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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.

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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.	

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IEC TC 44 : SAFETY OF MACHINERY - ELECTROTECHNICAL ASPECTS		
SECRETARIAT: United Kingdom		SECRETARY: Mrs Nyomee Hla-Shwe Tun
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 65		HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Electromagnetic Compatibility,Safety		

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TITLE:

Safety of machinery - Requirements for cableless control systems of machinery

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF MACHINERY –
CABLELESS CONTROL SYSTEMS OF MACHINERY: GENERAL
REQUIREMENTS****FOREWORD**

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

FDIS	Report on voting
44/783/FDIS	44/785/RVD

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

The French version of this standard has not been voted upon.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

112 The committee has decided that the contents of this document will remain unchanged until the
113 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to
114 the specific document. At this date, the document will be:

- 115 • reconfirmed,
- 116 • withdrawn,
- 117 • replaced by a revised edition, or
- 118 • amended.

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INTRODUCTION

Cableless control systems (CCS) are increasingly being used to provide an operator interface on a wide range of machinery. The functions of a CCS and the way in which they interface with the overall machine control system can therefore affect the safety of the machinery. The risk assessment can require the CCS to incorporate safety-related functions; in this case the CCS becomes a safety-related cableless control system (SR-CCS).

IEC 62745 specifies requirements for the functions of a cableless control system incorporating safety-related functions that is interfaced with or is part of a machine control system for use as an operator control station on a machine. Additional requirements can be necessary for particular applications.

The extent to which the safety-related functions of a CCS are relied upon to reduce risk on a machine is a key selection criterion. It is therefore important to select a CCS that provides suitable control functions with an appropriate safety integrity in accordance with the risk assessment at the machine.

SAFETY OF MACHINERY – CABLELESS CONTROL SYSTEMS OF MACHINERY: GENERAL REQUIREMENTS

1 Scope

This standard specifies requirements for the functionality and interfacing of cableless control systems, including safety-related functions, that provide cableless communication (for example radio, infra-red) between operator control station(s) and the control system of a machine. Specific requirements are included for operator control stations that are movable or portable by the operator. This document does not deal with cableless communication between parts of a machine(s) that are not operator control stations.

This document is not intended to specify all the necessary requirements for the design and construction of a cableless control system. For example, it does not specify communication protocols, frequency or bandwidth aspects, nor the full range of constructional requirements such as impact resistance, ingress protection, electromagnetic compatibility, etc.

The provisions of this document are intended to be applied in addition to the requirements for electrical equipment in relevant parts of IEC 60204 series.

This document is a type-B2 standard as stated in ISO 12100.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-27:2008, Environmental testing – Part 2-27: Tests - Test Ea and guidance: Shock

IEC 60068-2-31:2008, *Environmental testing – Part 2-31: Tests – Test Ec – Rough handling shocks, primarily for equipment-type specimens*

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 60947-5-5:1997+AMD1:2005+AMD2:2016, *Low-voltage switchgear and controlgear – Part 5-5: Control circuit devices and switching elements – Electrical emergency stop device with mechanical latching function*

IEC 61310 (all parts), *Safety of machinery – Indication, marking and actuation*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 62061:2021, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*

181 ISO 13849-1:2023, *Safety of machinery – Safety-related parts of control systems – Part 1:*
 182 *General principles for design*

183 ISO 13849-2:2012, *Safety of machinery – Safety-related parts of control systems – Part 2:*
 184 *Validation*

185 ISO 13850:2015, *Safety of machinery – Emergency stop function– Principles for design*

186

187 **3 Terms, definitions and abbreviations**

188 For the purposes of this document, the following terms, definitions and abbreviations apply.

189 **Table 1 – Alphabetical list of definitions**

Term	Definition number
active stop	3.18
address code	3.8
automatic stop	3.20
base station	3.14
cableless control	3.1
cableless control system	3.2
safety-related cableless control system	3.3
disabling of a remote station	3.23
error detection code	3.10
frame	3.7
Hamming distance	3.12
manual stop	3.21
neutral frame	3.11
OFF-state	3.16
operating command signal	3.9
operator control station	3.6
passive stop	3.19
receiver	3.4
remote station	3.13
safety-related stop function	3.17
stop output	3.15
transmitter	3.5
valid signal	3.22
cybersecurity	3.25

190

Table 2 – Abbreviations

Term	Abbreviation
automatic stop (4.7.3.5)	ATS
cableless control system (3.2)	CCS
safety-related cableless control system (3.3)	SR-CCS
emergency stop (4.7.3.4)	EMS
general safe stop (4.7.3.3)	GSS
remote station (3.14)	RST
base station (3.15)	BST

3.1**cableless control**

transmission of the machine operator's commands without any wired connection

3.2 cableless control system**CCS**

system that consisting of at least one remote station and one base station, which uses cableless control to transmit commands, controls signals and data between them

3.3**safety-related cableless control system****SR-CCS**

cableless control system that includes safety-related functions

Note 1 to entry: In the Ed. 1 of this document safety-related cableless control system was named only CCS.

Note 2 to entry: To be considered a safety-related cableless control system it complies with all applicable requirements of this Standard.

3.4**receiver**

part of a cableless control system which receives frames from a transmitter

3.5**transmitter**

part of a cableless control system which sends frames to a receiver

3.6**operator control station**

assembly of one or more control actuators (part of a device to which an external manual action is to be applied by an operator) fixed on the same panel or located in the same enclosure

Note 1 to entry: An operator control station can also contain related equipment, for example, potentiometers, signal lamps, instruments, display devices, etc.

3.7**frame**

"packet" of information exchanged between a remote station and a base station, and consisting of, for example:

a) address code;

b) operating command signals;

- 226 c) error detection code;
227 d) other commands, signals or information

228 Note 1 to entry: Sometimes “frame” is also called “telegram” or “message”.

229 3.8

230 address code

231 part of a frame that identifies the intended receiver of the frame

232 Note 1 to entry: The base station or remote station respond to commands that have the relevant address code.

233 3.9

234 operating command signal

235 3.10 control signal that is intended to initiate, set or maintain a machine operation

236 error detection code

237 information included in each frame to enable the detection of transmission errors

238 3.11

239 neutral frame

240 frame in which all operating command signals are in a state such that when it is received at the
241 base station it does not activate any outputs intended for control of hazardous operations of the
242 machine

243 Note 1 to entry: Neutral frames can be used to maintain communication (i.e. a valid signal) between a transmitter
244 and receiver, for example to preclude automatic initiation of the stop function at a machine.

245 Note 2 to entry: Neutral frame transmission is intended to prevent unexpected or unintended behaviour of the SR-
246 CCS resulting from establishment or re-establishment of communication.

247 Note 3 to entry: Neutral frames can contain data, for example parameterisation data, and commands that are not
248 intended to cause hazardous operations of the machine.

249 3.12

250 Hamming distance

251 number of bit positions in which any two frames of the same length differ from each other

252 3.13

253 remote station

254 part of a safety-related cableless control system which is not physically connected to the
255 machine control system intended to control the operations of the machine

256 Note 1 to entry: The remote station of a cableless control system is sometimes referred to as a “transmitter”, but a
257 remote station that is part of a bi-directional cableless control system will incorporate both a transmitter and a
258 receiver.

259 Note 2 to entry: The remote station forms the operator control station of a cableless control system.

260 Note 3 to entry: The remote station can be portable or non-portable

261 3.14

262 base station

263 part of the safety-related cableless control system physically connected to the machine control
264 system

265 Note 1 to entry: The base station of a cableless control system is sometimes referred to as a “receiver”, but a base
266 station that is part of a bi-directional cableless control system will incorporate both a receiver and a transmitter.

267 Note 2 to entry: The base station can be installed on stationary or mobile machines.

268 Note 3 to entry: The base station is not necessarily a discrete physical entity, but it includes all of the components
269 that fulfill the requirements specified in this standard for the base station.

3.15**stop output**

output circuit of the base station that interfaces with the control system of the machine to initiate a stop function

Note 1 to entry: Stop outputs can be safety-related or non-safety-related. See also Table 3.

Note 2 to entry: Interfaces to field bus part of a SR-CCS base station can also be considered as a stop output circuit.

3.16**OFF-state**

state of safety-related stop output(s) of the base station used to initiate one or more stop functions of a machine

3.17**safety-related stop function**

stop function provided by the SR-CCS that results in an OFF-state and whose failure can result in an immediate increase of the risk(s)

3.18**active stop**

stop resulting from transmission of a stop signal from the remote station to the base station

3.19**passive stop**

safety-related stop resulting from absence of a valid signal at the base station

Note 1 to entry: A passive stop can be initiated by, for example, an out of range condition, battery failure, electromagnetic interference.

3.20**automatic stop**

safety-related stop initiated without manual actuation of a device by an operator

3.21**manual stop**

stop initiated by actuation of a device by an operator

3.22**valid signal**

any received frame, including a neutral frame, that is accepted by the error checking routines of the receiver and contains the relevant address code for the receiver

3.23**disabling of a remote station**

deliberate operation that makes a remote station unable to communicate with the base station

3.24**cybersecurity**

set of activities necessary to protect SR-CCS and information systems of the SR-CCS, the users of such systems, and other persons from cyber threats, typically regarding the aspects of confidentiality, integrity and availability

[SOURCE: IEC TS 63074:2023, 3.1.6, modified removing <of the machine control system> and "network" and "machine control system".]