

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Industrial communication networks – Profiles –  
Part 5-2: Installation of fieldbuses – Installation profiles for CPF 2**

**Réseaux de communication industriels – Profils –  
Partie 5-2: Installation des bus de terrain – Profils d'installation pour CPF 2**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 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 la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

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

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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.

#### Useful links:

IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables you 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It also gives information on projects, replaced and withdrawn publications.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](http://webstore.iec.ch/justpublished)

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

Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - [webstore.iec.ch/csc](http://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: [csc@iec.ch](mailto:csc@iec.ch).

### A propos de la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

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

#### Liens utiles:

Recherche de publications CEI - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée vous permet de trouver des publications CEI 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.

Just Published CEI - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Industrial communication networks – Profiles –  
Part 5-2: Installation of fieldbuses – Installation profiles for CPF 2**

**Réseaux de communication industriels – Profils –  
Partie 5-2: Installation des bus de terrain – Profils d'installation pour CPF 2**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE **XH**  
CODE PRIX

ICS 25.040.40; 35.100.40

ISBN 978-2-8322-1060-4

**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.**

## CONTENTS

|  |    |
|--|----|
| FOREWORD.....  | 9  |
| INTRODUCTION.....  | 11 |
| 1 Scope.....   | 12 |
| 2 Normative references .....   | 12 |
| 3 Terms, definitions and abbreviated terms .....                             | 12 |
| 4 CPF 2: Overview of installation profiles .....                             | 12 |
| 5 Installation profile conventions .....                                     | 13 |
| 6 Conformance to installation profiles.....                                  | 14 |
| Annex A (normative) CP 2/1 (ControlNet™) specific installation profile.....  | 15 |
| A.1 Installation profile scope.....  | 15 |
| A.2 Normative references .....   | 15 |
| A.3 Installation profile terms, definitions, and abbreviated terms.....      | 15 |
| A.3.1 Terms and definitions .....  | 15 |
| A.3.2 Abbreviated terms .....  | 15 |
| A.3.3 Conventions for installation profiles.....                             | 15 |
| A.4 Installation planning .....  | 16 |
| A.4.1 General .....  | 16 |
| A.4.2 Planning requirements.....   | 17 |
| A.4.3 Network capabilities .....   | 18 |
| A.4.4 Selection and use of cabling components.....                           | 24 |
| A.4.5 Cabling planning documentation.....                                    | 41 |
| A.4.6 Verification of planning specification.....                            | 41 |
| A.5 Installation implementation.....   | 41 |
| A.5.1 General requirements.....  | 41 |
| A.5.2 Cable installation.....  | 41 |
| A.5.3 Connector installation.....  | 43 |
| A.5.4 Terminator installation.....   | 53 |
| A.5.5 Device installation.....   | 53 |
| A.5.6 Coding and labelling.....  | 55 |
| A.5.7 Earthing and bonding of equipment and devices and shield cabling.....  | 56 |
| A.5.8 As-implemented cabling documentation.....                              | 57 |
| A.6 Installation verification and installation acceptance test.....          | 57 |
| A.6.1 General .....  | 57 |
| A.6.2 Installation verification.....   | 57 |
| A.6.3 Installation acceptance test .....                                     | 60 |
| A.7 Installation administration.....   | 62 |
| A.8 Installation maintenance and installation troubleshooting .....          | 62 |
| A.8.1 General .....  | 62 |
| A.8.2 Maintenance.....   | 62 |
| A.8.3 Troubleshooting .....  | 62 |
| A.8.4 Specific requirements for maintenance and troubleshooting .....        | 67 |
| Annex B (normative) CP 2/2 (EtherNet/IP™) specific installation profile..... | 68 |
| B.1 Installation profile scope.....  | 68 |
| B.2 Normative references .....   | 68 |

|       |   |     |
|-------|---|-----|
| B.3   | Installation profile terms, definitions, and abbreviated terms .....        | 68  |
| B.3.1 | Terms and definitions .....   | 68  |
| B.3.2 | Abbreviated terms .....   | 68  |
| B.3.3 | Conventions for installation profiles .....                                 | 68  |
| B.4   | Installation planning .....   | 69  |
| B.4.1 | General .....   | 69  |
| B.4.2 | Planning requirements .....   | 70  |
| B.4.3 | Network capabilities .....  | 70  |
| B.4.4 | Selection and use of cabling components .....                               | 74  |
| B.4.5 | Cabling planning documentation .....  | 86  |
| B.4.6 | Verification of cabling planning specification .....                        | 87  |
| B.5   | Installation implementation .....   | 87  |
| B.5.1 | General requirements .....  | 87  |
| B.5.2 | Cable installation .....  | 87  |
| B.5.3 | Connector installation .....  | 88  |
| B.5.4 | Terminator installation .....   | 89  |
| B.5.5 | Device installation .....   | 89  |
| B.5.6 | Coding and labelling .....  | 89  |
| B.5.7 | Earthing and bonding of equipment and devices and shield cabling .....      | 89  |
| B.5.8 | As-implemented cabling documentation .....                                  | 91  |
| B.6   | Installation verification and installation acceptance test .....            | 91  |
| B.6.1 | General .....   | 91  |
| B.6.2 | Installation verification .....   | 91  |
| B.6.3 | Installation acceptance test .....  | 93  |
| B.7   | Installation administration .....   | 94  |
| B.8   | Installation maintenance and installation troubleshooting .....             | 94  |
|       | Annex C (normative) CP 2/3 (DeviceNet™) specific installation profile ..... | 95  |
| C.1   | Installation profile scope .....  | 95  |
| C.2   | Normative references .....  | 95  |
| C.3   | Installation profile terms, definitions, and abbreviated terms .....        | 95  |
| C.3.1 | Terms and definitions .....   | 95  |
| C.3.2 | Abbreviated terms .....   | 95  |
| C.3.3 | Conventions for installation profiles .....                                 | 95  |
| C.4   | Installation planning .....   | 96  |
| C.4.1 | General .....   | 96  |
| C.4.2 | Planning requirements .....   | 97  |
| C.4.3 | Network capabilities .....  | 98  |
| C.4.4 | Selection and use of cabling components .....                               | 112 |
| C.4.5 | Cabling planning documentation .....  | 121 |
| C.4.6 | Verification of cabling planning specification .....                        | 121 |
| C.5   | Installation implementation .....   | 121 |
| C.5.1 | General requirements .....  | 121 |
| C.5.2 | Cable installation .....  | 121 |
| C.5.3 | Connector installation .....  | 124 |
| C.5.4 | Terminator installation .....   | 136 |
| C.5.5 | Device installation .....   | 138 |
| C.5.6 | Coding and labelling .....  | 141 |

|  |     |
|--|-----|
| C.5.7 Earthing and bonding of equipment and devices and shield cabling.....    | 141 |
| C.5.8 As-implemented cabling documentation.....                                | 142 |
| C.6 Installation verification and installation acceptance test.....            | 142 |
| C.6.1 General.....   | 142 |
| C.6.2 Installation verification.....   | 142 |
| C.6.3 Installation acceptance test.....  | 145 |
| C.7 Installation administration.....   | 146 |
| C.8 Installation maintenance and installation troubleshooting.....             | 146 |
| C.8.1 General.....   | 146 |
| C.8.2 Maintenance.....   | 146 |
| C.8.3 Troubleshooting.....   | 146 |
| C.8.4 Specific requirements for maintenance and troubleshooting.....           | 146 |
| Annex D (informative) Additional information.....                              | 150 |
| D.1 Network validation check sheet for CP 2/3 (DeviceNet).....                 | 150 |
| Bibliography.....  | 154 |
| <br>   |     |
| Figure 1 – Standards relationships.....  | 11  |
| Figure A.1 – Interconnection of CPF 2 networks.....                            | 16  |
| Figure A.2 – Overview of CPF 2/1 networks.....                                 | 17  |
| Figure A.3 – Drop cable requirements.....                                      | 19  |
| Figure A.4 – Placement of BNC/TNC plugs.....                                   | 19  |
| Figure A.5 – Placement of terminators.....                                     | 20  |
| Figure A.6 – Extending a network using repeaters.....                          | 20  |
| Figure A.7 – Extending a network using active star topology.....               | 21  |
| Figure A.8 – Links.....  | 21  |
| Figure A.9 – Extending the network beyond 99 nodes.....                        | 22  |
| Figure A.10 – Maximum allowable taps per segment.....                          | 30  |
| Figure A.11 – Example of repeaters in star configuration.....                  | 31  |
| Figure A.12 – Repeater in parallel.....  | 32  |
| Figure A.13 – Repeater in combination series and parallel.....                 | 33  |
| Figure A.14 – Ring repeater.....   | 33  |
| Figure A.15 – Installing bulkheads.....  | 34  |
| Figure A.16 – Coaxial BNC and TNC terminators.....                             | 35  |
| Figure A.17 – Terminator placement in a segment.....                           | 35  |
| Figure A.18 – Redundant network icons.....                                     | 37  |
| Figure A.19 – Redundant coax media.....  | 38  |
| Figure A.20 – Redundant fibre media.....                                       | 38  |
| Figure A.21 – Repeater in series versus length difference for coax media.....  | 39  |
| Figure A.22 – Repeater in series versus length difference for fibre media..... | 39  |
| Figure A.23 – Example of redundant coax network with repeaters.....            | 40  |
| Figure A.24 – Example of improper redundant node connection.....               | 40  |
| Figure A.25 – Example tool kit for installing BNC connectors.....              | 44  |
| Figure A.26 – Calibration of coaxial stripper.....                             | 45  |
| Figure A.27 – Coax PVC strip length detail (informative).....                  | 45  |

|   |    |
|---|----|
| Figure A.28 – Memory cartridge and blade.....                                     | 46 |
| Figure A.29 – Cable position.....   | 47 |
| Figure A.30 – Locking the cable.....  | 47 |
| Figure A.31 – Stripping the cable.....  | 47 |
| Figure A.32 – Install the crimp ferrule.....                                      | 48 |
| Figure A.33 – Cable preparation for PVC type cables (informative).....            | 48 |
| Figure A.34 – Cable preparation for FEP type cables (informative).....            | 49 |
| Figure A.35 – Strip guides.....   | 49 |
| Figure A.36 – Using the flare tool.....   | 50 |
| Figure A.37 – Expanding the shields.....  | 50 |
| Figure A.38 – Install the centre pin.....   | 50 |
| Figure A.39 – Crimping the centre pin.....  | 51 |
| Figure A.40 – Installing the connector body.....                                  | 51 |
| Figure A.41 – Installing the ferrule.....   | 51 |
| Figure A.42 – Crimp tool.....   | 52 |
| Figure A.43 – Sealed IP65/67 cable.....   | 53 |
| Figure A.44 – Terminator placement.....   | 53 |
| Figure A.45 – Mounting the taps.....  | 54 |
| Figure A.46 – Mounting the tap assembly using the universal mounting bracket..... | 55 |
| Figure A.47 – Mounting the tap using tie wraps or screws.....                     | 55 |
| Figure A.48 – Redundant network icons.....  | 56 |
| Figure A.49 – Network test tool.....  | 58 |
| Figure A.50 – Shorting the cable to test for continuity.....                      | 59 |
| Figure A.51 – Testing fibre segments.....   | 61 |
| Figure A.52 – Multi-fibre backbone cable housing.....                             | 63 |
| Figure A.53 – Repeater adapter module.....  | 63 |
| Figure A.54 – Short and medium distance fibre module LEDs.....                    | 65 |
| Figure A.55 – Long and extra long repeater module LEDs.....                       | 66 |
| Figure B.1 – Interconnection of CPF 2 networks.....                               | 69 |
| Figure B.2 – Redundant linear bus.....  | 71 |
| Figure B.3 – Peer to peer connections.....  | 71 |
| Figure B.4 – Mated connections.....   | 74 |
| Figure B.5 – The 8-way modular sealed jack & plug (plastic housing).....          | 78 |
| Figure B.6 – The 8-way modular sealed jack & plug (metal housing).....            | 79 |
| Figure B.7 – M12-4 connectors.....  | 79 |
| Figure B.8 – Simplex LC connector.....  | 80 |
| Figure B.9 – Duplex LC connector.....   | 80 |
| Figure B.10 – IP65/67 sealed duplex LC connector.....                             | 81 |
| Figure B.11 – IP65/67 sealed duplex SC-RJ connector.....                          | 81 |
| Figure B.12 – M12-4 to 8-way modular bulkhead.....                                | 83 |
| Figure B.13 – The 8-way modular sealed jack & plug (plastic housing).....         | 88 |
| Figure B.14 – The 8-way modular sealed jack & plug (metal housing).....           | 89 |
| Figure B.15 – M12-4 connectors.....   | 89 |

|  |     |
|--|-----|
| Figure B.16 – Earthing of cable shield .....                             | 91  |
| Figure C.1 – Interconnection of CPF 2 networks .....                     | 96  |
| Figure C.2 – Connection to generic cabling.....                          | 97  |
| Figure C.3 – DeviceNet cable system uses a trunk/drop line topology..... | 98  |
| Figure C.4 – Measuring the trunk length .....                            | 100 |
| Figure C.5 – Measuring the trunk and drop length.....                    | 101 |
| Figure C.6 – Measuring drop cable in a network with multiports .....     | 101 |
| Figure C.7 – Removable device using open-style connectors .....          | 102 |
| Figure C.8 – Fixed connection using open-style connector.....            | 102 |
| Figure C.9 – Open-style connector pin out.....                           | 102 |
| Figure C.10 – Open-style connector pin out 10 position .....             | 103 |
| Figure C.11 – Power supply sizing example .....                          | 106 |
| Figure C.12 – Current limit for thick cable for one power supply.....    | 107 |
| Figure C.13 – Current limit for thick cable and two power supplies.....  | 108 |
| Figure C.14 – Worst case scenario .....                                  | 109 |
| Figure C.15 – Example using the lookup method .....                      | 109 |
| Figure C.16 – One power supply end connected .....                       | 111 |
| Figure C.17 – Segmenting power in the power bus .....                    | 112 |
| Figure C.18 – Segmenting the power bus using power taps.....             | 112 |
| Figure C.19 – Thick cable construction.....                              | 122 |
| Figure C.20 – Cable Type I construction .....                            | 123 |
| Figure C.21 – Thin cable construction.....                               | 123 |
| Figure C.22 – Flat cable construction.....                               | 123 |
| Figure C.23 – Cable preparation .....                                    | 124 |
| Figure C.24 – Connector assembly .....                                   | 125 |
| Figure C.25 – Micro connector pin assignment.....                        | 125 |
| Figure C.26 – Mini connector pin assignment.....                         | 125 |
| Figure C.27 – Preparation of cable end.....                              | 126 |
| Figure C.28 – Shrink wrap installation.....                              | 126 |
| Figure C.29 – Wire preparation .....                                     | 126 |
| Figure C.30 – Open-style connector (female).....                         | 127 |
| Figure C.31 – Open-style (male plug) .....                               | 127 |
| Figure C.32 – Flat cable.....  | 128 |
| Figure C.33 – Aligning the cable .....                                   | 128 |
| Figure C.34 – Closing the assembly.....                                  | 129 |
| Figure C.35 – Proper orientation of cable.....                           | 129 |
| Figure C.36 – Locking the assembly .....                                 | 129 |
| Figure C.37 – Driving the IDC contacts in to the cable .....             | 130 |
| Figure C.38 – End cap placement .....                                    | 130 |
| Figure C.39 – End cap seated.....  | 131 |
| Figure C.40 – End cap installation on alternate side of cable .....      | 131 |
| Figure C.41 – Flat cable IDC connectors.....                             | 132 |
| Figure C.42 – Installing the connectors .....                            | 132 |

|   |     |
|---|-----|
| Figure C.43 – Cable wiring to open-style terminals .....                                | 133 |
| Figure C.44 – Auxiliary power cable profile .....                                       | 133 |
| Figure C.45 – Pin out auxiliary power connectors.....                                   | 134 |
| Figure C.46 – Power supply cable length versus wire size .....                          | 135 |
| Figure C.47 – Sealed terminator .....   | 137 |
| Figure C.48 – Open-style terminator .....   | 137 |
| Figure C.49 – Open-style IDC terminator .....   | 137 |
| Figure C.50 – Sealed terminator IDC cable .....   | 138 |
| Figure C.51 – Direct connection to the trunk .....                                      | 138 |
| Figure C.52 – Wiring of open-style connector.....                                       | 139 |
| Figure C.53 – Wiring of open-style 10-position connector .....                          | 139 |
| Figure C.54 – Diagnostic temporary connections .....                                    | 139 |
| Figure C.55 – Thick cable preterminated cables (cord sets) .....                        | 140 |
| Figure C.56 – Thin cable preterminated cables (cord sets).....                          | 141 |
|   |     |
| Table A.1 – Basic network characteristics for copper cabling not based on Ethernet..... | 22  |
| Table A.2 – Allowable fibre lengths .....   | 23  |
| Table A.3 – RG6 coaxial electrical properties.....                                      | 25  |
| Table A.4 – RG6 coaxial physical parameters.....  | 25  |
| Table A.5 – Cable type selection.....   | 26  |
| Table A.6 – Information relevant to optical fibre cables .....                          | 27  |
| Table A.7 – Copper connectors for ControlNet.....                                       | 27  |
| Table A.8 – Fibre connectors for fieldbus systems.....                                  | 28  |
| Table A.9 – Relationship between FOC and fibre types (CP 2/1).....                      | 29  |
| Table A.10 – Parameters for Coaxial RG6 Cables.....                                     | 42  |
| Table A.11 – Bend radius for coaxial cables outside conduit .....                       | 42  |
| Table A.12 – Parameters for silica optical fibre cables .....                           | 42  |
| Table A.13 – Parameters for hard clad silica optical fibre.....                         | 43  |
| Table A.14 – Test matrix for BNC/TNC connectors.....                                    | 59  |
| Table A.15 – Wave length and fibre types .....  | 62  |
| Table A.16 – LED status table.....  | 64  |
| Table A.17 – Repeater adapter and module diagnostic .....                               | 64  |
| Table A.18 – Repeater adapter indicator diagnostic .....                                | 64  |
| Table A.19 – Repeater module indicator .....  | 65  |
| Table A.20 – Short and medium distance troubleshooting chart .....                      | 65  |
| Table A.21 – Long and extra long troubleshooting chart.....                             | 67  |
| Table B.1 – Network characteristics for balanced cabling based on Ethernet .....        | 72  |
| Table B.2 – Network characteristics for optical fibre cabling.....                      | 72  |
| Table B.3 – Fibre lengths for 1 mm POF A4a.2 POF 0.5 NA .....                           | 73  |
| Table B.4 – Fibre lengths for 1 mm POF A4d POF 0.3 NA .....                             | 74  |
| Table B.5 – Information relevant to copper cable: fixed cables.....                     | 75  |
| Table B.6 – Information relevant to copper cable: cords.....                            | 75  |
| Table B.7 – TCL limits for unshielded twisted-pair cabling .....                        | 76  |

|   |     |
|---|-----|
| Table B.8 – ELTCTL limits for unshielded twisted-pair cabling .....                     | 76  |
| Table B.9 – Coupling attenuation limits for screened twisted-pair cabling.....          | 76  |
| Table B.10 – Information relevant to optical fibre cables .....                         | 77  |
| Table B.11 – Connectors for balanced cabling CPs based on Ethernet .....                | 78  |
| Table B.12 – Industrial EtherNet/IP 8-way modular connector parameters .....            | 78  |
| Table B.13 – Industrial EtherNet/IP M12-4 D-coding connector parameters .....           | 79  |
| Table B.14 – Optical fibre connecting hardware .....                                    | 80  |
| Table B.15 – Relationship between FOC and fibre types (CP2/2).....                      | 81  |
| Table B.16 – Connector insertion loss.....  | 82  |
| Table B.17 – Parameters for balanced cables .....                                       | 87  |
| Table B.18 – Parameters for silica optical fibre cables .....                           | 87  |
| Table B.19 – Parameters for POF optical fibre cables .....                              | 88  |
| Table C.1 – Basic network characteristics for copper cabling not based on Ethernet..... | 99  |
| Table C.2 – Cable trunk and drop lengths for CP 2/3 .....                               | 99  |
| Table C.3 – Summary of available current for trunk cables (CP 2/3).....                 | 103 |
| Table C.4 – Permissible current for thin cable drop lines of various lengths .....      | 104 |
| Table C.5 – Power supply specification for DeviceNet.....                               | 104 |
| Table C.6 – Power supply tolerance stack up for DeviceNet.....                          | 105 |
| Table C.7 – Current versus cable length for one power supply thick cable .....          | 107 |
| Table C.8 – Current versus length for two power supplies.....                           | 108 |
| Table C.9 – Definition of equation variables.....                                       | 110 |
| Table C.10 – Information relevant to copper cable: fixed cables.....                    | 113 |
| Table C.11 – Information relevant to copper cable: cords.....                           | 113 |
| Table C.12 – DeviceNet cables and connector support cross reference .....               | 114 |
| Table C.13 – DeviceNet cable profiles .....   | 114 |
| Table C.14 – Copper connectors for non-Ethernet based fieldbus .....                    | 117 |
| Table C.15 – Additional connectors for CP 2/3 (DeviceNet) .....                         | 117 |
| Table C.16 – Parameters for balanced cables.....  | 122 |
| Table C.17 – Wire colour code and function.....   | 127 |
| Table C.18 – Auxiliary power cable colour code .....                                    | 133 |
| Table C.19 – Auxiliary power supply requirements .....                                  | 134 |
| Table C.20 – Signal wire verification .....   | 143 |
| Table C.21 – Shield to earth .....  | 144 |
| Table C.22 – Connector pin out .....  | 145 |

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –  
PROFILES –****Part 5-2: Installation of fieldbuses –  
Installation profiles for CPF 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.

International Standard IEC 61784-5-2 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

This edition includes the following technical changes with respect to the previous edition:

- updates pertaining to current installation practices;
- addition of new technology that has become recently available;
- errors have been corrected;
- improved alignment with IEC 61918.

This standard is to be used in conjunction with IEC 61918:2013.

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

|              |                  |
|--------------|------------------|
| FDIS         | Report on voting |
| 65C/738/FDIS | 65C/743/RVD      |

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 61784-5 series, under the general title *Industrial communication networks – Profiles – Installation of fieldbuses*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site 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 International Standard is one of a series produced to facilitate the use of communication networks in industrial control systems.

IEC 61918:2013 provides the common requirements for the installation of communication networks in industrial control systems. This installation profile standard provides the installation profiles of the communication profiles (CP) of a specific communication profile family (CPF) by stating which requirements of IEC 61918 fully apply and, where necessary, by supplementing, modifying, or replacing the other requirements (see Figure 1).

For general background on fieldbuses, their profiles, and relationship between the installation profiles specified in this standard, see IEC 61158-1.

Each CP installation profile is specified in a separate annex of this standard. Each annex is structured exactly as the reference standard IEC 61918 for the benefit of the persons representing the roles in the fieldbus installation process as defined in IEC 61918 (planner, installer, verification personnel, validation personnel, maintenance personnel, administration personnel). By reading the installation profile in conjunction with IEC 61918, these persons immediately know which requirements are common for the installation of all CPs and which are modified or replaced. The conventions used to draft this standard are defined in Clause 5.

The provision of the installation profiles in one standard for each CPF (for example IEC 61784-5-2 for CPF 2), allows readers to work with standards of a convenient size.

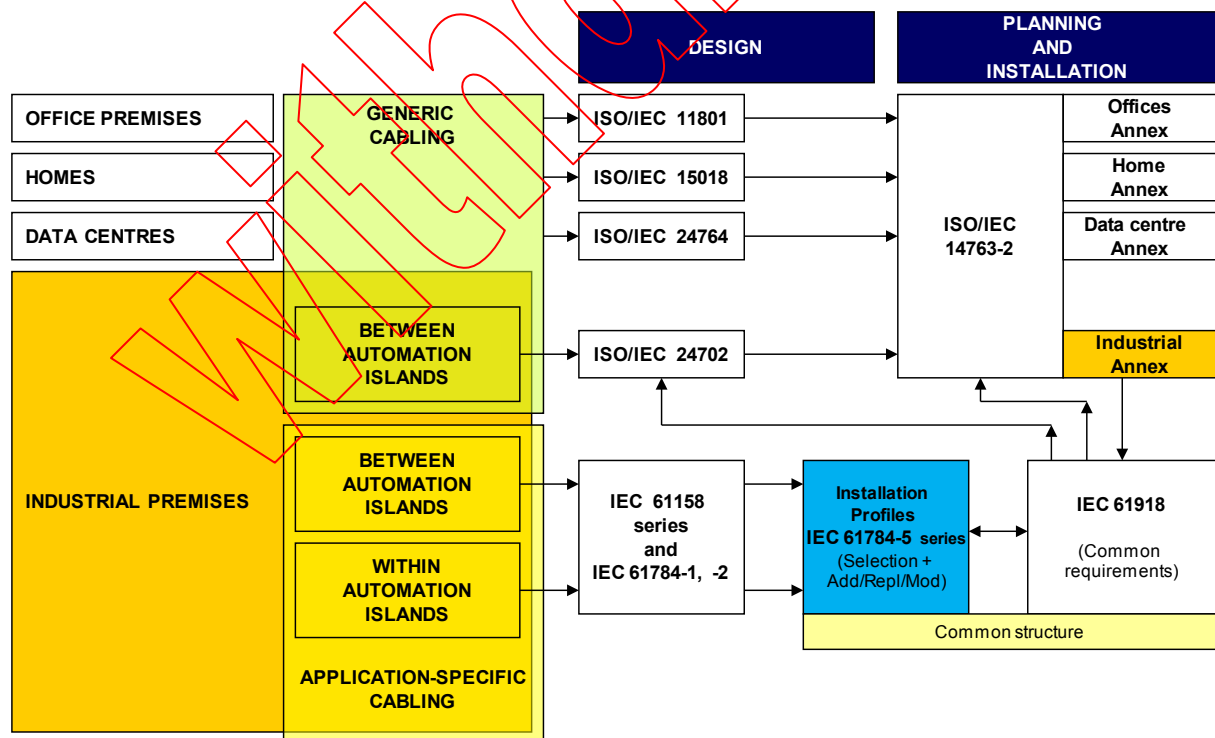


Figure 1 – Standards relationships

# INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

## Part 5-2: Installation of fieldbuses – Installation profiles for CPF 2

### 1 Scope

This part of IEC 61784-5 specifies the installation profiles for CPF 2 (CIP™<sup>1</sup>).

The installation profiles are specified in the annexes. These annexes are read in conjunction with IEC 61918:2013.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61918:2013, *Industrial communication networks – Installation of communication networks in industrial premises*

The normative references of IEC 61918:2013, Clause 2, apply. For profile specific normative references, see Clauses A.2, B.2, C.2.

### 3 Terms, definitions and abbreviated terms

IEC 61918:2013, Clause 3, applies. For profile specific terms, definitions and abbreviated terms, see Clauses A.3, B.3, C.3.

### 4 CPF 2: Overview of installation profiles

CPF 2 consists of three basic communication profiles as specified in IEC 61784-1 and IEC 61784-2. These profiles share a common upper layers protocol named CIP™ (Common Industrial Protocol).

---

<sup>1</sup> CIP™ (Common Industrial Protocol) is a trade name of ODVA, Inc. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this standard does not require use of the trade name CIP™. Use of the trade name CIP™ requires permission of ODVA, Inc.