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

Part 10: Vent valves

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

Partie 10: Robinets d'évent

Reference number
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Foreword

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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).

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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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

A list of all parts in the ISO 23551 series, published under the general title *Safety and control devices for gas burners and gas-burning appliances — Particular requirements*, can be found on the ISO website.

Introduction

This part of ISO 23551 is designed to be used in combination with ISO 23550. This part of ISO 23551 together with ISO 23550 establishes the full requirements as they apply to the product covered by this part of ISO 23551. This part of ISO 23551 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 of ISO 23551 that are not already covered by ISO 23550, this part of ISO 23551 may 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 full 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 part of ISO 23551 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 10: Vent valves

1 Scope

This part of ISO 23551 specifies the safety, design, construction and performance requirements and testing for automatic vent valves (hereafter referred to as "valves") for use with gas burners, gas appliances burning one or more gaseous fuels.

This part of ISO 23551 is applicable to valves with declared maximum inlet pressures up to and including 500 kPa (5 bar) of nominal connection sizes up to and including DN 100 (4").

This part of ISO 23551 is applicable to

— normally open valves,

— electrically operated valves and to valves actuated by fluids where the control valves for these fluids are actuated electrically, but not to any external devices for switching the control signal or actuating energy, and

— valves fitted with open position indicator switches.

This part of ISO 23551 is not applicable to

— valves for burners and appliances using renewables and/or waste gases (i.e. gases having corrosive characteristics),

In case valves are in contact with renewables and/or waste gases, it is recommend to use this part of ISO 23551 only if explicit information is provided and relevant test methods and requirements are specified.

— valves for appliances intended to be installed in the open air and exposed to the outdoor environment,

— valves that are connected directly to mains pipe-work or to a container that maintains a standard distribution pressure, and

— valves suitable with oil.

This part of ISO 23551 is applicable to type testing only.

NOTE Provisions for final product inspection and testing by the manufacturer are not specified.

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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
automatic vent valve
device which closes when energized and opens automatically when de-energized

3.2
actuating mechanism
part of the valve which moves the closure member

3.3
open position indicator switch
device fitted to a valve which indicates when the closure member is in the open position

3.4
actuating energy
required energy for the actuating mechanism to move the closure member to the closed position

Note 1 to entry: The actuating energy can have an external source (electrical, pneumatic or hydraulic) and can be transformed inside the valve.

3.5
opening force
force required to open the valve, independent of any force provided by fuel gas pressure

3.6
frictional force
largest force required to move the actuating mechanism and the closure member from the closed position to the open position with the opener spring removed, independent of any force provided by fuel gas pressure

3.7
actuating pressure
hydraulic or pneumatic pressure supplied to the actuating mechanism of the valve

3.8
opening time
time interval between de-energising the valve and the closure member attaining the open position

3.9
closing time
time interval between energising the valve and the closure member attaining the closed position

3.10
delay time
time interval between energising the valve and the start of the closure member moving to the closed position

3.11
control valve
device which controls the fluid (e.g. compressed air) supplied to the actuating mechanism

3.12
rated voltage
voltage as stated in the installation and operating instructions at which the valve may be operated

3.13
rated current
current as stated in the installation and operating instructions at which the valve may be operated

4 Classification

4.1 Classes of controls

ISO 23550:2011, 4.1 is not applicable.

4.2 Groups of controls

This subclause shall be according to ISO 23550:2011, 4.2.

5 Test conditions

This clause shall be according to ISO 23550:2011, Clause 5.

6 Construction

6.1 General

This subclause shall be according to ISO 23550:2011, 6.1.

6.2 Construction requirements

6.2.1 Appearance

This subclause shall be according to ISO 23550:2011, 6.2.1.

6.2.1.1 Design

There shall be no exposed shafts or operating levers which could adversely affect the ability of valves to open.

6.2.2 Holes

This subclause shall be according to ISO 23550:2011, 6.2.2.

6.2.3 Breather holes

This subclause shall be according to ISO 23550:2011, 6.2.3.

6.2.4 Screwed fastenings

This subclause shall be according to ISO 23550:2011, 6.2.4.

6.2.5 Jointing

This subclause shall be according to ISO 23550:2011, 6.2.5.

6.2.6 Moving parts

This subclause shall be according to ISO 23550:2011, 6.2.6.

6.2.7 Sealing caps

This subclause shall be according to ISO 23550:2011, 6.2.7.

6.2.8 Dismantling and reassembling for servicing and/or adjustment

This subclause shall be according to ISO 23550:2011, 6.2.8.

6.2.9 Auxiliary channels

This subclause shall be according to ISO 23550:2011, 6.2.9.

6.2.10 Open position indicator switch

Open position indicator switches, where fitted, shall not impair the correct operation of valves. Adjusters shall be sealed to indicate interference. Any drift of the switch and actuating mechanism from its setting shall not impair correct valve operation.

6.2.11 Controls assembled to a valve

Other controls assembled to a valve shall not interfere with its opening function.

6.3 Materials

6.3.1 General material requirements

This subclause shall be according to ISO 23550:2011, 6.3.1.

6.3.2 Housing

This subclause shall be according to ISO 23550:2011, 6.3.2.

6.3.3 Springs

ISO 23550:2011, 6.3.3 is replaced by the following.

Opening force shall be provided by spring action.

Springs providing the opening force for any closure member of the valve shall be calculated and designed in such a way as to withstand oscillating loads and at least 10^6 operations.

If a satisfactory calculation cannot be submitted to the test laboratory, the springs shall be subjected to an endurance test of 2×10^6 operations under normal operating conditions.

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

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

6.3.4 Resistance to corrosion and surface protection

This subclause shall be according to ISO 23550:2011, 6.3.4.

6.3.5 Impregnation

This subclause shall be according to ISO 23550:2011, 6.3.5.

6.3.6 Seals for glands for moving parts

This subclause shall be according to ISO 23550:2011, 6.3.6.

6.3.7 Closure member

Closure members shall either have a mechanical support (e.g. metallic) to carry the opening force or shall be made of metal.

6.4 Gas connections

6.4.1 Making connections

This subclause shall be according to ISO 23550:2011, 6.4.1.

6.4.2 Connection sizes

This subclause shall be according to ISO 23550:2011, 6.4.2.

6.4.3 Threads

This subclause shall be according to ISO 23550:2011, 6.4.3.

6.4.4 Union joints

This subclause shall be according to ISO 23550:2011, 6.4.4.

6.4.5 Flanges

This subclause shall be according to ISO 23550:2011, 6.4.5.

6.4.6 Compression fittings

This subclause shall be according to ISO 23550:2011, 6.4.6.

6.4.7 Nipples for pressure tests

This subclause shall be according to ISO 23550:2011, 6.4.7

6.4.8 Strainers

This subclause shall be according to ISO 23550:2011, 6.4.8 with the following addition.

Strainers fitted to valves of DN 25 and above shall be accessible for cleaning or replacement without removing the valve body by dismantling threaded or welded pipework.

6.4.9 Pneumatic and hydraulic actuating mechanisms

Pneumatically or hydraulically actuated valves shall be provided with protection to ensure that the blockage of an orifice in the control system does not adversely affect the performance requirements as given in Clause 7.

7 Performance

7.1 General

This subclause shall be according to ISO 23550:2011, 7.1 with the following addition.

— Valves shall open automatically when de-energized or in the absence of actuating energy.

— Valves with DC supplies shall fulfil the requirements of this part of ISO 23551 from the minimum rated voltage to the maximum rated voltage, as stated in the installation and operating instructions.

— For DC supplies, a tolerance of 20 % to the minimum and the maximum rated voltage applies.

— The electrical control valve of pneumatic or hydraulic actuating mechanisms shall also meet these requirements.

— The closing of pneumatically or hydraulically actuated valves shall be ensured over the range from 85 % to 110 % of the actuating pressure or pressure range as stated in the installation and operating instructions.

7.2 Leak-tightness

7.2.1 Criteria

This subclause shall be according to ISO 23550:2011, 7.2.1 with the following addition.

Replace the values in the column for internal leak tightness by 1 dm^3/h.

7.2.2 Test for leak-tightness

ISO 23550:2011, 7.2.2 is not applicable.

NOTE 1 Further information on the leak-tightness test is given in Annexes A, B and C.

NOTE 2 Specific regional requirements are given in ISO 23550:2011, F.7.2.2.

7.3 Torsion and bending

This subclause shall be according to ISO 23550:2011, 7.3.

7.4 Rated flow rate

This subclause shall be according to ISO 23550:2011, 7.4.

7.5 Durability

This subclause shall be according to ISO 23550:2011, 7.5.

7.6 Functional requirements

7.6.1 Requirement

Valves shall open automatically on reducing the voltage or current to 15 % of the minimum rated value.

Valves with pneumatic or hydraulic actuating mechanisms shall open automatically on reducing the voltage or current to 15 % of the minimum rated voltage of the control valve.

Valves shall open automatically on removal of the voltage or current of between 15 % of the minimum rated value and the maximum rated value including the tolerance according to 7.1.

In all cases, the opening time shall be in accordance with 7.8.

7.6.2 Test of opening function

Energize the valve at the maximum rated voltage or current and at the maximum actuating pressure, if applicable. Slowly reduce the voltage or current to 15 % of the minimum rated value. Verify that the valve has opened.

Energize the valve at the maximum rated voltage or current and at the maximum actuating pressure, if applicable. Increase the voltage or current to the maximum rated value increased by the tolerance according to 7.1, keeping the actuating pressure, if any, unchanged. De-energize the valve and verify that it has opened. For AC valves, remove the voltage at the peak of the current waveform.

7.7 Endurance

7.7.1 Requirement

After the endurance test described in 7.11.2, the valve shall conform to the requirements of 7.2, 7.3, and 7.6 to 7.10.

7.7.2 Endurance test

Carry out tests according to 7.11.1, before the endurance test, after the test at 55 °C and after the test at 20 °C.

Energize the valve at the maximum rated voltage or current increased by the tolerance according to 7.1, at maximum ambient temperature for a period of at least 24 h. Without de-energising the valve, slowly reduce the voltage or current to 15 % of the minimum rated value. Verify that the valve has opened.

Connect the gas inlet to an air supply at the maximum inlet pressure. Do not exceed 10 % of the maximum rated flow rate.

Operate the valve to the number of cycles given in Table 1 with a cycle period of no less than that the valve is designed for. Ensure that the valve travels to the fully closed and fully opened position during each cycle.

The test at maximum ambient temperature shall be carried out at maximum rated voltage or current. For the test at 20 °C, carry out 50 % of the cycles at the maximum rated voltage or current and 50 % at the minimum rated voltage or current.

If the minimum ambient temperature is below 0 °C, carry out 25 000 cycles at –15 °C at the minimum rated voltage or current. Reduce the number of cycles for the test at 20 °C by 25 000 cycles.

Where the valve has a pneumatic or hydraulic actuating mechanism, carry out the endurance test at the maximum actuating pressure.

Check the operation of the valve throughout the endurance test, for example by monitoring the outlet pressure or the flow rate.

Table 1 — Operating cycles

Nominal inlet size DN	Number of cycles at:	
	Maximum ambient temperature – at least (55 ± 5) °C	(20 ± 5) °C
DN ≤ 25	50 000	150 000
25 < DN ≤ 80	25 000	75 000
80 < DN ≤ 100	25 000	25 000

7.7.3 Endurance test for open position indicator switch

Carry out the endurance test described in 7.11.2 on an unmodified valve with the maximum inductive or capacitive load on the open position indicator switch as stated in the installation and operating instructions.

During the test, monitor the switch to ensure that it indicates that the valve is open when it is de-energized and closed when energized.

After the endurance test, carry out the test for indication of opening according to 7.10.2.

7.8 Opening force

7.8.1 Requirement

Valves shall have an opening force of:

— at least 5 times the value of the frictional force where the frictional force is up to and including 5 N;

— at least 2,5 times the value of the frictional force but at least 25 N where the frictional force is above 5 N.

The frictional force is measured in the ungreased condition.

7.8.2 Test of opening force

Measure the minimum opening force over the travel of the closure member from the closed position to the open position.

Remove the spring(s) providing the opening force from the valve and measure the maximum force required to move the closure member from the closed position to the open position.

NOTE Specific regional requirements are given in ISO 23550:2011, F.7.2.

7.9 Opening time

7.9.1 Requirement

The opening time for valves shall not exceed 1 s when tested to 7.8.2.

7.9.2 Test of opening time

Measure the time interval between de-energising the valve and the closure member attaining an open position with a flow rate, at least equal to the rated flow rate, under the following conditions:

— at the maximum inlet pressure, at the maximum rated voltage or current increased by the tolerance according to 7.1, and at the maximum actuating pressure, if applicable;

— at an inlet pressure of 0,6 kPa (6 mbar), at the maximum rated voltage or current increased by the tolerance according to 7.1, and at the maximum actuating pressure, if applicable.

7.10 Delay time and closing time

7.10.1 Requirement

The delay time and the closing time shall be:

— within ±20 % of the value for times above 1 s as stated in the installation and operating instructions;

— less than 1 s for declared times ≤ 1 s.

7.10.2 Test of delay time and closing time

Measure the time interval between energising the valve and the start of the closure member moving to the closed position.

Measure the time interval between energising the valve and the attainment of a flow rate equal to 5 % of the rated flow rate.

Carry out the tests under the following conditions, allowing the de-energized valve to reach thermal equilibrium before carrying out the tests:

— at 55 °C (or at the maximum ambient temperature, if higher), at the maximum inlet pressure, at a pressure difference for which the valve is designed, at the minimum rated voltage or current decreased by the tolerance according to 7.1, and at the minimum actuating pressure, if applicable;

— at 0 °C (or at the minimum ambient temperature, if lower), at an inlet pressure of 0,6 kPa (6 mbar), at the minimum pressure difference for which the valve is designed, at the minimum rated voltage or current decreased by the tolerance according to 7.1, and at the minimum actuating pressure, if applicable.

7.11 Open position indicator switch

7.11.1 Requirement

An open position indicator switch shall indicate the open position of the valve. The switch shall indicate opening when either

— the flow rate is equal to or greater than 80 % of the rated flow rate at the same pressure difference, or

— the closure member is within 1 mm of its open position.

7.11.2 Test of open position indicator switch

Modify a single valve to enable the closure member to be moved and positioned in any partially open position. Slowly move the closure member until the switch just indicates valve open. Measure the rated flow rate, if applicable.

8 EMC/Electrical requirements

This clause shall be according to ISO 23550:2011, Clause 8 with the following addition.

Controls which may be affected by power-frequency magnetic fields (e.g. Hall effect) shall comply with the test in Annex D.

9 Marking, installation and operating instructions

9.1 Marking

This subclause shall be according to ISO 23550:2011, 9.1.

9.2 Installation and operating instructions

This subclause shall be according to ISO 23550:2011, 9.2.

9.3 Warning notice

This subclause shall be according to ISO 23550:2011, 9.3.

Annex A
(informative)

Leak-tightness test — Volumetric method

This Annex shall be according to ISO 23550:2011, Annex A.

Annex B
(informative)

Leak-tightness test — Pressure-loss method

This Annex shall be according to ISO 23550:2011, Annex B.

Annex C
(normative)

Conversion of pressure loss into leakage rate

This Annex shall be according to ISO 23550:2011, Annex C.

Annex D
(normative)

Test for immunity to power-frequency magnetic fields

This Annex shall be according to ISO 23550:2011, Annex D.