BS EN 14597:2012

BSI Standards Publication

Temperature control devices and temperature limiters for heat generating systems

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 14597:2012. It supersedes BS EN 14597:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RHE/16, Performance requirements for control systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 73652 0

ICS 17.200.20; 97.120

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2012.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14597

June 2012

ICS 17.200.20; 97.120

Supersedes EN 14597:2005

English Version

Temperature control devices and temperature limiters for heat generating systems

Dispositifs de régulation et de limitation de température pour les systèmes générateurs de chaleur

Temperaturregeleinrichtungen und Temperaturbegrenzer für wärmeerzeugende Anlagen

This European Standard was approved by CEN on 10 May 2012.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 14597:2012: E

Contents

Page

Tables

Foreword

This document (EN 14597:2012) has been prepared by Technical Committee CEN/TC 247 “Building Automation, Controls and Building Management”, the secretariat of which is held by SNV.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2012, and conflicting national standards shall be withdrawn at the latest by December 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14597:2005.

Compared to the previous edition, the following significant technical changes have been incorporated in this European Standard:

a) In Clause 3, the classification of the controls to protective control or operating control was adjusted. If the letter “S” is used in the abbreviation, the word safety will also be used in the associated definition. Contractions between the definitions in Clause 3 and further requirements in the standard, especially in Table AX of the standard were removed;

b) In Clause 11, the action 2V was adapted to the requirements of the standard content;

c) In Annex H, the fault modes were adjusted to the existing approaches, a new Annex EX (informative) for characteristics of typical temperature sensors and their fault modes;

d) Annex J applies to thermistors;

e) Expansion of footnote 205 for requirement 27; also the new footnote 208 for the requirement 27 in Table BX.1. The test specification in requirement 27 was clarified.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard specifies the functional requirements and tests for control devices which result from their application in thermal installations. These include, for example, time response and safety aspects of those devices which enable the safe operation of the installation.

A distinction is made between special requirements for the different operating media: air, water, oil and flue gas.

This European Standard includes purely mechanical constructions, electrical and electronic constructions, and constructions using software.

There exist "standard applications" for which in the past "typical" devices or combinations thereof have been used. Some of these devices may also be of purely mechanical construction. Such "standard devices" are described in this document and identified by letter codes. Their properties and functions are described in definitions using the language and definitions of the EN 60730 series, so to make sure that existing devices (using the same letter codes) are not incompatible when tested using this document.

The devices described in this European Standard contain sensors, control units and positioning outputs and, if needed, actuator devices. The requirements for mechanical safety, electrical safety and EMC are covered by the standards of the EN 60730 series under the LVD and EMC Directives.

To make sure that when translating this document into other languages, no unintended meaning is attached to certain words or that words are used as in former practices, the different devices are identified and defined by device codes consisting of up to four letters. It is strongly recommended that no other meaning than that given by the definitions of this document and of the EN 60730 series is attached to the letter codes.

This European Standard has been created for temperature sensing controls for use in heat generating systems. It might still be useful however to quote it for other applications, either wholly or in part.

Remarks to product committees specifying devices within the scope of this European Standard to ensure safety of the controlled applications within the scope of their standards:

The attention of product committees specifying devices from this European Standard to cover technical risks of the operation of applications within the scope of their standards is drawn to the following fact. Merely specifying a general type of device (e. g. thermal cut out) according to this document for a specific application does not generally ensure the safety of the controlled application and may indeed be a recipe for disaster. The use of a control itself does not provide safety. Rather, safety is only provided if the control is suitable to be used with that application.

It is necessary to assess the risk situation of the controlled application by accepted engineering procedures (risk and/or fault analysis, FMEA, or other). It is also necessary to select from the devices with different device codes given in this document the device(s) that adequately limit the risk to acceptable levels by controlling or preventing possible failures and errors from occurring during operation of the application.

In order to limit risk in the controlled applications, controls as specified in Annex AX of this document need to be used. For control purposes operating controls, and for risk limiting protective controls need to be used. If a protective control also provides operating control functions, any failure of the operating function or part of the control should not prevent the protective operation of the control.

This European Standard covers safety related aspects pertaining to the operation and inherent safety of operating and protective controls for heat generating systems.

This European Standard does not limit construction to single function devices: multifunctional devices which could be classified for different functions are allowed within specified conditions. In this way, the use of devices using electronics or software is possible.

In this European Standard, the term "heat generating system" can also mean "heat exchanger".

In this European Standard, the term "heat generating system" comprises all equipment incorporated in such a system, for which other standards will normally apply as well. Examples are given below in Table 1.

Table 1 — List of standards (non-exhaustive) for equipment using temperature control devices within the scope of this document

Standard number	Title (short version)	CEN/TC	Remarks
EN 26	Gas-fired instantaneous water heaters for sanitary uses production, fitted with atmospheric burners	TC 48	Domestic gas fired water heaters
EN 89	Gas-fired storage water heaters for the production of domestic hot water	TC 48	
EN 30	Domestic cooking appliances burning gas	TC 49	Gas cooking appliances
EN 303-1	Heating boilers — Part 1: Heating boilers with forced draught burners — Terminology, general requirements, testing and marking	TC 57	Heating boilers
EN 613	Independent gas-fired convection heaters	TC 62	Independent gas-fired space heaters
EN 1266	Independent gas-fired convection heaters incorporating a fan to assist transportation of combustion air and/or flue gases	TC 62	
EN 203	Gas heated catering equipment	TC 106	Large kitchen appliances using gaseous fuels
EN 297 EN 483 EN 656	Gas-fired central heating boilers	TC 109	Central heating boilers using gaseous fuels
EN 303-3	Heating boilers — Part 3: Gas-fired central heating boilers — Assembly comprising a boiler body and a forced draught burner	TC 109	
EN 625	Gas-fired central heating boilers — Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kW	TC 109	
EN 677	Gas-fired central heating boilers — Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW	TC 109	
EN 676	Automatic forced draught burners for gaseous fuels	TC 131	Gas burners using fans

Table 1 *(continued)*

Standard number	Title (short version)	CEN/TC	Remarks
EN 525	Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW	TC 180	Gas-fired air heaters
EN 621	Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, without a fan to assist transportation of combustion air and/or combustion products		
EN 1020	Non-domestic forced convection gas-fired air heaters for space heating not exceeding a net heat input of 300 kW incorporating a fan to assist transportation of combustion air or combustion products		
EN 778	Domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 70 kW, without a fan to assist transportation of combustion air and/or combustion products	TC 180	
EN 1319	Domestic gas-fired forced convection air heaters for space heating, with fan-assisted burners not exceeding a net heat input of 70 kW		
EN 1196	Domestic and non-domestic gas-fired air heaters — Supplementary requirements for condensing air heaters	TC 180	
EN 12669	Direct gas-fired hot air blowers for use in greenhouses and supplementary non-domestic space heating	TC 180	
EN 12828	Heating systems in buildings — Design for water-based heating systems	TC 228	
EN 416-1	Single burner gas-fired overhead radiant tube heaters for non-domestic use — Part 1: Safety	TC 180	Non-domestic gas-fired overhead radiant heaters
EN 416-2	Single burner gas-fired overhead radiant tube heaters for non-domestic use — Part 2: Rational use of energy		
EN 419-1	Non-domestic gas-fired overhead luminous radiant heaters — Part 1: Safety		
EN 419-2	Single burner gas-fired overhead radiant tube heaters for non-domestic use — Part 2: Rational use of energy		
EN 12952-8	Water-tube boilers and auxiliary installations — Part 8: Requirements for firing systems for liquid and gaseous fuels for the boiler	TC 269	Shell and water-tube boilers
EN 12953-7	Shell boilers — Part 7: Requirements for firing systems for liquid and gaseous fuels for the boilers	TC 269	

When referring to this European Standard, product committees should require in their product standards particular values as necessary for requirements according to Annex BX.

If this European Standard is used for controls other than for heat generating systems and it is considered necessary to add or modify requirements, care needs to be taken to follow the principles of risk management contained in the EN 60730 series in order to maintain the overall integrity of the requirements of that series of standards.

This European Standard refers to EN 60730-2-9 and modifies and replaces requirements of that standard as appropriate for the purpose of this document. If not stated otherwise, all references refer to Clauses of EN 60730-2-9, which is applied in combination with EN 60730-1. Actuator devices are covered by EN 60730-2-14, if applicable.

NOTE Additional requirements or tests are numbered, starting with a number higher than X.200 and X being the particular Clause number. This is done in order to distinguish additional requirements from the requirements and tests of EN 60730-1 and the corresponding Parts 2, where numbering starts above X.100. All other Clause numbers refer to Clauses of EN 60730-2-9 and EN 60730-1.

1 Scope

1.1 This European Standard applies to electrical or non-electrical temperature control devices which are used to control temperatures within heat generating systems by controlling the supply of energy. It also applies to limiting devices which ensure that the temperature in heat generating systems will not exceed a predefined limit.

This European Standard specifies operating values, operating times, and operational sequences associated with the safety of the heat generating system.

This European Standard also applies to controls using NTCs or PTCs thermistors, additional requirements for which are contained in Annex J of EN 60730-2-9:2010.

This European Standard applies to controls with a rated voltage not exceeding 690 V and with a rated current not exceeding 63 A.

This European Standard also applies to manual controls if, electrically and/or mechanically, they form an integral part of automatic controls.

NOTE Requirements for manually operated switches not forming part of an automatic control are contained in EN 61058-1.

This European Standard does not apply to room thermostats.

1.2 This European Standard does not take into account the response value of an automatic action of the control, if such a response value is dependent upon the method of mounting the control in the heat generating system or equipment, in which case the control should be tested together with the heat generator. Where a response value is of significance for the protection of the user or surroundings, the value defined in the appropriate household equipment standard or as determined by the manufacturer applies.

1.3 This European Standard applies also to controls incorporating electronic devices, requirements for which are contained in Annex DX.

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.

EN 60730-1:2011, *Automatic electrical controls for household and similar use — Part 1: General requirements (IEC 60730-1:2010, modified)*

EN 60730-2-8:2002+A1:2003, *Automatic electrical controls for household and similar use — Part 2-8: Particular requirements for electrically operated water valves, including mechanical requirements (IEC 60730-2-8:2000+A1:2002, modified)*

EN 60730-2-9:2010, *Automatic electrical controls for household and similar use — Part 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9:2008, modified)*

EN 60730-2-14:1997+A1:2001+A11:2005+A2:2008, *Automatic electrical controls for household and similar use — Part 2-14: Particular requirements for electric actuators (IEC 60730-2-14:1995, modified +A1:2001+A2:2007, modified)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 60730-2-9:2010, Clause 2 and the following apply.

3.201
operating differential
difference between the upper and lower values of the operating value; for control devices types TB, STB, and ASTB, the difference between the fixed limit value and the temperature at the sensing element at which a manual reset is possible

Note 1 to entry: The definition according to EN 60730-1:2011, has been modified.

3.202
temperature sensing control type TR
thermostat or modulating thermostat used in heat generating systems for controlling the temperature of liquid or/and gaseous media, which has provisions for setting by the user and which, if equipped with an electrical output, provides at least type 1B action

Note 1 to entry: See 2.2.4 and 2.2.6 of EN 60730-1:2011 and see 2.2.105 of EN 60730-2-9:2010.

Note 2 to entry: Elsewhere in this document, this device is designated by the device code TR.

3.203
temperature sensing control type FR
combustion control used in heat generating systems, which is a TR influencing the supply of combustion air for solid fuels as a function of the temperature of the controlled medium

Note 1 to entry: Usually these devices are mechanical. If they are electrical, they will be TRs with an additional actuator. See EN 60730-2-14 for control of the air flow.

Note 2 to entry: Elsewhere in this document, this device is designated by the device code FR.

3.204
temperature sensing control type TW
temperature operating control for heat generating systems where, upon response, automatic reset takes place after the temperature at the sensing element has dropped/risen below/above the adjusted limit value by the amount of the operating differential, and which, if electrical, provides type 2B action, and whose settings are unchangeably fixed or can be fixed with a tool or a special tool

Note 1 to entry: TW is a monitoring control as a class A control function according to EN 60730-1:2011.

Note 2 to entry: Elsewhere in this document, this device is designated by the device code TW.

3.205
temperature sensing control type STW
safety thermal cut out; protective control for heat generating systems where, upon response, automatic reset takes place after the temperature at the sensing element has dropped/risen below/above the adjusted limit value by the amount of the operating differential, and which provides type 2P and type 2K actions, and, if electrical, type 2B action, and whose settings are unchangeably fixed or can be fixed with a tool or a special tool

Note 1 to entry: Type 2K action will be considered to be provided if type 2N action is provided.

Note 2 to entry: This device is typically required to prevent overheating in heat generating systems under abnormal operation conditions (see EN 483 and EN 1020).

Note 3 to entry: See also EN 60730-1:2011.

Note 4 to entry: Elsewhere in this document, this device is designated by the device code STW.

3.206
temperature sensing control type ATW
safety thermal cut out; protective control for limiting the flue gas temperature in heat generating systems where, upon response, automatic reset takes place after the temperature at the sensing element has dropped/risen below/above the adjusted limit value by the amount of the operating differential, and which provides type 2P and type 2K actions, and, if electrical, type 2B action, and whose settings are unchangeably fixed or can be fixed with a tool or a special tool

Note 1 to entry: The concept of "extended safety", which is the action of a temperature limiting device to cut out or limit the temperature of the controlled application, should a fault internal to the control occur, has been worked into 2.205 and other definitions. For the same purpose, Notes 8 and 9 have been added to Table AX.1 which contains the requirements for software class and fault analysis of controls using electronic devices.

Note 2 to entry: Elsewhere in this document, this device is designated by the device code ATW.

3.207
temperature sensing control type Th
STW used as a thermal bypass protection for solid fuel heat generating systems and which senses the heated media temperature and operates to cause energy to be carried off by opening a regulating unit, e. g. a valve; the settings of this control are unchangeably fixed

Note 1 to entry: Usually this is a mechanical device. This function could also be provided by an STW controlling a valve.

Note 2 to entry: Elsewhere in this document, this device is designated by the device code Th.

3.208
temperature sensing control type ASW
flue gas flow control (protective) for heat generating systems which senses wrong direction of the flue gas flow by monitoring the flue gas temperature and causes the fuel flow to be cut off

Note 1 to entry: The control provides either an automatic reset after a minimum time delay of 10 min or type 2H and type 2V actions.

Note 2 to entry: The flue gas flow control is used for monitoring the flue gas passages of gas-fired equipment with natural draught burners.

Note 3 to entry: Elsewhere in this document, this device is designated by the device code ASW.

3.209
temperature sensing control type TB
temperature limiter (protective control) for heat generating systems which can only be reset manually or with a tool and which provides at least the following actions: type 2B, type 2V and optionally type 2F, the settings of which are unchangeably fixed or can be fixed with a tool or a special tool

Note 1 to entry: Elsewhere in this document, this device is designated by the device code TB.

3.210
temperature sensing control type STB
safety temperature limiter (thermal cut out, protective control) for heat generating systems which can only be reset manually or by a tool and which provides at least the following actions: type 2B, type 2K, type 2P and type 2V and optionally any of the following actions: type 2F and type 2N; the settings of this control are unchangeably fixed or can be fixed with a tool or a special tool

Note 1 to entry: Type 2K action will be considered to be provided if type 2N action is provided.

Note 2 to entry: Elsewhere in this document, this device is designated by the device code STB.

3.211
temperature sensing control type ASTB
STB suitable for limiting the flue gas temperature

Note 1 to entry: Elsewhere in this document, this device is designated by the device code ASTB.

3.212
two position control
control device where the manipulated variable can assume only two values (in the case of a contact output, the manipulated variables "closed" and "open")

3.213
controls with and without auxiliary energy

3.213.1
control with auxiliary energy
control that requires electrical, pneumatic or hydraulic energy for transferring the temperature measured by its sensing element(s) to an electrical or mechanical output or actuator

3.213.2
control without auxiliary energy
control that uses a sensing element acting directly on a contact output or an actuator

3.214
lockout
shutdown after which a restart can only be accomplished by a manual reset and by no other means

Note 1 to entry: "Reset with tool" is considered to be covered by "manual reset".

Note 2 to entry: This is essentially the same as EN 60730-2-5:2002+A1:2004+A11:2005, 2.3.112.1, non volatile lockout: the condition of a burner control system following safety shut down such that a restart can only be accomplished by a manual reset of the burner control system and by no other means [5].

3.215
manual reset
reset actuated manually which can be made directly on the control or remotely via data transfer initiated by human action

Note 1 to entry: Regardless of the technical solution, the safety level of the manual reset will not be reduced.

3.216
heat generating system
HGS

Note 1 to entry: In what follows, "heat generating system" or "heat generating systems" will be referred to as HGS; for the purposes of this document, the relevant devices will be referred to as "temperature sensing controls for HGS".

3.217
actuator device
device consisting of an actuator and an actuator element which are joined by a connection element and form a constructional unit

3.218
electrical actuator
a device in which a prime mover is mechanically linked to a valve, damper or similar device and which responds to initiation from a control or switch

Note 1 to entry: The electric actuator moves the valve, damper or similar device to defined positions; it might also incorporate other functions, such as electric interlock switches and/or feedback.

[SOURCE: EN 60730-2-14:1997, 2.2.101]

3.219
actuator element
element that is actuated either by an actuator (electrical, pneumatic or hydraulic) or directly by a sensing element

3.220
closing time
period of time from the moment the actuator closing signal is delivered to the moment the actuator element reaches the fully closed position

3.221
shut off pressure
declared maximum pressure between valve inlet and valve outlet against which the actuator device shuts off in cases of emergency

3.222
kvs value
flow through a fully opened valve, measured in m^3/h at a differential pressure of 1 bar and using water of 20 °C ± 10 K

4 General requirements and general notes on tests

EN 60730-2-9:2010, Clause 3 is applicable.

EN 60730-2-9:2010, Clause 4 is applicable.

5 Rating

EN 60730-2-9:2010, Clause 5 is applicable.

6 Classification

EN 60730-2-9:2010, Clause 6 is applicable, with the following addition:

Addition:

NOTE Non-electrical temperature sensing devices are not classified according to clauses relating to purely electro-technical requirements, e. g. protection against electrical shock.

6.3 *Addition* to 6.3.1, 6.3.2 and 6.3.3:

The actions shall be declared according to the codes given in Annex AX, Tables AX.1a and AX.1b.

6.4 *Addition:*

6.4.3.201 lockout: type 2V

7 Information

EN 60730-2-9:2010, Clause 7 is applicable, with the following addition:

7.1 *Addition:*

Temperature sensing controls shall be marked with their device code according to Annex AX, Table AX.1a or AX.1b.

NOTE This is to assist in the correct application of these controls.

7.2 *Addition:*

Information on any particular type of temperature sensing control for HGS shall be given as indicated in Table 7.2 of EN 60730-2-9:2010 (including that of EN 60730-1 as modified by that standard) and in addition shall be as indicated in Annex BX, Table BX.1.

NOTE 1 Annex BX.1 gives requirements for specific values, additional requirements particular to controls for HGS and additional notes to the requirements of EN 60730-2-9:2010, Table 7.2. The requirements of Table 7.2 are not modified.

NOTE 2 Additional performance requirements are indicated in Table BX.1.

8 Protection against electric shock

EN 60730-2-9:2010, Clause 8 is applicable.

9 Provision for protective earthing

EN 60730-2-9:2010, Clause 9 is applicable.

10 Terminals and terminations

EN 60730-2-9:2010, Clause 10 is applicable.

11 Constructional requirements

EN 60730-2-9:2010, Clause 11 is applicable, with the following modification:

11.4.13.102 *Modification*

11.4.13.102 b) and c) are not applicable.

Addition of a sentence:

Controls within the scope of this document shall be reset as required by Annex AX, Table AX.1. Constructions according to 11.4.13.102 b) or c) or 11.4.103 of EN 60730-2-9:2010 therefore are not allowed for temperature sensing controls for HGS.

11.4.103 Replacement:

Controls within the scope of this document shall be reset as required by Annex AX, Table AX.1. Constructions according to 11.4.13.102 b) or c) or 11.4.103 of EN 60730-2-9:2010 therefore are not allowed for temperature sensing controls for HGS.

Additional sub-clauses:

11.201 Temperature sensing controls for HGS shall be constructed in accordance with Annex AX, Tables AX.1a and AX.1b.

11.202 Temperature sensing controls type FR shall be able to withstand a torque of 50 Ncm to the axis of the lever.

The torque is applied by an appropriate force to the lever parallel to the direction of the lever's movement.

11.203 If the operating differential of a temperature sensing control is adjustable, an adjustment shall be possible only with the aid of a tool.

11.204 If temperature sensing controls for HGS include several of the types given in Annex AX, Table AX.1, the requirements according to EN 60730-1:2011 shall be fulfilled.

11.205 Devices whose functions according to Annex AX.1 can be changed shall be marked in such a manner that the selected function is clearly perceptible on the device.

11.206 Type 2K action can also be achieved by two independent systems, the contacts of which are connected in series; in the case of a thermal bypass protection, type 2K action can be achieved by two sensing elements and one common actuator.

11.207 A temperature sensing control for HGS intended to provide lockout shall provide type 2V action.

Type 2V action: A type 2V action shall be so constructed that a restart or reset can only be accomplished for a TB, STB and ASTB by manual reset, (see 3.215) of the control. Temperature sensing controls for heat generating systems classified as type 2V shall have at least one reset mechanism classified as type 2H or 2J.

Compliance is checked by inspection and by test.

11.208 If devices for functional checks are provided (e. g. checking the TB by electrically bridging the TR), they shall be operative only during actuation. The devices and their actuating members shall be marked and described accordingly.

11.209 During fluctuations of the electrical auxiliary energy within the following ranges, temperature sensing control devices shall operate as intended:

— V_R -15 % to V_R +10 % for AC powered controls;

— V_R –15 % to V_R +15 % for DC powered controls;

— for pneumatic or hydraulic auxiliary energy within the range of ±10 %, in relation to the rated supply pressure.

In any case, it shall be ensured that below the specified lower limit protective temperature sensing controls either operate as intended or reach the safety position.

The operating temperature shall not change by more than the combined manufacturing deviation and drift or as declared in Annex BX, Table BX.1, requirement 216.

Upon loss of auxiliary energy, the output shall be as declared in Annex BX, Table BX.1, requirement 217.

Test: It shall be checked whether these requirements are satisfied both as supplied and after the endurance tests of Clause 17.

NOTE 1 To prevent unsafe states in the controlled application, values for specific applications and/or types of temperature sensing controls for HGS should be specified by the relevant standards body.

NOTE 2 Requirements for actuator devices with safety functions in heat generating systems are given in DX.11.210 to DX.11.218.

12 Moisture and dust resistance

EN 60730-2-9:2010, Clause 12 is applicable, with the following modification:

12.101 Not applicable.

13 Electric strength and insulation resistance

EN 60730-2-9:2010, Clause 13 is applicable.

14 Heating

EN 60730-2-9:2010, Clause 14 is applicable, with the following additions:

14.201 Temperature sensing controls for HGS shall be rated for an ambient temperature of 0 °C to 70 °C. If the temperature sensing element and the switch head are placed at different locations, the switch head shall be rated for an ambient temperature of between 0 °C and 50 °C minimum.

The manufacturer can declare wider ranges, which shall be considered during the test and which shall include the ranges 0 °C to 70 °C and 0 °C to 50 °C.

NOTE The effect of the ambient temperature on the switching point is described in 14.203 to 14.209.

14.202 The effect of the change of the ambient temperature of capillaries or the switch head respectively on the operating point shall be specified by the manufacturer (see Annex BX, Table BX.1, requirement 206).

14.203 For an ambient temperature range between 20 °C and the maximum permissible ambient temperature specified by the manufacturer, the switching point of temperature sensing controls of the types TB, STW, ATW, Th, ASW, STB, and ASTB shall not shift to higher temperatures.

For temperature sensing controls of the types TR, FR, and TW, a shift to higher temperature is acceptable if this higher temperature does not exceed the highest adjustable set point.

For temperature sensing controls of the types TB, STW, ATW, Th, ASW, STB and ASTB the following applies.

a) If the factory-set switching point is set for an ambient temperature exceeding 20 °C, the switching point may increase by a maximum of 5 K if the ambient temperature drops from that level to 20 °C.

b) The effect of the ambient temperature shall be checked in an adequate manner together with the determination of the switching values.

c) This property shall be declared by the manufacturer (see Table BX.1, requirement 206).

14.204 Sensing elements of temperature sensing controls for heat generating systems of type 1 action or type 2 action shall be capable of withstanding for one hour temperatures 15 % or 25 K above the maximum setting temperature, whichever is the highest value, unless the manufacturer declares a different value in Table 7.2, requirement 218 of EN 60730-2-9:2010. In this case, the declared value applies. After the test, the temperature sensing elements shall continue to operate in the intended manner.

For controls of type TB, STW, ATW, Th, STB, ASW, and ASTB which are intended to keep the temperature below a certain limit, the operating temperature shall not have changed by more than ±2 K after the test. Furthermore, no change of the operating point above the rated operating temperature as declared under requirement 48 of Table 7.2 of EN 60730-1:2011 shall occur. The tests shall be carried out at the highest setting (if applicable).

The following values in Table 14.201 reflect the experiences made so far or the preferred values, respectively.

Table 14.201 — Test parameters for temperature sensing controls used in specific applications

Application	Upper setting temperature	Temperature rise	Maximum temperature at the sensing element	Criterion of compliance
Controls for air heaters	–	–	200 °C	<0 K
Controls for solid fuel boilers	–	–	400 °C	<0 K
Thermal bypass protection	–	–	125 °C	<0 K
ASW	Highest setpoint (HEW)	+50 K	HEW + 50 K, but at least 130 °C	±2 K
ASTB	Highest setpoint (HEW)	+50 K	HEW + 50 K, but at least 130 °C	-2 K

14.210 See Annex DX.

15 Manufacturing deviation and drift

EN 60730-2-9:2010, Clause 15 is applicable with the following modification:

15.1, 15.5.3.102, 15.5.3.103, 15.5.3.109, and 15.5.6 are not applicable.

Additional sub-clauses:

15.201 The absolute value of the manufacturing deviation from the declared set point or, for adjustable devices, the highest temperature of the set point range for TR, FR and TW, shall not exceed the maximum of 5 % or 2 K, whichever gives the wider range.

The manufacturing deviation from the set point or, for adjustable devices, the highest temperature of the set point range for TB, STW, ATW, Th, ASW, STB and ASTB shall not exceed 0 % to –10 % [°C] or 0 K to –4 K, whichever gives the wider range. All percentage values refer to the highest adjustable temperature.

NOTE "Gives the wider range" is equivalent to "gives the lower temperature".

15.202 The absolute value of the drift for all device codes shall not exceed the maximum of 5 % of the highest adjustable temperature or 2 K, whichever gives the wider range.

15.203 The determination of the operating differential shall take place together with the measurements of the manufacturing deviation.

16 Environmental stress resulting from transport and storage

EN 60730-2-9:2010, Clause 16 is applicable, with the following addition:

NOTE The manufacturer may declare a wider range, which shall be considered when making the test.

17 Endurance

EN 60730-2-9:2010, Clause 17 is applicable, with the following modification:

NOTE The number of switching cycles in accordance with EN 60730-2-9:2010, Table 7.2, is given in Annex BX.

17.8.4.101, 17.15, and 17.16 are not applicable.

Additional sub-clause:

17.201 See Annex DX.

18 Mechanical strength

EN 60730-2-9:2010, Clause 18 is applicable.

19 Threaded parts and connections

EN 60730-2-9:2010, Clause 19 is applicable.

20 Creepage distances, clearances and distances through insulation

EN 60730-2-9:2010, Clause 20 is applicable.

21 Resistance to heat, fire, and tracking

EN 60730-2-9:2010, Clause 21 is applicable.

22 Resistance to corrosion

EN 60730-2-9:2010, Clause 22 is applicable.

23 Electromagnetic Compatibility (EMC) requirements — Emission

EN 60730-2-9:2010, Clause 23 is applicable.

24 Components

EN 60730-2-9:2010, Clause 24 is applicable.

25 Normal operation

EN 60730-2-9:2010, Clause 25 is applicable, with the following addition:

NOTE Clause 25 of EN 60730-1:2011 states: "See Annex H" of EN 60730-1:2011; Clause 25 of EN 60730-1:2011 does not add to or modify this.

26 Electromagnetic compatibility (EMC) requirements — Immunity

EN 60730-2-9:2010, Clause 26 is applicable, with the following modification.

Clause 26 does not apply for non-electronic controls.

27 Abnormal operation

EN 60730-2-9:2010, Clause 27 is applicable, with the following additions:

27.201 With TB, STW, ATW, ASW, STB and ASTB (for definitions, see Clause 2), fault condition on components as described in H.27.1.4 of EN 60730-1:2011 shall not cause the drift as declared in Table 7.2, requirement 42 of EN 60730-1:2011 to be exceeded.

TB, STB, ASTB in lockout shall not reset.

28 Guidance on the use of electronic disconnection

EN 60730-2-9:2010, Clause 28 is applicable.

Figures:

Figures of EN 60730-2-9:2010 are applicable.

Annexes:

Annex A Indelibility of markings

EN 60730-1:2011, Annex A is applicable.

Annex B Measurement of creepage distances and clearances in air

EN 60730-1:2011, Annex B is applicable.

Annex E Circuit for measuring leakage current

EN 60730-1:2011, Annex E is applicable.

Annex F Heat and fire resistance categories

EN 60730-1:2011, Annex F is applicable, except for non-electrical controls.

Annex G Heat and fire resistance tests

EN 60730-1:2011, Annex G is applicable.

Annex H Requirements for electronic controls

EN 60730-2-9:2010, Annex H is applicable in combination with EN 60730-1.

Table H.27.1, Additional fault modes for sensors:

Fault modes of the temperature sensing element and the sensor assembly shall be assessed. The assessment shall include the wiring, open, short, and depending on the technology used, the following failure modes shall be considered:

1) If control classified as type 2K, a sensor does not respond to the actual temperature value as was to be expected ("stuck at-open or stuck-at-short");
2) If control classified as type 2N, the temperature related sensor characteristic changes in principle or by an offset;
3) If control classified as 2N, specific fault modes depend on the sensor technology.

See Annex EX *"Characteristics of typical temperature sensors and their fault modes".*

Annex J Requirements for controls using thermistors

EN 60730-2-9:2010, Annex J is applicable for thermistors used as sensors for temperature sensing controls.

Annex K Nominal voltages of supply systems for different modes of overvoltage control

EN 60730-1:2011, Annex K is applicable.

Annex L Overvoltage categories

EN 60730-1:2011, Annex L is applicable.

Annex M Typical usage

EN 60730-1:2011, Annex M is applicable.

Annex N Pollution degrees

EN 60730-1:2011, Annex N is applicable.

Annex P Printed circuit board coating performance test

EN 60730-1:2011, Annex P is applicable.

Annex Q Printed circuit board performance test

EN 60730-1:2011, Annex Q is applicable.

Annex R Explanatory notes for surge immunity test

EN 60730-1:2011, Annex R is applicable.

Annex S Guidance for applying Clause 20

EN 60730-1:2011, Annex S is applicable.

Annex ZA Normative references to international publications with their corresponding European publications

EN 60730-2-9:2010, Annex ZA is applicable.

Annex ZB Special national conditions

EN 60730-2-9:2010, Annex ZB is applicable.

Annex AA Manufacturing deviation and drift

EN 60730-2-9:2010, Annex AA is not applicable.

NOTE The requirements are given in Clause 15 of this document.

Annex BB Time factor

EN 60730-2-9:2010, Annex BB is applicable with the following modifications:

Table BB.1 is replaced with Annex CX, Table CX.1.

Annex CC Number of switching cycles for independently mounted and in-line cord controls

EN 60730-2-9:2010, Annex CC is not applicable.

NOTE Annex CC is replaced by the minimum numbers of switching cycles given in Annex BX of this document, Table BX.1, requirement 27.

Annex AX
(normative)

Actions required

The tables in this annex refer to Clauses 6 and 11.

Table AX.1a — Actions required for operating and protective controls for HGS according to their device codes

For actuator devices TAD see Table AX.1b.

	Device Code									
	Operating controls			Protective controls						
Action	**TR**	**FR**	**TW**	**TB**	**STW** [f]	**ATW**	**Th**	**ASW** [c]	**STB** [f]	**ASTB**
Method of temperature setting [d]	adjustable	adjustable	setting (X) with tool [a], or fixed setting	setting (X) with tool [a], or fixed setting	setting with tool [a], (X), or fixed setting	setting with tool [a], (X), or fixed setting	fixed setting	setting with tool [a], (X), or fixed setting	setting with tool [a], (X), or fixed setting	setting with tool [a], (X), or fixed setting
Method of resetting	automatic	automatic	automatic	manual or with tool	auto-matic	auto-matic	auto-matic	automatic or manual	manual or with tool [a],	manual or with tool [a],
Type 1	X	X	NA	NA	NA	NA	NA	NA	NA	NA
Type 2 [g]	W		X	X	X	X	X	X	X	X
A	W		W	W	W	W		W	W	W
B	X		X	X	X	X		X	X	X
F				W					W	
H				X					X	X
J				W				W [j]	W	W
K					X	X	X	X	X	X
N					W	W	W	W	W	W
P					X	X	X		X	X

TableAX.1a (*continued*)

	Device Code									
	Operating controls			Protective controls						
Action	**TR**	**FR**	**TW**	**TB**	**STW** [f]	**ATW**	**Th**	**ASW** [c]	**STB** [f]	**ASTB**
V				X				W [j]	X	X
Software Class	A	A	A	B	C	C	Mechanical control, NA	B	C	C
Electronic circuit component faults with regard to functional safety	No fault considera-tion	No fault considera-tion	No fault consideration	single fault	double fault	double fault		single fault	double fault	double fault

The symbols in the columns signify the following:

Symbol	The requirement is:
W	optional
X	mandatory
(X)	can also be achieved by incorporation
NA	this construction is not allowed
none	not applicable

[a] For definition see EN 60730-1:2011, 2.13.2.

[c] With automatic resetting, reset shall occur not less than 10 min after cut-out. With manual reset, immediate resetting is permitted.

[d]
– For TR and FR: There may be means for setting by the manufacturer, by the installer, or by the user;
– the settings of TW, TB, STW, ATW, ASW, STB, ASTB are fixed or can by fixed with a special tool or tool;
– the settings of Th are unchangeably fixed.

[f] If applicable, also valid for actuator devices, see Table AX.1b.

[g] If type 2 is required, all actions indicated for that device shall be type 2 actions.

[j] The control either provides an automatic reset after a minimum time delay of 10 min or it provides type 2H or 2J and 2V actions.

Table AX.1b — Actions required for actuators for HGS according to their device code

	Device Code				
	Operating TAD[h]		Protective TAD[h]		
Action	**TR-AD[h]**	**TW-AD[h]**	**TB-AD[h]**	**STW-AD[h]**	**STB-AD[h]**
Method of temperature setting	adjustable	setting with tool [a], [(X)], or fixed setting	setting with tool [a], [(X)], or fixed setting	setting with tool [a], [(X)], or fixed setting	setting with tool [a], [(X)], or fixed setting
Method of resetting	automatic	automatic	manual or with tool	automatic	with tool
Type 1	X	NA	NA	NA	NA
Type 2 [f]	W	X	X	X	X
A	W	W	W	W	W
B	X	X	X	X	X
F			W		(X)
J			X		X
K				X	X
N				W	W
P				X	X
V			X		X
Software Class	A	A	B	C	C
Electronic circuit component faults with regard to functional safety	No fault consideration	No fault consideration	single fault	double fault	double fault

Notes to Table AX.1b:

The symbols in the fields signify the following:

Symbol	The requirement is:
W	optional
X	mandatory
(X)	can also be achieved by incorporation
NA	this construction is not allowed
none	not applicable

[a] For definition see EN 60730-1:2011, 2.13.2.

[c] With automatic resetting, reset shall occur not less than 10 min after cut-out. With manual reset, immediate resetting is permitted.

[f] If applicable, also valid for actuator devices, see Table AX.1b.

[g] If type 2 is required, all actions indicated for that device shall be type 2 actions.

[h] AD = actuator device; TAD = temperature controlled actuator device.

Annex BX
(normative)

Information

Table 7.2 of EN 60730-2-9:2010 is applicable except as indicated by the following additions or modifications:

NOTE Additional requirements to Table 7.2 of EN 60730-2-9:2010 are indicated by numbers starting from 201 and below 300.

Table BX.1 — Information according to temperature sensing controls for HGS

Require-ment	Information	Clause	Method	TR	FR	TW	TB	STW	ATW	Th	ASW	STB	ASTB	Actuators
1	Manufacturer's name or trade mark [2)]	*7.2.6	C	A	A	A	A	A	A	A	A	A	A	A
2	Unique type reference [1) 2)]	*2.11.1 *2.13.1 *7.2.6	C	A	A	A	A	A	A	A	A	A	A	A
3	Rated voltage or rated voltage range in volts (V)	*4.3.2 *2.1.2	C	A		A	A	A	A		A	A	A	B
4	Nature of supply unless the control is for both AC and DC, or unless the rating is the same for AC and DC	*4.3.2 *6.1	C	A		A	A	A	A		A	A	A	B
5	Frequency if other than for range 50 Hz to 60 Hz inclusive	*4.3.2	C	A		A	A	A	A		A	A	A	B
6	Purpose of control	*2.2 *4.2.4 *4.3.5 *6.3 *17.16	D	A	A	A	A	A	A		A	A	A	B
6a	Construction of control and whether the control is electronic	*6.15 Annex H *H.2.5.7	D	A		A	A	A	A		A	A	A	B

Table BX.1 (*continued*)

Require-ment	Information	Clause	Method	TR	FR	TW	TB	STW	ATW	Th	ASW	STB	ASTB	Actuators
7	The type of load controlled by each circuit [7)]	*6.2 *14 *17 *23.1.1	C	A		A	A	A	A		A	A	A	B
15	Degree of protection provided by enclosure [8)]	*6.5.1 *6.5.2 *11.5	C	A		A	A	A	A		A	A	A	B
17	Which of the terminals are suitable for the connection of external conductors, and if they are suitable for line or neutral conductors, or both	*6.6 *7.4.2 *7.4.3	C	A		A	A	A	A		A	A	A	B
18	Which of the terminals for external conductors are intended for a wider range of conductor sizes than those indicated in the table of 10.1.4.	*10.1	D	A		A	A	A	A		A	A	A	B
19	For screwless terminals the method of connection and disconnection [9)]	*10	D	A		A	A	A	A		A	A	A	B
20	Details of any special conductors which are intended to be connected to the terminals for internal conductors	*10.2	D	A		A	A	A	A		A	A	A	B
21	Maximum temperature of terminals for internal conductors, if higher than 85 °C	*14	X	A		A	A	A	A		A	A	A	B
22	Temperature limits of the switch head, if Tmin lower than 0 °C or Tmax other than 55 °C	*6.7 *14.5 *14.7 *17.3	C	A		A	A	A	A		A	A	A	B
23	Temperature limits of mounting surfaces Ts if more than 20 K above Tmax	*6.12.2 *14.1 *17.3	C	A	A	A	A	A	A		A	A	A	B
24	Classification of control according to protection against electric shock	*6.8	X	A		A	A	A	A		A	A	A	B

Table BX.1 (*continued*)

Require-ment	Information	Clause	Method	TR	FR	TW	TB	STW	ATW	Th	ASW	STB	ASTB	Actuators
25	For Class II controls, the symbol for Class II construction	*7.3	C	A		A	A	A	A		A	A	A	B
26	Number of cycles of actuation (M) for each manual action	*6.10 *17.10 *17.11	X	B	B	B	A	B	B		B	A	A	B
27	Number of automatic cycles (A) for each automatic action: [205), 208)]	*6.11 *17.8 *17.9	X											
	without switching action but with increasing the temperature close to the set point			–	30 000	–	–	30 000	–	1 000	–	30 000	30 000	
	with switching action under specified load conditions			250 000	–	100 000	10 000	300	3 000	10 [204)]	300	300	300	
28	Ageing period (Y) for controls with type 1M or 2M action [201)]	*6.16 *17.6	X											
29	Type of disconnection or interruption provided by each circuit	*2.4.1 *2.4.2 *2.4.3 *2.4.4 *6.9	X	A		A	A	A	A		A	A	A	B
30	PTI of materials used for insulation	*6.13 *Table 20.2, Note 2 *Table 20.4 *21.2.7	X	A		A	A	A	A		A	A	A	B
31	Method of mounting control [5)]	*11.6	D	A	A	A	A	A	A	A	A	A	A	B
31a	Method of providing earthing of control	*7.4.3 *9 *9.1.1 *9.1.2	D	A		A	A	A	A		A	A	A	B

Table BX.1 (*continued*)

Require-ment	Information	Clause	Method	TR	FR	TW	TB	STW	ATW	Th	ASW	STB	ASTB	Actuators
32	Method of attachment for non-detachable cords [6)]	*10.1	D	A		A	A	A	A		A	A	A	B
33	Intended transportation condition of control [20)]	*16.1	X	A	A	A	A	A	A	A	A	A	A	B
36	Limits of activating quantity for any sensing element over which micro-disconnection is secured (see also H.7.2, requirement [36)]	*11.3.2	X	B		B	B	B	B		B	B	B	B
37	Minimum and/or maximum rates of change of activating quantity, of minimum and/or maximum cycling rates for a sensing control [4)]	*4.1.7 *15 *17	X	B		B	B	B	B	B	B	B	B	B
38	Values of overshoot of activating quantity for sensing controls which are necessary for correct action, or which can be used for test purposes	*17	X	B	B	B	B	B	B	B	B	B	B	B
39	Type 1 or type 2 action	*6.4 Annex AX	D	A	A	A	A	A	A	A	A	A	A	A
41	Manufacturing deviation and condition of test appropriate to deviation	*2.11.1 *11.4.3 *15 *17.14	X	A		A	A	A	A	A	A	A	A	B
42	Drift	*2.11.2 *11.4.3 *15 *16.2.4	X	A		A	A	A	A	A	A	A	A	B
43	Reset characteristics for cut-out action [3)]	*6.4	D				A			A		A	A	B
44	If a control is either to be hand-held or is intended for hand-held equipment [202)]	*21	X	202)	202)	202)	202)	202)	202)	202)	202)	202)	202)	202)

Table BX.1 (*continued*)

Require-ment	Information	Clause	Method	TR	FR	TW	TB	STW	ATW	Th	ASW	STB	ASTB	Actuators
47	Extent of any sensing element	*2.8.1	D	A	A	A	A	A	A	A	A	A	A	B
48	Operating value (or values) or operating time [203)]	*2.3.11, *2.3.12, *6.4.3.10, *11, *14, 14.205, 14.206, 14.207, 14.208, 14.209, *15.6.17	D	A	A	A	A	A	A	A	A	A	A	B
49	Control pollution situation	*6.5.3	D	A	A	A	A	A	A	A	A	A	A	B
50	Control intended to be delivered exclusively to the equipment manufacturer	*7.2.1 *7.2.6	X	B	B	B	B	B	B	B	B	B	B	B
51	Heat and fire resistance category	*21	X	A	A	A	A	A	A	A	A	A	A	A
101	Maximum sensing element temperature (other than relevant to requirement [105) 101)]	**17.101	X	A	A	A	A	A	A	A	A	A	A	A
102	Time factor [207)]	**11.101 **2.3.14.101	X	A	A	A	A	A	A	A	A	A	A	A
103	Bimetallic SOD [202)] reset temperature (either -35 °C or 0 °C) not allowed	*11.4.103 *2.2.9	X	202)	202)	202)	202)	202)	202)	202)	202)	202)	202)	202)
104	Number of cycles for bimetallic single-operated-devices [202)] with 0 °C	*17.15.3.1	X	202)	202)	202)	202)	202)	202)	202)	202)	202)	202)	202)
601	Automatic reset temperature of a manually resettable [202)] thermal cut-out (not higher than -20 °C)	*11.4.601 *2.2.9		202)	202)	202)	202)	202)	202)	202)	202)	202)	202)	202)
201	Operating differential	*2.3.26	D	A	A	A		A	A		A			

Table BX.1 (*continued*)

Require-ment	Information	Clause	Method	TR	FR	TW	TB	STW	ATW	Th	ASW	STB	ASTB	Actuators
47	Extent of any sensing element	*2.8.1	D	A	A	A	A	A	A	A	A	A	A	B
202	Drawing specifying the main dimensions and identifying the parts		D	A	A	A	A	A	A	A	A	A	A	A
203	Rated pressure range of protection pocket or immersion pockets, if applicable		D	B	B	B	B	B	B	B	B	B	B	B
204	Controlled medium		D	A	A	A	A	A	A	A	A	A	A	A
205	Maximum flow-rate for type Th temperature control device	3.207	D							A				
206	Influence of the ambient temperature on the operating temperature at a fixed setpoint	14.202 14.203	D	B		B	B	B	B		B	B	B	B
207	Max. closing time	3.220 DX.11.210	D											A
208	Behaviour of emergency actuator in case of reduction/failure of auxiliary energy	DX.11.211	D											A
209	Leakage at max. shut-off pressure	DX.11.212 DX.11.216	D											A
210 [206)]	Rated pressure		C											A
211 [206)]	Direction of flow		C											A
212 [206)]	Max. shut-off pressure	DX.11.212	D											A
213 [206)]	Nominal size of closing valve		C											A

Table BX.1 (*continued*)

Require-ment	Information	Clause	Method	TR	FR	TW	TB	STW	ATW	Th	ASW	STB	ASTB	Actuators
214 [206)]	kvs-value	2.220, DX.11.212	C											A
215	Device Code	3, 7.200 Annex AX Annex CX	C	A	A	A	A	A	A	A	A	A	A	A
216	Maximum change of operating temperature for devices with auxiliary energy, if declared for 11.209	11.209	X											
217	State of the output(s) on loss of auxiliary energy	11.209	X											

Table BX.1 (*continued*)

The footnotes to Table 7.2 of EN 60730-2-9:2010 are applicable except as follows:

Explanation of the abbreviations used:

C, D, X = for explanation, see EN 60730-1:2011, 7.2, C: Marking, D: Documentation, X: Declaration

A = information is mandatory

B = information if applicable

* refers to clause in EN 60730-1:2011

** refers to clause in EN 60730-2-9:2010

Changes to notes in EN 60730-2-9:

5) Addition to footnote 5): Method of mounting includes documentation concerning e.g. protection pockets or accessories to be tested with the control, installation instructions with functional descriptions and circuit diagram, if required.

8) Replacement: If the IP-rating of an electrical control is less than IP 20 further protection will be required in the equipment.

4) and 9) of Table 7.2 of EN 60730-2-9:2010 are not applicable.

Additional footnotes

201) Only to be applied if declared so by the manufacturer.

202) Such devices are not allowed for applications within the scope of this document.

203) This includes documentation on the set point range, if any, of the temperature sensing control or the switching point.

204) Working cycles, with flow of cold water.

205) This applies to electrical and mechanical controls. For mechanical systems the number of cycles refers to mechanical cycling of the mechanism with 20 % of the maximum stroke. For operating controls the given values are proposed values, and used for these controls if not otherwise specified product standards or declared by the manufacturer.

206) For water valves requirements for information in Clause 7 of EN 60730-2-8:2002+A1:2003 and for gas valves requirements for information of Clauses 8 and 9 of EN 161:2011 shall be complied with.

207) Specified values for the time factor are given in Annex CX of this document.

208) for type 2.P action, the non switching part of the electronic sensors shall be subjected to the test of EN 60730-2-9:2010, 17.101. This test can be combined with the tests of requirement 27 of this table.

For other footnotes to Table 7.2 see EN 60730-2-9:2010 and EN 60730-1.

Annex CX
(normative)

Maximum permissible time factor values

Table CX.1 — Maximum permissible time factor values according to the application

Device code	Operating method	Time factor in seconds for operation in		
		water	air	oil
TR FR	continuous	130	120	160
TR TW TB	two-position characteristic	45	120	60
STW STB	two-position characteristic	45	120	60
Th	continuous	60	–	–
ASW	two-position characteristic	–	30	–
TR, TW, or TB with clip-on sensor	two-position characteristic	120	–	–
ATW	two-position characteristic	–	45	–
ASTB	two-position characteristic	–	60	–

Annex DX
(normative)

Actuator devices with safety functions in heat generating systems

For actuator devices, the requirements of Clauses 1 through to 28 including the figures and all annexes of EN 60730-2-14 are applicable, if relevant, except as follows:

DX.11 Construction *additions:*

DX.11.210 The actuator shall close the actuator element within the closing time declared by the manufacturer (see Annex BX, requirement 207).

DX.11.211 The behaviour of the actuator in case of reduction or failure of the auxiliary energy shall comply with the information provided by the manufacturer (see Annex BX, requirement 208). The actuator shall be fully operational within a voltage range of V_R –15 % to V_R +10 %, in relation to the rated voltage. An electromagnetic actuator shall be suitable for continuous operation at V_R +10 % and the highest permissible ambient temperature. It shall automatically close at a voltage level of V_R –70 %.

DX.11.212 The actuator element shall provide tight shut-off before and after the endurance test (Clause 17). 'Tight shut-off' means adherence to the leakage rate at the shut-off pressure (see Annex BX, requirements 209, 211). The maximum leakage rate is 0,05 % of the kvs-value (see Annex BX, requirement 214) at the shut-off pressure.

DX.11.213 Manually adjustable sealing glands are not permitted.

DX.11.214 Manual actuation of the actuator device shall be possible only if safety shut-off is still operational.

DX.11.215 The actuator element shall be tight to the outside.

The test is performed with the actuator element fully open. The test pressure is 1,5 times the rated pressure. The actuator element is considered tight if, externally, no leakage is perceptible. The test is carried out with water of 25 °C ± 10 K during one minute. The test is carried out before and after the endurance test according to 17.1.3 of EN 60730-1:2011 and EN 60730-2-9:2010.

DX.11.216 The actuator element shall be tight in the fully closed position. 'Tight shut-off' means adherence to the leakage rate declared by the manufacturer (see Annex BX, requirement 209).

For actuator elements closing in the direction of flow, the test is carried out with a test pressure of 0,3 times and 1,0 times the maximum shut-off pressure, with the actuator element in the fully closed position. For actuator elements closing against the direction of flow, the test is carried out with a test pressure representing 1,0 times the maximum shut-off pressure, with the actuator element in the fully closed position. The test is carried out before and after the endurance test according to 17.1.3.

DX.11.217 The quality of the materials used and the shape and sizing of the components shall ensure that they will withstand the resulting mechanical, chemical and thermal stress and provide safe operation for an adequate period of time if the actuator devices are correctly installed and the normal operating, maintenance and setting conditions as specified by the manufacturer are observed. Control pipes with a reduction in their cross-sectional area, which causes the function of the actuator device to change to an unsafe state, shall be protected against dirt (e. g. by a strainer) and against corrosion (e. g. by using stainless materials). They shall have an inner diameter of at least 2 mm. If the control medium is filtered, the inner diameter may be reduced to 1 mm.

DX.11.218 Components intended to generate or transfer closing force shall be designed such that the breaking load will be five times the greatest load occurring under normal operating conditions. This also applies to components of the actuator devices, with the exception of springs. This requirement need not be fulfilled if, in the event that the component fails, the function does not change to an unsafe state and tightness is not be adversely affected.

DX.11.219 Return springs shall be calculated and designed such that they are capable of withstanding oscillating loads and at least 10^6 operating cycles.

If there is no proof of calculation, the spring shall be subjected to an endurance test under realistic operating conditions (load and stroke changes) as follows:

— springs subjected to static loads or loads that change only rarely, that is, springs that shall work only if the auxiliary energy fails: 2×10^5 operating cycles;

— springs subjected to oscillating loads, that is, springs that shall work not only if the auxiliary energy fails but also in normal control operation: 2×10^6 operating cycles.

DX.14 Heating

Heating of the actuator shall comply with the requirements of Clause 14 of EN 60730-1:2011.

DX.17 Endurance *Addition to 17.1:*

An endurance test with 5 000 cycles shall be performed, using water of 130 °C and a test pressure of 4 bar, with the actuator member fully open, and at an ambient temperature of 50 °C.

If the actuator devices are to be used at higher ambient temperatures, then this ambient temperature shall be applied during the endurance test and particularly mentioned within the test report.

After the endurance test an additional 25 000 cycles shall be performed using a gaseous medium at the maximum permissible operating temperature for the medium and at an ambient temperature of 50 °C.

Electrical tests are performed only if the actuator uses electricity and if the tests are applicable.

Annex EX
(informative)

Characteristics of typical temperature sensors and their fault modes

Table EX.1 — Characteristics of typical temperature sensors

	Thermocouples	**Resistance temperature sensors (RTD)**	**Negative Temperature Coefficient Thermistors (NTC)**	**Positive Temperature Coefficient Thermistors (PTC)**	**Semiconductor sensors**
Technology	Junction between two different metals	Metal film resistors, metal wire-wound resistors, metal coil elements; carbon film resistors,	Polycrystalline mixed oxids ceramics	Polycrystalline mixed oxides ceramics	Silicon Diode
Examples	Types B, E, J, K, N, R, S, T	Pt 100, Pt 1000			KTY-…
Function	Output voltage increases with temperature	Resistance increases with temperature	Resistance decreases with temperature	Resistance increases with temperature	Resistance increases with temperature
Standards	EN 60584-3 DIN 43714	EN 60751	–	–	–
Fault mode "Open Circuit"	YES	YES	YES	YES	YES
Fault mode "Short Circuit"	YES	YES [1)]	YES	YES	YES
Fault mode "Drift"	YES (Thermoelectric coefficients of materials in the area of high temperature change with time [2)])	YES [4)]	YES (Conductivity at grain boundaries changes with time; contamination of the ceramics)	YES (Conductivity at grain boundaries changes with time; contamination of the ceramics)	YES
Fault mode "Sensor characteristic changes in principle"	YES [3)]	NO	YES (Conductivity at grain boundaries changes with time; contamination of the ceramics)	YES (Conductivity at grain boundaries changes with time; contamination of the ceramics)	YES [5)]
Fault mode "Sensor characteristic changes by an offset	YES (Offset caused by temperature of the cold junction)	NO	YES	YES	YES
Other fault modes	NO	YES (Partial loss of active area [1)])	YES (Partial loss of active area due to cracks in the ceramics)	YES (Partial loss of active area due to cracks in the ceramics)	YES [5)]

[1)] For coated sensors according to EN 60751:2008 the fault modes "short circuit of the sensor" and "partial loss of active area" can be excluded.
[2)] E.g. refer to: http://www.msm.cam.ac.uk/utc/thermocouple/pages/Drift.html
[3)] For thermocouples according to EN 60584-3 and DIN 43714 mounted in protective tubes the fault mode "Sensor characteristic changes in principle" can be excluded.
[4)] E.g. refer to http://www.burnsengineering.com/document/pdf/a080306.pdf
[5)] If the sensor includes other electronic components (e.g. for amplifiers, transmitters).

Bibliography

[1] EN 161, *Automatic shut-off valves for gas burners and gas appliances*

[2] EN 483, *Gas-fired central heating boilers – Type C boilers of nominal heat input not exceeding 70 kW*

[3] EN 1020, *Non-domestic forced convection gas-fired air heaters for space heating not exceeding a net heat input of 300 kW incorporating a fan to assist transportation of combustion air or combustion products*

[4] EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529)*

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

[6] EN 60584-3, *Thermocouples — Part 3: Extension and compensating cables — Tolerances and identification system (IEC 60584-3)*

[7] EN 60751, *Industrial platinum resistance thermometers and platinum temperature sensors(IEC 60751)*

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

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™