

INTERNATIONAL STANDARD

**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**

Withdrawn



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2007 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.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

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

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

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

Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

**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**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE **XD**

Withhold

CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	12
2 Normative references	12
3 Terms, definitions and abbreviated terms	13
3.1 Terms and definitions	13
3.2 Abbreviated terms	16
4 Mapping to PROFIBUS DP	19
4.1 General.....	19
4.2 Mapping to PROFIBUS data types.....	19
4.3 Base Model at PROFIBUS DP	19
4.3.1 Communication Devices	19
4.3.2 Communication Relationship	20
4.3.3 Communication Network.....	21
4.3.4 Communication Services	22
4.3.5 P-Device Communication Model.....	24
4.3.6 Base Model State Machine	25
4.3.7 Definition of the CO	26
4.4 Drive Model at PROFIBUS DP.....	26
4.4.1 P-Device	26
4.4.2 Drive Unit	27
4.5 DO IO Data	27
4.5.1 COs for DO IO Data configuration	27
4.5.2 Standard telegram configuration	28
4.5.3 Cyclic Data exchange between DP-Slaves (DXB)	30
4.6 Parameter Access	39
4.6.1 RAP for Parameter Access	39
4.6.2 Definition of the Base Mode Parameter Access mechanism	40
4.7 P-Device Configuration.....	46
4.7.1 P-Device Configuration on PROFIBUS DP.....	46
4.7.2 Drive Unit Configuration on PROFIBUS DP	47
4.7.3 Getting the Drive Object – ID (DO-ID).....	49
4.8 Alarm Mechanism.....	51
4.9 Clock Synchronous Operation	51
4.9.1 Sequence of an isochronous DP cycle.....	51
4.9.2 Time settings.....	52
4.9.3 Running-up, cyclic operation	57
4.9.4 Parameterisation, configuring (Set_Prm, GSD).....	68
4.9.5 Clock cycle generation (Global Control) and clock cycle save.....	69
4.9.6 Monitoring mechanisms.....	73
4.10 PROFIBUS DP specific Parameter	75
4.10.1 Overview of the communication interface related parameters	75
4.10.2 Definition of the specific parameters.....	75
4.11 Specified communication functions for the Application Classes	76
5 Mapping to PROFINET IO	77

5.1	General	77
5.2	Mapping to PROFINET IO data types	77
5.3	Base Model at PROFINET IO	77
5.3.1	Communication Devices	77
5.3.2	Communication Relationship	78
5.3.3	Communication Network	79
5.3.4	Communication Services	80
5.3.5	P-Device Communication Model	81
5.3.6	Base Model State Machine	83
5.3.7	Definition of the CO	84
5.4	Drive Model at PROFINET IO	84
5.4.1	P-Device	84
5.4.2	Drive Unit	85
5.4.3	DO Architecture	85
5.4.4	Definition of the Module Ident Number and API	87
5.4.5	Definition of the Submodule Ident Number	87
5.5	DO IO Data	88
5.5.1	COs for DO IO Data configuration	88
5.5.2	IO Data Producer and Consumer Status	89
5.6	Parameter Access	89
5.6.1	PAPs for Parameter Access	89
5.6.2	Base Mode Parameter Access	90
5.7	P-Device Configuration	92
5.7.1	P-Device Configuration on PROFINET IO	92
5.7.2	Drive Unit Configuration on PROFINET IO	93
5.7.3	Getting the Drive Object – ID (DO-ID)	93
5.8	Alarm Mechanism	94
5.8.1	Use of the Diagnosis Objects	94
5.8.2	Use of the Alarm Mechanism	94
5.8.3	Use of the ChannelDiagnosisData Structure	95
5.8.4	Use of the ChannelErrorType	96
5.8.5	On demand access of Diagnosis Information	97
5.9	Clock Synchronous Operation	97
5.10	PROFINET IO specific Parameter	99
5.10.1	Overview about the communication interface related Parameters	99
5.10.2	Definition of the specific parameters	99
5.11	Specified communication functions for the Application Classes	100

Bibliography	102
--------------	-----

Figure 1 – Structure of IEC 61800-7	11
Figure 2 – PROFIBUS DP Devices in a PROFIdrive drive system	20
Figure 3 – PROFIdrive Devices and their Relationship for PROFIBUS DP	21
Figure 4 – General Communication Model for PROFIdrive at PROFIBUS DP	22
Figure 5 – PROFIBUS DP DXB communication designations	23
Figure 6 – Synchronous communication for PROFIdrive at PROFIBUS DP	24
Figure 7 – Overview about the P-Device Communication Model on PROFIBUS	24
Figure 8 – Mapping of the Base Model State Machine at PROFIBUS DP	26

Figure 9 – PROFIBUS DP specific Logical P-Device model (multi axis drive)	26
Figure 10 – Mapping of PROFIBUS Slot to the PROFIdrive DO	27
Figure 11 – Application example of DXB communication	32
Figure 12 – Dataflow inside a Homogeneous P-Device with DXB relations	35
Figure 13 – Structure of a DXB Subscriber table (inside a Prm-Block)	36
Figure 14 – Timing diagram of PROFIBUS with slave-to-slave communication	37
Figure 15 – PAP and Parameter Access mechanism for a PROFIBUS homogeneous P-Device	39
Figure 16 – PAP and Parameter Access mechanism for a PROFIBUS heterogeneous P-Device	40
Figure 17 – Telegram sequence via MS1 AR or MS2 AR	41
Figure 18 – Drive Unit Structure	48
Figure 19 – Configuration and communication channels for the Modular Drive Unit type at PROFIBUS DP	49
Figure 20 – Meaning of parameter P978 (list of all DO-Ids) for the DU at PROFIBUS DP 50	
Figure 21 – Example of P978 for a complex Modular Drive Unit at PROFIBUS DP	51
Figure 22 – Sequence of an isochronous DP cycle	52
Figure 23 – Time settings	53
Figure 24 – Example: Simplest DP cycle	55
Figure 25 – Example: Optimised DP cycle	56
Figure 26 – Example: Optimised DP cycle ($T_{MAPC} = 2 \times T_{DP}$)	57
Figure 27 – Running-up (sequence with respect to time)	58
Figure 28 – Phase 1: Slave parameterisation, configuration	59
Figure 29 – Phase 2: Synchronization of the PLL to the Clock Global Control	60
Figure 30 – Phase 3: Synchronization of the slave application with the master's Sign-Of-Life	62
Figure 31 – State diagram of phases 2 and 3 of the run-up	63
Figure 32 – Phase 4: Synchronization of the master application to the slave's Sign-Of-Life 64	
Figure 33 – Example: Running-up to cyclic operation (Phase 1) ($T_{MAPC}/T_{DP} = 2/1$)	65
Figure 34 – Example: Running-up to cyclic operation (Phase 2) ($T_{MAPC}/T_{DP} = 2/1$)	65
Figure 35 – Example: Running-up to cyclic operation (Phase 3) ($T_{MAPC}/T_{DP} = 2/1$)	66
Figure 36 – Example: Running-up to cyclic operation (Phase 4) ($T_{MAPC}/T_{DP} = 2/1$)	67
Figure 37 – Example: Running-up to cyclic operation (Phase 5) ($T_{MAPC}/T_{DP} = 2/1$)	67
Figure 38 – PLL for clock save in the slave	71
Figure 39 – Run time compensation	73
Figure 40 – DP cycle violation	74
Figure 41 – Example: Clock failure (fault after 4 DP cycles)	74
Figure 42 – PROFINET IO Devices in a PROFIdrive drive system	78
Figure 43 – PROFIdrive Devices and their Relationship for PROFINET IO	79
Figure 44 – General Communication Model for PROFIdrive at PROFINET IO	80
Figure 45 – Synchronous communication for PROFIdrive at PROFINET IO	81
Figure 46 – Overview about the P-Device Communication Model on PROFINET IO	81
Figure 47 – Contents of IO AR and Supervisor AR	82

Figure 48 – M CR used for Cyclic Data Exchange between P-Devices	83
Figure 49 – Mapping of the Base Model State Machine at PROFINET IO	84
Figure 50 – PROFINET IO specific Logical P-Device model (multi axis drive)	85
Figure 51 – Representation of the PROFIdrive DO by PROFINET IO Submodules (CO).....	86
Figure 52 – Hierarchical model of the P-Device on PROFINET IO.....	87
Figure 53 – Modularity of the DO IO Data block (example).....	89
Figure 54 – Data flow for request and response for the Base Mode Parameter Access	92
Figure 55 – Configuration and communication channels for the Modular Drive Unit type at PROFINET IO	93
Figure 56 – Meaning of parameter P978 "list of all DO-IDs" for the DU at PROFINET IO	94
Figure 57— Generation of Diagnosis Data according to the fault classes mechanism	96
Figure 58 – Sequence of an isochronous Data Cycle	98
Table 1 – Mapping of data types	19
Table 2 – DP IDs and PROFIdrive IDs of the standard telegrams.....	28
Table 3 – 1 Drive Axis, standard telegram 3.....	29
Table 4 – 2 Drive Axes, standard telegram 3.....	30
Table 5 – 2 Drive Axes, standard telegram 3, per axis one DXB link each with 2 words	30
Table 6 – 1 Drive Axis, standard telegram 20.....	30
Table 7 – Slave No.11 (Publisher)	33
Table 8 – Slave No.12 (Publisher and Subscriber)	33
Table 9 – Configuration of the DXB communication link of the coating drive	34
Table 10 – Slave No.10 (Subscriber)	34
Table 11 – Configuration of the DXB communication links of the unwinder.....	34
Table 12 – Parameters (Set_Prm, GSD) for slave-to-slave communication (Data- eXchange Broadcast).....	38
Table 13 – Services used for Parameter Access on PROFIBUS DP	41
Table 14 – Defined PAPs for Parameter Access	41
Table 15 – State machine for DP-slave processing	42
Table 16 – MS1/MS2 AR telegram frame, Write request.....	42
Table 17 – MS1/MS2 AR telegram frame, Write response	43
Table 18 – MS1/MS2 AR telegram frame, Read request	43
Table 19 – MS1/MS2 AR telegram frame, Read response.....	43
Table 20 – Process data ASE telegram frame, Error response	44
Table 21 – Allocation of Error class and code for PROFIdrive	44
Table 22 – Data block lengths.....	45
Table 23 – Limits due to the Process data ASE data block length	46
Table 24 – GSD parameters for the MS1/MS2 AR services	46
Table 25 – DP Services for Running-up, cyclic operation	57
Table 26 – Parameters (Set_Prm, GSD) for "Clock Cycle Synchronous Drive Interface"	68
Table 27 – Possible synchronization type combinations	69
Table 28 – Conditions for Isochronous Mode	70
Table 29 – Input signals of the PLL.....	71
Table 30 – Output signals of the PLL	72

Table 31 – Overview of the specific PROFIBUS DP parameters for “Communication system interfaces”	75
Table 32 – PROFIdrive Specific Parameter listed by number	75
Table 33 – Coding of the baud rate in Parameter 963	76
Table 34 – Specified communication functions for the Application Classes	76
Table 35 – Mapping of data types	77
Table 36 – Structure of the Submodule-ID	88
Table 37 – Definition of Submodule-Type Classes	88
Table 38 – Definition of Parameter Access Modes (PAP)	90
Table 39 – Use of the AlarmNotification-PDU	95
Table 40 – Use of ChannelDiagnosisData	95
Table 41 – Use of ChannelErrorType	96
Table 42 – Use of the DiagnosisData	97
Table 43 – Overview of the specific PROFINET IO parameters for “Communication system interfaces”	99
Table 44 – PROFIdrive Specific Parameter listed by number	99
Table 45 – Specified communication functions for the Application Classes	101

