IEC 61800-7-302

Edition 2.0 2015-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Adjustable speed electrical power drive systems – Part 7-302: Generic interface and use of profiles for power drive systems – Mapping of profile type 2 to network technologies

Entraînements électriques de puissance à vitesse variable – Partie 7-302: Interface générique et utilisation de profils pour les entraînements électriques de puissance – Mise en correspondance du profil de type 2 avec les technologies de réseaux

IEC 61800-7-302:2015-11(en-fr)

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 7-302: Generic interface and use of profiles for power drive systems – Mapping of profile type 2 to network technologies

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International Standard IEC 61800-7-302 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) update of patent information;
b) updates to the Connection Format and connection points;
c) support of an additional object.

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

FDIS	Report on voting
22G/312/FDIS	22G/327/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- withdrawn,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 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.

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 profiles types for CiA® 402[1], CIP Motion™[2], PROFIdrive[3] 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 trademarks.

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 2 (CIP Motion™) is mapped to the network technologies DeviceNet™[5], ControlNet™[6] and EtherNet/IP™[7].

IEC 61800-7-301, IEC 61800-7-303 and IEC 61800-7-304 specify how the profile types 1, 3 and 4 are mapped to different network technologies (such as CANopen®[8],

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CC-Link IE® Field Network[9], EPA™[10], EtherCAT™[11], Ethernet Powerlink™[12], PROFIBUS[13], PROFINET[14] and SERCOS®).

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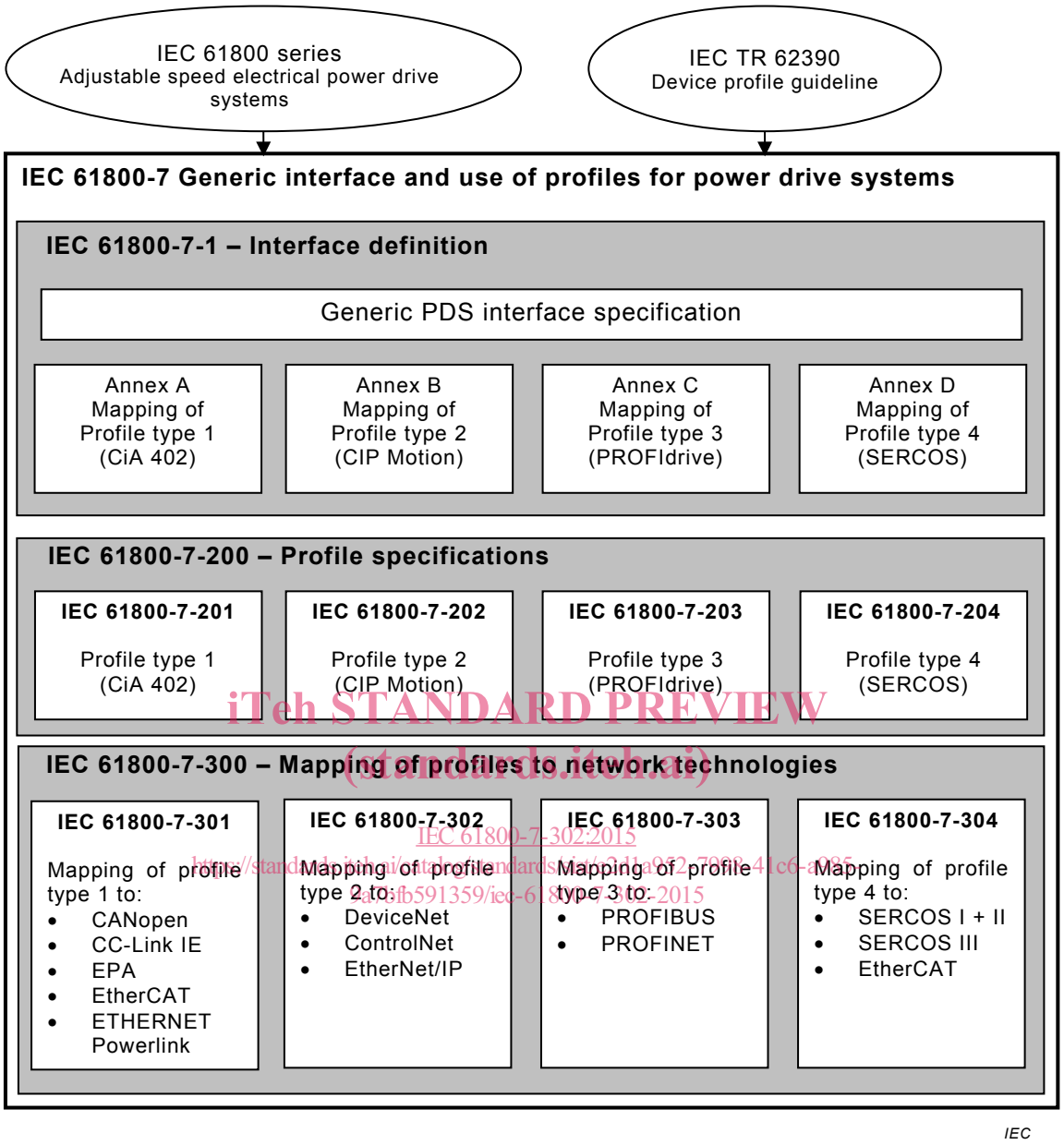

Figure 1 – Structure of IEC 61800-7

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. This patent is held by its inventors under license to ODVA, Inc:

Publication / Application serial number	Holder	Title
US 7,983,769 EP 1659465	[ODVA]	Time stamped motion control network protocol that enables balanced single cycle timing and utilization of dynamic data structures

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

ODVA and the holder of this patent right have assured the IEC that ODVA is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of ODVA and the holder of this patent right is registered with IEC. Information may be obtained from:

[ODVA]	ODVA, Inc. 2370 East Stadium Boulevard #1000 Ann Arbor, Michigan 48104 USA Attention: Office of the Executive Director email: odva@odva.org

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ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 7-302: Generic interface and use of profiles for power drive systems – Mapping of profile type 2 to network technologies

1 Scope

This part of IEC 61800 specifies the mapping of the profile type 2 (CIP Motion™) specified in IEC 61800-7-202 onto different network technologies.

– DeviceNet™ (CP 2/3), see Clause 5,

– ControlNet™ (CP 2/1), see Clause 6,

– EtherNet/IP™ (CP 2/2), see Clause 7.

The functions specified in this part of IEC 61800-7 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 61158-4-2:2014, *Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements*

IEC 61158-5-2:2014, *Industrial communication networks – Fieldbus specifications – Part 5-2: Application layer service definition – Type 2 elements*

IEC 61158-6-2:2014, *Industrial communication networks – Fieldbus specifications – Part 6-2: Application layer protocol specification – Type 2 elements*

IEC 61588:2009, *Precision clock synchronization protocol for networked measurement and control systems*

IEC 61800-7-202, *Adjustable speed electrical power drive systems – Part 7-202: Generic interface and use of profiles for power drive systems – Profile type 2 specification*

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]

3.1.2
application
software functional element specific to the solution of a problem in industrial-process measurement and control

Note 1 to entry: An application may be distributed among resources, and may communicate with other applications.

[SOURCE: IEC 61800-7-1:2015, 3.2.2]

3.1.3
attribute
property or characteristic of an entity

[SOURCE: IEC 61800-7-1:2015, 3.2.3]

3.1.4
axis
logical element inside an automation system (e.g. a motion control system) that represents some form of movement

Note 1 to entry: Axes can be rotary or linear, physical or virtual, controlled or simply observed.

[SOURCE: IEC 61800-7-1:2015, 3.2.4]

3.1.5
CIP Motion™ [15]
extensions to the CIP services and protocol to support motion control over CIP networks

[SOURCE: IEC 61800-7-1:2015, 3.3.3.1]

3.1.6
CIP Motion™ controller
CIP compliant controller containing a Motion Control Axis Object that can interface to a CIP Motion device via a CIP Motion I/O Connection

Note 1 to entry: A description of the Motion Control Axis Object is beyond the scope of IEC 61800-7.

[SOURCE: IEC 61800-7-1:2015, 3.3.3.2]

3.1.7
CIP Motion™ device
CIP compliant device containing one or more Motion Device Axis Object instances that can communicate to a CIP Motion controller via a CIP Motion I/O Connection

EXAMPLE: A CIP Motion drive is a particular case of a CIP Motion device.

[SOURCE: IEC 61800-7-1:2015, 3.3.3.3]

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15 CIP Motion™ and CIP Sync™ are trade names 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 names CIP Motion™ or CIP Sync™. Use of the trade names CIP Motion™ or CIP Sync™ requires permission of ODVA, Inc.

3.1.8
CIP Motion™ drive profile
collection of objects used to implement a CIP Motion drive device that includes the Motion Device Axis Object, as well as standard support objects like the Identity Object and the Time Sync Object

Note 1 to entry: The Device Type assigned to the CIP Motion drive profile is 25_{hex}.

[SOURCE: IEC 61800-7-202:2015, 3.1.10]

3.1.9
CIP Motion™ I/O Connection
CIP Motion™ Connection
periodic bi-directional, class 1, CIP connection between a controller and a drive that is defined as part of the CIP Motion specification

[SOURCE: IEC 61800-7-1:2015, 3.3.3.4]

3.1.10
CIP Sync™[15]
extensions to the CIP services and protocol to encapsulate IEC 61588:2009 time synchronization functionality over a CIP Network

Note 1 to entry: See Time Sync Object in IEC 61158-5-2 and IEC 61158-6-2.

[SOURCE: IEC 61800-7-1:2015, 3.3.3.5]

3.1.11
class
description of a set of objects that share the same attributes, operations, methods, relationships, and semantics

[SOURCE: IEC 61800-7-1:2015, 3.2.5]

3.1.12
closed loop
methods of control where there is a feedback signal of some kind that is used to drive the actual dynamics of the motor to match the commanded dynamics by servo action

Note 1 to entry: In most cases, there is a literal feedback device to provide this signal, but in some cases, the signal is derived from the motor excitation (i.e. sensorless operation).

[SOURCE: IEC 61800-7-202:2015, 3.1.14]

3.1.13
commands
set of commands from the application control program to the PDS to control the behavior of the PDS or functional elements of the PDS

Note 1 to entry: The behavior is reflected by states or operating modes.

Note 2 to entry: The different commands may be represented by one bit each.

[SOURCE: IEC 61800-7-1:2015, 3.3.1.3]

3.1.14
control
purposeful action on or in a process to meet specified objectives

[SOURCE: IEC 61800-7-1:2015, 3.2.6]