This document is a preview generated by EVS

Industrial networks - Profiles - Part 2-3: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 - CPF 3

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

This document is a preview generated by EVS

See Eesti standard EVS-EN IEC 61784-2-3:2023 sisaldab Euroopa standardi EN IEC 61784-2-3:2023 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 61784-2-3:2023 consists of the English text of the European standard EN IEC 61784-2-3:2023.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 05.05.2023.	Date of Availability of the European standard is 05.05.2023.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 35.100.20, 35.240.50

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis-ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis-ja Akrediteerimiskeskusega: Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61784-2-3

May 2023

ICS 35.240.50; 35.100.20

Supersedes EN IEC 61784-2:2019 (partially)

English Version

Industrial networks - Profiles - Part 2-3: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 - CPF 3 (IEC 61784-2-3:2023)

Réseaux industriels - Profils - Partie 2-3: Profils de bus de terrain supplémentaires pour les réseaux en temps réel fondés sur l'ISO/IEC/IEEE 8802-3 - CPF 3
(IEC 61784-2-3:2023)

Industrielle Kommunikationsnetze - Profile - Teil 2-3: Zusätzliche Feldbusprofile für Echtzeitnetzwerke basierend auf ISO/IEC/IEEE 8802-3 - Kommunikationsprofilfamilie (CPF) 3
(IEC 61784-2-3:2023)

This European Standard was approved by CENELEC on 2023-05-03. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard 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 European Standard 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2023 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

This document is a preview generated by EVS

European foreword

The text of document 65C/1209/FDIS, future edition 1 of IEC 61784-2-3, 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 61784-2-3:2023.

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) 2024-02-03
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-05-03

This document, together with other parts of the same series, partially supersedes EN IEC 61784-2:2019 and all of its amendments and corrigenda (if any).

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.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61784-2-3:2023 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 61158-1	NOTE Approved as EN IEC 61158-1
IEC 61158-2	NOTE Approved as EN IEC 61158-2
IEC 61158-3-3	NOTE Approved as EN 61158-3-3
IEC 61158-4-3	NOTE Approved as EN IEC 61158-4-3
IEC 61158-5-3	NOTE Approved as EN 61158-5-3
IEC 61158-6-3	NOTE Approved as EN IEC 61158-6-3
IEC 61784-1 (series)	NOTE Approved as EN IEC 61784-1 (series)
IEC 61784-1-0	NOTE Approved as EN IEC 61784-1-0
IEC 61784-2 (series)	NOTE Approved as EN IEC 61784-2 (series)
IEC 61918	NOTE Approved as EN IEC 61918

This document is a preview generated by EVS

IEC 61784-2-3

Edition 1.0 2023-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

This document is a preview generated by EVS

Industrial networks – Profiles – Part 2-3: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – CPF 3

Réseaux industriels – Profils – Partie 2-3: Profils de bus de terrain supplémentaires pour les réseaux en temps réel fondés sur l'ISO/IEC/IEEE 8802-3 – CPF 3

IEC 61784-2-3:2023-03(en-fr)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2023 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembé
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 corrigendum or an amendment might have been published.

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 once a month by email.

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.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

This document is a preview generated by EVS

IEC 61784-2-3

Edition 1.0 2023-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

This document is a preview generated by EVS

Industrial networks – Profiles – Part 2-3: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – CPF 3

Réseaux industriels – Profils – Partie 2-3: Profils de bus de terrain supplémentaires pour les réseaux en temps réel fondés sur l'ISO/IEC/IEEE 8802-3 – CPF 3

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 35.100.20; 35.240.50

ISBN 978-2-8322-6692-2

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

CONTENTS

FOREWORD 8
INTRODUCTION 10
1 Scope 11
2 Normative references 11
3 Terms, definitions, abbreviated terms, acronyms, symbols and conventions 13
3.1 Terms and definitions 13
3.2 Abbreviated terms and acronyms 13
3.3 Symbols 15
3.4 Conventions 16
4 CPF 3 (PROFIBUS & PROFINET) – RTE communication profiles 16
4.1 General 16
4.2 Common 20
4.2.1 Administrative numbers 20
4.2.2 Node Classes 21
4.2.3 Application classes 25
4.2.4 Communication classes 31
4.2.5 Void 36
4.2.6 Protocol and timing parameters 36
4.2.7 Media redundancy classes 50
4.2.8 Media classes 52
4.2.9 Records 52
4.2.10 Communication feature list 62
4.3 Conformance class behaviors 63
4.3.1 General 63
4.3.2 IO controller, IO device, IO supervisor and Network Management Entity 64
4.3.3 End station component 65
4.3.4 Bridge component 74
4.3.5 Network components 80
4.3.6 Interconnect 81
4.4 Profile 3/4 82
4.4.1 Physical layer 82
4.4.2 Data link layer 82
4.4.3 Application layer 83
4.4.4 Performance indicator selection 92
4.5 Profile 3/5 99
4.5.1 Physical layer 99
4.5.2 Data link layer 99
4.5.3 Application layer 100
4.5.4 Performance indicator selection 108
4.6 Profile 3/6 110
4.6.1 Physical layer 110
4.6.2 Data link layer 110
4.6.3 Application layer 110
4.6.4 Performance indicator selection 118
4.7 Profile 3/7 122
4.7.1 Physical layer 122
4.7.2 Data link layer 122

This document is a preview generated by EVS

4.7.3 Application layer 122
4.7.4 Performance indicator selection 130
4.8 Additional information 133
Annex A (informative) CPF 3 (PROFINET) – Performance Indicator calculation 134
A.1 Application Scenario 134
A.2 Structural examples used for calculation 134
A.2.1 CP 3/4 134
A.2.2 CP 3/5 136
A.2.3 CP 3/6 137
A.2.4 CP 3/7 143
A.3 Principles used for calculation 143
A.3.1 General 143
A.3.2 Stack traversal time 143
A.3.3 Bridge structure 143
Bibliography 146

Figure 1 – Conformance class model 17
Figure 2 – End station and bridge systems 17
Figure 3 – Bridge as network component 18
Figure 4 – End station with wireless 18
Figure 5 – Network component with wireless 19
Figure 6 – Hierarchical conformance class model 19
Figure 7 – Hierarchical conformance class model – with integrated bridge component 20
Figure 8 – Hierarchical conformance class model – network component 20
Figure 9 – Example of network topology using CP 3/4, CP 3/5, and CP 3/6 components 81
Figure 10 – Example of network topology using CP 3/4, CP 3/5, CP 3/6 and CP 3/7 components 82
Figure 11 – Example of network topology with wireless segment 85
Figure 12 – Calculation basis for delivery time and throughput RTE 95
Figure A.1 – CP 3/4: Example of line structure 134
Figure A.2 – CP 3/4: Example of ring structure 135
Figure A.3 – CP 3/4: Example of a wireless segment 135
Figure A.4 – CP 3/4: Example of an integrated wireless client 136
Figure A.5 – CP 3/5: Example of line structure 136
Figure A.6 – CP 3/5: Example of ring structure 137
Figure A.7 – CP 3/6: Example of line structure 138
Figure A.8 – CP 3/6: Example of line structure 139
Figure A.9 – CP 3/6: Example of ring structure 140
Figure A.10 – CP 3/6: Example of tree structure 141
Figure A.11 – CP 3/6: Example of comb structure 142
Figure A.12 – CP 3/6: Example of comb structure (optional) 143
Figure A.13 – Definition of bridge delay 144

Table 1 – CPF 3 symbols 15
Table 2 – Administrative numbers assignment 21

This document is a preview generated by EVS

Table 3 – Node Classes and assigned Traffic Classes 22
Table 4 – Maximum diagnosis data for one submodule 22
Table 5 – Maximum storage delay 23
Table 6 – Reporting system minimum storage size 23
Table 7 – Reporting system storage 23
Table 8 – Reporting system Timeouts 24
Table 9 – Maximum storage delay 25
Table 10 – NME requirements 25
Table 11 – Application classes applicable in conformance classes for IO device and IO controller 26
Table 12 – Application classes applicable in conformance classes for network components 26
Table 13 – Application class "isochronous application" AL service selection 26
Table 14 – Application class "isochronous application" AL protocol selection component 27
Table 15 – Application class "high availability" AL service selection 27
Table 16 – Application class "high availability" AL protocol selection component 27
Table 17 – Basis application class for "process automation" 28
Table 18 – Application class "process automation" AL service selection 28
Table 19 – Application class "process automation" AL protocol selection component 28
Table 20 – Application class "High performance" features supported 29
Table 21 – Application class "High performance" parameter values 29
Table 22 – Application class "Controller to Controller" features supported 29
Table 23 – Application class "Functional safety" features supported by IO device 30
Table 24 – Application class "Functional safety" features supported by IO controller 30
Table 25 – Application class "Energy saving" AL service selection 31
Table 26 – Application class "Energy saving" features supported by IO device 31
Table 27 – Application class "Energy saving" features supported by IO controller 31
Table 28 – Communication classes applicable in conformance classes 32
Table 29 – Communication performance parameters 32
Table 30 – FrameSendOffset deviation for RT_CLASS_1 / RT_CLASS_UDP 33
Table 31 – FrameSendOffset deviation for RT_CLASS_1 / RT_CLASS_UDP certification 33
Table 32 – FrameSendOffset deviation factors – SendListControl 34
Table 33 – FrameSendOffset deviation factors – PHY 34
Table 34 – FrameSendOffset deviation 34
Table 35 – Minimum FrameSendOffset 35
Table 36 – FrameSendOffset deviation 35
Table 37 – Parameters for RT_CLASS_3 bridges 35
Table 38 – PTCP control loop 36
Table 39 – IEEE Std 802.1AS-2020 control loop 36
Table 40 – Maximum frame size 36
Table 41 – IP layer parameters for IO controller 37
Table 42 – IP layer parameters for IO device 37

This document is a preview generated by EVS

Table 43 – Timeout values for name resolution 37
Table 44 – Values for hello request deviation 37
Table 45 – DCP Identify responder resources 38
Table 46 – DCP access control 38
Table 47 – DCP Identify pruning support 38
Table 48 – Maximum time values for MRP for 10 Mbit/s and for ≥ 100 Mbit/s 38
Table 49 – Maximum packet size for MRP 39
Table 50 – Maximum time values for PTCP 39
Table 51 – Precision of timers used for PTCP 39
Table 52 – Maximum time values 40
Table 53 – Maximum deviation values for Global Time 40
Table 54 – Maximum deviation values for Working Clock 40
Table 55 – Maximum time values for LLDP 41
Table 56 – Required RPC resources 42
Table 57 – Required RPCActivityUUID resources 42
Table 58 – Number of ImplicitARs 42
Table 59 – RTA Timeout deviation 42
Table 60 – Required receive resources 43
Table 61 – Number of LogBookData entries 43
Table 62 – Recommended out of the box default 43
Table 63 – CIMSNMPAdjust 43
Table 64 – Community name, default values 44
Table 65 – SNMP timeout values 44
Table 66 – MIB objects update time values 44
Table 67 – DHCP client 44
Table 68 – High Availability times 45
Table 69 – Address parameter 45
Table 70 – AR Parameters 46
Table 71 – PDEV parameters 47
Table 72 – Reaction time for an IO device 48
Table 73 – Data Hold Time deviation 49
Table 74 – Expected PHY delay 50
Table 75 – Expected Bridge delay 50
Table 76 – Media redundancy class applicable in conformance classes 51
Table 77 – Media redundancy – additional forwarding rules 51
Table 78 – Media redundancy startup mode 52
Table 79 – Version controlled "Read Record" 52
Table 80 – Index (user specific) 53
Table 81 – Index (subslot specific) 53
Table 82 – Index (slot specific) 56
Table 83 – Index (AR specific) 57
Table 84 – Index (API specific) 58
Table 85 – Index (device specific) 59

This document is a preview generated by EVS

Table 86 – PDPortDataAdjust (sub blocks) 61
Table 87 – PDPortDataCheck (sub blocks) 62
Table 88 – Communication feature list 62
Table 89 – IO controller, IO device, IO supervisor and Network Management Entity 63
Table 90 – Network Component 64
Table 91 – Conformance class behaviors 64
Table 92 – Node classes 65
Table 93 – Link speed dependent local injection per Ethernet interface 65
Table 94 – SNMP feature selection 66
Table 95 – IETF RFC 1213-MIB (MIB-2) objects 67
Table 96 – LLDP-MIB objects – range 1 67
Table 97 – LLDP-MIB objects – range 2 68
Table 98 – LLDP-MIB objects – range 3 68
Table 99 – LLDP-EXT-PNO-MIB objects – range 1 69
Table 100 – LLDP-EXT-PNO-MIB objects – range 2 69
Table 101 – LLDP-EXT-DOT3-MIB objects – range 1 69
Table 102 – LLDP-EXT-DOT3-MIB objects – range 2 69
Table 103 – IEEE 802.1Q-BRIDGE-MIB objects 70
Table 104 – NETCONF feature selection 70
Table 105 – IEEE Std 802.3-2018 feature selection 71
Table 106 – IEEE Std 802.1Q-2018 feature selection 71
Table 107 – Node classes for bridge 74
Table 108 – Supported concurrent Link Speed for bridges 74
Table 109 – IEEE Std 802.1Q-2018 bridge components for Conformance Class D 74
Table 110 – IEC 61784-5-3 feature selection 75
Table 111 – IEC 62439-2 feature selection 75
Table 112 – Buffering capacity per port 76
Table 113 – Special case: Buffering capacity for eight and more ports 76
Table 114 – IEEE Std 802.1AB-2016 feature selection 77
Table 115 – IEEE Std 802.1AS-2020 feature selection 77
Table 116 – IEEE Std 802.1CB-2017 feature selection 78
Table 117 – IEEE Std 802.1Q-2018 feature selection 79
Table 118 – Cut through feature selection 80
Table 119 – Wireless feature selection 80
Table 120 – Node classes for network component 80
Table 121 – Conformance class constraints – wireline 81
Table 122 – Conformance class constraints – wireless 81
Table 123 – CP 3/4: AL service selection for an IO device 83
Table 124 – CP 3/4: Additional AL service selection for an IO controller 86
Table 125 – CP 3/4: Additional AL service selection for an IO supervisor 86
Table 126 – CP 3/4: AL protocol selection for an IO device 87
Table 127 – CP 3/4: AL protocol selection for an IO controller 89
Table 128 – CP 3/4, CP 3/5, CP 3/6 and CP 3/7: performance indicator overview 92

This document is a preview generated by EVS

Table 129 – CP 3/4, CP 3/5, CP 3/6 and CP 3/7: performance indicator dependency matrix 93
Table 130 – Media Redundancy Manager (MRM) parameters 96
Table 131 – Media Redundancy Client (MRC) parameters 97
Table 132 – Media redundancy Interconnection Manager (MIM) parameters 97
Table 133 – Media redundancy Interconnection Client (MIC) parameters 97
Table 134 – CP 3/4: Consistent set of PI for MinDeviceInterval=128 ms 98
Table 135 – CP 3/4: Assumed values for consistent set of PI calculation 99
Table 136 – CP 3/5: AL service selection for an IO device 100
Table 137 – CP 3/5: Additional AL service selection for an IO controller 102
Table 138 – CP 3/5: Additional AL service selection for an IO supervisor 102
Table 139 – CP 3/5: AL protocol selection for an IO device 103
Table 140 – CP 3/5: AL protocol selection for an IO controller 105
Table 141 – CP 3/5: Consistent set of PI for MinDeviceInterval=128 ms 108
Table 142 – CP 3/5: Assumed values for consistent set of PI calculation 109
Table 143 – CP 3/6: AL service selection for an IO device 110
Table 144 – CP 3/6: Additional AL service selection for an IO controller 112
Table 145 – CP 3/6: AL protocol selection for an IO device 113
Table 146 – CP 3/6: AL protocol selection for an IO controller 116
Table 147 – CP 3/6: Consistent set of PI for MinDeviceInterval = 1 ms and NumberOfSwitches = 20 119
Table 148 – CP 3/6: Consistent set of PI for MinDeviceInterval = 1 ms and NumberOfSwitches = 63 119
Table 149 – CP 3/6: Assumed values for consistent set of PI calculation 120
Table 150 – CP 3/6: Consistent set of PI for MinDeviceInterval = 31,25 µs and NumberOfSwitches = 10 121
Table 151 – CP 3/6: Assumed values for consistent set of PI calculation 121
Table 152 – CP 3/7: AL service selection for an IO device 122
Table 153 – CP 3/7: Additional AL service selection for an IO controller 124
Table 154 – CP 3/7: AL protocol selection for an IO device 125
Table 155 – CP 3/7: AL protocol selection for an IO controller 127
Table 156 – CP 3/7: Consistent set of PI for MinDeviceInterval = 1 ms and NumberOfSwitches = 20 130
Table 157 – CP 3/7: Consistent set of PI for MinDeviceInterval = 1 ms and NumberOfSwitches = 63 131
Table 158 – CP 3/7: Assumed values for consistent set of PI calculation 131
Table 159 – CP 3/7: Consistent set of PI for MinDeviceInterval = 31,25 µs and NumberOfSwitches = 10 132
Table 160 – CP 3/7: Assumed values for consistent set of PI calculation 133

This document is a preview generated by EVS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

INDUSTRIAL NETWORKS – PROFILES –

Part 2-3: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – CPF 3

This document is a preview generated by EVS

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.

Attention is drawn to the fact that the use of some of the associated protocol types is restricted by their intellectual-property-right holders. In all cases, the commitment to limited release of intellectual-property-rights made by the holders of those rights permits a layer protocol type to be used with other layer protocols of the same type, or in other type combinations explicitly authorized by their respective intellectual property right holders.

NOTE Combinations of protocol types are specified in the IEC 61784-1 series and the IEC 61784-2 series.

IEC 61784-2-3 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This first edition, together with the other parts of the same series, cancels and replaces the fourth edition of IEC 61784-2 published in 2019. This first edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 61784-2:2019:

a) split of the original IEC 61784-2 into several subparts, one subpart for the material of a generic nature, and one subpart for each Communication Profile Family specified in the original document;
b) addition of new profile CP 3/7;
c) update of the requirements for all conformance classes;
d) updated timing requirements for IO devices;
e) refining the added application classes.

The text of this International Standard is based on the following documents:

Draft	Report on voting
65C/1209/FDIS	65C/1237/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of the IEC 61784-2 series, published under the general title *Industrial networks – Profiles – Part 2: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3*, 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 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.

This document is a preview generated by EVS

INTRODUCTION

The IEC 61784-2 series provides additional Communication Profiles (CP) to the existing Communication Profile Families (CPF) of the IEC 61784-1 series and additional CPFs with one or more CPs. These profiles meet the industrial automation market objective of identifying Real-Time Ethernet (RTE) communication networks coexisting with ISO/IEC/IEEE 8802-3 – commonly known as Ethernet. These RTE communication networks use provisions of ISO/IEC/IEEE 8802-3 for the lower communication stack layers and additionally provide more predictable and reliable real-time data transfer and means for support of precise synchronization of automation equipment.

More specifically, these profiles help to correctly state the compliance of RTE communication networks with ISO/IEC/IEEE 8802-3, and to avoid the spreading of divergent implementations.

Adoption of Ethernet technology for industrial communication between controllers and even for communication with field devices promotes the use of Internet technologies in the field area. This availability would be unacceptable if it causes the loss of features required in the field area for industrial communication automation networks, such as:

- real-time,
- synchronized actions between field devices like drives,
- efficient, frequent exchange of very small data records.

These new RTE profiles can take advantage of the improvements of Ethernet networks in terms of transmission bandwidth and network span.

Another implicit but essential requirement is that the typical Ethernet communication capabilities, as used in the office world, are fully retained, so that the software involved remains applicable.

The market is in need of several network solutions, each with different performance characteristics and functional capabilities, matching the diverse application requirements. RTE performance indicators, whose values will be provided with RTE devices based on communication profiles specified in the IEC 61784-2 series, enable the user to match network devices with application-dependent performance requirements of an RTE network.

This document is a preview generated by EVS

INDUSTRIAL NETWORKS – PROFILES –

Part 2-3: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – CPF 3

This document is a preview generated by EVS

1 Scope

This part of IEC 61784-2 defines extensions of Communication Profile Family 3 (CPF 3) for Real-Time Ethernet (RTE). CPF 3 specifies a set of Real-Time Ethernet (RTE) communication profiles (CPs) and related network components based on the IEC 61158 series (Type 10), ISO/IEC/IEEE 8802-3 and other standards.

For each RTE communication profile, this document also specifies the relevant RTE performance indicators and the dependencies between these RTE performance indicators.

NOTE 1 All CPs are based on standards or draft standards or International Standards published by the IEC or on standards or International Standards established by other standards bodies or open standards processes.

NOTE 2 The RTE communication profiles use ISO/IEC/IEEE 8802-3 communication networks and its related network components and in some cases amend those standards to obtain RTE features.

NOTE 3 Some CPs of CPF 3 are specified in IEC 61784-1-3.

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.

NOTE All parts of the IEC 61158 series, as well as the IEC 61784-1 series and the IEC 61784-2 series, are maintained simultaneously. Cross-references to these documents within the text therefore refer to the editions as dated in this list of normative references.

IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61158-5-10:2023, *Industrial communication networks – Fieldbus specifications – Part 5-10: Application layer service definition – Type 10 elements*

IEC 61158-6-10:2023, *Industrial communication networks – Fieldbus specifications – Part 6-10: Application layer protocol specification – Type 10 elements*

IEC 61784-1-3:2023, *Industrial networks – Profiles – Part 1-3: Fieldbus profiles – Communication Profile Family 3*

IEC 61784-2-0:2023, *Industrial networks – Profiles – Part 2-0: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – General concepts and terminology*

IEC 61784-3-3:2021, *Industrial communication networks – Profiles – Part 3-3: Functional safety fieldbuses – Additional specifications for CPF 3*

IEC 61784-5-3:2018, *Industrial communication networks – Profiles – Part 5-3: Installation of fieldbuses – Installation profiles for CPF 3*

IEC 62439-2:2021*, Industrial communication networks – High availability automation networks – Part 2: Media Redundancy Protocol (MRP)*

ISO/IEC/IEEE 8802-3, *Telecommunications and exchange between information technology systems – Requirements for local and metropolitan area networks – Part 3: Standard for Ethernet*

ISO/IEC 9834-8:2014, *Information technology – Procedures for the operation of object identifier registration authorities – Part 8: Generation of universally unique identifiers (UUIDs) and their use in object identifiers*

ISO 15745-4:2003/Amd. 1:2006, *Industrial automation systems and integration – Open systems application integration framework – Part 4: Reference description for Ethernet-based control systems – Amendment 1: PROFINET profiles*

IEEE Std 802-2014, *IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture*

IEEE Std 802.1AB-2016, *IEEE Standard for Local and metropolitan area networks – Station and Media Access Control Connectivity Discovery*

IEEE Std 802.1AS-2020, *IEEE Standard for Local and Metropolitan Area Networks – Timing and Synchronization for Time-Sensitive Applications*

IEEE Std 802.1CB-2017, *IEEE Standard for Local and metropolitan area networks – Frame Replication and Elimination for Reliability*

IEEE Std 802.1Q-2018, *IEEE Standard for Local and Metropolitan Area Networks – Bridges and Bridged Networks*

IEEE Std 802.3-2018, *IEEE Standard for Ethernet*

IEEE Std 802.11-2020, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications*

IEEE Std 802.11n-2009, *IEEE Standard for Information technology – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications – Amendment 5: Enhancements for Higher Throughput*

IEEE Std 802.15.1-2005, *IEEE Standard for Information technology – Local and metropolitan area networks – Specific requirements – Part 15.1a: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications for Wireless Personal Area Networks (WPAN)*

IETF RFC 768, J. Postel, *User Datagram Protocol*, August 1980, available at https://www.rfc-editor.org/info/rfc768 [viewed 2022-02-18]

IETF RFC 791, J. Postel, *Internet Protocol*, September 1981, available at https://www.rfc-editor.org/info/rfc791 [viewed 2022-02-18]

IETF RFC 792, J. Postel, *Internet Control Message Protocol*, September 1981, available https://www.rfc-editor.org/info/rfc792 [viewed 2022-02-18]

IETF RFC 793, J. Postel, *Transmission Control Protocol*, September 1981, available at https://www.rfc-editor.org/info/rfc793 [viewed 2022-02-18]

This document is a preview generated by EVS

IETF RFC 826, D. Plummer, *An Ethernet Address Resolution Protocol: Or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware*, November 1982, available at https://www.rfc-editor.org/info/rfc826 [viewed 2022-02-18]

IETF RFC 1034, P.V. Mockapetris, *Domain names – concepts and facilities*, November 1987, available at https://www.rfc-editor.org/info/rfc1034 [viewed 2022-02-18]

IETF RFC 1157, J.D. Case, M. Fedor, M.L. Schoffstall, J. Davin, *Simple Network Management Protocol (SNMP)*, May 1990, available at https://www.rfc-editor.org/info/rfc1157 [viewed 2022-02-18]

IETF RFC 1213, K. McCloghrie, M. Rose, *Management Information Base for Network Management of TCP/IP-based internets: MIB-II*, March 1991, available at https://www.rfc-editor.org/info/rfc1213 [viewed 2022-02-18]

IETF RFC 2131, R. Droms, *Dynamic Host Configuration Protocol*, March 1997, available at https://www.rfc-editor.org/info/rfc2131 [viewed 2022-02-18]

IETF RFC 4836, E. Beili, *Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs)*, April 2007, available at https://www.rfc-editor.org/info/rfc4836 [viewed 2022-02-18]

The Open Group – Publication C706, *Technical standard DCE1.1: Remote Procedure Call,* available at www.opengroup.org/onlinepubs/9629399/toc.htm [viewed 2022-02-18]

Metro Ethernet Forum – MEF 10.4:2018, *Subscriber Ethernet Service Attributes*, available at https://www.mef.net/resources/mef-10-4-subscriber-ethernet-services-attributes [viewed 2022-02-18]

3 Terms, definitions, abbreviated terms, acronyms, symbols and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61784-2-0, ISO/IEC/IEEE 8802-3, IEEE Std 802-2014, IEEE Std 802.1AB-2016, IEEE Std 802.1AS-2020 and IEEE Std 802.1Q-2018 apply.

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

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

3.2 Abbreviated terms and acronyms

For the purposes of this document, abbreviated terms and acronyms defined in IEC 61784-2-0 and the following apply.

API	Application Process Identifier
AR	Application Relationship
ARP	Address Resolution Protocol (see IETF RFC 826)
ASE	Application Service Element
BMCA	Best Master Clock Algorithm
CBS	Committed Burst Size
CIM	Communication Interface Management

This document is a preview generated by EVS