



BSI Standards Publication

Safety of machinery

Part 2: Examples of application

National foreword

This Published Document is the UK implementation of IEC TR 62998-2:2020.

The UK participation in its preparation was entrusted to Technical Committee MCE/3, Safeguarding of machinery.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 539 04835 3

ICS 13.110; 21.020

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 April 2020.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------



TECHNICAL REPORT



Safety of machinery – Part 2: Examples of application

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.110; 21.020

ISBN 978-2-8322-7975-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviated terms	7
3.1 Terms and definitions.....	7
3.2 Abbreviated terms.....	8
4 Applications for mobile robots.....	8
4.1 General.....	8
4.2 SRSS on mail transport mobile robot	9
4.2.1 Intended use.....	9
4.2.2 SRSS performance class determination	10
4.2.3 SRS limits of use and SRSS function.....	10
4.2.4 Safety-related requirements.....	11
4.2.5 Object classes and physical properties	12
4.2.6 Sensing zones	13
4.2.7 Dependability under environmental influences	15
4.2.8 Safety-related information.....	16
4.2.9 Verification and validation.....	17
4.2.10 Information for use of the SRSS	18
4.3 SRSS on cleaning mobile robot.....	19
4.3.1 Intended use.....	19
4.3.2 SRSS performance class determination	20
4.3.3 SRS limits of use and SRSS function.....	20
4.3.4 Safety-related requirements.....	21
4.3.5 Object classes and physical properties	22
4.3.6 Sensing zones	23
4.3.7 Dependability under environmental influences	24
4.3.8 Safety-related information.....	24
4.3.9 Verification and validation.....	25
4.3.10 Information for use of the SRSS	26
5 Application for container handling equipment for harbour logistics	27
5.1 General.....	27
5.2 SRSS for CHE	28
5.2.1 Intended use.....	28
5.2.2 SRS limits of use and SRSS function.....	29
5.2.3 SRSS performance class determination	30
5.2.4 Safety-related requirements.....	31
5.2.5 Object classes and physical properties	31
5.2.6 Sensing zones	32
5.2.7 Dependability under environmental influences	34
5.2.8 Safety-related information.....	34
5.2.9 SRSS performance class after fusion.....	34
5.2.10 Verification and validation.....	34
5.2.11 Information for use of the SRSS	35
Bibliography.....	37

Figure 1 – Outdoor scene	8
Figure 2 – Mobile robot with 2 distinctive safety-related zones	10
Figure 3 – Combination of three SRSs into an SRSS and SRSS functions	11
Figure 4 – Mounting positions and sensing zones of the SRS and safety-related zones of SRSS	14
Figure 5 – Mounting positions and sensing zones of the SRS and safety-related zones of SRSS	14
Figure 6 – Examples of measurement data for evaluation of coverage interval	17
Figure 7 – Test setup	18
Figure 8 – CHE application	28
Figure 9 – Operation areas of CHE	29
Figure 10 – SRSS structure and safety-related functions	30
Figure 11 – Safety-related zones of SRSS	32
Figure 12 – Mounting positions and sensing zones of the SRS, and safety-related zones of the SRSS	33
Table 1 – Safety-related requirements	12
Table 2 – Example of confidence information for SRS	17
Table 3 – Information for use of the SRSS	19
Table 4 – Safety-related requirements	22
Table 5 – Information for use of the SRSS	27
Table 6 – Safety-related requirements	31
Table 7 – Environmental limits of SRSS	34
Table 8 – Information for use of the SRSS	36

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF MACHINERY –**Part 2: Examples of application****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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 62998-2, which is a Technical Report, has been prepared by IEC technical committee TC 44: Safety of machinery – Electrotechnical aspects.

The text of this Technical Report is based on the following documents:

Enquiry draft	Report on voting
44/849/DTR	44/865A/RVDTR

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

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

This document is to be used in conjunction with IEC TS 62998-1:2019.

A list of all parts in the IEC 62998 series, published under the general title *Safety of machinery*, can be found on the IEC website.

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

reconfirmed,

withdrawn,

replaced by a revised edition, or

amended.

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.

INTRODUCTION

Safety-related sensors are applied to machinery presenting a risk of personal injury. They provide protection by causing the machine to revert to a safe condition before a person can be placed in a hazardous situation.

IEC TS 62998-1:2019 is intended for use by safety-related sensor manufacturers and integrators of safety-related sensors for the design of safety-related sensor systems used for the protection of persons.

This document gives guidance for manufacturers and integrators on the application of IEC TS 62998-1:2019.

SAFETY OF MACHINERY –

Part 2: Examples of application

1 Scope

This document establishes guidance for the application of IEC TS 62998-1:2019.

It provides examples of:

- application for which SRS/SRSS are relevant,
- use of SRS/SRSS information from an application point of view,
- fusion of SRS into SRSS for given applications, and
- appropriate information for use for given applications.

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 TS 62998-1:2019, *Safety of machinery – Safety-related sensors used for protection of persons*

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

mobile robot

robot able to travel under its own control

[SOURCE: ISO 8373:2012, 2.13, modified – The note has been omitted.]

3.1.2

robot

actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks

[SOURCE: ISO 8373:2012, 2.6, modified – Notes 1 and 2 have been omitted.]