INTERNATIONAL STANDARD

ISO 23551-4

Second edition
2018-04

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

Part 4: Valve-proving systems for automatic shut-off valves

Dispositifs de contrôle et de sécurité pour les brûleurs à gaz et pour les appareils utilisant le gaz — Exigences particulières —

Partie 4: Systèmes de contrôle d'étanchéité pour robinets automatiques de sectionnement

Reference number
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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).

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.

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

This second edition cancels and replaces the first edition (ISO 23551-4:2005), which has been technically revised. The main changes compared to the previous edition are as follows:

— alignment to the structure of ISO 23550:2018;

— inclusion of updated references to IEC 60730-1:2013+AMD1:2015;

— inclusion of requirements for “faults during lockout or safety shutdown”;

— inclusion of software and hardware design requirements;

— inclusion of requirements for reset devices;

— updated EMC immunity requirements.

Introduction

This document is designed to be used in combination with ISO 23550. Together with ISO 23550, this document establishes the full requirements for valve-proving systems for automatic shut-off valves. 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.

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

Part 4: Valve-proving systems for automatic shut-off valves

1 Scope

This document specifies safety, constructional and performance requirements of valve-proving systems (VPS), intended for use with gas burners and gas-burning appliances. It also describes the test procedures for checking compliance with these requirements and provides information necessary for the purchaser and user.

This document is applicable to all types of VPS which are used for the automatic detection of leakage in a gas burner section having at least two valves designed in accordance with ISO 23551-1 and which give a signal if the leakage of one of the valves exceeds the detection limit.

This document is applicable to VPS with a maximum working pressure up to and including 500 kPa for use in systems using fuel gases.

This document is not applicable to VPSs for use in explosive atmospheres.

NOTE Provisions for production control are not part of the ISO 23551 series.

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

IEC 60730-1:2013+AMD1:2015, *Automatic electrical controls — Part 1: General requirements*

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

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
valve proving system
VPS
system to check the closure of automatic shut-off valves by detecting leakage, that often consists of a programming unit, a measuring device, valves and other functional assemblies

3.2
detecting device
device for direct or inferential detection of leakage, i.e. by measuring flow or pressure

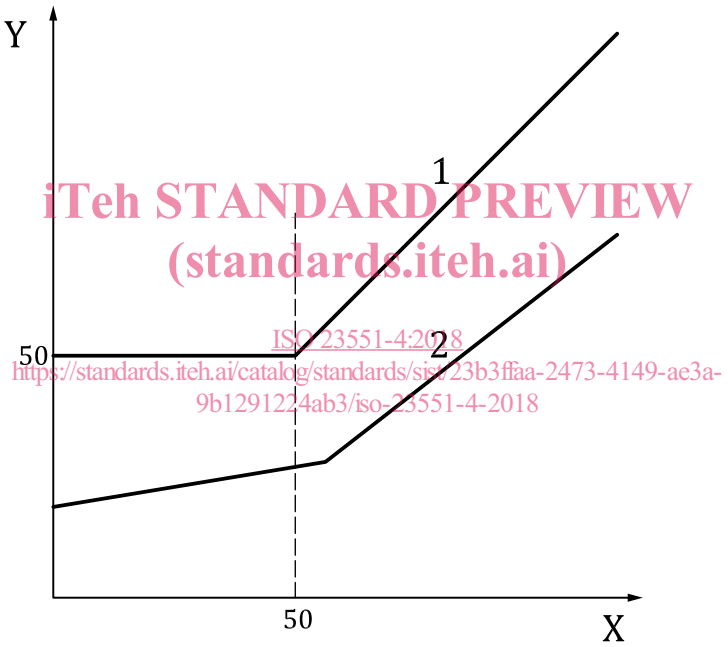
3.3
VPS operational time
time taken by the VPS to perform its entire cycle of operation

3.4
detection limit
maximum amount of leakage that can occur before the VPS is required to give a signal

Note 1 to entry: See Figure 1.

3.5
detection setting
actual leakage rate at which the VPS gives a signal

Note 1 to entry: See Figure 1.



Key

X burner heat, gas flow, expressed in m^3/h
Y detected leakage rate, expressed in dm^3/h
1 detection limit, 3.4
2 detection setting, see 3.5

Figure 1 — Illustration of detection limit and detection setting

3.6
leakage testing time
time in which the VPS monitors a gas valve for leakage

3.7
safety shut-down
process which is effected immediately following the detection of a leakage exceeding the detection limit, or detection of an internal fault, disabling energization of the ignition and of the automatic shut-off valves

3.8
volatile lock-out
safety shut-down condition of the system where a restart can only be accomplished by either the manual reset of the system, or an interruption of the main power and its subsequent restoration

3.9
non-volatile lock-out
safety shut-down condition of the system, where a restart can only be accomplished by the manual reset of the system and by no other means

4 Classification

4.1 Classes of control

Shall be according ISO 23550:2018, 4.1.

4.2 Groups of controls

Shall be according ISO 23550:2018, 4.2.

4.3 Types of DC supplied controls

Shall be according ISO 23550:2018, 4.3.

4.4 Classes of control functions

Shall be according ISO 23550:2018, 4.4 with the following addition:

VPS is a class C control function.

5 Test conditions and tolerances

Shall be according ISO 23550:2018, Clause 5.

6 Construction

6.1 General

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

The VPS shall be designed such that changes in critical circuit component values (such as those affecting timing or sequence) within the component manufacturer's declared worst case tolerances, including the long-term stability, shall result in the system continuing to function in accordance with this document. Compliance shall be checked by worst-case analysis.

The construction of any additional functions included in the VPS for which no provisions exist in this document shall be such that they do not degrade the safe and correct operation.

Where components are used to complete the VPS, these components shall comply with the relevant component International Standard.

6.2 Construction requirements

Shall be according to ISO 23550:2018, 6.2.

6.3 Materials

Shall be according to ISO 23550:2018, 6.3.

6.4 Gas connections

Shall be according to ISO 23550:2018, 6.4.

6.5 Gas controls employing electrical components in the gas way

Shall be according to ISO 23550:2018, 6.5.

6.6 Electronic parts of the control

Subclause specific to this document.

Shall be according to IEC 60730-1:2013/AMD1:2015.

6.7 Additional constructional requirements for VPS systems

Subclause specific to this document.

6.7.1 Signal for indication

A signal for indication, e.g. optical indication, shall be given when the leakage exceeds the detection limit.

6.7.2 VPS setting

The setting of a detecting device shall require the use of tools. If the VPS is adjustable, the installation and operating instructions shall provide information for this setting, e.g. detection setting.

7 Performance

7.1 General

Shall be according to ISO 23550:2018, 7.1 with the following addition:

Where components are used to complete the VPS, these components shall comply with the relevant component International Standard.

7.2 Leak tightness

7.2.1 General

Shall be according to ISO 23550:2018, 7.2.1.

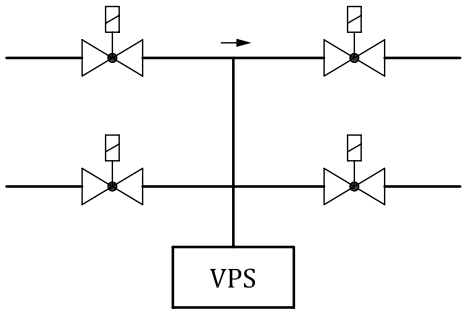
7.2.2 Requirements

Shall be according to ISO 23550:2018, 7.2.2 with the following modification.

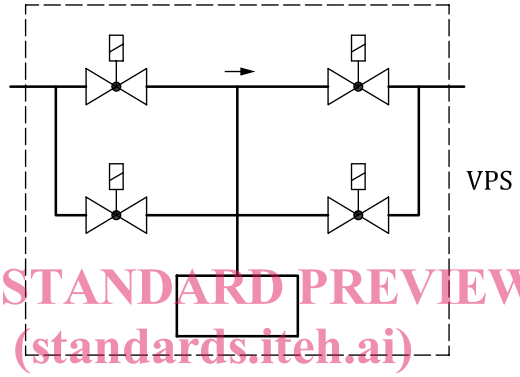
The external leak-tightness requirements are replaced by the following:

A VPS according to Figure 2 a) is considered to be externally leak tight, if no single component of a VPS has an external leakage rate higher than 60 $cm^3 \times h^{-1}$.

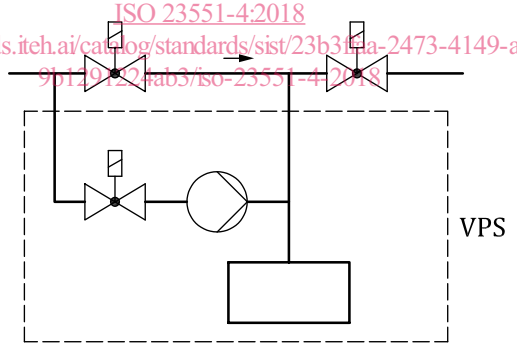
A VPS with integrated or partly integrated actuators (e.g. valves, pumps), according to Figure 2 b) and c) is considered to be a single component and shall have an external leakage rate not higher than 120 $cm^3 \cdot h^{-1}$.



a) External valves supervised by a VPS



b) VPS with integrated valves



c) VPS with partly integrated valves

Figure 2 — Examples of VPS configurations

7.2.3 Test

Shall be according to ISO 23550:2018, 7.2.3.

7.3 Torsion and bending

Shall be according to ISO 23550:2018, 7.3.

7.4 Rated flow rate

Shall be according to ISO 23550:2018, 7.4.

7.5 Durability

Shall be according to ISO 23550:2018, 7.5.

7.6 Functional requirements

Shall be according to ISO 23550:2018, 7.6 with the following addition.

NOTE Specific regional requirements are given in G.2.3.

7.6.1 Manufacturer information

The manufacturer shall declare the maximum detection limit, programme sequence and any other relevant information. The VPS shall be capable of meeting the functional tests detailed in 7.6.2 to 7.6.5.

7.6.2 Detection limit

The VPS shall prevent ignition and the opening of the burner valves at a leakage-rate limit depending on the burner heat input, starting over 50 dm^3/h and up to a minimum value of 0,1 % of the burner heat input.

Conformity is checked by measuring the actual or inferred detection limit at three values; at 50 dm^3/h, at the maximum value and at the midpoint and/or the minimum value declared by the manufacturer.

7.6.3 Programme sequence

The VPS programme sequence shall allow the gas valves to open when detection limit is at or below the manufacturers declared value, or the maximum specified in 7.6.2.

The VPS programme sequence shall prevent the gas valves to open when detection limit exceeds the manufacturers declared value, or the maximum specified in 7.6.2 followed by a lock-out.

The lock-out may be executed on the system application directly or by the VPS itself. An automatic start-up attempt by a separate control function shall not override the lock-out conditions.

Any gas necessary for the operation of the VPS may be discharged into the combustion chamber during the programme sequence if the maximum release volume, expressed in volume per switching sequence, does not exceed 0,083 % of the burner heat input referred to the nominal volume flow, expressed in cubic metres per hour.

NOTE 0,083 % is based on the quantity within 3 s.

However, when the VPS is used as an alternative for pre-purge or post-purge, the discharge of the gas necessary for the operation of the VPS into the combustion chamber shall not be allowed. The gas shall be safely vented.

If the actuating energy in the safety circuit fails, the VPS shall close the main gas valves and any ignition gas valve or give a shut-down signal to the automatic gas-burner control system.

7.6.4 Timing

The leakage testing time and the pressure pump time shall be declared by the manufacturer.

Adjustment of safety critical timing is permitted but shall be possible only by means of tools.

Where these times can be adjusted using an existing scale on the component, the scale shall be accurate to ±10 % of the indicated value. The means of adjustment shall be readily identifiable (e.g. colour-coded).

Shortening of leakage testing time, causing conflict with these requirements, shall not be allowed due to internal failures such as wear and tear, drop in accuracy of adjustments and similar causes.

Leakage testing time shall not be less than the value declared by the manufacturer.

