



TECHNICAL REPORT

**Functional safety – Safety instrumented systems for the process industry sector –
Part 4: Explanation and rationale for changes in IEC 61511-1 from Edition 1 to Edition 2**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.110, ICS 25.040.01

ISBN 978-2-8322-7870-3

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

CONTENTS

| | |
|--|----|
| CONTENTS | 2 |
| FOREWORD | 5 |
| INTRODUCTION | 7 |
| 1 Scope | 8 |
| 2 Normative references | 8 |
| 3 Terms, definitions and abbreviated terms | 8 |
| 3.1 Terms and definitions | 8 |
| 3.2 Abbreviated terms | 9 |
| 4 Background | 10 |
| 5 Management of functional safety (IEC 61511-1 Ed. 2 Clause 5) | 10 |
| 5.1 Why is this clause important? | 10 |
| 5.2 Common misconceptions | 10 |
| 5.3 What was changed from Ed. 1 to Ed. 2 and why? | 11 |
| 5.3.1 Existing systems | 11 |
| 5.3.2 Change management | 11 |
| 5.3.3 Performance metrics and quality assurance | 11 |
| 5.3.4 Competency | 12 |
| 5.3.5 More requirements for functional safety product and service providers | 12 |
| 5.4 Summary on how | 12 |
| 6 Safety life cycle (IEC 61511-1 Ed. 2 Clause 6) | 12 |
| 6.1 Why is this clause important? | 12 |
| 6.2 Common misconceptions | 12 |
| 6.3 What was changed from Ed. 1 to Ed. 2 and why? | 13 |
| 6.4 Summary on how | 13 |
| 7 Verification (IEC 61511-1 Ed. 2 Clause 7) | 13 |
| 7.1 Why is this clause important? | 13 |
| 7.2 Common misconceptions | 13 |
| 7.3 What was changed from Ed. 1 to Ed. 2 and why? | 13 |
| 7.4 Summary on how | 13 |
| 8 Hazard and risk analysis (IEC 61511-1 Ed. 2 Clause 8) | 13 |
| 8.1 Why is this clause important? | 13 |
| 8.2 Common misconceptions | 14 |
| 8.3 What was changed from Ed. 1 to Ed. 2 and why? | 14 |
| 8.4 Summary on how | 15 |
| 9 Allocation of safety functions to protection layers (IEC 61511-1 Ed. 2 Clause 9) | 15 |
| 9.1 Why is this clause important? | 15 |
| 9.2 Common misconceptions | 15 |
| 9.3 What was changed from Ed. 1 to Ed. 2 and why? | 16 |
| 9.3.1 Limits on BPCS protection layers | 16 |
| 9.3.2 Requirements for claiming RRF > 10 000 in total for instrumented safeguards | 16 |
| 9.4 Summary on how | 16 |
| 10 SIS safety requirements specification (IEC 61511-1 Ed. 2 Clause 10) | 17 |
| 10.1 Why is this clause important? | 17 |
| 10.2 Common misconceptions | 17 |
| 10.3 What was changed from Ed. 1 to Ed. 2 and why? | 18 |

| | | |
|--------|---|----|
| 10.4 | Summary on how | 18 |
| 11 | Design and engineering (IEC 61511-1 Ed. 2 Clause 11) | 18 |
| 11.1 | Why is this clause important? | 18 |
| 11.2 | Common misconceptions | 18 |
| 11.3 | What was changed from Ed. 1 to Ed. 2 and why? | 19 |
| 11.3.1 | Hardware fault tolerance | 19 |
| 11.3.2 | Security risk requirements | 20 |
| 11.3.3 | Safety manual | 20 |
| 11.3.4 | Requirements for system behaviour on detection of a fault | 20 |
| 11.3.5 | Limitations on field device communication design | 21 |
| 11.4 | Summary on how | 21 |
| 12 | Application program development (IEC 61511-1 Ed. 2 Clause 12) | 21 |
| 12.1 | Why is this clause important? | 21 |
| 12.2 | Common misconceptions | 22 |
| 12.3 | What was changed from Ed. 1 to Ed. 2 and why? | 22 |
| 12.4 | Summary on how | 22 |
| 13 | Factory acceptance test (IEC 61511-1 Ed. 2 Clause 13) | 22 |
| 13.1 | Why is this clause important? | 22 |
| 13.2 | Common misconceptions | 23 |
| 13.3 | What was changed from Ed. 1 to Ed. 2 and why? | 23 |
| 13.4 | Summary on how | 23 |
| 14 | Installation (IEC 61511-1 Ed. 2 Clause 14) | 23 |
| 14.1 | Why is this clause important? | 23 |
| 14.2 | Common misconceptions | 24 |
| 14.3 | What was changed from Ed. 1 to Ed. 2 and why? | 24 |
| 14.4 | Summary on how | 24 |
| 15 | Validation (IEC 61511-1 Ed. 2 Clause 15) | 24 |
| 15.1 | Why is this clause important? | 24 |
| 15.2 | Common misconceptions | 24 |
| 15.3 | What was changed from Ed. 1 to Ed. 2 and why? | 24 |
| 15.4 | Summary on how | 24 |
| 16 | Operation and maintenance (IEC 61511-1 Ed. 2 Clause 16) | 25 |
| 16.1 | Why is this clause important? | 25 |
| 16.2 | Common misconceptions | 25 |
| 16.3 | What was changed from Ed. 1 to Ed. 2 and why? | 26 |
| 16.3.1 | Fault detection, bypassing, and compensating measures | 26 |
| 16.3.2 | Proof testing after repair and change | 26 |
| 16.4 | Summary on how | 26 |
| 17 | Modification (IEC 61511-1 Ed. 2 Clause 17) | 26 |
| 17.1 | Why is this clause important? | 26 |
| 17.2 | Common misconceptions | 26 |
| 17.3 | What was changed from Ed. 1 to Ed. 2 and why? | 27 |
| | Planning for and completing change | 27 |
| 17.4 | Summary on how | 27 |
| 18 | Decommissioning (IEC 61511-1 Ed. 2 Clause 18) | 27 |
| 18.1 | Why is this clause important? | 27 |
| 18.2 | Common misconceptions | 27 |

| | | |
|--------|--|----|
| 18.3 | What was changed from Ed. 1 to Ed. 2 and why?..... | 28 |
| 18.3.1 | Planning for and completing change | 28 |
| 18.4 | Summary on how | 28 |
| 19 | Documentation (IEC 61511-1 Ed. 2 Clause 19)..... | 28 |
| 19.1 | Why is this clause important? | 28 |
| 19.2 | Common misconceptions | 28 |
| 19.3 | What was changed from Ed. 1 to Ed. 2 and why?..... | 28 |
| 19.4 | Summary on how | 28 |
| 20 | Definitions (IEC 61511-1 Ed. 2 Clause 3)..... | 29 |
| 20.1 | Why is this clause important? | 29 |
| 20.2 | Common misconceptions | 29 |
| 20.3 | What was changed from Ed. 1 to Ed. 2 and why?..... | 29 |
| 20.4 | Summary on how | 37 |
| | Bibliography..... | 38 |
| | Table 1 – Abbreviated terms used in IEC TR 61511-4 | 9 |
| | Table 2 – Rationale for IEC 61511-1 Ed. 2 terms and definitions..... | 29 |

IECNORM.COM : Click to view the full PDF of IEC/TR 61511-4 ed 1.0:2020

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FUNCTIONAL SAFETY – SAFETY INSTRUMENTED SYSTEMS
FOR THE PROCESS INDUSTRY SECTOR –**

**Part 4: Explanation and rationale for changes in IEC 61511-1
from Edition 1 to Edition 2**

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 61511-4, which is a Technical Report, has been prepared by subcommittee 65A: Systems aspects, of IEC technical committee 65: Industrial-process measurement, control and automation.

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

| | |
|-------------|------------------|
| Draft TR | Report on voting |
| 65A/911/DTR | 65A/920A/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.

A list of all parts in the 61511 series, published under the general title *Functional safety – Safety instrumented systems for the process industry sector*, 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.

IECNORM.COM : Click to view the full PDF of IEC/TR 61511 4 ed 1.0:2020