



DPC: 23 / 30456216 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: 01 August 2023

Origin: International

Latest date for receipt of comments: 23 September 2023

Project No. 2022/01017

Responsible committee: MCE/3 Safeguarding of machinery

Interested committees:

Title: BS EN IEC 62745 Safety of machinery - Requirements for cableless control systems of machinery

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 23 September 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. 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 Christopher Brown (BSI)**
Direct tel: **02089967441**
E-mail: **christopher.brown@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.	



44/1010/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 62745 ED2

DATE OF CIRCULATION:

2023-07-28

CLOSING DATE FOR COMMENTS:

2023-09-22

SUPERSEDES DOCUMENTS:

44/948/RR

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

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.

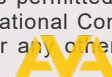
Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In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

TITLE:

Safety of machinery - Requirements for cableless control systems of machinery

NOTE FROM TC/SC OFFICERS:

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.



Documents
Document Sharing Hub

CONTENTS

1		
2	CONTENTS	2
3	FOREWORD	4
4	INTRODUCTION	6
5	1 Scope	7
6	2 Normative references	7
7	3 Terms, definitions and abbreviations	8
8	4 Functional requirements	12
9	4.1 General	12
10	4.2 Operational preventions	12
11	4.2.1 Prevention of inadvertent actuation	12
12	4.2.2 Prevention of unauthorised operation	13
13	4.2.3 Prevention of unintended commands	13
14	4.3 Serial data transfer	13
15	4.4 Removal of remote station transmission	14
16	4.5 Establishment and indication of transmission and communication	14
17	4.6 Safety-related functions of the SR-CCS	14
18	4.7 Stop functions of the SR-CCS	15
19	4.7.1 General	15
20	4.7.2 Safety-related stop functions of a CCS	15
21	4.7.3 Classification of stop functions	15
22	4.8 Reset	18
23	4.9 Cessation of transmission function	18
24	4.10 Latching control functions	19
25	4.11 Behaviour on loss of supply	19
26	4.12 Multiple configurations of SR-CCS	19
27	4.12.1 Case a) Single base and single remote station	20
28	4.12.2 Case b) Additional requirements for multiple remote stations and one	
29	base station	20
30	4.12.3 Case c) Additional requirements for multiple base stations and one	
31	remote station	20
32	4.12.4 Case d) Additional requirements for other combinations	20
33	4.13 Localization of SR-CCS	21
34	4.14 Suspension of SR-CCS control	21
35	4.15 Configurability protection	21
36	4.16 Cybersecurity	21
37	4.17 Monitoring means on SR-CCS	22
38	5 Verification	23
39	5.1 General	23
40	5.2 Labelling and markings	23
41	5.3 Documentation	23
42	5.4 Functional verifications	23
43	6 Information for use	26
44	6.1 General	26
45	6.2 Information to be provided	26
46	7 Labelling and markings	28
47	Annex A (informative) Logic of stop functions	29

48	Annex B (informative) Relationship between requirements of GSS and EMS	31
49	Bibliography	33
50		
51	Figure 1 – Block diagram example of a SR-CCS and its interaction with the machine	
52	control system	12
53	Figure A.1 – Logic for stop functions	29
54		
55	Table 1 – Alphabetical list of definitions	8
56	Table 2 – Abbreviations	9
57	Table 3 – Overview of stop functions of the SR-CCS	16
58	Table 4 – Possible configurations of SR-CCS	20
59	Table 5 – SR-CCS related particular attack vectors	22
60	Table 6 – Verification of functional requirements	24
61	Table 7 – List of possible verifications to be required to the system integrator	28
62		
63		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62745 has been prepared by IEC technical committee 44: Safety of machinery – Electrotechnical aspects.

This bilingual version (2018-01) corresponds to the monolingual English version, published in 2017-03.

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.

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

- 117 • reconfirmed,
- 118 • withdrawn,
- 119 • replaced by a revised edition, or
- 120 • amended.

121

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

122

123

124

INTRODUCTION

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

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

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

137

138

139

140

141

142

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 mobile 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 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*

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

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

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

3 Terms, definitions and abbreviations

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

For an alphabetical list of definitions, see Table 1.

For list of abbreviations see Table 2.

Table 1 – Alphabetical list of definitions

Term	Definition number
active stop	3.17
address code	3.7
automatic stop	3.19
base station	3.13
cableless control	3.1
safety-related cableless control system (SR-CCS)	3.2
disabling of a remote station	3.22
error detection code	3.9
frame	3.6
Hamming distance	3.11
manual stop	3.20
neutral frame	3.10
OFF-state	3.15
operating command signal	3.8
operator control station	3.5
passive stop	3.18
receiver	3.3
remote station	3.12
safety-related stop function	3.16
stop output	3.14
transmitter	3.4
valid signal	3.21
cybersecurity	3.24

Table 2 – Abbreviations

Term	Abbreviation
automatic stop (4.7.3.5)	ATS
cableless control system (3.2)	CCS
safety-related cableless control system (3.2)	SR-CCS
emergency stop (4.7.3.4)	EMS
general safe stop (4.7.3.3)	GSS
Remote station (3.13)	RST
Base station (3.14)	BST

3.1**cableless control**

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

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

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

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

3.3**receiver**

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

3.4**transmitter**

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

3.5**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.

3.6**frame**

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

- a) address code;
- b) operating commands;
- c) error detection code;
- d) other commands, signals or information

Note 1 to entry: A "frame" is sometimes referred to as a "telegram" or "message".