SLOVENSKI STANDARD
SIST EN 61784-3:2017/A1:2018

01-februar-2018

Industrijska komunikacijska omrežja - Profili - 3. del: Funkcijska varnost procesnih vodil - Splošna pravila in definicije profilov - Dopolnilo 1 (IEC 61784-3:2016/A1:2017)

Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions (IEC 61784-3:2016/A1:2017)

Industrielle Kommunikationsnetze - Profile - Teil 3: Funktional sichere Übertragung bei Feldbussen - Allgemeine Regeln und Festlegungen für Profile (IEC 61784-3:2016/A1:2017)

Réseaux de communication industriels - Profils - Partie 3: Bus de terrain de sécurité fonctionnelle - Règles générales et définitions de profils (IEC 61784-3:2016/A1:2017)

Ta slovenski standard je istoveten z: EN 61784-3:2016/A1:2017

ICS:

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
35.100.05	Večslojne uporabniške rešitve	Multilayer applications

SIST EN 61784-3:2017/A1:2018 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61784-3:2016/A1

November 2017

ICS 25.040.40; 35.100.05

English Version

Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions (IEC 61784-3:2016/A1:2017)

Réseaux de communication industriels - Profils - Partie 3: Bus de terrain de sécurité fonctionnelle - Règles générales et définitions de profils (IEC 61784-3:2016/A1:2017)

Industrielle Kommunikationsnetze - Profile - Teil 3: Funktional sichere Übertragung bei Feldbussen - Allgemeine Regeln und Festlegungen für Profile (IEC 61784-3:2016/A1:2017)

This amendment A1 modifies the European Standard EN 61784-3:2016; it was approved by CENELEC on 2017-09-08. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 65C/879/FDIS, future IEC 61784-3:2016/A1, prepared by SC 65C "Industrial networks", of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61784-3:2016/A1:2017.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2018-06-08
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2020-09-08

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61784-3:2016/A1:2017 was approved by CENELEC as a European Standard without any modification.

IEC 61784-3

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

AMENDMENT 1
AMENDEMENT 1

Industrial communication networks – Profiles – Part 3: Functional safety fieldbuses – General rules and profile definitions

Réseaux de communication industriels – Profils – Partie 3: Bus de terrain de sécurité fonctionnelle – Règles générales et définitions de profils

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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FOREWORD

This amendment has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this amendment is based on the following documents:

FDIS	Report on voting
65C/879/FDIS	65C/886/RVD

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

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

This Amendment 1 discusses the concepts of implicit data safety mechanisms for use in functional safety communications protocols (FSCPs) as specified in IEC 61784-3:2016.

3 Terms, definitions, symbols, abbreviated terms and conventions

3.1 Terms and definitions

Add the following new terms and definitions 3.1.56 and 3.1.57:

3.1.56
explicit data
data that is transmitted

3.1.57
implicit data
additional data that is not transmitted but is known to the sender and receiver

[SOURCE: IEC 62280:2014, 3.1.25]

3.2 Symbols and abbreviated terms

Add two new Subclauses 3.2.1 and 3.2.2, as specified below:

3.2.1 Abbreviated terms

Move the existing list of symbols and abbreviated terms to this new Subclause 3.2.1.

Delete "Pe" and "RP" from the existing list of abbreviated terms. Add, in alphabetical order, in the list of abbreviated terms the following new abbreviated terms:

A-code	Authenticity code
T-code	Timeliness code

3.2.2 Symbols

Add, in this new Subclause 3.2.2 the following list of symbols:

A_k	Weight distribution of the code: number of valid codewords having k bits set to "one"
e	Bit length of explicit data
err_{impl}	Bitwise disjunction of $impl_S$ and $impl_R$
expl	Explicit data
$expl_R$	Explicit data in the receiver
$expl_S$	Explicit data in the sender
FCS_C	Frame check sequence calculated in the receiver
FCS_R	Frame check sequence received
FCS_S	Frame check sequence sent
i	Bit length of implicit data
ID	Incorrect delivery
$impl_R$	Implicit data in the receiver
$impl_S$	Implicit data in the sender

n	Bit length of SPDU
P_e	Bit error probability
P_{ID}	Probability of incorrect delivery
r	Bit length of FCS (degree of generator polynomial)
RP	Residual error probability

Add, after Annex F, the following new informative Annex G:

Annex G
(informative)

Implicit data safety mechanisms for IEC 61784-3 functional safety communication profiles (FSCPs)

G.1 Overview

Annex G discusses the concepts of implicit data safety mechanisms for use in functional safety communications protocols (FSCPs) as specified in this standard. Implicit data is that which is not explicitly transmitted in a PDU. Instead, the implicit data values are known by both the sender (source) and the receiver (sink). Implicit data values are validated by the value of one or more transmitted frame check sequence(s) (FCS) which are calculated using an overall data string comprised of the implicit data string appended with the explicit data string. Because the implicit data is not transmitted, the load on the transmission media is reduced.

Today, the FSCPs that use implicit data mechanisms do so in order to communicate complete or partial timeliness codes (T-codes) and/or authenticity codes (A-codes), see Annex E. These FSCPs also use cyclic redundancy check (CRC) algorithms for the frame check sequence (FCS) exclusively. Therefore, Annex G is limited to the analysis of implicitly transmitted T-codes and A-codes using CRC-algorithms.

According to Clause E.8, with regard to implicit data, "Due to the various possible approaches generic formulae cannot be provided. It is up to the individual FSCP to prove sufficient residual error probabilities." In the hope of advancing IEC 61784-3 for the next edition and beyond, the subject of this new Annex G is to improve the understanding of formulating models for the residual error probabilities of FSCPs using CRC-algorithms to implicitly transmit T-codes and A-codes when a single FCS code is used by the protocol.

Presented in Annex G are two formulae examples, applicable for two special cases, and from which a better understanding is promoted for the development of additional (specific and general) formulae.

Also presented is a summation method generally applicable when conditional weight distributions for implicit data error patterns are known and can be quantified in a way either leading to a closed-form solution, or suitable for iterative summation with a reasonably bounded execution time.

G.2 Basic principles

Calculations in Annex G also use the binary symmetric channel (BSC) model as specified in Annex B.

NOTE 1 Although it does not take into account burst errors, the BSC model with a sufficiently conservative bit error probability is so far the most practical known for use in probability calculations needed for the determination of the FSCP residual error rate.

Figure G.1 shows the basic principle of an FSCP using single FCS protection mechanisms involving implicit data. In the sender, a CRC-checksum over the implicit data $impl_S$ concatenated with the explicit data $expl_S$ is generated, resulting in a frame check sequence FCS_S. When multiple FCS codes are used in an FCSP format, the calculation shall be done for each FCS code. While $expl_S$ and FCS_S are explicitly transmitted over the black channel, $impl_S$ is not transmitted, but impacts the value of the FCS_S. Therefore, it can only contain data whose value is already known to the receiver. Implicit data is used to detect e.g. SPDUs which were misdirected in either space (“authentication error”) or time (“timeliness error”). This is accomplished by deriving the implicit data from the A-code (e.g. connection identifier) and/or the T-code (e.g. sequence number) of an SPDU.