
**Safety and control devices for gas and/or
oil burners and gas and/or oil
appliances — Particular requirements —**

**Part 1:
Fuel/air ratio controls, electronic type**

*Dispositifs de commande et de sécurité pour brûleurs à gaz et/ou à fioul
et pour appareils à gaz et/ou à fioul — Exigences particulières —
Partie 1: Dispositifs de régulation du rapport air/combustible de type
électronique*

ISO 23552-1:2007

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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.

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 23552-1 was prepared by Technical Committee ISO/TC 161, *Control and protective devices for gas and oil burners and gas and oil burning appliances*.

ISO 23552 consists of the following parts, under the general title *Safety and control devices for gas and/or oil burners and gas and/or oil appliances* — *Particular requirements*:

— *Part 1: Fuel/air ratio controls, electronic type* [ISO 23552-1:2007](https://standards.iteh.ai/catalog/standards/sist/fec7f4a5-1166-440c-9450-23d4336af1d8/iso-23552-1-2007)

Additional parts are planned. <https://standards.iteh.ai/catalog/standards/sist/fec7f4a5-1166-440c-9450-23d4336af1d8/iso-23552-1-2007>

Introduction

For electronic fuel/air ratio control systems, there are numerous solutions for specific applications in the market. For this reason, ISO/TC 161 decided to draft an International Standard for type testing for closed-loop fuel/air ratio control systems only.

This part of ISO 23552 does not override requirements of relevant appliance standards. It is the intention that the safety of the appliance not be reduced by any normal or abnormal operation of the ERC described in this part of ISO 23552.

In this part of ISO 23552, there is no classification, either by heat input or by applications.

The accuracy of actual fuel/air ratio is not specified as a fixed value.

This part of ISO 23552 specifies which parameters the manufacturer is required to declare and under what conditions this declaration is considered fulfilled. These parameters relate to the fuel/air ratio control systems rather than the combustion process.

This part of ISO 23552 does not include a standard test rig, however, the purpose of the tests is to verify the manufacturer's declaration under the conditions required in this part of ISO 23552.

This part of ISO 23552 is expected to be used in conjunction with ISO 23550:2004. This part of ISO 23552 refers to clauses and subclauses of ISO 23550:2004 or to variations thereof by the qualifier "addition", "modification" or "replacement" in the corresponding element.

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

Part 1: Fuel/air ratio controls, electronic type

1 Scope

This part of ISO 23552 specifies safety, construction and performance requirements for electronic fuel/air ratio control systems intended for use with gas or oil burners and gas or oil burning appliances. It also describes the test procedures for evaluating these requirements and specifies information necessary for installation and use.

This part of ISO 23552 is applicable only to closed-loop fuel/air ratio controls (see 3.1) and does not differentiate into classes by heat input.

This part of ISO 23552 applies to electronic fuel/air ratio control systems that can be tested independently or as part of an appliance or as part of a burner.

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 23550:2004, *Safety and control devices for gas burners and gas-burning appliances — General requirements*

IEC 60068-2-6:1995, *Environmental testing — Part 2: Tests — Test Fc: Vibration (sinusoidal)*

IEC 60529:2001, *Degrees of protection provided by enclosures (IP Code)*

IEC 60730-1:2007, *Automatic electrical controls for household and similar use — Part 1: General requirements*

IEC 60730-2-5:2004, *Automatic electrical controls for household and similar use — Part 2-5: Particular requirements for automatic electrical burner control systems*

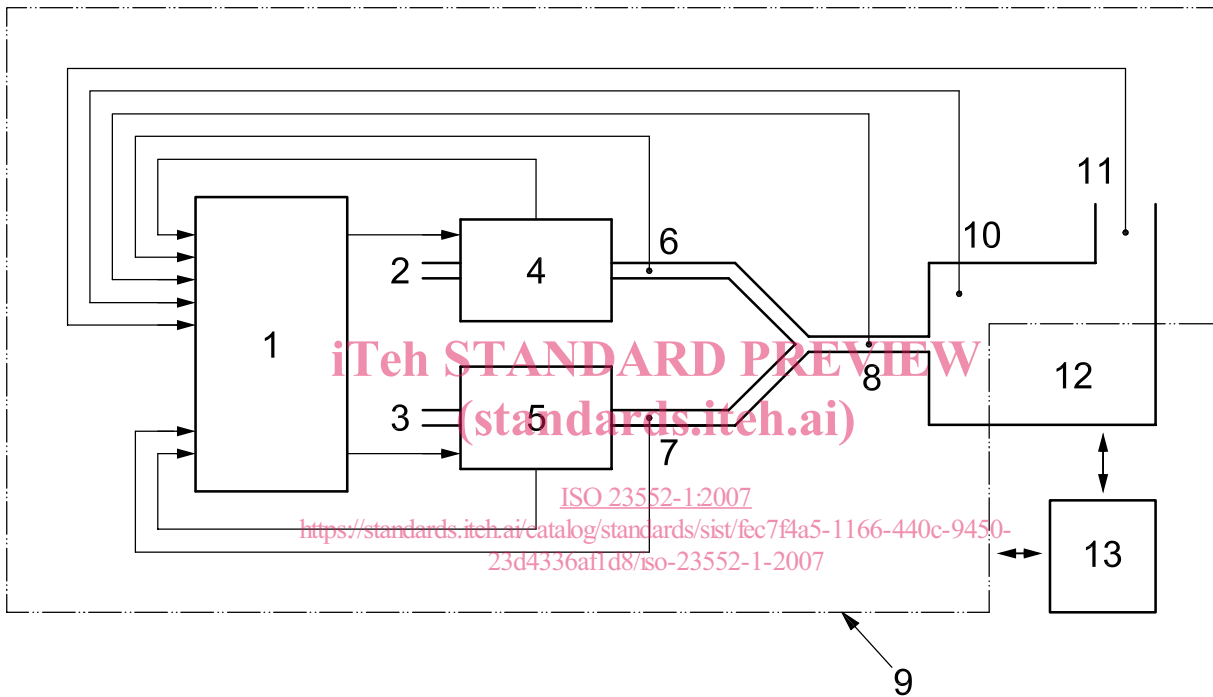
3 Terms and definitions

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

3.1 electronic fuel/air ratio control ERC

closed-loop modulating system consisting of the electronic control, actuating elements for the fuel flow and the air flow as a minimum, and allocated feedback signal(s)

NOTE Figure 1 shows an example of different feedback alternatives. For details, see also Table 1.



Key

- | | |
|-----------------------------|------------------------------|
| 1 electronic control module | 8 sensor fuel/air |
| 2 air | 9 system boundary of the ERC |
| 3 fuel | 10 sensor flame |
| 4 actuator air | 11 sensor flue gas |
| 5 actuator fuel | 12 combustion process |
| 6 sensor air | 13 burner control system |
| 7 sensor fuel | |

Figure 1 — Example of an ERC configuration

3.2 electronic control module

electronic main control module incorporating all inputs and outputs for the controlling elements

3.3 actuator

device for controlling the amount of fuel or air

3.4**sensor**

device that gives a signal related to a physical property to which it responds

3.5**combustion process**

chemical reaction between fuel and air to produce heat

3.6**defined state**

state with one of the following characteristics:

- a) the system passively assumes a state in which the signal available at the output terminals ensures a safe situation under all circumstances
- b) the system actively executes a protective action causing it to shut down followed by a restart or a lock out
- c) the system remains in operation, continuing to satisfy all safety-related functional requirements

3.7**fault reaction time**

time between the occurrence of a fault and the reaching of a defined state by the ERC

3.8**safety shut-down**

de-energization of the main fuel flow means as the result of the action of a limiter, a cut-out or the detection of an internal fault of the system

3.9**lock-out**

process in which the system goes into one of the conditions described in 3.9.1 or 3.9.2

3.9.1**non-volatile lock-out**

safety shut-down condition of the system, such that a restart can be accomplished only by a manual reset of the system and by no other means

3.9.2**volatile lock-out**

safety shut-down condition of the system, such that a restart can be accomplished by either a manual reset of the system or an interruption of the mains power and its subsequent restoration

3.10**abnormal operation**

operation of the appliance under the effect of internal failures or under the effect of foreseeable influences outside the specified operational conditions

4 Classification

There is no classification used in this standard.

5 Test conditions

Unless otherwise stated, the ERC shall be tested in the relevant situations such as standby, start-up, normal operation and lock-out.

Unless otherwise stated, the practical assessment shall be carried out under the following conditions:

- ambient temperature: 20 °C ± 5 °C;
- relative humidity: between 40 % and 80 %;
- at rated supply voltage and frequency.

Testing shall always be performed according to a test plan, which shall be included in the test report. The relevant assessment criteria should be part of this test plan.

6 Construction

6.1 General

The ERC shall consist of at least two actuators and either two actuator sensors or a process sensor; see Figure 1 and Table 1, which shall be considered together. It shall have continuous, self-checking modes that can be relevant, e.g. operating mode, stand-by mode, start-up mode and shut down mode. The complete system shall include the peripheral elements, e.g. servo motors, actuators, positional devices, sensors, variable-speed controls for combustion air fans and combustion analysis feedback systems.

Table 1 — Acceptable feedback types

Actuator	Device	Feedback		Output feedback	
		Position ^a	Speed ^b	Flow or ΔP	Pressure
For air	Valve	X	—	X	X
	Fan	—	X	X	X
For fuel	Valve	X	—	X	X
	Pressure regulator	—	—	X	X
—		At least 2 feedbacks (1 gas, 1 air) required ^c			
<p>^a A feedback signal that is directly related to the mechanical part of the actuator.</p> <p>^b If a fan speed signal is used as means to control the air flow, proof of air flow may not rely on fan rotation alone. A possible additional signal can be derived from an independent air-proving device checked at least during start up.</p> <p>^c Actuator feedbacks can also be the following from the process:</p> <ul style="list-style-type: none"> — ratio of the actual fuel/air mixture; — ratio signal from the flame; — signal from the flue gas. 					

6.2 Construction requirements

ISO 23550:2004; 6.2, shall apply with the addition of the following.

For components constructed of plastic material, aspects of the following apply:

- dimensional stability;
- flow characteristics of the material;

- possible heat shrinkage;
- durability.

They shall be considered with respect to the mechanical, chemical, thermal and environmental conditions of the intended use.

6.3 Materials

ISO 23550:2004; 6.3.1 to 6.3.6, shall apply with the addition of 6.3.7.

6.3.1 Special requirements for electromechanical actuators with position feedback sensors

The actuator feedback sensor shall always represent the actual position of the controlling element. At least the following aspects shall be considered.

- The mechanical connection between the actuator and the actuator feedback sensor shall be of form closure construction and ensure no slippage, e.g. use of form-fitting constructions.
- Torsion of the connection between the sensor and the controlling element shall be minor in relation to the position measured.

If an actuator consists of a separate actuating and controlling element, the non-slippage requirement shall be fulfilled. Screws, pins and other components that are necessary to ensure no slippage shall be secured, e.g. by a locking compound.

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6.4 Gas connections

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ISO 23550:2004; 6.4, shall apply.

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7 Performance

7.1 Performance test

Replace ISO 23550:2004, 7.1, with 7.1.1 to 7.1.3.

7.1.1 At ambient temperature

The timings and sequence actions are measured in the delivered state. The ERC is connected and installed according to the manufacturer's instructions.

The timings and sequence of actions shall conform to 7.6.3 and 7.6.4.

These tests shall be performed under normal conditions (see Clause 5)

- at the manufacturer's declared rated voltage(s) or, if this is a range, at the lowest and highest rated voltages;
- at 85 % of the lowest declared rated voltage;
- at 110 % of the highest declared rated voltage.