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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 23552-1

Control and protective devices for gaseous and liquid fuels — Particular requirements —

Part 1: Electronic fuel/air ratio control systems, including associated sensors and mechanical actuators

ICS: 27.060.20

ISO/TC 161

Secretariat: **DIN**

Voting begins on:
2025-01-06

Voting terminates on:
2025-03-31

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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).

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For an explanation of 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 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 23552-1:2007+A1:2010), which has been technically revised.

The main changes are as follows:

- a) Modification of title and scope
- b) Alignment with ISO 23550:2018, IEC 60730-1:2022
- c) integration of the requirements for fuel/air ratio using oil as the fuel;
- d) addition of the control types ERS and ERT;
- e) addition and update of definition;
- f) update accuracy requirements;
- g) update [clause 7](#). Endurance;
- h) added clause "Data exchange";
- i) update "Protection against internal faults for the purpose of functional safety";
- j) update "Electromagnetic compatibility".

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is designed to be used in combination with ISO 23550. Together with ISO 23550, this document establishes the full requirements as they apply to the product covered by this document.

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 can 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 design associated with gas 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.

For electronic fuel/air ratio control/supervision 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 electronic fuel/air ratio control systems (ERC), electronic fuel/air ratio supervision systems (ERS) and electronic fuel/air ratio trim systems (ERT) intended for use with burners and appliances burning gaseous or liquid fuels.

NOTE Trim function is a special design of electronic fuel/air ratio control function.

This document does not override requirements of relevant appliance standards. It is the intention of this document that the safety of the appliance will not be reduced by any normal or abnormal operation of the ERC, ERS or ERT.

In this document, 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 document specifies which parameters shall be declared in the instruction and under what conditions this declaration is considered fulfilled. These parameters relate to the fuel/air ratio control/supervision systems rather than the combustion process.

This document 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 document.

Control and protective devices for gaseous and liquid fuels — Particular requirements —

Part 1:

Electronic fuel/air ratio control systems, including associated sensors and mechanical actuators

1 Scope

This document specifies safety, design, construction, and performance requirements and testing for electronic fuel/air ratio control (FARC) /systems. . Systems may include sensors, mechanical actuators and/or motor/blower that make up the complete system. Systems can be described as, but not limited to:

- closed loop fuel/air ratio control systems (ERC), see [3.1.1](#);
- closed loop fuel/air ratio trim systems (ERT), see [3.1.2](#);
- fuel/air ratio supervision systems (ERS), see [3.2](#).

Note 1 Throughout this document, the word “System” means “FARC control and system components”.

These systems are intended for use with burners and appliances burning gaseous or liquid fuels. This document describes the procedures for evaluating these requirements and specifies information necessary for installation and use.

This document applies to the inherent safety of the system and its , to the declared operating values, operating times and operating sequences where such are associated with FARC safety and to the testing of FARC systems used in, on, or in association with, appliances .

Note 2 The documents for burners, appliances or processes which use ERC, ERS or ERT can override the requirements of this document.

This document prescribes testing requirements in addition to the relevant standards for integrated devices or components (e.g., actuators) to ensure safe operation of the FARC system.

If no part 2 standards in ISO/TC161 or IEC/TC72 exist, then IEC 60730-1 has to be considered.

Note 3 Supplemental or modified requirements and tests and evaluations can be needed for ERC, ERS or ERT system to fulfil relevant burner, appliance or process standards. Compliance of an ERC, ERS or ERT with this standard does not imply that such systems or components thereof are acceptable for use on an appliance without supplemental tests of the control system applied to the particular appliance to fulfill the requirements of the relevant burner, appliance or process standard(s).

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

This document does not cover burner control function like e.g. burner ignition, flame supervision, and fuel shutoff

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 23550:2018, *Safety and control devices for gas and/or oil burners and appliances — General requirements*
 IEC 60529:2013, *Degrees of protection provided by enclosures (IP Code)*
 IEC 60730-1:2022, *Automatic electrical controls — Part 1: General requirements*
 IEC 60730-2-5:2021, *Automatic electrical controls — Part 2-5: Particular requirements for automatic electrical burner control systems*

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 terminology databases for use in standardization at the following addresses:

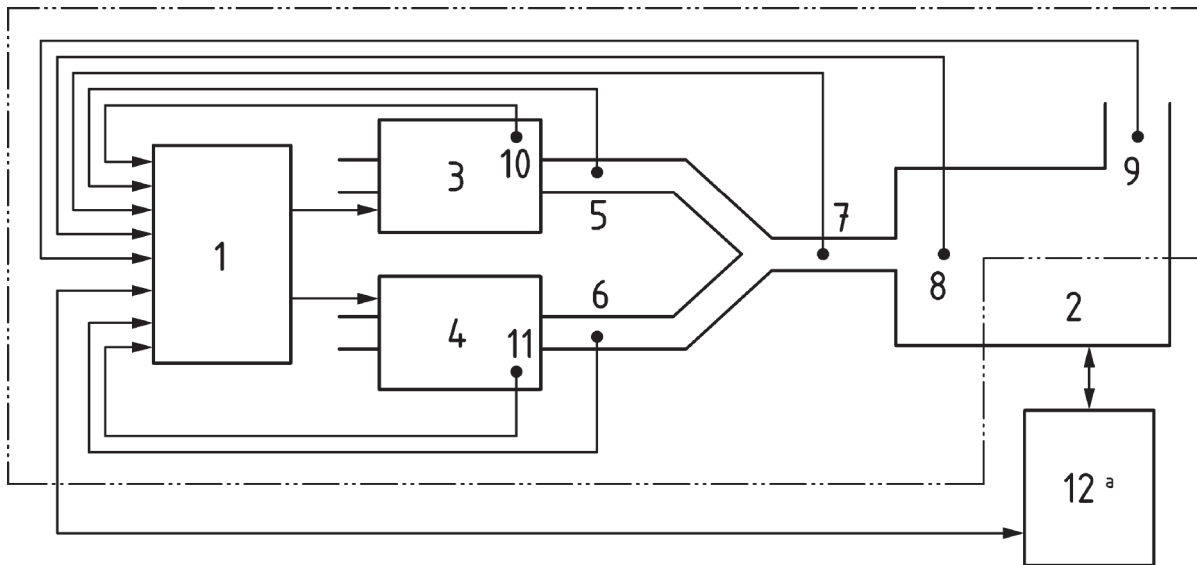
- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 Types of electronic fuel/air ratio systems

3.1.1 electronic fuel/air ratio control system ERC

closed-loop system consisting of the electronic control unit, actuating elements for the fuel flow and the air flow as a minimum, and allocated feedback signal(s) that are used to control fuel/air ratio of a burner

Note 1 to entry: [Figure 1](#) shows an example of different feedback alternatives. For details, see also [Table 1](#).



Key

1	electronic control unit (ECU)	8	sensor flame (for FARC function)
2	combustion process	9	sensor flue gas
3	actuator air	10	actuator air feedback
4	actuator fuel	11	actuator fuel feedback
5	sensor air	12	automatic burner control system

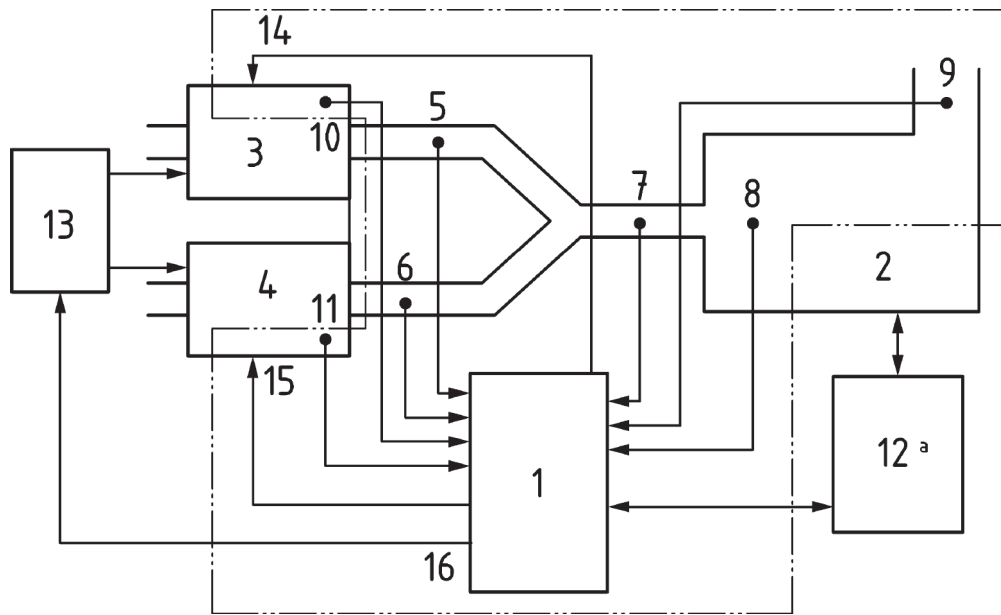
- 6 sensor fuel
- 7 sensor fuel/air mixture
- a From the ERC point of view, 12 acts in case a defined state is requested by 1 to de-energize the safety shut-off valves.

Figure 1 — Scope of the electronic fuel/air ratio control system (ERC)

3.1.2 electronic fuel/air ratio trim system ERT

closed loop system consisting of the electronic control unit, actuating element(s) or control output(s) to influence the fuel/air ratio controlled by other means (see Figure 2, item 13), and the allocated feedback signal(s) to the electronic control unit.

Note 1 to entry: Figure 2 shows an example of different feedback alternatives. For details, see also Table 1.



Key

- | | | | |
|---|-------------------------------|----|---------------------------------|
| 1 | electronic control unit (ECU) | 9 | sensor flue gas |
| 2 | combustion process | 10 | actuator air feedback |
| 3 | actuator air | 11 | actuator fuel feedback |
| 4 | actuator fuel | 12 | automatic burner control system |
| 5 | sensor air | 13 | arbitrary control |
| 6 | sensor fuel | 14 | trim signal air |
| 7 | sensor fuel/air mixture | 15 | trim signal fuel |
| 8 | sensor flame | 16 | e.g. release signal to 13 |
- scope of ERT

- a From the ERT point of view, 12 acts in case a defined state is requested by 1 to de-energize the safety shut-off valves.

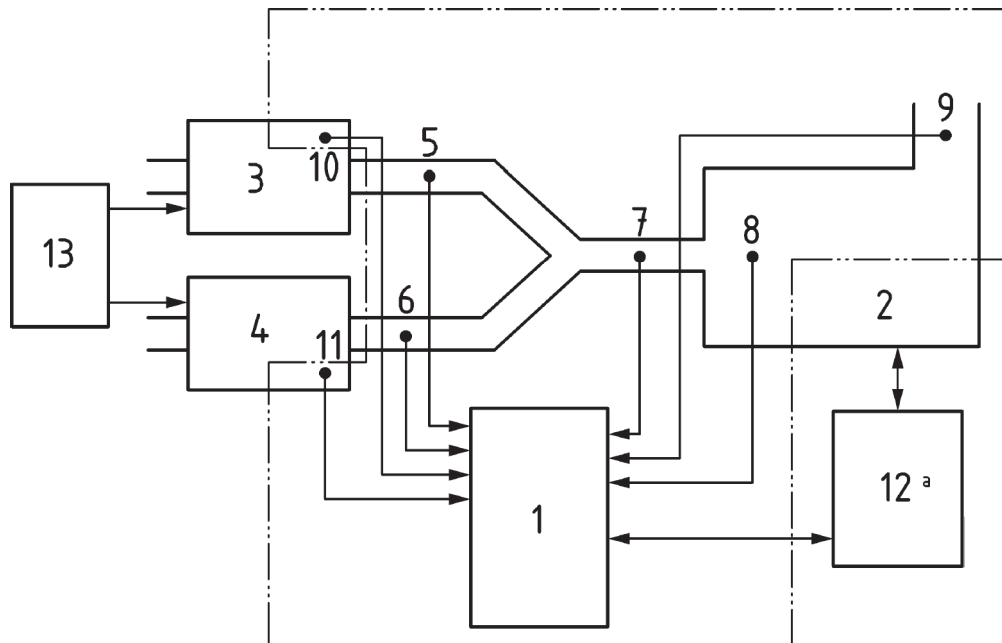
Figure 2 — Scope of the electronic fuel/air ratio trim system (ERT)

3.2 electronic fuel/air ratio supervision system ERS

supervision system consisting of electronic control unit and sensor(s), providing at least one output signal to indicate if the fuel/air ratio is outside of the safe area of the application

Note 1 to entry: [Figure 3](#) shows an example of different feedback alternatives. For details, see also [Table 1](#).

Note 2 to entry: ECU is not intended to control actuators.



Key

1	electronic control unit (ECU)	8	sensor flame
2	combustion process	9	sensor flue gas
3	actuator air	10	actuator air feedback
4	actuator fuel	11	actuator fuel feedback
5	sensor air	12	automatic burner control system
6	sensor fuel	13	arbitrary control
7	sensor fuel/air mixture	— · — · — · —	scope of ERC

^a From the ERS point of view, 12 acts in case a defined state is requested by 1 to de-energize the safety shut-off valves.

Figure 3 — Scope of the electronic fuel/air ratio supervision system (ERS)

3.3 electronic control unit ECU

electronic main control module incorporating all inputs and outputs of the ERC, ERS or ERT function

3.4 actuator

device for controlling the amount of fuel and/or air

Note 1 to entry: A variable speed fan is an example of an air actuator.

3.5 sensor

device which responds to a physical activating quantity on the sensing element that then generates a signal related to the value of that activating quantity

3.6

combustion process

chemical reaction between fuel and air to produce heat

3.7

defined state

the system assumes a state to ensure a safe situation under all circumstances

Note 1 to entry: For example, the system can execute a protective action to the burner control system causing it to safety shut-down and lock out or the system remains in operation, continuing to satisfy all safety related functional requirements

3.8

fault tolerating time

FTT

time between the occurrence of a fault and reaching a defined state, which is tolerated by the application without resulting in a hazardous situation

Note 1 to entry: For illustration of the fault tolerating time, see [Figure 4](#) or [Figure 5](#).

[SOURCE: IEC 60730-1:2022, H.3.22.2, modified — The part of the sentence “the shut-down of the controlled equipment” replaced by “reaching a defined state”. Note 1 to entry replaced.]

3.9

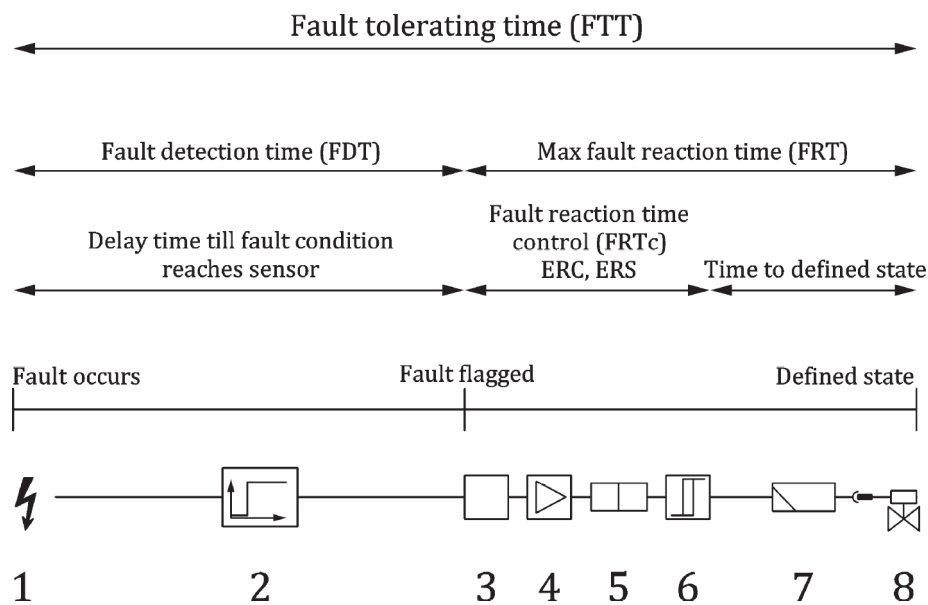
fault reaction time control

FRTc

time that the ERC, ERS or ERT needs from the moment the fault condition reaches the sensor to the moment of an initialization to reach a defined state

Note 1 to entry: For illustration of the fault reaction time of control for ERC and ERS, see [Figure 4](#).

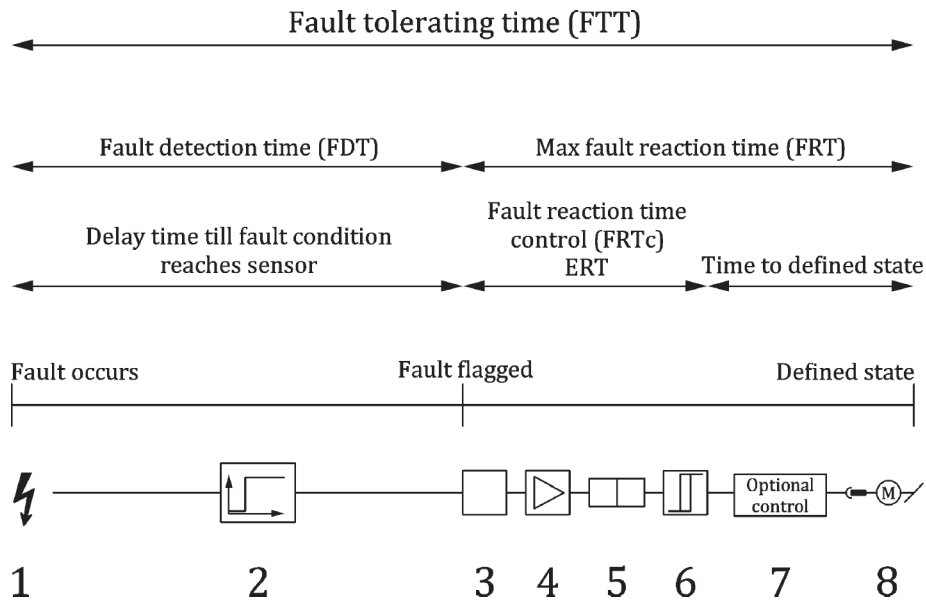
Note 2 to entry: For illustration of the fault reaction time of control for ERT, see [Figure 5](#).



Key

- | | | | |
|---|--|---|--|
| 1 | fuel/air ratio moves outside of the safe area of the application | 5 | amplified signal passes filter |
| 2 | effect of fault condition reaches the sensor | 6 | effect of fault condition is flagged by limit switch |
| 3 | sensor e.g. position sensors, flue gas sensors outputs effect of fault | 7 | flag is processed by automatic burner control |
| 4 | sensor output is amplified | 8 | defined state is reached |

Figure 4 — Relationship between fault tolerating time and fault reaction time of control for ERC and ERS



Key

- | | | | |
|---|--|---|--|
| 1 | fuel/air ratio moves outside of the safe area of the application | 5 | amplified signal passes filter |
| 2 | effect of fault condition reaches the sensor | 6 | effect of fault condition is flagged by limit switch |
| 3 | sensor e.g. position sensors, flue gas sensors outputs effect of fault | 7 | flag may be processed by optional control ^a system to initiate a defined state |
| 4 | sensor output is amplified | 8 | shut-off element or actuating element influences the fuel/air ratio to reach a defined state |

^a Examples for optional control are key 12 or key 13 in [Figure 2](#). An optional control can only be used to reach a defined state if the control has the required safety class for this function.

Figure 5 — Relationship between fault tolerating time and fault reaction time of control for ERT

3.10

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

Note 1 to entry: Safety shut-down may include additional actions by the system.

[SOURCE: IEC 60730-2-5:2021, 2.3.32]

3.11

lock-out

process in which the system goes into one of the following lock-out conditions, [3.11.1](#) and [3.11.2](#) following **safety shut-down**

[SOURCE: IEC 60730-2-5:2021, 2.3.112, with adding references]

3.11.1

non-volatile lock-out

condition such that a restart can only be accomplished by a manual reset of the system and by no other cause

[SOURCE: IEC 60730-2-5:2021, 2.3.112.1]