



DPC: 23 / 30472047 DC

## BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 29 March 2023

Origin: International

**Latest date for receipt of comments: 19 April 2023**

Project No. 2019/00795

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 sensing 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

**WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD.  
THIS DRAFT IS NOT CURRENT BEYOND 19 April 2023**

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email [cservices@bsigroup.com](mailto:cservices@bsigroup.com). British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <http://standardsdevelopment.bsigroup.com>

Responsible Committee Secretary: **Mr Simon Bounds (BSI)**Direct tel: **0208 996 7281**E-mail: [simon.bounds@bsigroup.com](mailto:simon.bounds@bsigroup.com)

## 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 |
|------------------|------------------------|

| 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.                                       |                                                    |

PROJECT NUMBER:

**IEC 60730-2-23 ED1**

DATE OF CIRCULATION:

**2023-03-24**

CLOSING DATE FOR COMMENTS:

**2023-05-19**

SUPERSEDES DOCUMENTS:

**72/1322/CD, 72/1349/CC**

IEC TC 72 : AUTOMATIC ELECTRICAL CONTROLS

SECRETARIAT:

United States of America

SECRETARY:

Ms Grace Roh

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.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

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

NOTE FROM TC/SC OFFICERS:

Previous DCs and related INFs:

- 72/1247/DC and 72/1269/INF
- 72/1270/DC and 72/1281/INF
- 72/1283/DC and 72/1294/INF

Previous CDs and related CCs:

- 72/1295/CD and 72/1321/CC
- 72/1322/CD and 72/1349/CC

**Copyright © 2023 International Electrotechnical Commission, IEC.** All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## AUTOMATIC ELECTRICAL CONTROLS –

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

## 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 publication of Edition 6.0.

This part 2-23 supplements or modifies the corresponding clauses in 60730-1, Ed 6.0 (from 72/1307/FDIS), 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.

**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 sensors in so far as defining the reliability and accuracy of its inherent operating characteristics and corresponding response under normal and abnormal conditions within the sensor. Sensors, as defined herein, are used in conjunction within the scope of automatic electrical controls or as independent devices used in connection with controls and control systems.

The use of this document for other applications in which sensors are used is possible provided that the appropriate safety is maintained as defined by the end product standard. 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 voltage, current, 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 sensing element(s) as well as 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.

## 1.2 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 60751, *Industrial platinum resistance thermometers and platinum temperature sensors*

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*

### 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.

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

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

*Additional definitions:*

##### 3.2.101

##### **sensor**

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

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

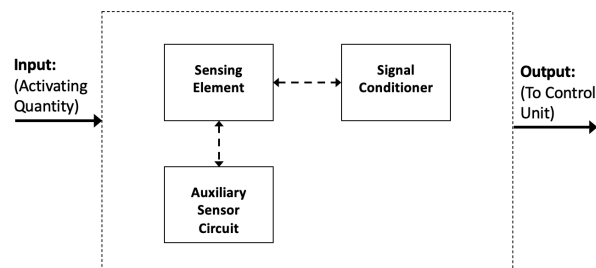


**Figure 1. Example: Schematic diagram of a typical sensor**

##### 3.2.102

##### **temperature sensor**

device designed to respond to temperature providing a usable signal

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

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

##### 3.2.103

##### **gasoline vapour sensor**

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

Note to entry: Gasoline vapour sensors can detect flammable or non-flammable gasoline vapours.

- 111 **3.2.104**  
112 **pressure sensor**  
113 device designed to respond to pressure of gas(es) or liquid(s) providing a usable signal
- 114 **3.2.105**  
115 **optical sensor**  
116 device designed to respond to light providing a usable signal
- 117 **3.2.106**  
118 **humidity sensor**  
119 device designed to respond to **humidity** providing a usable signal
- 120 Note to entry: Humidity sensors usually have two sensing elements within the sensor. One to measure the moisture and the  
121 other temperature.
- 122 **3.2.107**  
123 **current sensor**  
124 device designed to respond to the electrical current providing a usable signal
- 125  
126 **3.2.108**  
127 **voltage sensor**  
128 device designed to respond to voltage providing a usable signal
- 129 Note to entry: A voltage sensor may perform other integral functions as part of the output signal such as to  
130 calculate and/or monitor the voltage of an object.
- 131  
132 **3.3 Definitions relating to the function of controls**
- 133 **3.3.4 – 3.3.9** Not applicable
- 134 **3.3.15** Not applicable
- 135 **3.3.24** Not applicable
- 136 **3.3.29** Replace “switch head” by “sensing element or sensor”
- 137 **3.3.31** Not applicable
- 138 **3.4 Definitions relating to disconnection and interruption**  
139 Not applicable.
- 140  
141 **3.5 Definitions of types of control according to construction**
- 142 3.5.3 and 3.5.4, not applicable.  
143 3.5.6 – 3.5.12, not applicable.  
144
- 145 **3.8 Definitions relating to component parts of controls**
- 146 *Replacement.*
- 147 **3.8.1**  
148 **sensing element**  
149 functional device that senses the effect of a measurand at its input and places a corresponding  
150 measurement (electrical) signal at its output
- 151 [SOURCE: IEC 60050-351:2013, 351-56-26]
- 152 Note to entry: In general, a sensing element does not include an enclosure, or any signal conditioning circuits.  
153

154 *Additional definitions.*

155

156 **3.8.101**

157 **auxiliary sensor circuit**

158 circuit that provides additional functions in order to ensure correct functioning of the sensor (e.g. heating the  
159 sensing element, power supply, etc.)

160 **3.8.102**

161 **signal conditioner**

162 part of a sensor that either transforms the signal from the sensing element or conditions the signal into  
163 the desired signal type

164 **3.13 Miscellaneous definitions**

165 *Additional definitions.*

166

167 **3.13.101**

168 **humidity**

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

171 **3.15 Definitions pertaining to thermistors**

172 Not applicable except as follows:

173 *Additional definitions:*

174 **3.15.101**

175 **PTC thermistor**

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

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

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

184 **3.15.101.1**

185 **ceramic PTC**

186 **CPTC**

187 PTC thermistor made of doped polycrystalline ceramic material

188 **3.15.101.2**

189 **polymeric PTC**

190 **PPTC**

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

193 **3.15.102**

194 **NTC thermistor**

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