

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Adjustable speed electrical power drive systems –  
Part 7-303: Generic interface and use of profiles for power drive systems –  
Mapping of profile type 3 to network technologies**

**Entraînements électriques de puissance à vitesse variable –  
Partie 7-303: Interface générique et utilisation de profils pour les entraînements  
électriques de puissance – Mise en correspondance du profil de type 3 avec les  
technologies de réseaux**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 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 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.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://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 - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

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](http://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](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 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 60 000 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](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 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.

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

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

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](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. 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 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 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### 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



**Adjustable speed electrical power drive systems –  
Part 7-303: Generic interface and use of profiles for power drive systems –  
Mapping of profile type 3 to network technologies**

**Entraînements électriques de puissance à vitesse variable –  
Partie 7-303: Interface générique et utilisation de profils pour les entraînements  
électriques de puissance – Mise en correspondance du profil de type 3 avec les  
technologies de réseaux**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 29.200; 35.100.05

ISBN 978-2-8322-2933-0

**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.....   | 7  |
| INTRODUCTION.....   | 9  |
| 0.1 General.....  | 9  |
| 0.2 Patent declaration.....   | 12 |
| 1 Scope.....  | 14 |
| 2 Normative references.....   | 14 |
| 3 Terms, definitions and abbreviated terms.....                         | 14 |
| 3.1 Terms and definitions.....  | 14 |
| 3.2 Abbreviated terms.....  | 19 |
| 4 Mapping to PROFIBUS DP.....   | 21 |
| 4.1 General.....  | 21 |
| 4.2 Mapping to PROFIBUS data types.....                                 | 21 |
| 4.3 Base Model at PROFIBUS DP.....                                      | 22 |
| 4.3.1 Communication devices.....  | 22 |
| 4.3.2 Communication relationship.....                                   | 23 |
| 4.3.3 Communication network.....  | 24 |
| 4.3.4 Communication services.....                                       | 25 |
| 4.3.5 P-Device communication model.....                                 | 27 |
| 4.3.6 Base Model State Machine.....                                     | 28 |
| 4.3.7 Definition of the CO.....   | 29 |
| 4.4 Drive Model at PROFIBUS DP.....                                     | 29 |
| 4.4.1 P-Device.....   | 29 |
| 4.4.2 Drive Unit.....   | 30 |
| 4.5 DO IO Data.....   | 30 |
| 4.5.1 COs for DO IO Data configuration.....                             | 30 |
| 4.5.2 Standard telegram configuration.....                              | 32 |
| 4.5.3 Cyclic Data Exchange between DP-Slaves (DXB).....                 | 34 |
| 4.6 Parameter Access.....   | 43 |
| 4.6.1 PAP for Parameter Access.....                                     | 43 |
| 4.6.2 Definition of the Base Mode Parameter Access mechanism.....       | 45 |
| 4.7 P-Device configuration.....   | 53 |
| 4.7.1 P-Device configuration on PROFIBUS DP.....                        | 53 |
| 4.7.2 Drive Unit configuration on PROFIBUS DP.....                      | 53 |
| 4.7.3 Getting the Drive Object – ID (DO-ID).....                        | 55 |
| 4.8 Diagnosis.....  | 57 |
| 4.9 Clock Synchronous Operation.....                                    | 57 |
| 4.9.1 Sequence of an isochronous DP cycle.....                          | 57 |
| 4.9.2 Time settings.....  | 58 |
| 4.9.3 Running-up, cyclic operation.....                                 | 63 |
| 4.9.4 Parameterisation, configuring (Set_Prm, GSD).....                 | 73 |
| 4.9.5 Clock cycle generation (Global Control) and clock cycle save..... | 75 |
| 4.9.6 Monitoring mechanisms.....  | 79 |
| 4.10 PROFIBUS DP specific parameter.....                                | 81 |
| 4.10.1 Overview of the communication interface related parameters.....  | 81 |
| 4.10.2 Definition of the specific parameters.....                       | 81 |
| 4.11 Specified communication functions for the Application Classes..... | 82 |

|        |   |     |
|--------|---|-----|
| 5      | Mapping to PROFINET IO.....   | 83  |
| 5.1    | General.....  | 83  |
| 5.2    | Mapping to PROFINET IO data types.....                                      | 83  |
| 5.3    | Base Model at PROFINET IO.....  | 84  |
| 5.3.1  | Communication devices.....  | 84  |
| 5.3.2  | Communication relationship.....   | 85  |
| 5.3.3  | Communication network.....  | 86  |
| 5.3.4  | Communication services.....   | 87  |
| 5.3.5  | P-Device communication model.....   | 88  |
| 5.3.6  | Base Model State Machine.....   | 90  |
| 5.3.7  | Definition of the CO.....   | 91  |
| 5.4    | Drive Model at PROFINET IO.....   | 91  |
| 5.4.1  | P-Device.....   | 91  |
| 5.4.2  | Drive Unit.....   | 92  |
| 5.4.3  | DO architecture.....  | 92  |
| 5.4.4  | Definition of the Module Ident Number and API.....                          | 94  |
| 5.4.5  | Definition of the Submodule Ident Number.....                               | 94  |
| 5.5    | DO IO Data.....   | 96  |
| 5.5.1  | COs for DO IO Data configuration.....                                       | 96  |
| 5.5.2  | IO Data Producer and Consumer Status.....                                   | 96  |
| 5.6    | Parameter Access.....   | 96  |
| 5.6.1  | PAPs for Parameter Access.....  | 96  |
| 5.6.2  | Base Mode Parameter Access.....   | 97  |
| 5.7    | P-Device Configuration.....   | 99  |
| 5.7.1  | P-Device Configuration on PROFINET IO.....                                  | 99  |
| 5.7.2  | Drive Unit Configuration on PROFINET IO.....                                | 100 |
| 5.7.3  | Getting the Drive Object – ID (DO-ID).....                                  | 100 |
| 5.8    | Diagnosis.....  | 101 |
| 5.8.1  | Use of PROFINET IO Diagnosis for PROFIdrive.....                            | 101 |
| 5.8.2  | Use of the Alarm ASE.....   | 101 |
| 5.8.3  | Use of the ChannelDiagnosisData structure.....                              | 102 |
| 5.8.4  | Use of the ChannelErrorType.....  | 104 |
| 5.8.5  | On demand access of Diagnosis Information.....                              | 104 |
| 5.9    | Clock Synchronous Operation.....  | 105 |
| 5.10   | PROFINET IO specific parameter.....   | 106 |
| 5.10.1 | Overview about the communication interface related parameters.....          | 106 |
| 5.10.2 | Definition of the specific parameters.....                                  | 106 |
| 5.11   | Specified communication functions for the Application Classes.....          | 108 |
| 5.12   | I&M data records.....   | 108 |
|        | Bibliography.....   | 109 |
|        | Figure 1 – Structure of IEC 61800-7.....                                    | 12  |
|        | Figure 2 – PROFIBUS DP Devices in a PROFIdrive drive system.....            | 23  |
|        | Figure 3 – PROFIdrive Devices and their relationship for PROFIBUS DP.....   | 24  |
|        | Figure 4 – General Communication Model for PROFIdrive at PROFIBUS DP.....   | 25  |
|        | Figure 5 – PROFIBUS DP DXB communication designations.....                  | 26  |
|        | Figure 6 – Synchronous communication for PROFIdrive at PROFIBUS DP.....     | 27  |
|        | Figure 7 – Overview about the P-Device communication model on PROFIBUS..... | 27  |

|   |    |
|---|----|
| Figure 8 – Mapping of the Base Model State Machine at PROFIBUS DP.....                                    | 29 |
| Figure 9 – PROFIBUS DP specific logical P-Device model (multi axis drive) .....                           | 30 |
| Figure 10 – Mapping of PROFIBUS Slot to the PROFIdrive DO.....  | 31 |
| Figure 11 – Application example of DXB communication.....   | 36 |
| Figure 12 – Dataflow inside a Homogeneous P-Device with DXB relations.....                                | 39 |
| Figure 13 – Structure of a DXB Subscriber Table (inside a Prm-Block) .....                                | 40 |
| Figure 14 – Timing diagram of PROFIBUS with Cyclic Data Exchange between DP-slaves .....                  | 41 |
| Figure 15 – PAP and Parameter Access mechanism for a PROFIBUS homogeneous P-Device.....                   | 44 |
| Figure 16 – PAP and Parameter Access mechanism for a PROFIBUS heterogeneous P-Device.....                 | 45 |
| Figure 17 – Telegram sequence via MS1 AR or MS2 AR.....   | 47 |
| Figure 18 – Drive Unit Structure.....   | 54 |
| Figure 19 – Configuration and communication channels for the Modular Drive Unit type at PROFIBUS DP ..... | 55 |
| Figure 20 – Meaning of parameter PNU978 (list of all DO-IDs) for the DU at PROFIBUS DP.....               | 56 |
| Figure 21 – Example of P978 for a complex Modular Drive Unit at PROFIBUS DP.....                          | 57 |
| Figure 22 – Sequence of an isochronous DP cycle.....  | 58 |
| Figure 23 – Time settings .....   | 59 |
| Figure 24 – Example: Simplest DP cycle.....   | 61 |
| Figure 25 – Example: Optimised DP cycle.....  | 62 |
| Figure 26 – Example: Optimised DP cycle ( $T_{MAPC} = 2 \times T_{DP}$ ).....                             | 63 |
| Figure 27 – Running-up (sequence with respect to time).....   | 64 |
| Figure 28 – Phase 1: Slave parameterisation, configuration.....   | 65 |
| Figure 29 – Phase 2: Synchronisation of the PLL to the Clock Global Control .....                         | 66 |
| Figure 30 – Phase 3: Synchronisation of the slave application with the master's Sign-Of-Life .....        | 68 |
| Figure 31 – State diagram of Phases 2 and 3 of the run-up.....  | 69 |
| Figure 32 – Phase 4: Synchronisation of the master application to the slave's Sign-Of-Life .....          | 70 |
| Figure 33 – Example: Running-up to cyclic operation (Phase 1) ( $T_{MAPC}/T_{DP} = 2/1$ ).....            | 71 |
| Figure 34 – Example: Running-up to cyclic operation (Phase 2) ( $T_{MAPC}/T_{DP} = 2/1$ ).....            | 72 |
| Figure 35 – Example: Running-up to cyclic operation (Phase 3) ( $T_{MAPC}/T_{DP} = 2/1$ ).....            | 72 |
| Figure 36 – Example: Running-up to cyclic operation (Phase 4) ( $T_{MAPC}/T_{DP} = 2/1$ ).....            | 73 |
| Figure 37 – Example: Running-up to cyclic operation (Phase 5) ( $T_{MAPC}/T_{DP} = 2/1$ ).....            | 73 |
| Figure 38 – PLL for clock regeneration in the slave.....  | 77 |
| Figure 39 – Run time compensation.....  | 79 |
| Figure 40 – DP cycle violation.....   | 80 |
| Figure 41 – Example: Clock failure (fault after 4 DP cycles).....   | 81 |
| Figure 42 – PROFINET IO Devices in a PROFIdrive drive system.....   | 85 |
| Figure 43 – PROFIdrive Devices and their relationship for PROFINET IO .....                               | 86 |
| Figure 44 – General Communication Model for PROFIdrive at PROFINET IO.....                                | 87 |
| Figure 45 – Synchronous communication for PROFIdrive at PROFINET IO .....                                 | 88 |



|  |     |
|--|-----|
| Figure 46 – Overview about the P-Device communication model on PROFINET IO .....                             | 88  |
| Figure 47 – Contents of IO AR and Supervisor AR .....  | 89  |
| Figure 48 – M CR used for Cyclic Data Exchange between P-Devices .....                                       | 90  |
| Figure 49 – Mapping of the Base Model State Machine at PROFINET IO .....                                     | 91  |
| Figure 50 – PROFINET IO specific Logical P-Device model (multi axis drive) .....                             | 92  |
| Figure 51 – Representation of the PROFIdrive DO by PROFINET IO Submodules (CO).....                          | 93  |
| Figure 52 – Hierarchical model of the P-Device on PROFINET IO .....  | 94  |
| Figure 53 – Modularity of the DO IO Data block (example) .....   | 96  |
| Figure 54 – Data flow for request and response for the Base Mode Parameter Access .....                      | 99  |
| Figure 55 – Configuration and communication channels for the Modular Drive Unit type<br>at PROFINET IO ..... | 100 |
| Figure 56 – Meaning of parameter P978 "List of all DO-IDs" for the DU at<br>PROFINET IO .....                | 101 |
| Figure 57 – Generation of Diagnosis Data according to the fault classes mechanism.....                       | 103 |
| Figure 58 – Sequence of an isochronous Data Cycle .....  | 105 |
|  |     |
| Table 1 – Mapping of data types .....  | 22  |
| Table 2 – DP IDs and PROFIdrive IDs of the standard telegrams .....  | 32  |
| Table 3 – 1 Drive Axis, standard telegram 3 .....  | 33  |
| Table 4 – 2 Drive Axes, standard telegram 3 .....  | 33  |
| Table 5 – 2 Drive Axes, standard telegram 3, per axis one DXB link each with 2 words .....                   | 34  |
| Table 6 – 1 Drive Axis, standard telegram 20 .....   | 34  |
| Table 7 – Slave No. 11 (Publisher) .....   | 37  |
| Table 8 – Slave No. 12 (Publisher and Subscriber) .....  | 37  |
| Table 9 – Configuration of the DXB communication link of the coating drive.....                              | 38  |
| Table 10 – Slave No. 10 (Subscriber) .....   | 38  |
| Table 11 – Configuration of the DXB communication links of the unwinder.....                                 | 38  |
| Table 12 – Parameters (Set_Prm, GSD) for slave-to-slave communication (Data-<br>eXchange Broadcast).....     | 43  |
| Table 13 – Services used for Parameter Access on PROFIBUS DP .....   | 46  |
| Table 14 – Defined PAPs for Parameter Access.....  | 46  |
| Table 15 – State machine for DP-slave processing .....   | 48  |
| Table 16 – MS1/MS2 AR telegram frame, Write request.....   | 48  |
| Table 17 – MS1/MS2 AR telegram frame, Write response .....   | 49  |
| Table 18 – MS1/MS2 AR telegram frame, Read request .....   | 49  |
| Table 19 – MS1/MS2 AR telegram frame, Read response .....  | 49  |
| Table 20 – Process data ASE telegram frame, Error response .....   | 50  |
| Table 21 – Allocation of Error class and code for PROFIdrive .....   | 51  |
| Table 22 – Data block lengths.....   | 51  |
| Table 23 – Limits due to the Process data ASE data block length .....  | 52  |
| Table 24 – GSD parameters for the MS1/MS2 AR services .....  | 53  |
| Table 25 – DP services for running-up, cyclic operation .....  | 63  |
| Table 26 – Parameters (Set_Prm, GSD) for "Clock Cycle Synchronous Drive Interface" .....                     | 74  |
| Table 27 – Possible synchronisation type combinations .....  | 75  |

|  |     |
|--|-----|
| Table 28 – Conditions for Isochronous Mode .....   | 76  |
| Table 29 – Input signals of the PLL .....  | 77  |
| Table 30 – Output signals of the PLL .....   | 78  |
| Table 31 – Overview of the specific PROFIBUS DP parameters for “Communication system interfaces” ..... | 81  |
| Table 32 – PROFIdrive specific parameter listed by number .....  | 82  |
| Table 33 – Coding of the data rate in parameter 963 .....  | 82  |
| Table 34 – Specified communication functions for the Application Classes .....                         | 83  |
| Table 35 – Mapping of data types .....   | 84  |
| Table 36 – Structure of the Submodule-ID .....   | 95  |
| Table 37 – Definition of Submodule-Type Classes .....  | 95  |
| Table 38 – Definition of Parameter Access Modes (PAP) .....  | 97  |
| Table 39 – Use of the AlarmNotification-PDU .....  | 102 |
| Table 40 – Use of ChannelDiagnosisData .....   | 102 |
| Table 41 – Use of ChannelErrorType .....   | 104 |
| Table 42 – Use of the DiagnosisData .....  | 104 |
| Table 43 – Overview of the specific PROFINET IO parameters for “Communication system interfaces” ..... | 106 |
| Table 44 – PROFIdrive Specific Parameter listed by number .....  | 107 |
| Table 45 – Specified communication functions for the Application Classes .....                         | 108 |

**IEC STANDARD PREVIEW**  
 (standards.iteh.ai)

[IEC 61800-7-303:2015](https://standards.iteh.ai/catalog/standards/sist/7b48269c-de2f-43fd-bfcf-0338a5fb48a9/iec-61800-7-303-2015)

<https://standards.iteh.ai/catalog/standards/sist/7b48269c-de2f-43fd-bfcf-0338a5fb48a9/iec-61800-7-303-2015>



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –****Part 7-303: Generic interface and use of profiles for power drive systems – Mapping of profile type 3 to network technologies**

## 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.  
<https://standards.iteh.ai/catalog/standards/sist/7b48269c-de2f-43fd-bfcf>
- 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.

International Standard IEC 61800-7-303 has been prepared by subcommittee SC 22G: Adjustable speed electric drive systems incorporating semiconductor power converters, of IEC technical committee TC 22: Power electronic systems and equipment.

This second edition cancels and replaces the first edition published in 2007. This edition constitutes a technical revision.

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

- a) Enhanced definition of the using of PROFINET IO Diagnosis ASE and Alarm ASE;
- b) Minor updates in the mapping of the Base Mode Parameter Access to PROFIBUS and PROFINET.

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

|              |                  |
|--------------|------------------|
| FDIS         | Report on voting |
| 22G/313/FDIS | 22G/328/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 the IEC 61800 series, under the general title *Adjustable speed electrical power drive systems*, 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.

## iTeh STANDARD PREVIEW

(standards.iteh.ai)

**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.**

<https://standards.iteh.ai/catalog/standards/sist/7b48269c-de2f-43fd-bfcf-0338a5fb48a9/iec-61800-7-303-2015>

## INTRODUCTION

### 0.1 General

The IEC 61800 series is intended to provide a common set of specifications for adjustable speed electrical power drive systems.

IEC 61800-7 specifies profiles for power drive systems (PDS) and their mapping to existing communication systems by use of a generic interface model.

IEC 61800-7 describes a generic interface between control systems and power drive systems. This interface can be embedded in the control system. The control system itself can also be located in the drive (sometimes known as "smart drive" or "intelligent drive").

A variety of physical interfaces is available (analogue and digital inputs and outputs, serial and parallel interfaces, fieldbuses and networks). Profiles based on specific physical interfaces are already defined for some application areas (e.g. motion control) and some device classes (e.g. standard drives, positioner). The implementations of the associated drivers and application programmers interfaces are proprietary and vary widely.

IEC 61800-7 defines a set of common drive control functions, parameters, and state machines or description of sequences of operation to be mapped to the drive profiles.

IEC 61800-7 provides a way to access functions and data of a drive that is independent of the used drive profile and communication interface. The objective is a common drive model with generic functions and objects suitable to be mapped on different communication interfaces. This makes it possible to provide common implementations of motion control (or velocity control or drive control applications) in controllers without any specific knowledge of the drive implementation.

**STANDARD PREVIEW**  
(standards.iteh.ai)  
IEC 61800-7-303:2015  
<https://standards.iteh.ai/catalog/standards/sist/7b48269c-de2f-43fd-bfcf-0338a5fb48a9/iec-61800-7-303-2015>

There are several reasons to define a generic interface:

#### **For a drive device manufacturer**

- less effort to support system integrators;
- less effort to describe drive functions because of common terminology;
- the selection of drives does not depend on availability of specific support;

#### **For a control device manufacturer**

- no influence of bus technology;
- easy device integration;
- independent of a drive supplier;

#### **For a system integrator**

- less integration effort for devices;
- only one understandable way of modeling;
- independent of bus technology.

Much effort is needed to design a motion control application with several different drives and a specific control system. The tasks to implement the system software and to understand the functional description of the individual components may exhaust the project resources. In some cases, the drives do not share the same physical interface. Some control devices just support a single interface which will not be supported by a specific drive. On the other hand, the functions and data structures are often specified with incompatibilities. This requires the

system integrator to write special interfaces for the application software and this should not be his responsibility.

Some applications need device exchangeability or integration of new devices in an existing configuration. They are faced with different incompatible solutions. The efforts to adapt a solution to a drive profile and to manufacturer specific extensions may be unacceptable. This will reduce the degree of freedom to select a device best suited for this application to the selection of the unit which will be available for a specific physical interface and supported by the controller.

IEC 61800-7-1 is divided into a generic part and several annexes as shown in Figure 1. The drive profile types for CiA® 402<sup>1</sup>, CIP Motion™<sup>2</sup>, PROFIdrive<sup>3</sup> and SERCOS®<sup>4</sup> are mapped to the generic interface in the corresponding annex. The annexes have been submitted by open international network or fieldbus organizations which are responsible for the content of the related annex and use of the related trade marks.

The different profile types 1, 2, 3 and 4 are specified in IEC 61800-7-201, IEC 61800-7-202, IEC 61800-7-203 and IEC 61800-7-204.

This part of IEC 61800-7 specifies how the profile type 3 (PROFIdrive) is mapped to the network technologies PROFIBUS<sup>5</sup> and PROFINET<sup>6</sup>.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 61800-7-303:2015](https://standards.iteh.ai/catalog/standards/sist/7b48269c-de2f-43fd-bfcf-0338a5fb48a9/iec-61800-7-303-2015)

<https://standards.iteh.ai/catalog/standards/sist/7b48269c-de2f-43fd-bfcf-0338a5fb48a9/iec-61800-7-303-2015>

- 
- <sup>1</sup> CiA® 402 is a registered trade mark of CAN in Automation e.V. (CiA) This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade mark holder or any of its products. Compliance to this profile does not require use of the registered trade mark CiA® 402. Use of the registered trade mark CiA® 402 requires permission of CAN in Automation e.V. (CiA).
  - <sup>2</sup> CIP Motion™ is a trade mark 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 trade mark holder or any of its products. Compliance to this profile does not require use of the trade mark CIP Motion™. Use of the trade mark CIP Motion™ requires permission of ODVA, Inc.
  - <sup>3</sup> PROFIdrive is a trade name of PROFIBUS & PROFINET International. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance to this profile does not require use of the trade name PROFIdrive. Use of the trade name PROFIdrive requires permission of PROFIBUS & PROFINET International.
  - <sup>4</sup> SERCOS® is a registered trade mark of SERCOS International e.V. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade mark holder or any of its products. Compliance to this profile does not require use of the registered trade mark SERCOS®. Use of the registered trade mark SERCOS® requires permission of the trade mark holder.
  - <sup>5</sup> PROFIBUS is a trade name of PROFIBUS & PROFINET International. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance to this profile does not require use of the trade name PROFIBUS. Use of the trade name PROFIBUS requires permission of PROFIBUS & PROFINET International.
  - <sup>6</sup> PROFINET is a trade name of PROFIBUS & PROFINET International. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance to this profile does not require use of the trade name PROFINET. Use of the trade name PROFINET requires permission of PROFIBUS & PROFINET International.

IEC 61800-7-301, IEC 61800-7-302 and IEC 61800-7-304 specify how the profile types 1, 2 and 4 are mapped to different network technologies (such as CANopen<sup>®7</sup>, CC-Link IE<sup>®</sup> Field Network<sup>8</sup>, EPA<sup>™9</sup>, EtherCAT<sup>®10</sup>, Ethernet Powerlink<sup>™11</sup>, DeviceNet<sup>™12</sup>, ControlNet<sup>™13</sup>, EtherNet/IP<sup>™14</sup>, and SERCOS<sup>®</sup>).

## iTeh STANDARD PREVIEW (standards.iteh.ai)

- 7 CANopen<sup>®</sup> is a registered trade mark of CAN in Automation e.V. (CiA). This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade mark holder or any of its products. Compliance to this profile does not require use of the registered trade mark CANopen<sup>®</sup>. Use of the registered trade mark CANopen<sup>®</sup> requires permission of CAN in Automation e.V. (CiA). CANopen<sup>®</sup> is an acronym for Controller Area Network *open* and is used to refer to EN 50325-4.
- 8 CC-Link IE<sup>®</sup> Field Network is a registered trade mark of Mitsubishi Electric Corporation. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade mark holder or any of its products. Compliance to this profile does not require use of the registered trade mark CC-Link IE<sup>®</sup> Field Network. Use of the registered trade mark CC-Link IE<sup>®</sup> Field Network requires permission of Mitsubishi Electric Corporation.
- 9 EPA<sup>™</sup> is a trade mark of SUPCON Group Co. Ltd. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade mark holder or any of its products. Compliance to this profile does not require use of the trade mark EPA<sup>™</sup>. Use of the trade mark EPA<sup>™</sup> requires permission of the trade mark holder.
- 10 EtherCAT<sup>®</sup> is a registered trade mark of Beckhoff, Verl. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade mark holder or any of its products. Compliance to this profile does not require use of the registered trade mark EtherCAT<sup>®</sup>. Use of the registered trade mark EtherCAT<sup>®</sup> requires permission of the trade mark holder.
- 11 Ethernet Powerlink<sup>™</sup> is a trade mark of Bernecker & Rainer Industrieelektronik Ges.m.b.H., control of trade mark use is given to the non profit organisation EPSG. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trade mark holder or any of its products. Compliance to this profile does not require use of the trade mark Ethernet Powerlink<sup>™</sup>. Use of the trade mark Ethernet Powerlink<sup>™</sup> requires permission of the trade mark holder.
- 12 DeviceNet<sup>™</sup> is a trade mark 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 trade mark holder or any of its products. Compliance to this profile does not require use of the trade mark DeviceNet<sup>™</sup>. Use of the trade mark DeviceNet<sup>™</sup> requires permission of ODVA, Inc.
- 13 ControlNet<sup>™</sup> is a trade mark 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 trade mark holder or any of its products. Compliance to this profile does not require use of the trade mark ControlNet<sup>™</sup>. Use of the trade mark ControlNet<sup>™</sup> requires permission of ODVA, Inc.
- 14 EtherNet/IP<sup>™</sup> is a trade mark 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 trade mark holder or any of its products. Compliance to this profile does not require use of the trade mark EtherNet/IP<sup>™</sup>. Use of the trade mark EtherNet/IP<sup>™</sup> requires permission of ODVA, Inc.

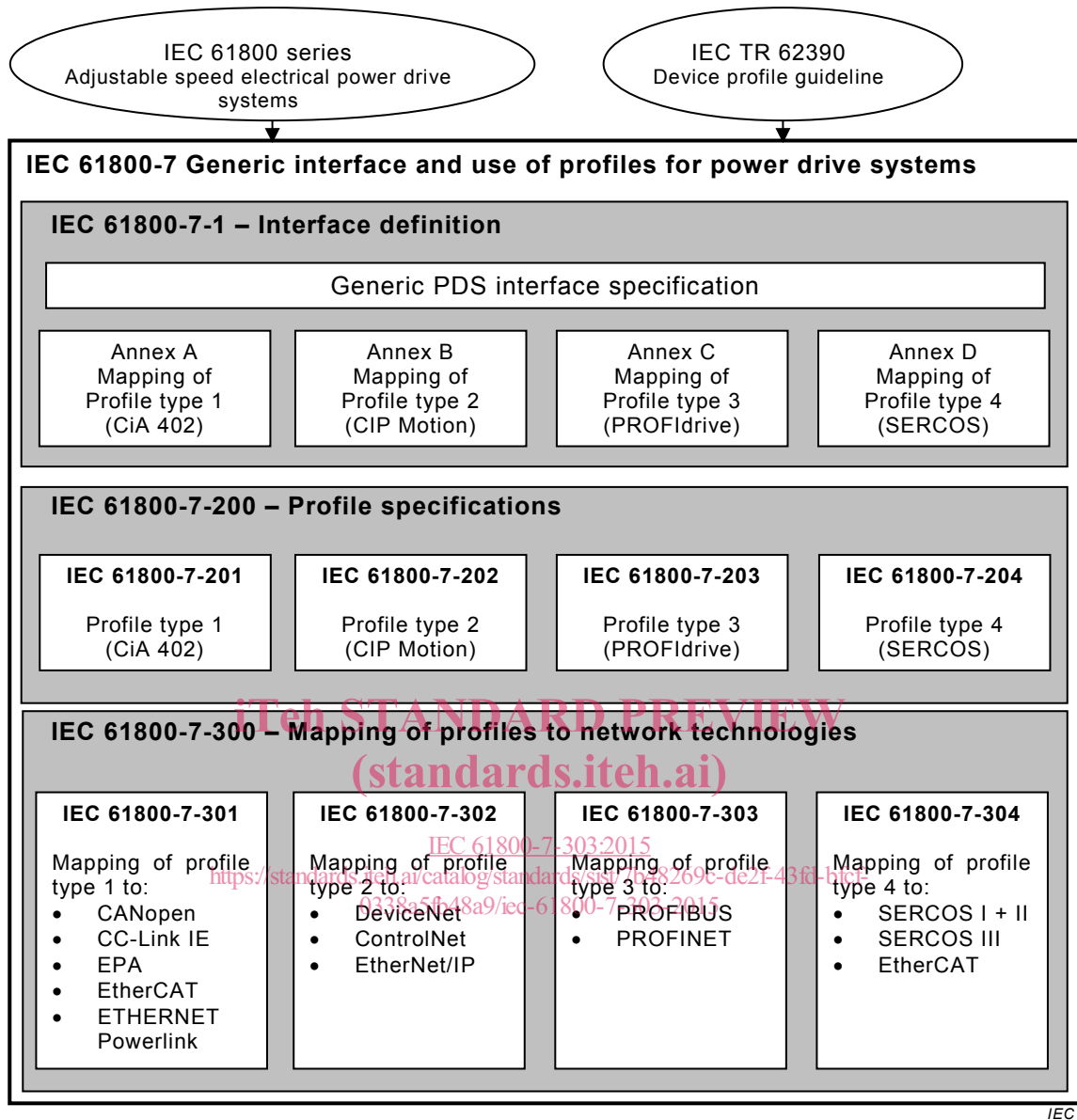


Figure 1 – Structure of IEC 61800-7

0.2 Patent declaration

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning the following.

| Publication / Application serial number | Holder | Title  | Derwent accession Number | Derwent publication  |
|---|--------|--|--------------------------|--|
| EP844542                                | [SI]   | Numerical control method and control structure for controlling of movement of objects whereby speed control is effected at a higher rate than position control | 1998-274369              | EP844542-A1<br>27.05.1998;<br>DE59603496-G<br>02.12.1999;<br>EP844542-B1<br>27.10.1999 |

The IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the IEC that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from

|      |  |
|------|--|
| [SI] | Siemens AG<br>Corporate Intellectual Property<br>Licensing & Transactions<br>Otto-Hahn-Ring 6<br>81730 Munich<br>Germany |
|------|--|

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

ISO ([www.iso.org/patents](http://www.iso.org/patents)) and IEC (<http://patents.iec.ch>) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

## **iTeh STANDARD PREVIEW** **(standards.iteh.ai)**

[IEC 61800-7-303:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/7b48269c-de2f-43fd-bfcf-0338a5fb48a9/iec-61800-7-303-2015>