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Responsible committee: CPL/72 Electrical control devices for household equipment and appliances

Interested committees:

Title: BS EN IEC 60730-2-23 Automatic electrical controls

Part 2-23: Particular requirements for electrical sensors and sensor elements

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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Introduction

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

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

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



72/1295/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 60730-2-23 ED1

DATE OF CIRCULATION:

2022-02-04

CLOSING DATE FOR COMMENTS:

2022-04-29

SUPERSEDES DOCUMENTS:

72/1165/NP, 72/1177C/RVN

IEC TC 72 : AUTOMATIC ELECTRICAL CONTROLS

SECRETARIAT:

United States of America

SECRETARY:

Mr Joseph Musso

OF INTEREST TO THE FOLLOWING COMMITTEES:

TC 23, SC 23B, SC 23J

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☒ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☒ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Automatic electrical controls - Part 2-23: Particular requirements for electrical sensors and sensing elements

NOTE FROM TC/SC OFFICERS:

This CD for 60730-2-23 is based on the latest CDV (72/1249/CDV) for IEC 60730-1, edition 6 which is currently being prepared for the FDIS stage in the near future. Any changes resulting from the Part 1, edition 6 FDIS will be considered prior to the CDV stage of IEC 60730-2-23, to ensure that the final publication of IEC 60730-2-23 is based on the final published (IS) version of the part 1.

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FOREWORD

This draft International Standard IEC 60730-2-23 has been prepared by WG12, Electrical sensors, of IEC technical Committee 72: Automatic electrical controls.

This part 2-23 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the future publication of Edition 6.0.

This part 2-23 supplements or modifies the corresponding clauses in 60730-1, Ed 6.0 (from 17/1249/CDV), so as to convert that publication into the IEC standards: Safety requirements for electrical sensors and sensing elements.

Where this part 2-23 states “addition”, “modification”, or “replacement”, the relevant requirement, test specification or explanatory matter in Part 1 should be adapted accordingly.

Where no change is necessary, this part 2-23 indicates that the relevant clause or subclass in the Part 1 applies.

Sensor manufacturers may refer to this Part 2 as a template to understand how to apply the relevant clauses in the Part 1 and to begin designing sensors and sensing elements and apply these requirements for their devices.

AUTOMATIC ELECTRICAL CONTROLS -

Part 2-23: Particular requirements for electrical sensors and sensing elements

1 Scope and normative references

1.1 Scope

Replacement:

This part of IEC 60730 applies to the safety of electrical, electro-mechanical and electronic sensors including sensing elements and any conditioning circuitry. Sensors covered under the scope of this document serve only to transform an activating quantity into a usable output and do not perform a control **operation** as defined in the part 1.

This document applies to discrete sensing elements in so far as defining the reliability and accuracy of its inherent operating characteristics and corresponding response.

Sensors, as defined herein, are used within controls or as independent devices used in connection with controls and control systems.

This document applies to discrete sensors constructed of, but not limited to, conductor, semi-conductor, or substrate, for the detection of activating quantities such as temperature, pressure, humidity, light (e.g. optical), gasoline vapours, and the like.

Note: Future consideration will be given to other sensors technologies constructed of other materials such as, chemical, mechanical and Micro-Electromechanical Systems (MEMS), along with other activating quantities like mass flow, liquid, movement, weight, vibration, or other as needed.

This document applies to any electronic hardware, software, or other conditioning circuits that are inherent to the sensor and relied upon to reliably transform the input signal into a useable response signal (output) for functional safety purposes. Conditioning circuits that are inseparable from the control for which the sensing element relies upon to perform its desired function are evaluated by the requirements of the relevant control Part 2 standard and/or the Part 1, IEC 60730-1.

Note 1: Additional requirements may be also applied by the application standard in which the sensor is used.

Throughout this document, whenever it is indicated that the Part 1 requirements are applicable, the term “control(s)”, is replaced by the term “sensor(s)”, and the term “equipment” is replaced by the term “control”, as they are used in the Part 1, respectively, unless otherwise specified herein.

This document does not apply to sensors explicitly described in another relevant part 2 of the IEC 60730 series.

Note 2: For example, a flame sensor as described in 60730-2-5.

This document does not apply to flame supervision devices and thermocouples that are already described in ISO 23551-6 and ISO 23551-8, respectively.

This document does not apply to sensors used for laboratory measurement equipment covered under standard IEC 61010-1, Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

55

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

IEC 60539-2, *Directly heated negative temperature coefficient thermistors – Part 2: Sectional specification – Surface mount negative temperature coefficient thermistors*

IEC 60730-1, *Automatic electrical controls – Part 1: General requirements.*

IEC 60738-1, *Thermistors - Directly heated positive temperature coefficient - Part 1: Generic specification*

IEC 60738-1-1, *Thermistors - Directly heated positive step-function temperature coefficient - Part 1-1: Blank detail specification – Current limiting application – Assessment level EZ*

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements*

ISO 23551-6, *Safety and control devices for gas burners and gas-burning appliances – Particular requirements – Part 6: Thermoelectric flame supervision controls*

ISO 23551-8, *Safety and control devices for gas burners and gas-burning appliances – Particular requirements – Part 8: Multifunctional controls*

71

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

3.1 Definitions relating to ratings, voltages, currents, frequencies and wattages

Additional definitions:

3.1.101

signal

physical variable quantity, one or more parameters of which carry information about one or more variable quantities

Note 1 to entry: These parameters are designated “information parameters”.

Note 2 to entry: This entry was numbered 351-21-51 in IEC 60050-351:2006.

82 [SOURCE: IEC 60050-351:2011, 351-41-17]

83 3.2 Definitions of types of control according to purpose

84 *Additional definitions:*

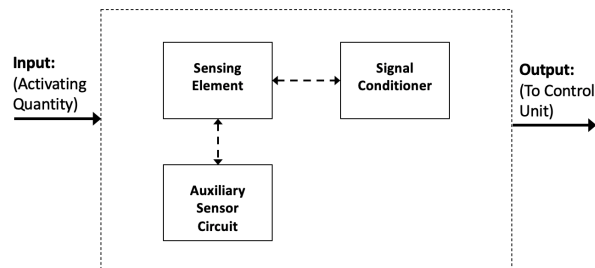
85 3.2.101

86 **sensor**

87 device that embodies a **sensing element**, which is directly affected by the activating quantity and which
88 generates a signal related to the value of the activating quantity and may also include an **auxiliary**
89 **sensor circuit**, and/or **signal conditioner**

90 Note to entry: when the term “sensor” is used throughout this document in a general way, it refers to all types of sensors unless
91 otherwise noted.

92



93

94

95 3.2.102

96 **temperature sensor**

97 **temperature sensing element**

98 device designed to respond to temperature providing a usable signal

99 [SOURCE: IEC 60050-426:2020, 426-20-44]

100 Note to entry: Example include thermocouples, resistance temperature detector (RTD), etc.

101 3.2.103

102 **gas vapour sensor**

103 device designed to respond to the presence of a specific concentration of gas vapour(s) providing a
104 usable signal

105 Note to entry: Gas vapour sensors can detect flammable or non-flammable gas vapours.

106 3.2.104

107 **pressure sensor**

108 device designed to respond to pressure of gas(es) or liquid(s) providing a usable signal

109 3.2.105

110 **optical sensor**

111 device designed to respond to light providing a usable signal

112 3.2.106

113 **humidity sensor**

114 device designed to respond to **humidity** providing a usable signal

115 Note to entry: Humidity sensors usually have two sensing elements within the sensor. One to measure the moisture and the
116 other temperature.

- 117 **3.2.107**
118 **current sensor**
119 device designed to respond to the electrical current providing a usable signal
- 120 **3.2.108**
121 **voltage sensor**
122 device designed to respond to voltage providing a usable signal
123 Note to entry: A voltage sensor may perform other integral functions as part of the output signal such as to calculate and/or
124 monitor the voltage of an object.
- 125
- 126 **3.3 Definitions relating to the function of controls**
- 127 **3.3.4 – 3.3.9** Not applicable
- 128 **3.3.15** Not applicable
- 129 **3.3.25** Not applicable
- 130 **3.3.29** Replace “switch head” by “sensing element or sensor”
- 131 **2.3.31** Not applicable
- 132 **3.4 Definitions relating to disconnection and interruption**
133 Not applicable.
- 134 **3.5 Definitions of types of control according to construction**
135 3.5.3 and 3.5.4, not applicable.
136 3.5.6 – 3.5.12, not applicable.
- 137 **3.8 Definitions relating to component parts of controls**
138 *Replacement.*
- 139 **3.8.1**
140 **sensing element**
141 functional device that senses the effect of a measurand at its input and places a corresponding
142 measurement (electrical) signal at its output
- 143 [SOURCE: IEC 60050-351:2013, 351-56-26]
- 144 *Additional definitions.*
- 145
- 146 **3.8.101**
147 **auxiliary sensor circuit**
148 circuit that provides additional functions in order to ensure correct functioning of the sensor (e.g. heating
149 the sensing element, power supply, etc.)
- 150 **3.8.102**
151 **signal conditioner**
152 part of a sensor that either transforms the signal from the sensing element or conditions the signal into
153 the desired signal type
- 154 **3.13 Miscellaneous definitions**
155 *Additional definitions.*

156 **3.13.101**157 **humidity**

158 a quantity representing the amount of water vapour in the atmosphere, or in a gas, relative to the
159 temperature of the air or gas

160 **3.15 Definitions pertaining to thermistors**

161 Not applicable except as follows:

162 *Additional definitions:*

163 **3.15.101**164 **PTC thermistor**

165 positive temperature coefficient (**PTC**) **thermistor** that exhibits an increase in resistance with increasing
166 temperature over the useful portion of the resistance/temperature (R/T) characteristic

167 Note 1 to entry: **PTC thermistors** also exhibit a decreasing resistance with applied voltage as a secondary effect.

168 Note 2 to entry: For a **PTC thermistor**, the significant portion of the resistance/temperature characteristic is usually the portion
169 in which a step-like increase in resistance occurs in a temperature increment, usually preceded by a gradual change in resistance
170 at lower temperatures, and a similar gradual change at temperatures above the step-like increase. The resistance/temperature
171 characteristic of some **PTC thermistors** can take on a negative slope after a slight gradual increase following the step-like
172 increase.

173 **3.15.101.1**174 **ceramic PTC**175 **CPTC**

176 PTC thermistor made of doped polycrystalline ceramic material

177 **3.15.101.2**178 **polymeric PTC**179 **PPTC**

180 PTC thermistor made of non-conductive crystalline organic polymer matrix impregnated with carbon
181 black particles

182 **3.15.102**183 **NTC thermistor**

184 negative temperature coefficient (**NTC**) **thermistor** that exhibits a decrease in resistance with increasing
185 temperature over the useful portion of the resistance/temperature characteristic

186 **3.15.103**187 **beta value**188 **β value**

189 **NTC thermistor's** index, which expresses the degree of resistance change when calculated from any
190 two points specified by the manufacturer on the resistance/temperature (R/T) curve

191 **3.15.104**192 **$R_{\min}$**

193 for a **PTC thermistor**, point of minimum resistance on the R/T curve

194 **3.15.105**195 **R_x (R_{25})**

196 rated **resistance** at a temperature specified by the manufacturer for R_x or at $25\text{ }^{\circ}\text{C} \pm 2\text{ K}$ for R_{25}

197 **3.15.106**198 **switching resistance**199 **R_{sw}**

200 for a **PTC thermistor**, **resistance** value at which the **resistance** begins to increase sharply with
201 temperature increase