

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Adjustable speed electrical power drive systems –
Part 7-203: Generic interface and use of profiles for power drive systems –
Profile type 3 specification**

**Entraînements électriques de puissance à vitesse variable –
Partie 7-203: Interface générique et utilisation de profils pour les entraînements
électriques de puissance – Spécification de profil de type 3**



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
www.iec.ch

About the IEC

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

About IEC publications

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

IEC Catalogue - webstore.iec.ch/catalogue

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

IEC publications search - 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

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

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 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

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

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

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

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 aussi une fois par mois par email.

Electropedia - 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

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

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

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Adjustable speed electrical power drive systems –
Part 7-203: Generic interface and use of profiles for power drive systems –
Profile type 3 specification**

**Entraînements électriques de puissance à vitesse variable –
Partie 7-203: Interface générique et utilisation de profils pour les entraînements
électriques de puissance – Spécification de profil de type 3**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.200; 35.100.05

ISBN 978-2-8322-2944-6

**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.....	10
INTRODUCTION.....	12
0.1 General	12
0.2 Patent declaration	15
1 Scope	17
2 Normative references	17
3 Terms, definitions and abbreviated terms	17
3.1 Terms and definitions.....	17
3.2 Abbreviated terms.....	22
4 General	23
4.1 Background	23
4.2 Requirements	23
4.3 Goals of the PROFIdrive Profile	24
5 Data types	24
5.1 Data types overview.....	24
5.2 Standard data types.....	24
5.3 Profile-specific data types.....	25
5.3.1 General	25
5.3.2 Normalised value: N2, N4	26
5.3.3 Normalised value (variable normalisation): X2, X4	27
5.3.4 Fixed point value: E2	27
5.3.5 Fixed point value: C4.....	28
5.3.6 Bit sequence: V2	28
5.3.7 Nibble: L2.....	29
5.3.8 Time constant: T2, T4	29
5.3.9 Time constant: D2	29
5.3.10 Reciprocal time constant: R2	30
6 Specifications	30
6.1 Integration of drives in automation systems	30
6.1.1 General	30
6.1.2 Base Model	30
6.1.3 Drive model	38
6.1.4 P-Device communication model	42
6.1.5 Application Model and Application Classes	43
6.2 Parameter model	49
6.2.1 Parameter definition	49
6.2.2 Global and local parameters	61
6.2.3 Base Mode Parameter Access	62
6.3 Drive control application process	87
6.3.1 General Axis type Drive Object architecture.....	87
6.3.2 Control and status words	90
6.3.3 Operating modes and State Machine	97
6.3.4 DO IO Data.....	113
6.3.5 Dynamic Servo Control (DSC)	125
6.3.6 Position feedback interface.....	130

6.3.7	Periphery	152
6.3.8	Diagnosis	152
6.3.9	Identification	162
6.3.10	Drive reset (power-on reset)	165
6.3.11	Operation priority of parameters and control priority	168
6.3.12	User data reliability	169
6.3.13	Specified DO functions for the Application Classes	174
6.4	Parameter definition	175
6.4.1	PROFIdrive Parameter listed by Function	175
6.4.2	PROFIdrive Parameter listed by number	180
6.5	Integration of Drives in Process Technology (VIK-NAMUR)	188
6.5.1	General	188
6.5.2	Commands and Checkback Signals	189
6.5.3	State diagrams	192
6.5.4	Inevitable line interruption	194
6.5.5	Forced inverter inhibit	195
6.5.6	External interlock	196
6.5.7	Standard telegram	196
	Bibliography	198
	Figure 1 – Structure of IEC 61800-7	15
	Figure 2 – PROFIdrive Devices and there relationship	31
	Figure 3 – General Communication Model of a PROFIdrive automation system	32
	Figure 4 – The PROFIdrive Device (consists of one or several Functional Objects)	33
	Figure 5 – Hierarchical order in the Object Model	34
	Figure 6 – PROFIdrive Base Model contains the Application Layer and Communication Layer	35
	Figure 7 – Typical use case for Clock Synchronous Operation	36
	Figure 8 – General model for Clock Synchronous Operation	37
	Figure 9 – Base Model State Machine	38
	Figure 10 – General Drive Unit model	39
	Figure 11 – General Drive Object architecture	40
	Figure 12 – Principle functional model of an Axis type Drive Object	41
	Figure 13 – Classes of PROFIdrive P-Devices	42
	Figure 14 – Classes of PROFIdrive Drive Units	42
	Figure 15 – Overview of the available communication services between the PROFIdrive Devices	43
	Figure 16 – Application Class 1	45
	Figure 17 – Application Class 2	46
	Figure 18 – Application Class 3	47
	Figure 19 – Application Class 4	48
	Figure 20 – Application Class 5	48
	Figure 21 – Application Class 6	49
	Figure 22 – Example overview of global and local parameters of a Multi-Axis/Modular Drive Unit	62
	Figure 23 – Byte order for Words and Double words	64

Figure 24 – Data flow for Base Mode Parameter Access	73
Figure 25 – General functional elements of the PROFIdrive Axis type DO	88
Figure 26 – Functional block diagram of the PROFIdrive Axis type DO	89
Figure 27 – General state diagram for all operating modes	99
Figure 28 – General functionality of a PROFIdrive Axis DO with Application Class 1 functionality	101
Figure 29 – Speed setpoint channel for use in Application Class 1 and 4	102
Figure 30 – General functionality of a PROFIdrive Axis DO with Application Class 4 functionality	103
Figure 31 – Reduced speed setpoint channel for use in Application Class 4 (optional)	104
Figure 32 – General functionality of a PROFIdrive Axis DO with Application Class 3 functionality	105
Figure 33 – Functionality of the Motion Controller in the Program submode	106
Figure 34 – Functionality of the Motion Controller in the MDI submode	107
Figure 35 – State diagram of the positioning mode	110
Figure 36 – Homing Procedure: Home Position Set	111
Figure 37 – Homing Procedure: Abortion by the controller	111
Figure 38 – Traversing Task active	112
Figure 39 – Change of the Traversing Tasks immediately	112
Figure 40 – Example for configuring a telegram	122
Figure 41 – Structure of the position control circuit based on the velocity setpoint interface without DSC	126
Figure 42 – Structure of the position control circuit based on the velocity setpoint interface with DSC	127
Figure 43 – Example of the sensor interface (Sensor-1: two actual values/Sensor-2: one actual value)	131
Figure 44 – Actual value format, Example 1	135
Figure 45 – Actual value format, Example 2	135
Figure 46 – Actual value format, Example 3	135
Figure 47 – Actual value format, Example 4	136
Figure 48 – Actual value format, Example 5	136
Figure 49 – Actual value format, Example 6	136
Figure 50 – Actual value format, Example 7	136
Figure 51 – Actual value format, Example 8	137
Figure 52 – State diagram of the position feedback interface with designations of the states and transitions	142
Figure 53 – Acknowledgement of acknowledgeable sensor error	147
Figure 54 – Acknowledgement of unacknowledgeable sensor error	148
Figure 55 – Timing diagram: Measurement on the fly – sequence 1	149
Figure 56 – Timing diagram: Measurement on the fly – sequence 2	150
Figure 57 – Timing diagram: Reference mark search	151
Figure 58 – Overview about the diagnostic mechanisms of PROFIdrive	153
Figure 59 – Working of the warning mechanism	154
Figure 60 – Overview about the fault buffer mechanism	155
Figure 61 – Fault acknowledgement for the fault buffer mechanism	156

Figure 62 – Processing of the fault messages in the fault buffer mechanism	157
Figure 63 – Fault buffer with fault sequence example	159
Figure 64 – Fault number list and fault code list with example.....	160
Figure 65 – Drive reset: Direct initiation (P972 = 1).....	167
Figure 66 – Example: Permanent failure of the controller LS	170
Figure 67 – Example: Temporary failure of the controller LS (negative deviation)	171
Figure 68 – Example: Temporary failure of the controller LS (positive deviation; double step)	171
Figure 69 – Example: Permanent failure of the DO LS	172
Figure 70 – Example: Temporary failure of the DO LS (negative deviation).....	172
Figure 71 – Example: Temporary failure of the DO LS (positive deviation; double step)	172
Figure 72 – Value of the DO Sign-Of-Life failure counter (axis-specific) with respect to the transferred controller Sign-Of-Life	173
Figure 73 – Functionality and Interfaces for drive integration according to VIK-NAMUR	188
Figure 74 – Principle structure of the drive interface according to VIK-NAMUR guideline.....	189
Figure 75 – Speed setpoint channel for VIK-NAMUR process technology operating mode	193
Figure 76 – Process technology operating mode, control word 1 bit 15 and status word 1 bit 10,11,13,14.....	194
Figure 77 – Process technology operating mode with inevitable line interruption.....	195
Figure 78 – Process technology operating mode with forced inverter inhibit.....	196
Table 1 – Standard data types	25
Table 2 – Profile specific data types	26
Table 3 – N2, N4-Range of values	26
Table 4 – N2, N4-Coding	27
Table 5 – X2, X4-Range of values.....	27
Table 6 – X2, X4-Coding (example x=12/28).....	27
Table 7 – E2-Range of values.....	28
Table 8 – E2-Coding	28
Table 9 – C4-Range of values.....	28
Table 10 – V2-Coding	28
Table 11 – L2-Coding	29
Table 12 – T2, T4-Range of values	29
Table 13 – D2-Range of values.....	29
Table 14 – R2-Range of values.....	30
Table 15 – Application Classes	44
Table 16 – Parameter definition	49
Table 17 – Parameter description elements	50
Table 18 – Parameter description element "Identifier (ID)"	51
Table 19 – Parameter description element "variable attribute"	51
Table 20 – Variable index and conversion index for SI units	53
Table 21 – Conversion values for the conversion index (SI units).....	56
Table 22 – Variable index and conversion index for US units	57

Table 23 – Conversion values for the conversion index (US units)	58
Table 24 – Parameter description elements “IO Data reference value/IO Data normalisation”	59
Table 25 – Text array for parameter description	60
Table 26 – Text array for the data type Boolean	60
Table 27 – Text array for data type V2 (bit sequence)	61
Table 28 – Base mode parameter request	64
Table 29 – Base mode parameter response	64
Table 30 – Permissible combinations consisting of attribute, number of elements and subindex	67
Table 31 – Coding of the fields in parameter request/parameter response of Base Mode Parameter Access	68
Table 32 – Error numbers in Base Mode parameter responses	70
Table 33 – General state machine for the parameter manager processing	73
Table 34 – Sequence 1: Parameter request	74
Table 35 – Sequence 1: Parameter response positive with data of data type Word	74
Table 36 – Sequence 1: Parameter response positive with data of data type Double word	74
Table 37 – Sequence 1: Parameter response, negative	75
Table 38 – Sequence 2: Parameter request	75
Table 39 – Sequence 2: Parameter response, positive	75
Table 40 – Sequence 2: Parameter response, negative	75
Table 41 – Sequence 3: Parameter request	76
Table 42 – Sequence 3: Parameter response, positive	76
Table 43 – Sequence 3: Parameter response, negative	76
Table 44 – Sequence 4: Parameter request	77
Table 45 – Sequence 4: Parameter response, positive	77
Table 46 – Sequence 4: Parameter response, negative	77
Table 47 – Sequence 5: Parameter request	78
Table 48 – Sequence 5: Parameter response, positive	78
Table 49 – Sequence 5: Parameter response, negative	78
Table 50 – Sequence 6: Parameter request	79
Table 51 – Sequence 6: Parameter response (+): all partial accesses OK	79
Table 52 – Sequence 6: Parameter response (-): first and third partial access OK, second partial access erroneous	80
Table 53 – Sequence 7: Parameter request	81
Table 54 – Sequence 7: Parameter response (+): all partial accesses OK	81
Table 55 – Sequence 7: Parameter response (-): first and third partial access OK, second partial access erroneous	82
Table 56 – Sequence 8: Parameter request	82
Table 57 – Sequence 8: Parameter response positive with data of the data type word (for example ID)	82
Table 58 – Sequence 8: Parameter response positive with text	83
Table 59 – Sequence 8: Parameter response, negative	83
Table 60 – Sequence 9: Parameter request	83

Table 61 – Sequence 9: Parameter response, positive	84
Table 62 – Sequence 9: Parameter response, negative	84
Table 63 – Sequence 10: Parameter request	84
Table 64 – Sequence 10: Parameter response, positive	85
Table 65 – Sequence 10: Parameter response, negative	85
Table 66 – Sequence 11: Request of values, description and text in one request.....	85
Table 67 – Sequence 11: Parameter response (+): all partial accesses OK.....	86
Table 68 – Sequence 12: Request of values, header with illegal Request ID.....	86
Table 69 – Sequence 12: Parameter response (-): service not supported.....	87
Table 70 – Overview on the assignment of the bits of control word 1	90
Table 71 – Detailed assignment of the common control word 1 bits (STW1) for speed control/positioning.....	91
Table 72 – Detailed assignment of the special control word 1 bits (STW1) for speed control mode.....	92
Table 73 – Detailed assignment of the special control word 1 bits (STW1) for the positioning mode.....	93
Table 74 – Overview on the assignment of the bits of control word 2	93
Table 75 – Overview on the assignment of the bits of Encoder control word 2	94
Table 76 – Overview on the assignment of the bits of status word 1.....	94
Table 77 – Detailed assignment of the common status word 1 bits (ZSW1) for the speed control /positioning mode.....	95
Table 78 – Detailed assignment of the special status word 1 bits (ZSW1) for the speed control mode.....	96
Table 79 – Detailed assignment of the special status word 1 bits (ZSW1) for the positioning mode.....	96
Table 80 – Overview on the assignment of the bits of status word 2.....	96
Table 81 – Overview on the assignment of the bits of Encoder status word 2.....	97
Table 82 – Structure of Parameter 924 “Status word bit Pulses Enabled”.....	97
Table 83 – Definition of signal SATZANW	108
Table 84 – Definition of signal AKTSATZ	108
Table 85 – Definition of signal MDI_MOD.....	109
Table 86 – Signal list – assignment.....	114
Table 87 – Definition of standard telegram 1.....	116
Table 88 – Definition of standard telegram 2.....	116
Table 89 – Definition of standard telegram 3.....	116
Table 90 – Definition of standard telegram 4.....	117
Table 91 – Definition of standard telegram 5.....	117
Table 92 – Definition of standard telegram 6.....	118
Table 93 – Definition of standard telegram 7.....	118
Table 94 – Definition of standard telegram 9.....	119
Table 95 – Definition of standard telegram 8.....	119
Table 96 – Parameters for configuring a telegram.....	120
Table 97 – Coding of P922	120
Table 98 – Example A/B for normalising DO IO Data, parameter values.....	123
Table 99 – Example A/B for normalising DO IO Data, parameter description elements.....	124

Table 100 – Example C for normalising DO IO Data, parameter values.....	124
Table 101 – Example C for normalising DO IO Data, parameter description elements.....	125
Table 102 – Structure of parameter 979 (sensor format)	132
Table 103 – Subindex 0 (header) of parameter 979	132
Table 104 – Subindex 1 (sensor type) of parameter 979	133
Table 105 – Subindex 2 (sensor resolution) of parameter 979.....	133
Table 106 – Assigning Gx_XIST2 (sensor-x position actual value-2)	137
Table 107 – Error codes in Gx_XIST2	138
Table 108 – Sensor control word	139
Table 109 – Sensor status word.....	141
Table 110 – States.....	143
Table 111 – Transitions	145
Table 112 – Prioritisation of Sensor Control Word.....	147
Table 113 – Example for standard telegram with additional peripheral control.....	152
Table 114 – Fault buffer parameters	158
Table 115 – Fault codes examples	159
Table 116 – Definition of the fault classes attribute	160
Table 117 – Definition of the PROFIdrive fault classes.....	161
Table 118 – Structure of parameter 964 (Drive Unit identification)	162
Table 119 – Definition of the Profile identification number.....	163
Table 120 – Structure of parameter 975 (DO identification).....	163
Table 121 – Structure of P975.5	163
Table 122 – DO type class definition in P975.5	164
Table 123 – Assignment of the bits of DO sub class 1 identification in P975.6	164
Table 124 – Structure of parameter 974 (Base Mode Parameter Access identification)	165
Table 125 – PROFIdrive I&M parameter definition	165
Table 126 – PROFIdrive parameter value definition	166
Table 127 – PROFIdrive error code definition	166
Table 128 – Specified DO functions for the Application Classes.....	174
Table 129 – Parameter for “Life sign monitoring”	175
Table 130 – Parameter for “DO IO DATA-Telegram selection and configuration”.....	175
Table 131 – Parameter for “Sensor interface”	176
Table 132 – Parameter for “Fault buffer handling”	176
Table 133 – Parameter for “Warning mechanism”	176
Table 134 – Parameter for “Closed loop control operating mode”	176
Table 135 – Parameter for “Set and store of the local parameter set”.....	176
Table 136 – Parameter for “Set and store complete parameter set”	177
Table 137 – Parameter for “Drive reset”	177
Table 138 – Parameter for “Operation priority for write parameters”	177
Table 139 – Parameter for “DO identification and setup”	178
Table 140 – Parameter for “Parameter set identification”	178
Table 141 – Parameter for “Device identification”	178
Table 142 – Parameter for “Alternative Supervisor DO IO Data control channel”	179

Table 143 – PROFIdrive Parameter listed by number.....	180
Table 144 – Overview on the assignment of the bits of control word1 for the process technology operating mode	190
Table 145 – Overview on the assignment of the bits of status word1 for the process technology operating mode	191
Table 146 – Overview on the assignment of the bits of drive status/fault word for the process technology operating mode	192
Table 147 – Definition of standard telegram 20	197

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –**Part 7-203: Generic interface and use of profiles for
power drive systems – Profile type 3 specification**

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.

International Standard IEC 61800-7-203 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) minor updates in the Base Mode Parameter Access mechanism;
- b) minor updates and simplification in the Application Class 3 state machine definition.

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

FDIS	Report on voting
22G/309/FDIS	22G/324/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 website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

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 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.

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 (builds modules, machines, plants etc.)

- 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 specified with incompatibilities. It is up to the systems

integrator to write interfaces to the application software to handle that which 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® 402¹, CIP Motion™², PROFIdrive³ and SERCOS®⁴ 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.

This part of IEC 61800-7 specifies the profile type 3 (PROFIdrive).

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

¹ 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).

² 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.

³ 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.

⁴ 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.

IEC 61800-7-301, IEC 61800-7-302, IEC 61800-7-303 and IEC 61800-7-304 specify how the profile types 1, 2, 3 and 4 are mapped to different network technologies (such as CANopen®⁵, CC-Link IE® Field Network⁶, EPA™⁷, EtherCAT®⁸, Ethernet Powerlink™⁹, DeviceNet™¹⁰, ControlNet™¹¹, EtherNet/IP™¹², PROFIBUS¹³, PROFINET¹⁴ and SERCOS®).

-
- ⁵ CANopen® 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®. Use of the registered trade mark CANopen® requires permission of CAN in Automation e.V. (CiA). CANopen® is an acronym for Controller Area Network *open* and is used to refer to EN 50325-4.
 - ⁶ CC-Link IE® 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® Field Network. Use of the registered trade mark CC-Link IE® Field Network requires permission of Mitsubishi Electric Corporation.
 - ⁷ EPA™ 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™. Use of the trade mark EPA™ requires permission of the trade mark holder.
 - ⁸ EtherCAT® 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®. Use of the registered trade mark EtherCAT® requires permission of the trade mark holder.
 - ⁹ Ethernet Powerlink™ 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™. Use of the trade mark Ethernet Powerlink™ requires permission of the trade mark holder.
 - ¹⁰ DeviceNet™ 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™. Use of the trade mark DeviceNet™ requires permission of ODVA, Inc.
 - ¹¹ ControlNet™ 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™. Use of the trade mark ControlNet™ requires permission of ODVA, Inc.
 - ¹² EtherNet/IP™ 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™. Use of the trade mark EtherNet/IP™ requires permission of ODVA, Inc.
 - ¹³ 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.
 - ¹⁴ 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.

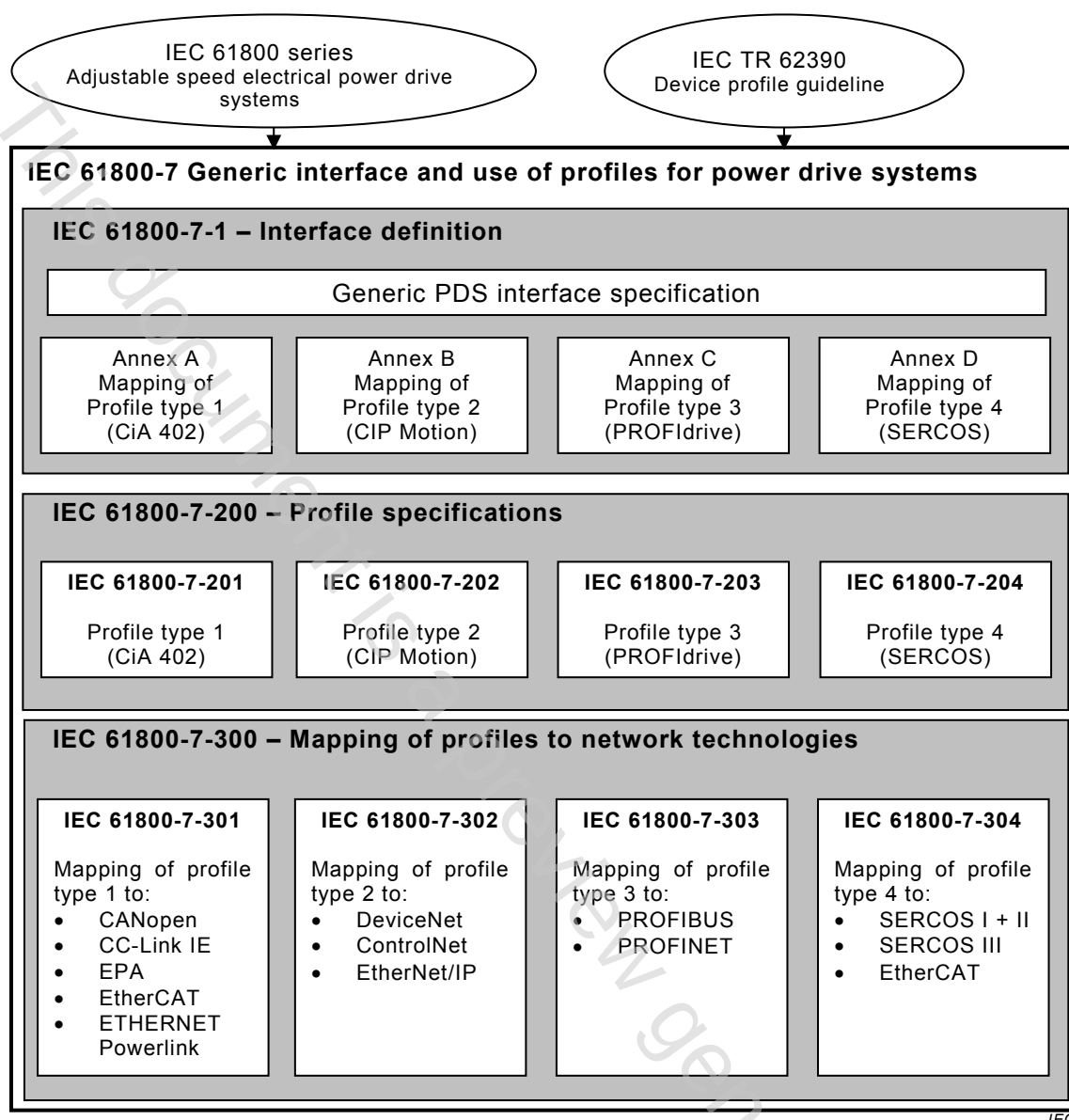


Figure 1 – Structure of IEC 61800-7

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 27.05.1998; DE59603496-G 02.12.1999; EP844542-B1 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 Corporate Intellectual Property Licensing & Transactions Otto-Hahn-Ring 6 81730 Munich 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) 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.

preview generated by EVS

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 7-203: Generic interface and use of profiles for power drive systems – Profile type 3 specification

1 Scope

This part of IEC 61800 specifies profile type 3 for power drive systems (PDS). Profile type 3 can be mapped onto different communication network technologies.

The functions specified in this part of IEC 61800 are not intended to ensure functional safety. This requires additional measures according to the relevant standards, agreements and laws.

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 61158-5-3, *Industrial communication networks – Fieldbus specifications – Part 5-3: Application layer service definition – Type 3 elements*

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

IEC 61158-6-3, *Industrial communication networks – Fieldbus specifications – Part 6-3: Application layer protocol specification – Type 3 elements*

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

IEC 61800-7-1:2015, *Adjustable speed electrical power drive systems – Part 7-1: Generic interface and use of profiles for power drive systems – Interface definition*

IEC 61800-7-303:2015, *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*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1

actual value

value of a variable quantity at a given instant

Note 1 to entry: Actual value is used in this document as input data of the application control program to monitor variables of the PDS (e.g. feedback variables).

[SOURCE: IEC 61800-7-1:2015, 3.3.1.1]