

TECHNICAL REPORT

**Functional safety – Safety instrumented systems for the process industry sector –
Part 0: Functional safety for the process industry and IEC 61511**

IECNORM.COM : Click to view the full PDF of IEC TR 61511-0:2018



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2018 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IECNORM.COM : Click to view the full text of IEC 61345-1:2018

TECHNICAL REPORT

Functional safety – Safety instrumented systems for the process industry sector –

Part 0: Functional safety for the process industry and IEC 61511

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.110, 25.040.01

ISBN 978-2-8322-5302-1

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

CONTENTS

FOREWORD.....	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Process industry environment and the Safety Instrumented System (SIS).....	5
4.1 General.....	5
4.2 Safety Instrumented Functions (SIF).....	6
4.3 Safety Instrumented System (SIS) components.....	6
5 IEC 61511 – Part 1	6
6 IEC 61511 – Part 2	8
7 IEC 61511 – Part 3	8
8 Utilization of IEC 61511 in system design	8
Figure 1 – SIS safety life-cycle phases and functional safety assessment (FSA) stages.....	7

IECNORM.COM : Click to view the full PDF of IEC TR 61511-0:2018

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FUNCTIONAL SAFETY –
SAFETY INSTRUMENTED SYSTEMS
FOR THE PROCESS INDUSTRY SECTOR –****Part 0: Functional safety for the process industry and IEC 61511****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 61511-0, which is a technical report, has been prepared by subcommittee 65A: System aspects, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
65A/847/DTR	65A/852/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 IEC 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.

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

IECNORM.COM : Click to view the full PDF of IEC TR 61511-0:2018

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

Part 0: Functional safety for the process industry and IEC 61511

1 Scope

This part of IEC 61511 provides an overview of the other three parts of IEC 61511.

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 61511-1:2016, *Functional safety – Safety instrumented systems for the process industry sector – Part 1: Framework, definitions, system, hardware and application programming requirements*

IEC 61511-2:2016, *Functional safety – Safety instrumented systems for the process industry sector – Part 2: Guidelines for the application of IEC 61511-1:2016*

IEC 61511-3:2016, *Functional safety – Safety instrumented systems for the process industry sector – Part 3: Guidance for the determination of the required safety integrity levels*

3 Terms and definitions

No terms and definitions are listed in this document.

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>

4 Process industry environment and the Safety Instrumented System (SIS)

4.1 General

There are many hazards in process industries that can lead to loss of containment, resulting in an impact on health, safety, environment and plant assets. Process safety is best achieved by using inherently safe processes. However, when this is not practical or possible, protective systems are required to mitigate the risk of hazards to an acceptable level. Functional requirements for these protective systems are determined from a Hazard and Risk Assessment (H&RA) and good engineering practices. Protective systems may be implemented using different technologies such as mechanical, chemical, pneumatic, hydraulic, electric, electronic or programmable electronic.

4.2 Safety Instrumented Functions (SIF)

Safety Instrumented Functions (SIF) are protective functions implemented in a Safety Instrumented System (SIS). A typical SIS is comprised of multiple SIFs; typically, each SIF has process sensors that measure a process deviation, a logic solver that executes the functional logic, and final control elements (e.g. valves, pumps) that bring the process to a safe state. The IEC 61511 series of standards addresses SIS based on the use of electrical, electronic, or programmable electronic technology in the process industry sector.

4.3 Safety Instrumented System (SIS) components

All components of a SIS are selected, designed, installed, operated, maintained and tested to achieve the specified risk reduction for each SIF. The SIS can fail to provide risk reduction due to failure of components or systematic failures resulting from human errors of omission or commission.

To minimize SIS failures:

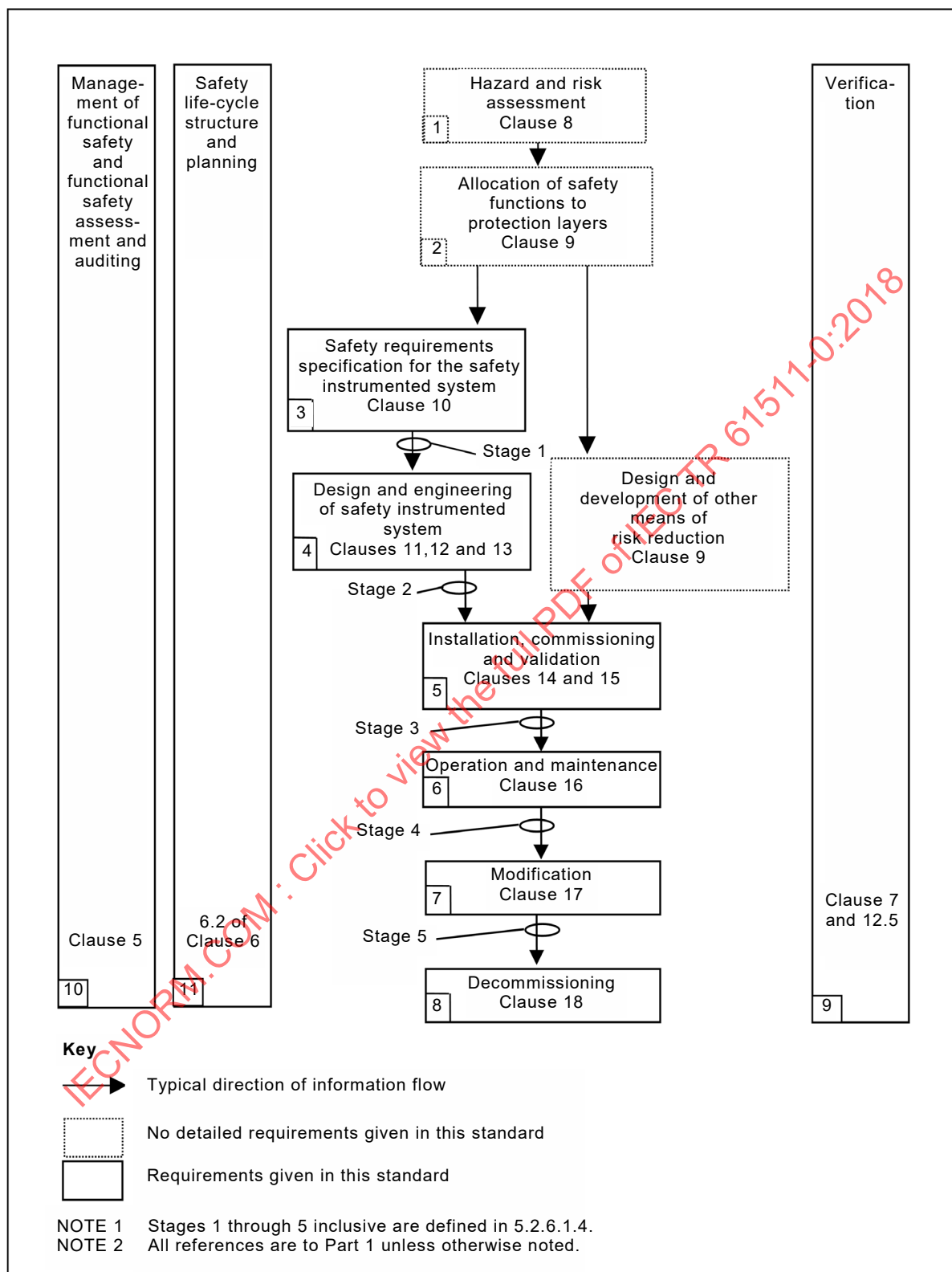
- a) selected SIS components are reliable and suitable for the service and environment in which they are operated, and
- b) a management system is implemented to verify and assure that systematic failures are minimized across the SIS lifecycle.

5 IEC 61511 – Part 1

Part 1 is the normative part of the series.

It includes terminology, and requirements for specification, hardware design and application programming, commissioning, validation, operation, maintenance and testing of SIS components. To address systematic failures, it also includes requirements for management of the SIS lifecycle (Figure 1) which include:

- a) developing a plan identifying responsibilities and activities for each lifecycle phase,
- b) competency of persons, departments and organizations,
- c) supplier quality management,
- d) change and bypass management,
- e) verification, testing, assessments and audits,
- f) tracking and timely closure of action items.



IEC

Figure 1 – SIS safety life-cycle phases and functional safety assessment (FSA) stages

NOTE See IEC 61511-1 for further information.