

# INTERNATIONAL STANDARD

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**Automatic electrical controls -  
Part 2-5: Particular requirements for automatic electrical burner control systems**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**Automatic electrical controls -  
Part 2-5: Particular requirements for automatic  
electrical burner control systems**

**FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 60730-2-5 has been prepared by IEC technical committee 72: Automatic electrical controls. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2013, Amendment 1:2017 and Amendment 2:2021. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

Adoption of IEC 60730-1:2022 with all of its significant changes to IEC 60730-1:2013, including Amendment 1:2015 and Amendment 2:2020.

The text of this International Standard is based on the following documents:

Draft	Report on voting
72/1530/FDIS	72/1539/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

This part 2-5 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the sixth edition of that standard. Consideration may be given to future editions of, or amendments to, IEC 60730-1.

This part 2-5 supplements or modifies the corresponding clauses in IEC 60730-1, so as to convert that publication into the IEC standard: Particular requirements for automatic electrical burner control systems.

Where this part 2-5 states "addition", "modification" or "replacement", the relevant requirement, test specification or explanatory matter in part 1 should be adapted accordingly.

When a particular clause or subclause of Part 1 is not mentioned in this part 2, that clause or subclause applies.

In the development of a fully international standard, it has been necessary to take into consideration the differing requirements resulting from practical experience in various parts of the world and to recognize the variation in national electrical systems and wiring rules.

The reader's attention is drawn to the fact that Annex Q, Annex R, Annex S and Annex T list all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

In this publication, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type;*
- explanatory matter: in smaller roman type;
- defined terms: **bold type**.

Subclauses, notes or items which are additional to those in Part 1 are numbered starting from 101, additional annexes are lettered AA, BB, etc.

A list of all parts of the IEC 60730 series, under the general title: *Automatic electrical controls*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](https://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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## 1 Scope

This clause of Part 1 is replaced by the following:

This part of IEC 60730 applies to automatic electrical **burner control systems** for the **automatic control** of burners for oil, gas, coal or other combustibles intended to be used

- for household and similar use;
- in shops, offices, hospitals, farms and commercial and industrial applications;

NOTE 1 Throughout this document, where it can be used unambiguously, the word "system" means "**burner control system**" and "systems" means "**burner control systems**".

- for equipment that is used by the public, such as equipment intended to be used in shops, offices, hospitals, farms and commercial and industrial applications;

NOTE 2 Throughout this document, the word "equipment" means "appliance and equipment."

EXAMPLE 1 Controls for commercial catering, heating and air-conditioning equipment.

- that are **smart enabled controls**;

EXAMPLE 2 Remote interfaces/control of burner operations.

- that are AC or DC powered controls with a **rated voltage** not exceeding 690 V AC or 600 V DC;
- used in, on, or in association with equipment that use electricity, gas, oil, solid fuel, solar thermal energy, etc., or a combination thereof;
- utilized as part of a control system or controls which are mechanically integral with multifunctional controls having non-electrical outputs;
- using **NTC** or **PTC thermistors** and to discrete **thermistors**, requirements for which are contained in Annex J;
- that are mechanically or electrically operated, responsive to or controlling such characteristics as temperature, pressure, passage of time, humidity, light, electrostatic effects, flow, or liquid level, current, voltage, acceleration, or combinations thereof;
- as well as manual controls when such are electrically and/or mechanically integral with automatic controls.

NOTE 3 Requirements for manually actuated mechanical switches not forming part of an automatic control are contained in IEC 61058-1-1.

This document is applicable

- to a complete **burner control system**;
- to a separate **programming unit**;
- to a separate electronic high-voltage **ignition source**;
- to a separate **flame detector**, and
- to a separate **high-temperature operation (HTO) detector**.
- to a **burner control system** intended to be used in warm air heating appliances (furnaces) where the appliance is equipped with an electromechanical differential pressure control to monitor the difference of the combustion air pressure (Type 2.AL). This pressure control provides a switch as an alternative to one of the two switching elements to directly de-energize the safety relevant terminals.

This document does not apply to thermoelectric flame supervision controls; thermoelectric flame supervision controls are covered by ISO 23551-6:2021.

This document also applies to electrical **burner control systems** intended exclusively for industrial process applications e.g. those applications covered by ISO TC 244 (ISO 13577 series).

This document applies to controls powered by primary or secondary batteries, requirements for which are contained within the standard.

This document applies to

- the inherent safety of automatic electrical **burner control systems**, and
- functional safety of automatic electrical **burner control systems**,
- automatic electrical **burner control systems** where the performance (for example the effect of EMC phenomena) of the product can impair the overall safety and performance of the controlled system,
- the operating values, operating times, and operating sequences where such are associated with burner safety and to the testing of automatic electrical **burner control systems** used in, on, or in association with, burners.

NOTE 4 Requirements for specific **operating values**, **operating times** and **operating sequences** are given in the standards for appliances and equipment.

This document specifies the requirements for construction, operation and testing of automatic electrical **burner control systems** used in, on, or in association with an equipment.

This document applies also to systems

- incorporating electronic devices,
- using **NTC** or **PTC thermistors**, additional requirements for which are contained in Annex J,
- to the electrical and functional safety of controls capable of receiving and responding to communications signals. The signals can be transmitted to or received from external units, connected wired or wireless, that can or can not be part of the **burner control system**.

This document does not

- take into account the response value of an automatic action of a control, if such a response value is dependent upon the method of mounting the control in the equipment. Where a response value is of significant purpose for the protection of the user, or surroundings, the value defined in the appropriate equipment standard or as determined by the manufacturer will apply;
- address the integrity of the output signal to the network devices, such as interoperability with other devices unless it has been evaluated as part of the control system.

## 2 Normative references

This clause of Part 1 is applicable except as follows:

*Addition:*

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

ISO/IEC 80079-20-1:2017, *Explosive atmospheres - Part 20-1: Material characteristics for gas and vapour classification - Test methods and data*

### 3 Terms and definitions

This clause of Part 1 is applicable except as follows:

#### 3.2 Definitions of types of control according to purpose

3.2.19 Not applicable.

*Additional definitions:*

##### 3.2.101

##### **burner control system**

system which includes a **programming unit**, a **flame detector** or, if applicable, an **HTO detector** and can include an **ignition source** and/or **ignition device** and which monitors the operation of fuel burners

Note 1 to entry: The various functions of the system can be in one or more housings.

##### 3.2.102

##### **flame detector**

device which provides the **programming unit** with a signal indicating the presence or absence of flame

Note 1 to entry: It includes the **flame sensor** and can include an amplifier and a relay for signal **transmission**. The amplifier and relay can be in its own housing or combined with the **programming unit**.

##### 3.2.103

##### **flame sensor**

device which senses the flame and provides the input signal to the **flame detector** amplifier

Note 1 to entry: Examples are optical sensors and flame electrodes (flame rods).

##### 3.2.104

##### **ignition source**

electrical or electronic system component which provides energy to an **ignition device**

Note 1 to entry: It can be separated from or incorporated in the **programming unit**. Examples are ignition transformers and electronic high-voltage generators.

##### 3.2.105

##### **ignition device**

device mounted on or adjacent to a burner for igniting fuel at the burner

Note 1 to entry: Examples are **pilot** burners, spark electrodes and hot surface igniters.

##### 3.2.106

##### **programming unit**

device which controls the burner **operation** in a declared sequence from start-up to shut-down within declared timings and in response to signals from regulating, limiting and monitoring devices

##### 3.2.107

##### **multitry system**

system that allows more than one **valve open period** during its declared **operating sequence**

**3.2.108****HTO detector**

device which provides the **programming unit** with a signal indicating presence or absence of **HTO**

Note 1 to entry: It includes the **HTO-sensor** and can include an amplifier and a relay for signal **transmission**. The amplifier and relay can be in its own housing or combined with the **programming unit**.

**3.2.109****HTO-sensor**

device which senses the temperature of a surface or a medium within the combustion chamber which is in direct contact with a flammable fuel-air mixture and provides a signal indicating presence or absence of **HTO**

**3.2.110****auto-ignition temperature****AIT**

lowest temperature (of a surface) at which under specified test conditions an ignition of a flammable gas or vapour in mixture with air or air-inert gas occurs

Note 1 to entry: Lowest temperature that ignites flammable gas without an additional external source of ignition like spark or arc

[SOURCE: ISO/IEC 80079-20-1:2017,3.3, modified – Note 1 to entry was replaced.]

**3.2.111****high-temperature operation****HTO**

operation on the basis of **auto-ignition temperature** which ensures ignition and burning of fuel

Note 1 to entry: **High-temperature operation** is used e.g. in fuel cells (IEC 62282-3-100) and in industrial furnaces and associated processing equipment (ISO 13577 series) where ignition and burning is detected by means of sensing the temperature.

**3.3 Definitions relating to the function of controls****3.3.29****maximum temperature**

$T_{\max}$

*Replacement:*

declared maximum continuous ambient temperature to which the **burner control system** is intended to be exposed during normal operation

**3.3.31****safety shut-down**

*Replacement:*

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 **burner control system**

Note 1 to entry: **Safety shut-down** can include additional actions by the **burner control system**.

*Additional definitions:*

**3.3.101****automatic recycle**

automatic repetition of the start-up procedure, without manual intervention, following loss of the supervised flame and subsequent fuel supply shutoff

**3.3.102****controlled shut-down**

de-energization of the fuel flow means as a result of the opening of a control loop by a control device such as a **thermostat** leading the **burner control system** to return to the **start position**

Note 1 to entry: **Controlled shut-down** can include additional actions by the **burner control system**.

**3.3.103****flame detector response time**

period of time between the loss of the sensed flame and the signal indicating the absence of flame

**3.3.104****flame detector operating characteristics**

that function of the **flame detector** which indicates absence or presence of flame as the output signal of the **flame detector** relating to the input signal

Note 1 to entry: Normally the input signal is provided by a **flame sensor**.

**3.3.104.1****signal for presence of flame****S<sub>1</sub>**

minimum signal which indicates the presence of flame when there was previously no flame

**3.3.104.2****signal for absence of flame****S<sub>2</sub>**

maximum signal which indicates the loss of flame

Note 1 to entry: **S<sub>2</sub>** is less than **S<sub>1</sub>**.

**3.3.104.3****maximum flame signal****S<sub>max</sub>**

maximum signal which does not affect the timings or the sequence

**3.3.104.4****signal for visible light flame simulation****S<sub>3</sub>**

minimum signal which indicates the presence of flame during the visible light **flame simulation** test

**3.3.105****self-checking flame detector**

**flame detector** which checks for correct **operation** of the **flame detector** and its associated electronic circuitry while the burner is in the **running position**

**3.3.106****flame detector self-checking rate**

frequency of the self-checking function of the **flame detector** (in number of **operations** per unit of time)

**3.3.107****flame failure lock-out time****flame failure response time**

period of time between the signal indicating absence of flame and **lock-out**

**3.3.108**

**flame failure re-ignition time  
relight time**

period of time between the signal indicating absence of flame and the signal to energize the **ignition device**, during which the fuel supply is not shut off

**3.3.109**

**flame signal**

output signal of the **flame detector**

**3.3.110**

**flame simulation**

condition which occurs when the **flame detector** indicates the presence of flame when in reality no flame is present

**3.3.111**

**ignition time**

period of time during which the **ignition device** is energized

**3.3.112**

**lock-out**

process in which the **burner control system** goes into one of the following **lock-out** conditions, following **safety shut-down**

**3.3.112.1**

**non-volatile lock-out**

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

**3.3.112.2**

**volatile lock-out**

condition such that a restart can be accomplished by either a manual **reset** of the **burner control system** or by an interruption of the power supply and its subsequent restoration

**3.3.113**

**main flame establishing period**

period of time between the signal to energize the main fuel flow means and the signal indicating presence of the main burner flame

**3.3.114**

**pilot flame establishing period**

period of time between the signal to energize the **pilot** fuel flow means and the signal indicating presence of the **pilot** flame

**3.3.115**

**post-ignition time**

period of the **ignition time** between the signal indicating presence of flame and the signal to de-energize the **ignition device**

**3.3.116**

**pre-ignition time**

period of the **ignition time** between the signal to ignite and the signal to energize the fuel flow means

### 3.3.117

#### **proved igniter proved igniter system**

system in which the fuel flow means is energized only after the availability of sufficient energy to ignite the fuel has been verified

Note 1 to entry: Examples are systems using spark supervision and those using proved hot surface igniters.

### 3.3.117.1

#### **proved igniter operating value**

signal which indicates that the **proved igniter** has the energy to ignite the fuel

### 3.3.117.2

#### **igniter proving time**

period of time between the signal to energize the **proved igniter** and the signal to energize the fuel flow means

### 3.3.117.3

#### **igniter failure response time**

period of time between loss of the supervised **proved igniter** and the signal to de-energize the fuel flow means

### 3.3.118

#### **purge time**

period during which air is introduced to displace any remaining air/fuel mixtures or products of combustion from the combustion zone and flue ways

Note 1 to entry: No fuel is admitted during this period.

### 3.3.118.1

#### **post-purge time**

**purge time** that takes place immediately following the shutting off of the fuel supply

### 3.3.118.2

#### **pre-purge time**

**purge time** that takes place between **initiation** of a burner **control** sequence and the admission of fuel to the burner

### 3.3.119

#### **re-ignition relight**

process by which, following loss of the **flame signal**, the **ignition device** will be re-energized without interruption of the fuel flow means

### 3.3.120

#### **recycle time**

period of time between the signal to de-energize the fuel flow means following the loss of flame and the signal to begin a new start-up procedure

### 3.3.121

#### **running position**

position denoting that the main burner flame is established and supervised, or the burner is in **HTO** and supervised

### 3.3.122

#### **start position**

position which denotes that the **burner control system** is not in the **lock-out** condition and has not yet received the **start signal**, but can proceed with the start-up sequence if required

### 3.3.123

#### **start signal**

signal, for example from a **thermostat**, which releases the **burner control system** from its **start position**

### 3.3.124

#### **start-up lock-out time**

period of time between the signal to energize the fuel flow means and **lock-out**

Note 1 to entry: For systems which control two separate fuel flow means, two different **start-up lock-out times** are possible (first and second **start-up lock-out times**).

### 3.3.125

#### **waiting time**

period between the **start signal** and the signal to energize the **ignition device**

Note 1 to entry: For burners without fans, natural ventilation of the combustion chamber and the flue passages normally takes place during this time.

### 3.3.126

#### **valve open period**

for **multitry systems**, period of time between the signal to energize the fuel flow means, and the signal to de-energize the fuel flow means, if proof of the supervised burner flame is not established

### 3.3.127

#### **valve sequence period**

for **multitry systems**, sum of all **valve open periods** prior to **lock-out**, if proof of the supervised burner flame is not established

### 3.3.128

#### **system restart**

process by which, after a **safety shut-down**, a full start-up procedure is automatically repeated

### 3.3.129

#### **reset from lock-out function**

function that provides **reset** from **lock-out** allowing the **burner control system** to attempt a restart

Note 1 to entry: The **reset** function can be performed by various electric/electronic (mobile) devices.

### 3.3.130

#### **HTO detector response time**

period of time between the temperature falling below the defined temperature limit for **HTO** and the signal indicating the absence of **HTO**

### 3.3.131

#### **HTO detector operating characteristics**

that function of the **HTO detector** which indicates absence or presence of **HTO** as the output signal of the **HTO detector** relating to the input signal

Note 1 to entry: Normally the input signal is provided by a **HTO-sensor**.

### 3.3.132

#### **HTO signal**

output signal of the **HTO detector**