

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

## **Industrial-process measurement, control and automation – Framework for functional safety and security**

*(IEC Technical Report 63069:2019)*

ISSN 1651-1417

---

ICS 13.110.00; 25.040.40; 29.020.00

---

Upplysningar om **sakinnehållet** i rapporten lämnas av  
SEK Svensk Elstandard.  
Postadress: Box 1284, 164 29 KISTA  
Telefon: 08 - 444 14 00.  
E-post: [sek@elstandard.se](mailto:sek@elstandard.se). Internet: [www.elstandard.se](http://www.elstandard.se)

---

### *Standarder underlättar utvecklingen och höjer elsäkerheten*

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

### *SEK är Sveriges röst i standardiseringsarbetet inom elområdet*

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

### *Stora delar av arbetet sker internationellt*

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

### *Var med och påverka!*

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

### **SEK Svensk Elstandard**

Box 1284  
164 29 Kista  
Tel 08-444 14 00  
[www.elstandard.se](http://www.elstandard.se)

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
0.1 Purpose of this document .....	6
0.2 Background.....	6
0.3 Issues on the terminology .....	6
0.4 Target audience.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms, definitions, symbols, abbreviated terms and conventions .....	7
3.1 Terms and definitions defined for this document .....	7
3.2 Abbreviated terms.....	15
3.3 Explanation for common terms with different definitions .....	15
4 Context of security related to functional safety.....	20
4.1 Description of functions.....	20
4.2 Security environment .....	20
5 Guiding principles.....	22
6 Life cycle recommendations for co-engineering .....	22
6.1 General.....	22
6.2 Managing security related safety aspects.....	25
7 Risk assessment considerations .....	25
7.1 Risk assessment at higher level.....	25
7.2 Trade-off analysis .....	26
7.3 Considerations for threat-risk assessment <security> .....	26
7.3.1 General .....	26
7.3.2 Recommendations to the threat-risk assessment <security> .....	27
7.3.3 Considerations related to security countermeasures .....	27
7.3.4 Vulnerabilities and examples of root causes .....	27
7.4 Malevolent and unauthorized actions .....	27
7.4.1 General .....	27
7.4.2 Reasonably foreseeable misuse (safety).....	28
7.4.3 Prevention of malevolent and unauthorized actions (security) .....	28
7.4.4 Combination of password protection measures .....	28
8 Incident response readiness and incident handling .....	28
8.1 General.....	28
8.2 Incident response readiness .....	28
8.3 Incident handling .....	28
Bibliography.....	30
Figure 1 – Overview of functions of an IACS .....	20
Figure 2 – Safety domain and security domain.....	21
Figure 3 – Security environment .....	21
Figure 4 – Safety and security interaction .....	23
Figure 5 – Safety and security risk assessments as part of a risk assessment at higher level.....	26

Table 1 – Terms with multiple definitions .....	15
Table 2 – Recommended activities in life cycle stages .....	24

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL-PROCESS MEASUREMENT, CONTROL AND AUTOMATION –  
FRAMEWORK FOR FUNCTIONAL SAFETY AND SECURITY**

## 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 63069 has been prepared by IEC technical committee TC 65: Industrial-process measurement, control and automation.

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

Draft DTR	Report on voting
65/698/DTR	65/713A/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.

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.

A bilingual version of this publication may be issued at a later date.

**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

### 0.1 Purpose of this document

Many sector specific guides, standards and technical specifications have been developed in the fields of safety and security. However, a generic document for framework for safety and security is largely expected by industry actors. Even the terms "safety" and "security" are sometimes used for different meanings in these documents. As a result, it can be difficult to apply them holistically at the same time to a manufacturing system.

### 0.2 Background

Security has become a new factor to be considered in system engineering. The parts of the IEC 61508 series published in 2010 took into account that security can impact functional safety.

In IEC TC 65 (Industrial-process measurement, control and automation), considerable concerns arose with respect to the impacts of security incidents to safety functions in IACS (industrial automation and control systems); many complex systems of that kind are becoming connected systems (particularly by interaction based on wireless connectivity from sensors/actuators to complete plants, grids, etc.) for maintenance and operations. The overall question was: "How to design and manage safety and security – in cooperation, integrated, or separate system?"

### 0.3 Issues on the terminology

Definitions of some terms, such as "safety", "security" and "risk", are sometimes different in different documents. Although they are consistent in a set of documents in each area of safety and security, they can be inconsistent when both standards are applied at the same time. From these reasons, the terminology is carefully used in this document.

### 0.4 Target audience

The target audience of this document includes, but is not limited to,

- asset owners (including those responsible for concept and governance),
- system integrators (including those responsible for design and realisation),
- product suppliers (including those responsible for design and realisation),
- service providers (including operators and maintainers), and
- authorities (including those responsible for assessment and audit).

# INDUSTRIAL-PROCESS MEASUREMENT, CONTROL AND AUTOMATION – FRAMEWORK FOR FUNCTIONAL SAFETY AND SECURITY

## 1 Scope

This document explains and provides guidance on the common application of IEC 61508 (all parts) and IEC 62443 (all parts) in the area of industrial-process measurement, control and automation.

This document can apply to other industrial sectors where IEC 61508 (all parts) and IEC 62443 (all parts) are applied.

NOTE Usage or reference of this document for industry specific sector standards is encouraged.

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

IEC 62443 (all parts), *Security for industrial automation and control systems*