

INTERNATIONAL STANDARD

NORME INTERNATIONALE



AMENDMENT 1
AMENDEMENT 1

Automatic electrical controls –
Part 2-9: Particular requirements for temperature sensing controls
(standards.iteh.ai)

Commandes électriques automatiques –
Partie 2-9: Exigences particulières pour les commandes de détection
de température





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FOREWORD

This amendment has been prepared by subcommittee IEC technical committee 72: Automatic electrical controls.

The text of this amendment is based on the following documents:

FDIS	Report on voting
72/1112A/FDIS	72/1118/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- replaced by a revised edition, or
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Table 1 – Required information and methods of providing information

Replace the existing Note 102 by the following:

In China, the use of liquid metal in or on cooking or food handling equipment is not allowed.

In Canada parts of controls containing mercury is not allowed.

Annex EE – Guide to the application of temperature sensing controls within the scope of IEC 60730-2-9

EE.1.2 Overview

Replace the third paragraph by the following:

Controls classified as type 2 are also assessed to provide a degree of confidence in terms of their operating temperature. Tests are made to determine that the spread of operating temperature in the new condition is within the manufacturer's declared value, and also to

determine that drift of operating temperature is within the manufacturer's declared value after the specified tests.

NOTE A temperature **sensing control** can be classified for more than one purpose, depending upon the application.

EE.3.3 Types of temperature sensing controls according to their purpose

Replace the existing text of this subclause by the following:

EE.3.3.1 Thermostat

Cycling temperature **sensing control**, which is intended to keep a temperature between two particular values under normal operating conditions of the controlled equipment and which may have provision for **setting by the user**. A **thermostat** is therefore also classified as an **operating control** with at least type 1 action (electromechanical) or at least Class A control function (electronic control). A typical usage of **thermostats** is to control the normal running temperature of a room heater or hot plate.

Thermostats are defined in IEC 60335-1 as follows:

thermostat

temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which during normal **operation** keeps the temperature of the controlled part between certain limits by automatically opening and closing a circuit

EE.3.3.2 Temperature limiter

Temperature **sensing control** which is intended to keep a temperature below or above one particular value during normal operating conditions of the controlled equipment and which may have provision for **setting by the user**. A **temperature limiter** is therefore also classified as an **operating control** with Class A control functions. Under certain applications, a **temperature limiter** may be classified as an **operating control** with Class B control functions. A typical usage of a **temperature limiter** with Class A function is to switch off a kettle on boiling.

A **temperature limiter** may be of the automatic or of the manual reset type. It does not make the reverse **operation** during the normal duty cycle of the appliance.

Temperature limiters are defined in IEC 60335-1 as follows:

temperature limiter

temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which during normal **operation** operates by opening or closing a circuit when the temperature of the controlled part reaches a predetermined value

NOTE 1 A **temperature limiter** does not make the reverse **operation** during the normal duty cycle of the appliance. It can require manual resetting.

NOTE 2 A **temperature limiter** control is used to limit the temperature of part of the appliance/equipment during normal **operation** of the appliance. The differential between the operating and remake temperature of a **temperature limiter** is large.

NOTE 3 An electromechanical **temperature limiter** can be either a type 1 or type 2 control depending on the application.

NOTE 4 An electronic **temperature limiter** is classified as an **operating control** with Class A control functions. Under certain applications, a **temperature limiter** may be classified as an **operating control** with Class B control functions.

EE.3.3.3 Thermal cut-out

Temperature **sensing control** intended to keep a temperature below or above one particular value during abnormal operating conditions of the controlled equipment and which has no provision for **setting by the user**. A **thermal cut-out** is therefore also classified as a protective control with a type 2 action (electromechanical) or at least Class B control function (electronic control). Under certain applications, an electronic **thermal cut-out** may be classified as a protective control with Class C control functions, for example, water heaters. Typical usage of **thermal cut-outs** is to provide overheating protection of a room heater, hot plate or water heater.

A **thermal cut-out** may be of the automatic or manual reset type.

Thermal cut-outs are defined in IEC 60335-1 as follows:

a) **thermal cut-out**

device which during abnormal **operation** limits the temperature of the controlled part by automatically opening the circuit, or by reducing the current, and is constructed so that its setting cannot be altered by the user

NOTE 1 A **thermal cut-out** control does not operate during normal **operation** of the appliance. It is used to regulate or limit the temperature of part of the appliance/equipment in fault conditions.

NOTE 2 When a **thermal cut-out** is built-in or on a motor, and is specifically intended to protect the motor against overheating due to running overload and failure to start and carries the motor current and is sensitive to motor temperature and current, it is a **thermal motor protector**. **Thermal motor protectors** are covered by IEC 60730-2-22.

b) **self-resetting thermal cut-out**

thermal cut-out that automatically restores the current after the relevant part of the appliance has cooled down sufficiently

NOTE 1 A **self-resetting thermal cut-out** control does not operate during normal **operation** of the appliance. It is used to regulate the temperature of part of the appliance/equipment in fault conditions.

NOTE 2 A **self-resetting thermal cut-out** is normally a type 2 control depending on the application and a declaration of number of cycles is between 300 and 10 000 (depending upon the end product application).

c) **non-self-resetting thermal cut-out**

thermal cut-out that requires a manual **operation** for resetting, or replacement of a part, in order to restore the current

NOTE 1 Manual **operation** includes disconnection of the appliance from the supply mains.

NOTE 2 A **non-self- resetting thermal cut-out** control does not operate during normal **operation** of the appliance. It is used to limit the temperature of part of the appliance/equipment in fault conditions and can disconnect the appliance from the supply mains.

NOTE 3 A **non-self- resetting thermal cut-out** control is usually a type 2 control that provides either micro-disconnection or full-disconnection. A declaration of the number of cycles of **operation** would be at least 30 cycles.

The following **thermal cut-out** is not specifically defined in IEC 60335 but can be used in appliances:

voltage maintained thermal cut-out

thermal cut-out which is maintained in its operated condition by the voltage which appears across it in that condition

NOTE 1 A **voltage maintained thermal cut-out** control can only be reset if the appliance is disconnected from the electrical supply.

NOTE 2 A **voltage maintained thermal cut-out** control does not operate during normal **operation** of the appliance. It is used to limit the temperature of part of the appliance/equipment in fault conditions and can disconnect the appliance from the supply mains.

NOTE 3 A **voltage maintained thermal cut-out** control is a type 2 control. A declaration of the number of cycles of **operation** would be at least 1 000 cycles.

EE.3.3.3.1 Motor protector

Automatic control that is specifically intended to protect the windings of an electric motor from overheating.

EE.3.3.3.2 Thermal motor protector

Automatic control, built-in or on a motor, that is specifically intended to protect the motor against overheating due to running overload and failure to start. The control carries the motor current and is sensitive to motor temperature and current.

NOTE 1 These are covered by IEC 60730-2-22.

NOTE 2 If it is not built-in or on a motor, does not carry the motor current, is not sensitive to motor temperature and current, it is a **thermal cut-out**, which is covered by IEC 60730-2-9.

EE.3.3.4 Single operation device (SOD)

EE.3.3.4.1 Bimetallic

Control having a bimetallic temperature **sensing element**, which is intended to operate only once, and then requires complete replacement. A **single operation device** is therefore also classified as a **protective control** with type 2 action (electromechanical). Typical usage of single **operation** devices is to provide overheating protection of an electric kettle or water heater.

A bimetallic single **operation** device does not reset above a declared temperature.

EE.3.3.4.2 Non-bimetallic

A **non-bimetallic single operation device** denotes a control having a non-bimetallic sensing device, the **operation** of which cannot be separated from other functions of the control, and which operates only once and then requires complete replacement. Such a device is classified as a protective control.

If such parts can be tested separately, then they are identified as thermal links, which are not within the scope of IEC 60730-2-9 and are covered by IEC 60691.

Typical usage of single **operation** devices is to provide overheating protection of an electric kettle or water heater.

EE.3.3.5 Protective controls

These are defined in IEC 60335-1 as follows:

protective device

device, the **operation** of which prevents a hazardous situation under abnormal **operation** conditions

NOTE 1 The aim of a **protective device** is to reduce the risk of a hazard by restoring the appliance to a fail-safe under abnormal conditions of the end product. Based on the application, the protective device could be automatically or manually resettable. Examples of a temperature protective device are **single operation devices (SOD)**, **thermal links** and **thermal cut-outs**.

NOTE 2 An electromechanical **protective device** control is a type 2 control. A declaration of the number of cycles of **operation** would be 1 cycle.

NOTE 3 An electronic **protective device** is classified as a control with Class B or C control functions (depending upon the application).

EE.3.4 Features of automatic action**EE.3.4.1 Controls are classified either as type 1 or type 2**

Replace the first two paragraphs as follows:

A **type 1** control is tested fully to determine inherent safety, but is not tested to determine operating temperature consistency, either in the new condition, or after the specified tests. Type 1 controls are therefore intended to be used in applications where the controlled temperature is not critical, in terms of performance or safety of the controlled equipment.

A **type 2** control is tested for inherent safety and for consistency of operating temperature, both in new condition, to check that the operating temperature is within the manufacturers' declared manufacturing tolerance (**manufacturing deviation**), and also for the change in operating temperature (drift) after the specified tests.

Add the following new subclauses:

EE.3.17 Definitions of type of control according to construction**electronic control**

a control which incorporates at least one electronic device

EE.3.18 Definitions relating to classes of control functions

For the evaluation of protective 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.

NOTE A control function consists of the entire loop beginning with the sensing means through the processing circuitry (hardware and software if used) and including the actuator drive.

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

a) class A control function

control functions which are not intended to be relied upon for the safety of the application

NOTE 1 Examples are: room **thermostats**, temperature control.

b) class B control function

control functions which are intended to prevent an unsafe state of the appliance

NOTE 1 Failure of the control function will not lead directly to a hazardous situation.

NOTE 2 Examples are: thermal limiter, pressure limiter.

c) class C control function

control functions which are intended to prevent special hazards such as explosion or whose failure could directly cause a hazard in the appliance

NOTE 1 Examples include **thermal cut-outs** for closed water systems (without vent protection).

Table EE.1 – Typical examples of the classification of temperature sensing controls in accordance with IEC 60730-2-9

Replace the existing table by the following:

Table EE.1 – Typical examples of the classification of temperature sensing controls in accordance with IEC 60730-2-9

Declaration/ Actions	Control applications												
	TRH	MTC RH	TC EK	TL EK	ART CSH	MTC SH	TC RC	TC RH	TC HD	TCT	TCF	TC WH	TC SP
Type 1	X			X									
Type 2		X	X		X	X	X	X	X	X	X	X	X
A				X									
B		X	X		X	X	X	X	X	X	X	X	X
C	X			X									
Y												X	X
D		X				X							
E													
F		X	X										
G						X							
H		X											
J													
K		X											
L	X	X											
M		X											
N													
P		X											
X													
Z													
AK													
AM													
Class A control function ^c	x			X									
Class B control function ^c		X	X		X	X	X	X	X	X	X	X ^a	X
Class C control function ^c												X ^b	
Electronic circuit faults with regard to functional safety		FF	FF		FF	FF	FF	FF	FF	FF	FF	SF ^b FF ^a	FF

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Control application codes:	
Control application	Code
Thermostat in room heaters	TRH
Manual reset thermal cut-out in room heaters (small)	MTCRH
Thermal cut-out for electric kettles	TCEK
Temperature limiter in electric kettles	TLEK
Auto reset thermal cut-out in space heaters (dwelling)	ARTCSH
Manual reset thermal cut-out in space heaters	MTCSH
Thermal cut-out for refrigerator compressor control (for thermal motor protector, refer to IEC 60730-2-22)	TCRC
Thermal cut-out for room heaters	TCRH
Thermal cut-out for hair dryers	TCHD
Thermal cut-out for transformers	TCT
Thermal cut-out for fans	TCF
Thermal cut-out for water heaters	TCWH
Thermal cut-out for spa applications	TCSP
^a First fault applies to non-closed water heater applications ^b First and second fault applies to closed water heater applications. ^c Control functions generally apply to electronic controls.	
Component fault code:	
Component fault	Code
First fault	FF
First and second fault	SF

Add the following new Clause EE.5:

EE.5 Examples of controls used with domestic appliances

EE.5.1 General usage of controls in appliances

See Figure EE.8 for a typical representation of controls evaluated to IEC 60730-2-9 used in appliances.

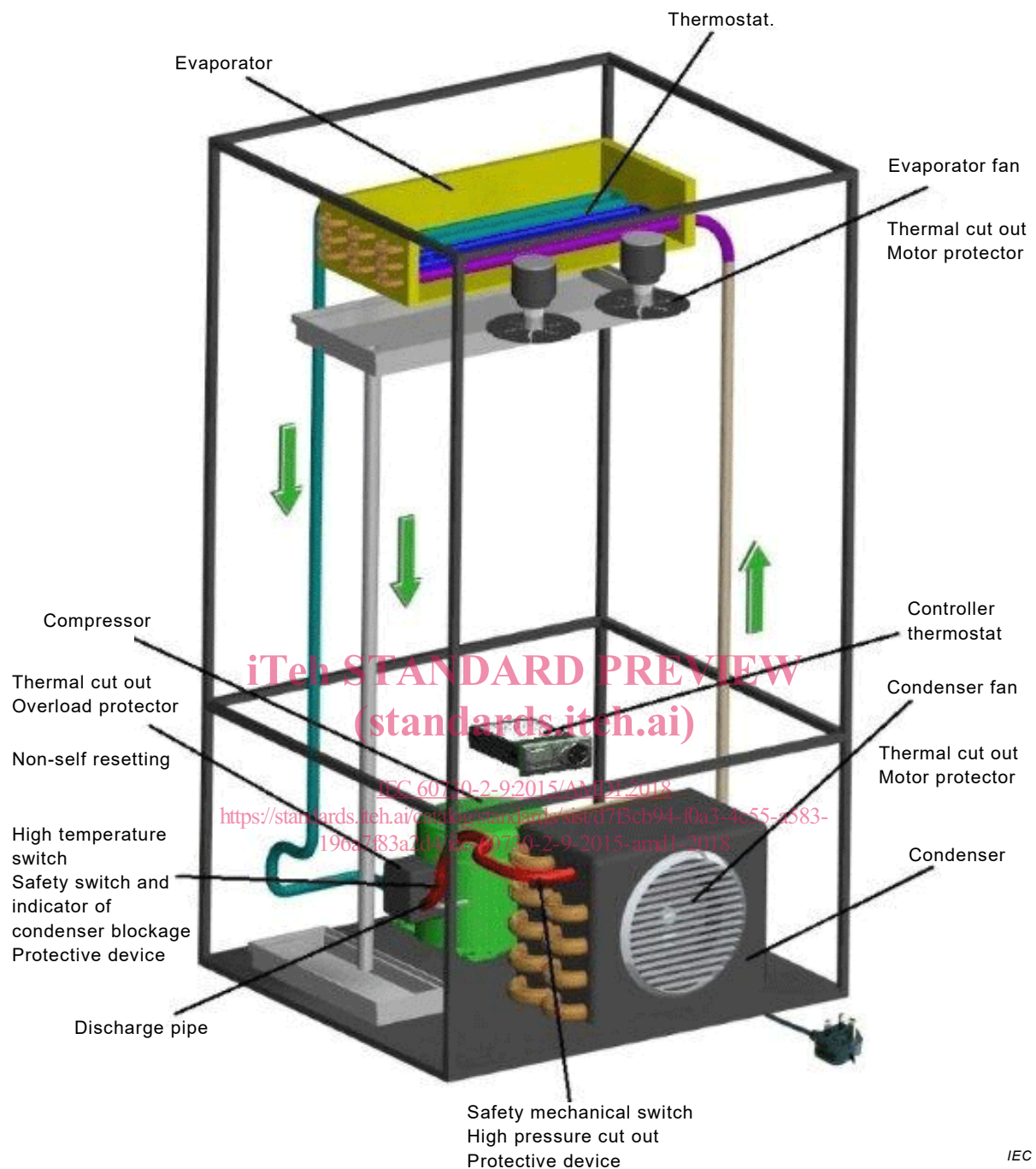


Figure EE.8 – Schematic diagram showing usage of various controls approved to IEC 60730-2-9

EE.5.2 Examples of which device is expected to operate during the tests of Clauses 11 and 19 of IEC 60335 (all parts)

Table EE.2 provides examples of applications where the controls are expected to operate during the tests of Clauses 11 and 19 of IEC 60335 (all parts)

Table EE.2 – Examples of controls expected to operate during Clauses 11 and 19 of IEC 60335 (all parts)

Iron IEC 60335-2-3	Thermostat operates (cycles) during the test of normal operation tests of Clause 11. SOD / thermal fuse / current fuse operate during the abnormal operation tests of Clause 19
Washing machine IEC 60335-2-7	Thermostat operates / cycles during the test of normal operation tests of Clause 11. SOD / thermal fuse / current fuse operate during the abnormal operation tests of Clause 19
Toaster IEC 60335-2-9	Temperature limiter / thermostat operate during the test of normal operation tests of Clause 11. Thermal cut-out / SOD / thermal fuse / current fuse operate during the abnormal operation tests of Clause 19
Kettle IEC 60335-2-15	Temperature limiter / thermostat operate during the test of normal operation tests of Clause 11. Thermal cut-out / SOD / thermal fuse / current fuse operate during the abnormal operation tests of Clause 19
Electric blanket IEC 60335-2-17	Temperature limiter / thermostat operate during the test of normal operation tests of Clause 11. Thermal cut-out / SOD / thermal fuse / current fuse operate during the abnormal operation tests of Clause 19
Skin or hair care IEC 60335-2-23	Temperature limiter / thermostat operate during the test of normal operation tests of Clause 11. SOD / thermal fuse / current fuse operate during the abnormal operation tests of Clause 19
Battery chargers IEC 60335-2-29	Temperature limiter / thermostat operate during the test of normal operation tests of Clause 11. Thermal cut-out / SOD / thermal fuse / current fuse operate during the abnormal operation tests of Clause 19
Panel heater IEC 60335-2-30	Thermostat operates during the test of normal operation tests of Clause 11. Thermal cut-out / SOD / thermal fuse / current fuse operate during the abnormal operation tests of Clause 19

Table EE.3 provides a correlation between the various part 2 standards of IEC 60335 to the type of action and functionality of various controls used in the particular products.