



**SLOVENSKI STANDARD**  
**SIST ENV 14459:2004**  
**01-januar-2004**

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Method of risk analysis and recommendations for the use of electronics in systems for the control of gas burners and gas burning appliances

Risikobewertung und Empfehlungen bei der Anwendung von Elektronik in Systemen für Schutz-, Regel- und Steuerungseinrichtungen an Gasbrennern und Gasgeräten

**iTeh STANDARD PREVIEW**

Méthode d'analyse des risques (et recommandations d'utilisation de l'électronique dans les systèmes de commande des brûleurs à gaz et appareils à gaz)

[SIST ENV 14459:2004](https://standards.iteh.ai/catalog/standards/sist/b0b033fe-1419-43e3-a9e2-59860f54285a/sist-env-14459-2004)

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**ICS:**

91.140.40	Sistemi za oskrbo s plinom	Gas supply systems
97.100.20	Plinski grelniki	Gas heaters

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ICS 91.140.40; 97.100.20

English version

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Steuerungseinrichtungen für Gasbrenner und Gasgeräte

This European Prestandard (ENV) was approved by CEN on 16 October 2002 as a prospective standard for provisional application.

The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard.

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

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## Foreword

This document ENV 14459:2002 has been prepared by Technical Committee CEN /TC 58, "Safety and control devices for gas-burners and gas-burning appliances burning appliances", the secretariat of which is held by BSI.

This document supersedes ENV 1954:1996.

Annexes A and B are informative.

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard : Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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## Introduction

Control systems are designed to control and protect gas appliances and the combustion process. All functions are performed depending on their safety relevance within a specific tolerance of measures and time and with a specific certainty under external influences and internal failures.

Existing control standards are based on fault recognition up to 2 faults deep. It was concluded in controls committees that it is not always needed to protect against the consequences of any hazardous event with uniform measures as hazards differ in severity and also the probability of unwanted occurrence may differ. As there exists large interpretation differences on what level of protection is needed against certain hazards, there is a need for guidance to bring the safety philosophy for gas appliances and controls in line. The discussions of different committees regarding safety related control functions and the application of controls in the appliances show that it is worthwhile to refine the basic safety philosophy of gas appliances into different risk levels.

For the evaluation of preventative measures concerning fault tolerance and avoidance of hazards it is essential to classify control functions with regard to their fault behaviour. For the classification of control functions their integration into the complete safety concept of the appliance should be taken into account.

For electronic controls covered by CEN/TC 58 consensus was reached by assuming 2 faults, including hardware and software, that should result in a safe situation. Class C software is regarded equivalent to this 2 faults assessment.

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In the appliance standards only specific fault conditions are considered when controls complying with CEN/TC 58 standards are used, e.g. flame simulation and air proving before each new start. In some cases (e.g. switch contacts) shorting is excluded when certain tests have proven that the probability of a fault occurrence is low. For gas valves it is considered that a single valve is not sufficient.

Regarding protection against overheat of gas appliances reference is made to EN 60730-2-9. In case of electronic temperature controls the safety philosophy is not on the same level as for controls covered by CEN/TC 58 (see e.g. EN 483:2000, 5.6.7.6 where only fault conditions of the sensor are considered, however other hardware or software faults are not considered). Actually the proper safety level for the control is not specified by the appliance committees.

This prestandard will give the manufacturer and the test house a method for a safety check for new products in the field of GAD for which no product standards are actually available.

The safety check is oriented on the controlled parameters (high/low temperature, pressure, flow) in the combustion process and in the functionality of the controls (open/closed; lock/un-lock; start/stop). Each control function needs to be classified concerning the safety aspect (Class A, B, C):

To analyse the effect of fault conditions it is essential to know the specific application and the related risk.

**NOTE** As a consequence of this, the appliance standard is supposed to describe the allowed behaviour of the appliance under fault conditions (e.g. specifying testing under abnormal operating conditions; for examples see EN 60335-series, clause 19 "Abnormal operation"). In order to evaluate the appliance on functional safety after inducing faults in safety relevant components and circuits such a description should also contain operating conditions in such cases when the appliance continues to operate to guide in judgements if remaining hazards or risks can be acceptable (examples are volatile lockout instead of non-volatile lockout, cycling operation, extended safety time etc.).

This European Prestandard covers type testing only.

## 1 Scope

This European Prestandard specifies the control functions of electric and electronic controls that are used to prevent unsafe operation of gas burners and gas burning appliances.

For this purpose this European Prestandard specifies methods for the assessment of function blocks with regards to their fault behaviour and preventative measures.

Function blocks which are not covered by dedicated control standards (see annex A) are within the scope of this prestandard.

An electric or an electronic device which contains a control function is based on the principle that it provides the same safety level as other technologies (e.g. mechanical solutions).

## 2 Normative references

This European Prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13611:2000, *Safety and control devices for gas burners and gas-burning appliances — General requirements.*

EN 60730-1:2000, *Automatic electrical controls for household and similar use - Part 1: General requirements (IEC 60730-1:1999, modified).*

EN 60730-2-9, *Automatic electrical controls for household and similar use — Part 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9:2000, modified).*

EN 61058-1, *Switches for appliances — Part 1: General requirements (IEC 61058-1:2000 + A1:2001, modified).*

## 3 Terms and definitions

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

NOTE Some of the following definition are not yet used in the draft but listed for clarification and for use during discussions.

### 3.1

#### **control function**

function providing safe operation of gas burners and gas burning appliances (examples see Table A.1)

### 3.2

#### **function block**

control function which is part of electric or electronic systems

NOTE This may include sensors, converters, actuators etc.

### 3.3

#### **defined state**

state of a system which is declared by the manufacturer for normal and abnormal operation (relevant failure mode see e.g. EN 60730-1) with the following characterisation:

- a) the system passively assumes a status in which the output terminals ensure a safe situation in all circumstances. When the effect is lifted, the application should start-up in accordance with the appropriate requirements; or

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- b) the system actively executes a protective action causing it to shut down and/or lock-out; or
- c) the system remains in operation, continuing to satisfy all safety related functional requirements.

### 3.4

electronic combustion products discharge safety function (later on referred to as TTB) control function causing at least shut down of the main burner when there is an unacceptable spillage of combustion products at the draught diverter

[1.3.3.2.4 of EN 297:1994]

### 3.5

#### reset function

function which provides reset from lock-out to allow the system to attempt a restart. The reset function may be performed by various electric/electronic (mobile) devices

### 3.6

#### failure

termination of the ability of an item to perform a required function

[191-14-01 of IEC 60050-191:1990]

### 3.7

#### degradation (of performance)

undesired departure in the operational performance of any device, equipment or system from its intended performance

[161-11-19 of IEC 60050-161:1990]

#### NOTE

The term "degradation" can apply to temporary or permanent failure.

### 3.8

#### fault

state of an item characterised by its inability to perform a required function, excluding the inability during preventive maintenance or other planned actions, or due to lack of external resources [IEV 60191-05 01]

EXPLANATORY NOTE 1 „Failure“ is an event, as distinguished from „fault“, which is a state.

EXPLANATORY NOTE 2 After failure the item has a fault.

EXPLANATORY NOTE 3 This concept as defined does not apply to items consisting of software only.

EXPLANATORY NOTE 4 A fault is often the result of a failure of the item itself, but may exist without prior failure.

### 3.9

#### harm

physical injury and/or damage to health or property [see ISO/IEC Guide 51:1999]

### 3.10

#### hazard

potential source of harm

[ISO/IEC Guide 51:1999]

### 3.11

#### risk

probable rate of occurrence of a hazard causing harm and the degree of severity of the harm

[ISO/IEC Guide 51:1999]



**3.12****reasonably foreseeable misuse**

use of a product, process or service under conditions or for purposes not intended by the supplier, but which may happen, induced by the design of the product in combination with, or as result of, common human behaviour

[ISO/IEC Guide 51:1999]

**3.13****functional safety**

freedom from an unacceptable risk of harm due to the malfunctioning of the equipment or a system including that resulting from reasonably foreseeable misuse

**3.14****safety integrity**

probability that an electric or electronic equipment will perform satisfactorily with regards to the safety functions under all the stated conditions within a stated period of time

[IEC 61508-4:1998]

**3.15****apparatus**

single piece of equipment with (a) direct function(s) intended for final use

**3.16****system**

combination of apparatus and/or active components constituting a single functional unit and intended to be installed and operated to perform (a) specific task(s)

NOTE 1 "Safety related systems" are specifically "designed" equipment that both:

- implement the required safety functions necessary to achieve or maintain a safe state for a controlled equipment
- are intended to achieve on their own or with other safety-related equipment's or external risk: reduction facilities, the necessary safety integrity for the required safety requirements.

NOTE 2 Adapted from IEC 61508-4:1998, 3-4-1.

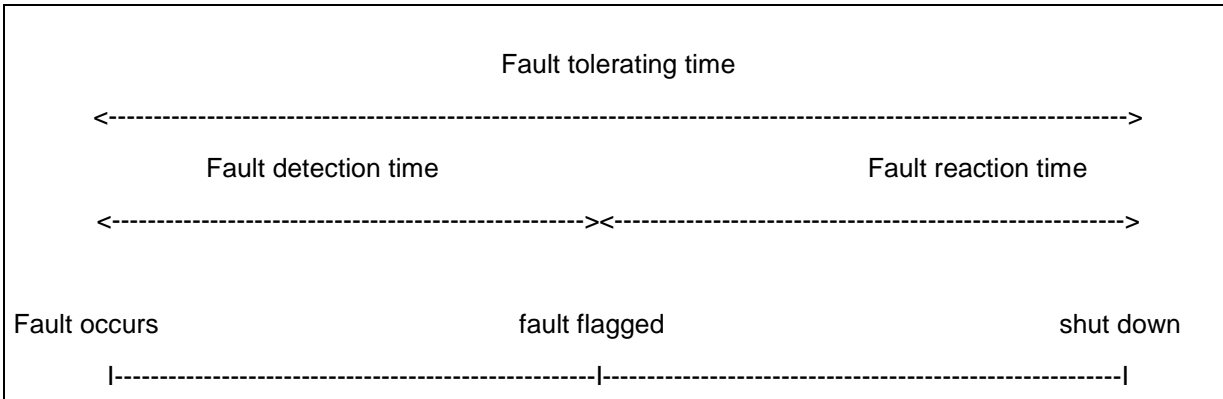
**3.17****installation**

combination of apparatuses, components and systems assembled and/or erected (individually) in a given area

For physical reasons (e. g. long distances between individual items) it is in many cases not possible to test an installation as a unit.

**3.18  
fault tolerating time**

time between the occurrence of a fault and the shut down of the burner (see Figure 1)



**Figure 1 — Fault tolerating time**

**3.19  
abnormal operation**

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

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**4 Classification**

For the evaluation of preventative measures for fault tolerance and avoidance of hazards it is necessary to classify control functions with regard to their fault behaviour.

At the classification of control functions their integration into the complete safety concept of the appliance shall be taken into account.

For the purpose of evaluating the design of a control function, present requirements recognise three distinct classes:

**Class A:** Control functions which are not intended to be relied upon for the safety of the application, however could contribute to safety in combination with other control functions or safety measures;

NOTE Examples are: room thermostats, temperature control.

**Class B:** Control functions which are intended to prevent an unsafe state of the appliance. Failure of the control function will not lead directly to a hazardous situation during normal operation;

NOTE Examples are: thermal limiter, pressure limiter.

**Class C:** Control functions which are intended to prevent special hazards such as explosion or whose failure could directly cause a hazard in the appliance.

NOTE Examples are: burner control systems, thermal cut-outs for closed water systems (without vent protection).

**5 Requirements**

**5.1 General**

The safety of gas burners and gas appliances is based on a fault tolerant system.

This system shall be assessed according to the requirements of clause 6.

Control functions shall be so designed that the effect on controlled output(s) fulfil the test criteria as laid down in this prestandard. This is also applicable under external influences and electromagnetic phenomena (see EN 13611).

## 5.2 Classification

The Control function shall be identified by manufacturer's declaration according to clause 4.

## 5.3 Construction

Relevant requirements of EN 13611:2000, clause 6 are applicable.

## 5.4 Performance requirements

Relevant requirements of EN 13611:2000, clause 7 are applicable.

## 5.5 EMC/Electrical requirements

Relevant requirements of EN 13611:2000, clause 8 are applicable.

## 5.6 Markings, operation and installation requirements

Relevant requirements of EN 13611:2000, clause 9 are applicable.

## 5.7 Alternative fault conditions

Fault conditions that are not described in this prestandard shall be declared by the manufacturer.

This declaration shall include the description of failure modes and their assessments which is based on fault conditions e.g. given in the relevant appliance standard.

The effects of the output(s) on the safety of the gas burner or gas burning appliance shall be such that the application remains safe.

## 5.8 Combined apparatus

If a system consists of two or more combined apparatus with different control functions, the interconnection and interference of the involved apparatus shall be considered during fault assessment.

Safety of a control function shall not be impaired by its integration in an appliance or system.

Responsibilities and safety critical interface parameters shall be declared when adapting the control in an over-all-system.

## 5.9 Multifunctional Systems

If a control system consists of one apparatus and provides two or more different control functions, the system shall provide the same safety level as the independent control functions are providing for the complete application.

Any interference between those individual control functions shall be assessed functional as well as under fault conditions.

Failures in any function shall not adversely affect the safe operation. Each individual function shall be assessed according to the requirements of this prestandard.

Compliance shall be achieved under following considerations and their according requirements:

Regarding a specific component or group of components three cases of use or application are to be differed due to their multifunctionality: