present, an ignition interlock shall prevent ignition as long as the closure member to the main burner is open.

If present, a re-start interlock shall prevent the re-opening of the closure member controlling the main burner or the main burner and the pilot burner until the armature plate has separated from the magnetic element.

7.6.102.2 Test for interlocks

The applicable test shall be carried out five times.

Using ignition interlock, verify that ignition can only take place when the pilot gas way is open and the closure member of the main gas way is closed. Thereafter, with the closure member of the main gas way opened, it shall not be possible to operate the ignition device.

To check a re-start interlock, energize the control with electrical means and bring the control in the normal operating position with closure member opened. Verify under these conditions that a re-start attempt is not possible as long as the closure member is in the open position.

7.6.103 Sealing force

7.6.103.1 Requirement

In the closed position, the control shall have a minimum sealing force of 1 kPa (10 mbar) over the closure member orifice area. The internal leak-tightness of the control according to the test method in 7.6.103.2, shall not exceed 100 cm^3/h.

NOTE Specific regional requirements are given in Annexes F and G.

7.6.103.2 Test for sealing force

Connect an air supply through a flow meter to the outlet of the control, such that the air pressure opposes the closing direction of the closure member.

Energize and de-energize the control twice.

Pressurize the control with an increasing rate less than 100 Pa/s (1 mbar/s) to a pressure of 1 kPa (10 mbar) and measure the leakage rate after the test system has stabilized.

7.6.104 Closing current

7.6.104.1 Requirement

The closing current shall be within the manufacturer's specified values.

7.6.104.2 Test

Compliance is checked by the following test.

A direct current power source of appropriate voltage in series with an ammeter shall be used. The current shall be set at the manufacturer's specified maximum operating current. The current shall then be slowly decreased. The current at which the valve drops out shall be within the manufacturer's specified maximum and minimum drop-out current. The test shall be repeated three times.

7.7 Endurance

7.7.101 Requirements

After each of the endurance tests described in 7.7.102 the control shall conform to the requirements of 7.2 and 7.6.

7.7.102 Endurance test

7.2.102.1 Static endurance test

Subject the control in closed (de-energized) position to temperature resistance tests under the following conditions:

— 48 h at the minimum operating temperature according to 7.1;

— 48 h at the maximum operating temperature according to 7.1.

NOTE Specific regional requirements for ambient temperature range are given in ISO 23550:2011, Annexes F and G.

Verify after these tests with the control at ambient temperature the requirements of 7.6.101, the operating torque or force being determined by a single measurement without any preliminary operation of the control.

7.7.102.2 Dynamic endurance test

Install the control according to the manufacturer's instructions.

Supply the gas inlet of the control with air at the maximum inlet pressure declared by the manufacturer at rated flow rate. Use an activating force during the endurance test between 30 % and 50 % greater than the operating force indicated by the manufacturer. The activating force shall act axially in the operating direction for controls with a push-button, at a speed of 100 mm/s. Keep the force constant during the endurance test (e.g. by using a spring).

Where a knob is used in place of a push-button, apply the above requirements with not more than 20 operations per minute carried out.

Supply the control during the test with a current corresponding to at least three times the closing current stated by the manufacturer. Arrange each cycle so that the current is not applied before the armature is in contact with the magnetic element of the control.

Perform the number of cycles in accordance with Table 3.

Check the operation of the control throughout the endurance test.

EXAMPLE One way of checking the operation of the control is by monitoring the outlet pressure or the flow rate.

Table 3 — Operating cycles

Total number of cycles	Number of cycles at:		
	Maximum ambient temperature ≥60 °C	**Ambient temperature** (20 ± 5) °C	**Minimum ambient temperature** ≤0 °C
40 000	10 000	25 000	5 000
10 000	2 000	7 000	1 000
6 000	3 000	—[a]	3 000
5 000	1 000	3 000	1 000

NOTE The number of cycles shall be selected based on the application. For example, a minimum of

— 5 000 operations for central heating or cooking controls,

— 10 000 operations space heater controls, and

— 40 000 operations for domestic cooking controls should be used.

[a] If the manufacturer declares its control within 0 to 60 °C, then all cycles are carried out at ambient temperature.

NOTE Specific regional requirements are given in Annex G.

8 EMC/electrical requirements

ISO 23550:2011, Clause 8 is not applicable.

9 Marking, installation, and operating instructions

9.1 Marking

ISO 23550:2011, 9.1 is replaced by the following:

The following information, at least, shall be durably marked on the control in a clearly visible position:

a) manufacturer and/or his identification symbol;

b) type reference (if applicable);

c) maximum inlet pressure in Pa or kPa (mbar or bar);

d) ambient temperature range;

e) group 1 (if applicable);

f) direction of gas flow (by a cast or embossed arrow);

g) date of manufacture (at least year) — can be in code.

9.2 Installation and operating instructions

Shall be according to ISO 23550:2011, with the following addition:

Instructions shall include all relevant information on use, installation, operating, and servicing, in particular:

a) class of control according to number of operations (see 4.1);

b) group 1 or 2 (if applicable);

c) rated flow rate at a specified pressure difference;

d) ambient temperature range (°C);

e) mounting position(s);

f) inlet pressure range in Pa or kPa (mbar or bar);

g) gas connection(s);

h) strainer details (if applicable);

i) gas families for which the control is suitable;

j) range of closing current (mA);

k) notices for installer to consider, e.g. conditions for up-stream pressure (overpressure at the inlet in case of failure of upstream components), dirt, corrosion products;

l) minimum and maximum electrical resistance (mΩ).

9.3 Warning notice

Shall be according to ISO 23550:2011, 9.3.

Annex A
(informative)

Leak-tightness test — Volumetric method

Shall be according to ISO 23550:2011, Annex A.

Annex B
(informative)

Leak-tightness test — Pressure-loss method

Shall be according to ISO 23550:2011, Annex B.

Annex C
(normative)

Conversion of pressure loss into leakage rate

Shall be according to ISO 23550:2011, Annex C.

Annex D
(normative)

Test for immunity to power-frequency magnetic fields

ISO 23550:2011, Annex D is not applicable.