

INTERNATIONAL STANDARD

**Adjustable speed electrical power drive systems –
Part 7-304: Generic interface and use of profiles for power drive systems –
Mapping of profile type 4 to network technologies**

Without a watermark



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 It also gives information on projects, withdrawn and replaced publications.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 7-304: Generic interface and use of profiles for power drive systems –
Mapping of profile type 4 to network technologies**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE **XC**

Withhold

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	11
2 Normative references	11
3 Terms, definitions and abbreviated terms	12
3.1 Terms and definitions	12
3.2 Abbreviated terms	17
4 General	17
5 Mapping to CP16/1 (SERCOS I) and CP16/2 (SERCOS II)	18
5.1 Reference to communication standards	18
5.2 Overview	18
5.3 Physical layer and topology.....	20
5.4 Synchronisation mechanism	21
5.4.1 General	21
5.4.2 Handling of command and feedback values	22
5.4.3 Position loop with fine interpolator.....	23
5.5 Telegram contents.....	24
5.5.1 General	24
5.5.2 Data block	25
5.5.3 Communication function group telegrams	25
5.5.4 Standard telegrams	26
5.5.5 Application telegrams	28
5.6 Non-cyclic data transfer.....	29
5.7 Real-time bits.....	29
5.7.1 Functions of Real time bits	29
5.7.2 Allocation of real-time bits	30
5.7.3 Possible cases	31
5.8 Signal control word and signal status word	33
5.9 Data container.....	34
5.10 Drive shutdown functions	36
5.11 Communication classes.....	37
5.11.1 General	37
5.11.2 Communication class A	38
5.11.3 Communication class B (Extended Functions)	41
5.11.4 Communication class C (Additional Functions)	42
5.11.5 Communication cycle time granularity.....	43
6 Mapping to CP16/3 (SERCOS III)	43
6.1 Reference to communication standards	43
6.2 Overview	43
6.3 Physical layer and topology.....	45
6.4 Synchronisation mechanism and telegram content	46
6.5 Non-cyclic data transfer.....	47
6.6 Real-time bits	47
6.7 Signal control word and signal status word	47
6.8 Data container.....	47

6.9	Drive shutdown functions	47
6.10	Communication classes	48
7	Mapping to EtherCAT	48
7.1	Reference to communication standards	48
7.2	Overview	48
7.3	SoE Synchronisation	49
7.3.1	General	49
7.3.2	CP16 Phase 0-2	50
7.3.3	CP16 Phase 3-4	50
7.4	SoE Application Layer Management	50
7.4.1	EtherCAT State Machine and IEC 61784 CPF 16 State Machine	50
7.4.2	Multiple Drives	51
7.4.3	IDN Usage	51
7.5	SoE Process Data Mapping	52
7.6	SoE Service Channel Services	55
7.6.1	Overview	55
7.6.2	SSC Read	55
7.6.3	SSC Write	60
7.6.4	SSC Procedure Commands	64
7.6.5	SSC Slave Info	66
7.7	SoE Coding General	67
7.8	SoE Protocol Data Unit Coding	69
7.8.1	SSC Read	69
7.8.2	SSC Write	72
7.8.3	Notify SSC Command Execution Request	76
7.8.4	SSC Slave Info	77
	Bibliography	79
	Figure 1 – Structure of IEC 61800-7	10
	Figure 2 – Topology	21
	Figure 3 – Validity of command values and feedback acquisition time in the PDSs	22
	Figure 4 – Synchronisation of cycle times	23
	Figure 5 – Synchronisation of the control loops and the fine interpolator	23
	Figure 6 – AT configuration (example)	29
	Figure 7 – Function of the real-time bits	30
	Figure 8 – Allocation of IDN ≠ 0 to the real-time bits	31
	Figure 9 – Allocation of IDN = 0 to the real-time bits	32
	Figure 10 – Allocation of IDN ≠ 0 to the real-time bits	33
	Figure 11 – Configuration example of signal status word	34
	Figure 12 – Data container configuration without acknowledge (slave)	35
	Figure 13 – Data container configuration with acknowledge (slave)	36
	Figure 14 – Structure of Communication classes	37
	Figure 15 – Topology	45
	Figure 16 – Telegram sequence	46
	Figure 17 – General communication cycle	47

Figure 18 – ESM and IEC 61158-4-16 State Machine	51
Figure 19 – Successful SSC Read sequence	56
Figure 20 – Unsuccessful SSC Read sequence	56
Figure 21 – Successful SSC Fragmented Read sequence.....	57
Figure 22 – Successful SSC Write sequence	60
Figure 23 – Unsuccessful SSC Write sequence	61
Figure 24 – Successful SSC Fragmented Write sequence.....	61
Figure 25 – Successful SSC Procedure Command sequence.....	64
Figure 26 – Aborted SSC Procedure Command sequence	65
Figure 27 – Slave Info sequence.....	66
Table 1 – CP16/1 and CP16/2 feature summary.....	18
Table 2 – Number of PDSs per network (examples)	19
Table 3 – Communication Profile Interoperability within a network.....	20
Table 4 – Typical operation data for cyclic transmission.....	24
Table 5 – Typical data for non-cyclic transmission	25
Table 6 – IDN for choice and parameterisation of telegrams	26
Table 7 – Structure of standard telegram-0.....	26
Table 8 – Structure of standard telegram-1.....	26
Table 9 – Structure of standard telegram-2.....	26
Table 10 – Structure of standard telegram-3.....	27
Table 11 – Structure of standard telegram-4.....	27
Table 12 – Structure of standard telegram-5.....	27
Table 13 – Structure of standard telegram-6.....	28
Table 14 – IDN for configuration of MDT	28
Table 15 – IDN for configuration of AT.....	28
Table 16 – IDN for real-time bits	29
Table 17 – Real-time bits assignment IDNs.....	30
Table 18 – IDN for configuring control and status words	33
Table 19 – Data containers IDN	34
Table 20 – Ring configuration – Timing.....	38
Table 21 – Ring configuration – Telegram configuration.....	39
Table 22 – Ring configuration – Phase run-up	39
Table 23 – Service channel protocol	39
Table 24 – Information & diagnostics	40
Table 25 – Communication class A settings	40
Table 26 – Ring configuration – Telegram configuration.....	41
Table 27 – Information & diagnostics	41
Table 28 – Real-time control bits	41
Table 29 – Real-time status bits.....	42
Table 30 – Communication class B settings	42
Table 31 – CP16/3 features summary	44
Table 32 – Number of PDSs per network (examples)	45

Table 33 – Synchronisation performance classes.....	47
Table 34 – EtherCAT feature summary	49
Table 35 – Number of PDSs per network (examples)	49
Table 36 – Obsolete IDNs.....	52
Table 37 – Changed IDNs.....	52
Table 38 – Status word of drive	53
Table 39 – Control word for drive	54
Table 40 – Mapping of SSC services to EtherCAT services.....	55
Table 41 – SSC Read Service.....	58
Table 42 – Read SSC Fragment Service.....	59
Table 43 – SSC Write Service.....	62
Table 44 – Write SSC Fragment Service.....	63
Table 45 – Notify SSC Command Execution Service.....	65
Table 46 – SSC Slave Info Service	67
Table 47 – SoE Mailbox Protocol	68
Table 48 – SSC Read Request	69
Table 49 – SSC Read Response.....	70
Table 50 – Read SSC Fragment Request.....	72
Table 51 – SSC Write Request	73
Table 52 – SSC Write Response.....	74
Table 53 – Write SSC Fragment Request.....	76
Table 54 – Notify SSC Command Execution Request.....	77
Table 55 – Slave Info Request.....	78