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**Elektrische Leistungsantriebssysteme mit einstellbarer Drehzahl –
Teil 7-201: Generisches Interface und Nutzung von Profilen für
Leistungsantriebssysteme (PDS) –
Spezifikation von Profil-Typ 1 (IEC 61800-7-201:2007);
Englische Fassung EN 61800-7-201:2008**

Adjustable speed electrical power drive systems –
Part 7-201: Generic interface and use of profiles for power drive systems –
Profile type 1 specification (IEC 61800-7-201:2007);
English version EN 61800-7-201:2008

Entraînements électriques de puissance à vitesse variable –
Partie 7-201: Interface et utilisation génériques de profils pour les entraînements
électriques de puissance –
Spécifications des profils de type 1 (CEI 61800-7-201:2007);
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Beginn der Gültigkeit

Die von CENELEC am 2008-02-01 angenommene EN 61800-7-201 gilt als DIN-Norm ab 2008-11-01.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN IEC 61800-7-2:2006-06.

Für diese Norm ist das nationale Arbeitsgremium K 226 „Ausrüstung von Starkstromgeräten und -anlagen mit elektronischen Betriebsmitteln“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (www.dke.de) zuständig.

Die enthaltene IEC-Publikation wurde vom SC 22G „Semiconductor power converters for adjustable speed electric drive systems“ erarbeitet.

Diese Norm erscheint ausschließlich in der englischsprachigen Originalfassung.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem Datum (maintenance result date) unverändert bleiben soll, das auf der IEC-Website unter „<http://webstore.iec.ch>“ zu dieser Publikation angegeben ist. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

- bestätigt,
- zurückgezogen,
- durch eine Folgeausgabe ersetzt oder
- geändert.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

**Adjustable speed electrical power drive systems –
Part 7-201: Generic interface and use of profiles for power drive systems –
Profile type 1 specification
(IEC 61800-7-201:2007)**

Entraînements électriques de puissance
à vitesse variable –
Partie 7-201: Interface et utilisation
génériques de profils pour les
entraînements électriques de puissance –
Spécifications des profils de type 1
(CEI 61800-7-201:2007)

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mit einstellbarer Drehzahl –
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und Nutzung von Profilen
für Leistungsantriebssysteme (PDS) –
Spezifikation von Profil-Typ 1
(IEC 61800-7-201:2007)

This European Standard was approved by CENELEC on 2008-02-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 22G/184/FDIS, future edition 1 of IEC 61800-7-201, prepared by SC 22G, Adjustable speed electric drive systems incorporating semiconductor power converters, of IEC TC 22, Power electronic systems and equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61800-7-201 on 2008-02-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2008-11-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2011-02-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61800-7-201:2007 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61499-1	NOTE	Harmonized as EN 61499-1:2005 (not modified).
IEC 61800	NOTE	Harmonized in EN 61800 series (not modified).
IEC 61800-7-1	NOTE	Harmonized as EN 61800-7-1:2008 (not modified).
IEC 61800-7-202	NOTE	Harmonized as EN 61800-7-202:2008 (not modified).
IEC 61800-7-203	NOTE	Harmonized as EN 61800-7-203:2008 (not modified).
IEC 61800-7-204	NOTE	Harmonized as EN 61800-7-204:2008 (not modified).
IEC 61800-7-302	NOTE	Harmonized as EN 61800-7-302:2008 (not modified).
IEC 61800-7-303	NOTE	Harmonized as EN 61800-7-303:2008 (not modified).
IEC 61800-7-304	NOTE	Harmonized as EN 61800-7-304:2008 (not modified).

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INTRODUCTION

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

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 adopt 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^{TM2}, PROFIdrive³ and SERCOS Interface^{TM4} 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.

This part of IEC 61800-7 specifies the profile type 1 (CiA 402).

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

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 CANopen⁵, EtherCAT^{TM6}, Ethernet Powerlink^{TM7}, DeviceNet^{TM8}, ControlNet^{TM9}, EtherNet/IP^{TM10}, PROFIBUS¹¹, PROFINET¹² and SERCOS Interface).

-
- 1 CiA 402 is a trade name of CAN in Automation, 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 name holder or any of its products. Compliance to this profile does not require use of the trade name CiA 402.
 - 2 CIP MotionTM is a trade name of Open DeviceNet Vendor Association, Inc. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name CIP MotionTM. Use of the trade name CIP MotionTM requires permission of Open DeviceNet Vendor Association, Inc.
 - 3 PROFIdrive is a trade name of PROFIBUS 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 International.
 - 4 SERCOSTM and SERCOS InterfaceTM are trade names 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 name holder or any of its products. Compliance to this profile does not require use of the trade name SERCOS and SERCOS interface. Use of the trade name SERCOS and SERCOS interface requires permission of the trade name holder.
 - 5 CANopen is an acronym for Controller Area Network *open* and is used to refer to EN 50325-4.
 - 6 EtherCATTM is a trade name 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 trademark holder or any of its products. Compliance to this profile does not require use of the trade name EtherCATTM. Use of the trade name EtherCATTM requires permission of the trade name holder.
 - 7 Ethernet PowerlinkTM is a trade name of B&R, control of trade name 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 trademark holder or any of its products. Compliance to this profile does not require use of the trade name Ethernet PowerlinkTM. Use of the trade name Ethernet PowerlinkTM requires permission of the trade name holder.
 - 8 DeviceNetTM is a trade name of Open DeviceNet Vendor Association, Inc. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name DeviceNetTM. Use of the trade name DeviceNetTM requires permission of Open DeviceNet Vendor Association, Inc.
 - 9 ControlNetTM is a trade name of ControlNet International, Ltd. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name ControlNetTM. Use of the trade name ControlNetTM requires permission of ControlNet International, Ltd.
 - 10 EtherNet/IPTM is a trade name of ControlNet International, Ltd. and Open DeviceNet Vendor Association, Inc. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name EtherNet/IPTM. Use of the trade name EtherNet/IPTM requires permission of either ControlNet International, Ltd. or Open DeviceNet Vendor Association, Inc.
 - 11 PROFIBUS is a trade name of PROFIBUS 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 International.
 - 12 PROFINET is a trade name of PROFIBUS 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 International.

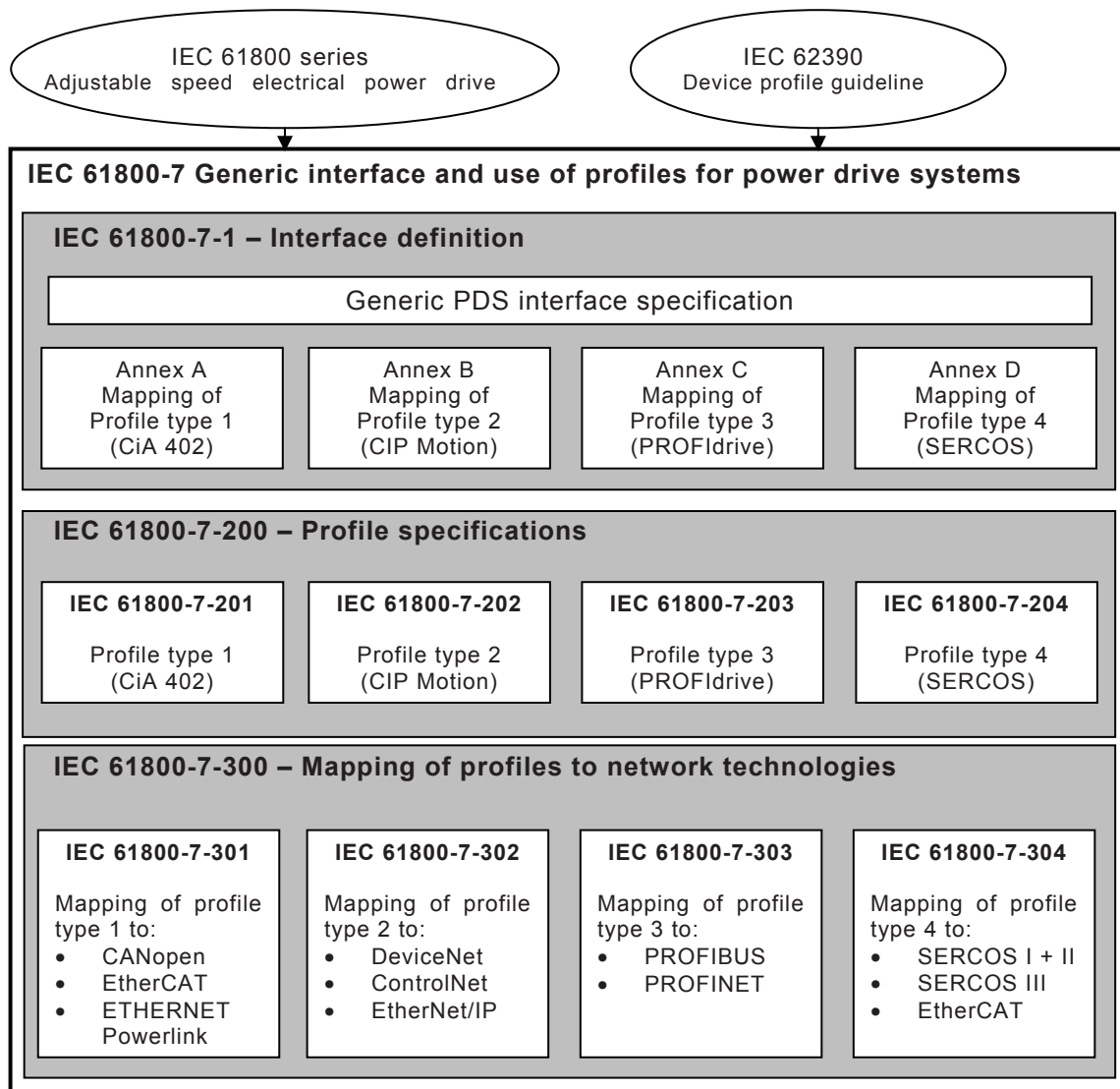


Figure 1 – Structure of IEC 61800-7

ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

Part 7-201: Generic interface and use of profiles for power drive systems – Profile type 1 specification

1 Scope

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

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.

This part of IEC 61800-7 specifies profile type 1 for Power Drive Systems (PDS). Profile type 1 can be mapped onto different communication network technologies.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61800-7 (all parts), *Adjustable speed electrical power drive systems – Generic interface and use of profiles for power drive systems*

IEC 61800-7-301, *Adjustable speed electrical power drive systems – Part 7-301: Generic interface and use of profiles for power drive systems – Mapping of profile type 1 to network technologies*

EN 50325-4, *Industrial communications subsystem based on ISO 11898 (CAN) for controller-device interfaces – Part 4: CANopen*

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 at a given instant

[IEV 351-21-02]

NOTE Actual value or actual variable are used in this part of the IEC 61800-7 series as input data of the application control program to monitor feedback variables or other process variables of the PDS.

3.1.2

algorithm

completely determined finite sequence of operations by which the values of the output data can be calculated from the values of the input data

[IEV 351-21-37)

3.1.3 application

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

NOTE An application may be distributed among resources, and may communicate with other applications.

[IEC/TR 62390:2005, 3.1.2, modified]

3.1.4 application mode

type of application that can be requested from a PDS

NOTE The different application modes reflect the control loop for torque control, velocity control, position control or other applications like homing.

3.1.5 attribute

property or characteristic of an entity

[IEC/TR 62390:2005, 3.1.3]

3.1.6 class

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

[ISO/IEC 19501, modified]

3.1.7 commands

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

NOTE 1 The behaviour is reflected by states or operating modes.

NOTE 2 The different commands may be represented by one bit each.

3.1.8 control

purposeful action on or in a process to meet specified objectives

[IEV 351-21-29]

3.1.9 control device

physical unit that contains – in a module/subassembly or device – an application program to control the PDS

3.1.10 data type

set of values together with a set of permitted operations

[ISO/IEC 2382-15:1999, 15.04.01, modified]

3.1.11 device

field device

networked independent physical entity of an industrial automation system capable of performing specified functions in a particular context and delimited by its interfaces

[IEC 61499-1:2005, 3.30, modified]

entity that performs control, actuating and/or sensing functions and interfaces to other such entities within an automation system

[ISO 15745-1:2003, 3.11]

3.1.12

device profile

representation of a device in terms of its parameters, parameter assemblies and behaviour according to a device model that describes the device's data and behaviour as viewed through a network

NOTE This is a definition from IEC/TS 61915 which is extended by the addition of the device functional structure.

[IEC/TR 62390:2005, 3.19, modified]

3.1.13

feedback variable

variable which represents a controlled variable and which is returned to a comparing element

[IEV 351-27-03]

3.1.14

functional element

entity of software or software combined with hardware, capable of accomplishing a specified function of a device

NOTE 1 A functional element has an interface, associations to other functional elements and functions.

NOTE 2 A functional element can be made out of function block(s), object(s) or parameter list(s).

[IEC/TR 62390:2005, 3.1.12]

3.1.15

high-level power

main electric power supply of the drive device

3.1.16

input data

data transferred from an external source into a device, resource or functional element

[IEC/TR 62390:2005, 3.1.14]

3.1.17

interface

shared boundary between two entities defined by functional characteristics, signal characteristics, or other characteristics as appropriate

[IEV 351-21-35, modified]

3.1.18

logical power drive system

model which includes PDS and communication network accessible through the generic PDS interface

3.1.19

low-level power

electrical power supply for the control section of the drive device

3.1.20

model

mathematical or physical representation of a system or a process, based with sufficient precision upon known laws, identification or specified suppositions

[IEV 351-21-36]

3.1.21

operating mode

characterisation of the way and the extent to which the human operator intervenes in the control equipment

[IEV 351-31-01]

3.1.22

output data

data originating in a device, resource or functional element and transferred from them to external systems

[IEC/TR 62390:2005, 3.1.21]

3.1.23

parameter

data element that represents device information that can be read from or written to a device, for example through the network or a local HMI

NOTE 1 Adapted from IEC/TS 61915.

NOTE 2 A parameter is typically characterised by a parameter name, data type and access direction.

[IEC/TR 62390:2005, 3.1.22, modified]

3.1.24

profile

representation of a PDS interface in terms of its parameters, parameter assemblies and behaviour according to a communication profile and a device profile

3.1.25

reference variable

input variable to a comparing element in a controlling system which sets the desired value of the controlled variable and is deducted from the command variable

[IEV 351-27-02]

3.1.26

set-point

value or variable used as output data of the application control program to control the PDS

3.1.27

status

set of information from the PDS to the application control program reflecting the state or mode of the PDS or a functional element of the PDS

NOTE The different status information may be coded with one bit each.

3.1.28

type

hardware or software element which specifies the common attributes shared by all instances of the type

[IEC/TR 62390:2005, 3.1.25]

3.1.29

use case

class specification of a sequence of actions, including variants, that a system (or other entity) can perform, interacting with actors of the system

[IEC/TR 62390:2005, 3.1.26]

3.1.30

variable

software entity that may take different values, one at a time

[IEC/TR 62390:2005, 3.1.27]

NOTE The values of a variable as well as of a parameter are usually restricted to a certain data type.

3.2 Abbreviated terms

AC	Alternating Current
BL	Brush-Less
c	Constant
CiA	CAN in Automation
COB	Communication Object
csp	Cyclic Synchronous Profile mode
cst	Cyclic Synchronous Torque mode
csv	Cyclic Synchronous Velocity mode
DC	Direct Current
DIV	Divisor
FC	Frequency Converter
FE	Functional Element
FIFO	First In, First Out
FSA	Finite State Automaton
hm	Homing Mode
HMI	Human Machine Interface
I/O	Input/Output
ip	Interpolated Position mode
MUL	Multiplication
NMT	Network Management

PDS	Power Drive System
PM	Permanent Magnet
pp	Profile Position mode
pV	Profile Velocity mode
r	Reserved
r.m.s.	Root Mean Square
ro	Read-Only
rw	Read-Write
tq	Torque Mode
vl	Velocity Mode

4 General

4.1 General considerations

This part of the IEC 61800-7 series specifies the bus-independent CiA 402 device profile for power drive systems such as frequency converters, servo controllers, or stepper motor controllers. It includes the definition of real-time control objects as well as of configuration, adjustment, identification and network management objects. The PDS finite state automaton (FSA) is also defined, which may be controlled externally by a control device communicating via a communication system to the drive device.

The device profile defines several modes of operation. They include profile position mode, homing mode, interpolated position mode, profile velocity mode, profile torque mode, velocity mode, cyclic synchronous position mode, cyclic synchronous velocity mode, and cyclic synchronous torque mode.

4.2 Communication interface

The communication system connects the drive device to the control device and other field devices. Via the communication system the control device uses communication services to exchange with the drive device:

- Non real-time data (configuration, identification, adjustment, diagnostic, etc.)
- Process data like target values and actual values

These services are defined in the IEC 61800-7-301. The process data are exchanged by real-time data messages. These messages may be configured by means of configuration services provided by the communication system.

The communication system shall provide services to transmit and receive communication objects (COB). The following COBs shall be supported:

- COB for real-time data transmission
- COB for emergency information transmission
- COB for network management purposes

Additionally, the communication system may provide the following COBs:

- COB for configuration data transmission

- COB for synchronisation purposes
- COB for system time distribution

The COBs are defined in detail in IEC 61800-7-301.

4.3 Object dictionary

All objects in this part of the IEC 61800-7 series are grouped in the object dictionary, and defined by attributes as defined in EN 50325-4. All objects shall be accessible via the network in an ordered pre-defined fashion by means of COB for configuration data transmission. Each object within the dictionary shall be addressed uniquely by using a 16-bit index and an 8-bit sub-index. The communication-related objects are defined in detail in IEC 61800-7-301.

The standardised device profile area at indices 6000_h through 9FFF_h shall contain all application objects common to this device profile specification. The following object indices shall be reserved for compatibility reasons: 6045_h, 6047_h, 604D_h, 604E_h, 604F_h, 6052_h, 6053_h, 6054_h, 6055_h, 6056_h, 6057_h, 6058_h, 6059_h, 6089_h, 608A_h, 608B_h, 608C_h, 608D_h, 608E_h, 6093_h, 6094_h, 6095_h, 6096_h, 6097_h, 60A0_h, 60A1_h, 60A2_h, 60F6_h, 60F7_h, 60F9_h, 60FB_h, 6410_h, 6504_h, and 6510_h.

The objects may be read respectively written via the network. Within this range of objects, up to 8 axes may be realised. Additionally, it is possible to implement other device profiles (e. g. generic I/O module or encoder) within the drive device. These other device profiles may be implemented instead of one or several axes.

For multi axes devices, the object range 6000_h to 67FF_h shall be shifted as follows:

- 6000_h to 67FF_h: axis 0
- 6800_h to 6FFF_h: axis 1
- 7000_h to 77FF_h: axis 2
- 7800_h to 7FFF_h: axis 3
- 8000_h to 87FF_h: axis 4
- 8800_h to 8FFF_h: axis 5
- 9000_h to 97FF_h: axis 6
- 9800_h to 9FFF_h: axis 7

The category and entry category attributes of an object indicate if the object shall be implemented (mandatory) or may be implemented (optional).

The object code and data type attributes are defined in detail in EN 50325-4 or in other network technology specifications. The used data type attributes are given in Clause 5. In the entry description, the access attribute indicating if an application object is read only (*ro*), read/write (*rw*) or write only (*wo*) or constant (*c*) is defined. Read only indicates that this shall not be written via the bus; read/write allows to read and to write this object; and write only means that this application object shall be not read via the bus.

The PDO mapping attribute shall indicate if this object shall be or may be or shall not be mapped into COB for real-time data transmission. The detailed definition of these attributes is given in IEC 61800-7-301.

The default value attribute defines the value of an object with access attribute of the value '*rw*' and '*c*' after power-on or application reset.

5 Data types

5.1 Standard data types

The data types used in this profile are listed in Table 1.

Table 1 – List of used data types

Data type	Reference
Unsigned8	EN 50325-4
Unsigned16	EN 50325-4
Unsigned32	EN 50325-4
Integer8	EN 50325-4
Integer16	EN 50325-4
Integer32	EN 50325-4
Visible string	EN 50325-4
Time of day	EN 50325-4
Interpolated time period	See Table 2
Interpolated data configuration	See Table 3
v/ velocity acceleration/deceleration	See Table 4

5.2 Record definitions

Table 2, Table 3, and Table 4 define the records used in this part of the IEC 61800-7 series.

Table 2 – Interpolated time period

Index	Sub-index	Description	Data type
0080 _h	00 _h	Highest index supported	Unsigned8
	01 _h	Interpolation time units	Unsigned8
	02 _h	Interpolation time index	Integer8

Table 3 – Interpolated data configuration

Index	Sub-index	Description	Data type
0081 _h	00 _h	Highest index supported	Unsigned8
	01 _h	Maximum buffer size	Unsigned32
	02 _h	Actual buffer size	Unsigned32
	03 _h	Buffer organisation	Unsigned8
	04 _h	Buffer position	Unsigned16
	05 _h	Size of data record	Unsigned8
	06 _h	Buffer clear	Unsigned8

Table 4 – vl velocity acceleration/deceleration

Index	Sub-index	Description	Data type
0082 _h	00 _h	Highest index supported	Unsigned8
	01 _h	Delta speed	Unsigned32
	02 _h	Delta time	Integer16

6 General object definitions

6.1 General

In the following Subclauses, the communication parameter objects, the additional identification and the information objects are defined.

6.2 Communication parameter objects

There are three communication parameter objects that shall be implemented:

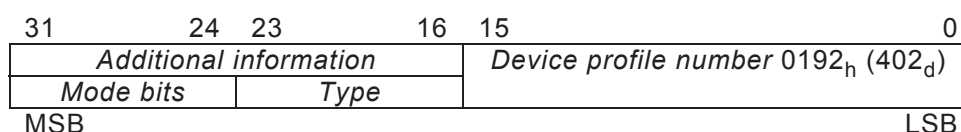
- Device type object 1000_h
- Error register object 1001_h
- Identity object 1018_h

They are defined in EN 50325-4 and the following definitions shall also apply.

The device type object shall define the device type, the device's functionality, and the mapping variant.

For multi device modules, the additional information parameter shall contain 0FFF_h and the device profile number referenced by object 1000_h is the device profile of the first device in the object dictionary. All other devices of a multiple device module shall identify their profiles at object 67FF_h + x × 800_h with x = internal number of the device (0 to 7). For details, see EN 50325-4.

Figure 2 specifies the structure and the values of the *device type* object, Table 5 specifies the object description, and Table 6 specifies the entry description.


Figure 2 – Value definition

Mode bits and *type* in the *additional information* are defined in IEC 61800-7-301.

Table 5 – Object description

Attribute	Value
Index	1000 _h
Name	Device type
Object Code	See EN 50325-4
Data Type	See EN 50325-4
Category	Mandatory

Table 6 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	c
PDO Mapping	See IEC 61800-7-301
Value Range	See value definition
Default Value	Manufacturer-specific

The device-profile specific bit in the *error register* object (1001_h) shall be used to indicate that the *error code* in the Emergency message is defined in this part of the IEC 61800-7 series.

NOTE The corresponding *error code* may be read in object 1003_h (see EN 50325-4) or object 603F_h.

6.3 Additional identification and information objects

6.3.1 Object 6402_h: Motor type

This object shall indicate the type of motor attached to and driven by the drive device. Table 7 specifies the value definition, Table 8 specifies the object description, and Table 9 specifies the entry description.

Table 7 – Value definition

Value	CANopen name	Other names
0000 _h	Non-standard motor	-
0001 _h	Phase modulated DC motor	-
0002 _h	Frequency controlled DC motor	-
0003 _h	PM synchronous motor	-
0004 _h	FC synchronous motor	AC synchronous sinewave wound field
0005 _h	Switched reluctance motor	AC synchronous reluctance switched
0006 _h	Wound rotor induction motor	AC asynchronous induction polyphase wound rotor
0007 _h	Squirrel cage induction motor	AC asynchronous induction squirrel cage
0008 _h	Stepper motor	AC synchronous step
0009 _h	Micro-step stepper motor	-
000A _h	Sinusoidal PM BL motor	AC synchronous sinusoidal PM
000B _h	Trapezoidal PM BL motor	AC synchronous brushless PM trapezoidal
000C _h	AC synchronous reluctance sync	-
000D _h	DC commutator PM	-
000E _h	DC commutator wound field series	-
000F _h	DC commutator wound field shunt	-
0010 _h	DC commutator wound field compound	-
0011 _h to 7FFE _h	reserved	-
7FFF _h	No motor type assigned	-
8000 _h to FFFF _h	Manufacturer-specific	-

Table 8 – Object description

Attribute	Value
Index	6402 _h
Name	Motor type
Object Code	Variable
Data Type	Unsigned16
Category	Optional

Table 9 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	See Table 7
Default Value	Manufacturer-specific

6.3.2 Object 6403_h: Motor catalogue number

This object shall indicate the motor catalogue number (nameplate number) provided by the motor manufacturer. If the number is not assigned yet, this object shall indicate this by /0 (empty string). Table 10 specifies the object description, and Table 11 specifies the entry description.

Table 10 – Object description

Attribute	Value
Index	6403 _h
Name	Motor catalogue number
Object Code	Variable
Data Type	Visible String
Category	Optional

Table 11 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	Visible String
Default Value	Manufacturer-specific

6.3.3 Object 6404_h: Motor manufacturer

This object shall indicate the name of the motor manufacturer. If the name is not assigned yet, this object shall indicate this by /0 (empty string). Table 12 specifies the object description, and Table 13 specifies the entry description.

Table 12 – Object description

Attribute	Value
Index	6404 _h
Name	Motor manufacturer
Object Code	Variable
Data Type	Visible String
Category	Optional

Table 13 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	Visible String
Default Value	Manufacturer-specific

6.3.4 Object 6405_h: http motor catalogue address

This object shall indicate the assigned web-address of the motor catalogue. If the address is not assigned yet, this object shall indicate this by /0 (empty string). Table 14 specifies the object description, and Table 15 specifies the entry description.

Table 14 – Object description

Attribute	Value
Index	6405 _h
Name	http motor catalogue address
Object Code	Variable
Data Type	Visible String
Category	Optional

Table 15 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	Visible String
Default Value	Manufacturer-specific

6.3.5 Object 6406_h: Motor calibration date

This object shall indicate the assigned date of the last motor inspection. If the date is not assigned yet, this object shall indicate this by a value of 0. Table 16 specifies the object description, and Table 17 specifies the entry description.

Table 16 – Object description

Attribute	Value
Index	6406 _h
Name	Motor calibration date
Object Code	Variable
Data Type	Time of Day
Category	Optional

Table 17 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	0 _d or Time of Day
Default Value	Manufacturer-specific

6.3.6 Object 6407_h: Motor service period

This object shall indicate the assigned motor service period. If the period is not assigned yet, this object shall indicate this by 0000 0000_h. The value shall be given in multiples of hours. Table 18 specifies the object description, and Table 19 specifies the entry description.

Table 18 – Object description

Attribute	Value
Index	6407 _h
Name	Motor service period
Object Code	Variable
Data Type	Unsigned32
Category	Optional

Table 19 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	Unsigned32
Default Value	Manufacturer-specific

6.3.7 Object 6503_h: Drive catalogue number

This object shall indicate the assigned manufacturer's drive catalogue number (nameplate number). Table 20 specifies the object description, and Table 21 specifies the entry description.

Table 20 – Object description

Attribute	Value
Index	6503 _h
Name	Drive catalogue number
Object Code	Variable
Data Type	Visible String
Category	Optional

Table 21 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	No
Default Value	/0 (empty string)

6.3.8 Object 6505_h: http drive catalogue address

This object shall indicate the assigned web address of the drive manufacturer. If the address is not assigned yet, this object shall indicate this by /0 (empty string). Table 22 specifies the object description, and Table 23 specifies the entry description.

Table 22 – Object description

Attribute	Value
Index	6505 _h
Name	http drive catalogue address
Object Code	Variable
Data Type	Visible String
Category	Optional

Table 23 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	No
Default Value	Manufacturer-specific

7 Error codes and error behaviour

7.1 Error codes

Emergency messages are triggered by internal errors and severe warnings detected within the drive device. They are defined in detail in the IEC 61800-7-301. They shall contain the 16-bit error code.

Error codes from xx00_h to xx7F_h are defined in EN 50325-4 or in Table 24. Error codes between xx80_h and xxFF_h are used manufacturer-specific.

Table 24 – Error codes

Error code	Meaning
2110 _h	Short circuit/earth leakage (input)
2120 _h	Earth leakage (input)
2121 _h	Earth leakage phase L1
2122 _h	Earth leakage phase L2
2123 _h	Earth leakage phase L3
2130 _h	Short circuit (input)
2131 _h	Short circuit phases L1-L2
2132 _h	Short circuit phases L2-L3
2133 _h	Short circuit phases L3-L1
2211 _h	Internal current no.1
2212 _h	Internal current no.2
2213 _h	Over-current in ramp function
2214 _h	Over-current in the sequence
2220 _h	Continuous over current (device internal)
2221 _h	Continuous over current no.1
2222 _h	Continuous over current no.2
2230 _h	Short circuit/earth leakage (device internal)
2240 _h	Earth leakage (device internal)
2250 _h	Short circuit (device internal)
2310 _h	Continuous over current
2311 _h	Continuous over current no.1
2312 _h	Continuous over current no.2
2320 _h	Short circuit/earth leakage (motor-side)
2330 _h	Earth leakage (motor-side)
2331 _h	Earth leakage phase U
2332 _h	Earth leakage phase V
2333 _h	Earth leakage phase W
2340 _h	Short circuit (motor-side)
2341 _h	Short circuit phases U-V
2342 _h	Earth leakage phase V-W
2343 _h	Earth leakage phase W-U
2350 _h	Load level fault (I ² t, thermal state)
2351 _h	Load level warning (I ² t, thermal state)
3110 _h	Mains over-voltage
3111 _h	Mains over-voltage phase L1
3112 _h	Mains over-voltage phase L2
3113 _h	Mains over-voltage phase L3
3120 _h	Mains under-voltage
3121 _h	Mains under-voltage phase L1

Error code	Meaning
3122 _h	Mains under-voltage phase L2
3123 _h	Mains under-voltage phase L3
3130 _h	Phase failure
3131 _h	Phase failure L1
3132 _h	Phase failure L2
3133 _h	Phase failure L3
3134 _h	Phase sequence
3140 _h	Mains frequency
3141 _h	Mains frequency too great
3142 _h	Mains frequency too small
3210 _h	DC link over-voltage
3211 _h	Over-voltage no. 1
3212 _h	Over voltage no. 2
3220 _h	DC link under-voltage
3221 _h	Under-voltage no. 1
3222 _h	Under-voltage no. 2
3230 _h	Load error
3310 _h	Output over-voltage
3311 _h	Output over-voltage phase U
3312 _h	Output over-voltage phase V
3313 _h	Output over-voltage phase W
3320 _h	Armature circuit
3321 _h	Armature circuit interrupted
3330 _h	Field circuit
3331 _h	Field circuit interrupted
4110 _h	Excess ambient temperature
4120 _h	Too low ambient temperature
4130 _h	Temperature supply air
4140 _h	Temperature air outlet
4210 _h	Excess temperature device
4220 _h	Too low temperature device
4300 _h	Temperature drive
4310 _h	Excess temperature drive
4320 _h	Too low temperature drive
4400 _h	Temperature supply
4410 _h	Excess temperature supply
4420 _h	Too low temperature supply
5100 _h	Supply
5110 _h	Supply low voltage
5111 _h	U1 = supply $\pm 15V$
5112 _h	U2 = supply +24 V
5113 _h	U3 = supply +5 V
5114 _h	U4 = manufacturer-specific

Error code	Meaning
5115 _h	U5 = manufacturer-specific
5116 _h	U6 = manufacturer-specific
5117 _h	U7 = manufacturer-specific
5118 _h	U8 = manufacturer-specific
5119 _h	U9 = manufacturer-specific
5120 _h	Supply intermediate circuit
5200 _h	Control
5210 _h	Measurement circuit
5220 _h	Computing circuit
5300 _h	Operating unit
5400 _h	Power section
5410 _h	Output stages
5420 _h	Chopper
5430 _h	Input stages
5440 _h	Contacts
5441 _h	Contact 1 = manufacturer-specific
5442 _h	Contact 2 = manufacturer-specific
5443 _h	Contact 3 = manufacturer-specific
5444 _h	Contact 4 = manufacturer-specific
5445 _h	Contact 5 = manufacturer-specific
5450 _h	Fuses
5451 _h	S1 = I1
5452 _h	S2 = I2
5453 _h	S3 = I3
5454 _h	S4 = manufacturer-specific
5455 _h	S5 = manufacturer-specific
5456 _h	S6 = manufacturer-specific
5457 _h	S7 = manufacturer-specific
5458 _h	S8 = manufacturer-specific
5459 _h	S9 = manufacturer-specific
5500 _h	Hardware memory
5510 _h	RAM
5520 _h	ROM/EPROM
5530 _h	EEPROM
6010 _h	Software reset (watchdog)
6301 _h to 630F _h	Data record no. 1 to no. 15
6310 _h	Loss of parameters
6320 _h	Parameter error
7100 _h	Power
7110 _h	Brake chopper
7111 _h	Failure brake chopper
7112 _h	Over current brake chopper
7113 _h	Protective circuit brake chopper

Error code	Meaning
7120 _h	Motor
7121 _h	Motor blocked
7122 _h	Motor error or commutation malfunc.
7123 _h	Motor tilted
7200 _h	Measurement circuit
7300 _h	Sensor
7301 _h	Tacho fault
7302 _h	Tacho wrong polarity
7303 _h	Resolver 1 fault
7304 _h	Resolver 2 fault
7305 _h	Incremental sensor 1 fault
7306 _h	Incremental sensor 2 fault
7307 _h	Incremental sensor 3 fault
7310 _h	Speed
7320 _h	Position
7400 _h	Computation circuit
7500 _h	Communication
7510 _h	Serial interface no. 1
7520 _h	Serial interface no. 2
7600 _h	Data storage (external)
8300 _h	Torque control
8311 _h	Excess torque
8312 _h	Difficult start up
8313 _h	Standstill torque
8321 _h	Insufficient torque
8331 _h	Torque fault
8400 _h	Velocity speed controller
8500 _h	Position controller
8600 _h	Positioning controller
8611 _h	Following error
8612 _h	Reference limit
8700 _h	Sync controller
8800 _h	Winding controller
8900 _h	Process data monitoring
8A00 _h	Control
F001 _h	Deceleration
F002 _h	Sub-synchronous run
F003 _h	Stroke operation
F004 _h	Control
FF00 _h to FFFF _h	Manufacturer-specific

7.2 Error behavior

The communication system may support an object specifying to which network management state the drive device shall transit, when a communication error or a severe device-internal error is detected. When the PDS FSA transits into *Error* state, this shall be regarded as a severe device-internal failure.

8 Controlling the power drive system

8.1 General

The PDS FSA is an abstraction to define the behavior of a black box as a control device experiences the PDS. It defines the application behavior of the PDS. Due to the requirement that a PDS provides local control even when the communication network is not working properly, the communication FSA as defined in the communication system mapping specifications and the PDS FSA are only loosely coupled.

Figure 3 specifies how the PDS may be operated locally or via the network remotely. The PDS is operated by local signals (not in the scope of this part of IEC 61800) and by the controlword sent by the control device via the network. The state of the PDS is reported by the statusword produced by the drive device. The FSA is also controlled by error detection signals.

The PDS FSA defines the PDS status and the possible control sequence of the PDS. A single state represents a special internal or external behavior. The state of the PDS also determines which commands are accepted. For example, it is only possible to start a point-to-point move when the drive is in the *operation enabled* state.

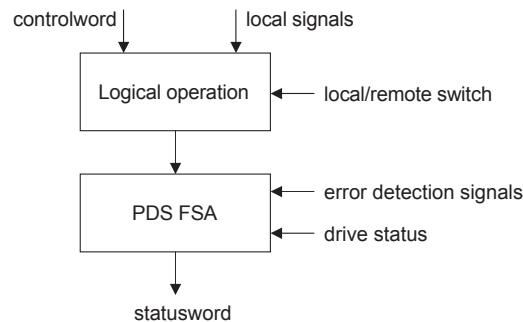


Figure 3 – Remote and local control

8.2 Finite state automaton

Figure 4 specifies the PDS FSA with respect to control of the power electronics as a result of user commands and internal drive faults.

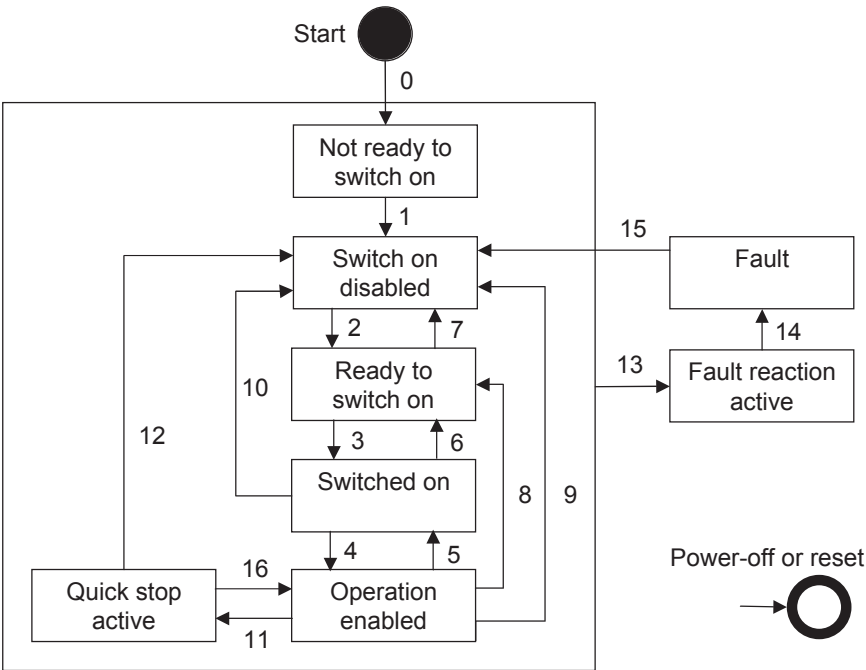


Figure 4 – Power drive system finite state automaton

The FSA states shall support the functions as shown in Table 25. The *start* state shall be a pseudo state indicating the start when the FSA is activated during the start-up sequence of the device drive’s application software.

Table 25 – FSA states and supported functions

Function	FSA states							
	Not ready to switch on	Switch on disabled	Ready to switch on	Switched on	Operation enabled	Quick stop active	Fault reaction active	Fault
Brake applied, if present	Yes	Yes	Yes	Yes	Yes/No	Yes/No	Yes/No	Yes
Low-level power applied	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
High-level power applied	Yes/No	Yes/No	Yes/No	Yes	Yes	Yes	Yes	Yes/No
Drive function enabled	No	No	No	No	Yes	Yes	Yes	No
Configuration allowed	Yes	Yes	Yes	Yes	Yes/No	Yes/No	Yes/No	Yes

If in the *quick stop active* state the quick stop option code is set to 5, 6, 7 or 8, the drive device shall not leave this state, but it may transit to the *operation enabled* state with the *Enable operation* command.

The drive device shall support the transitions and actions as given in Table 26. The events shall initiate the transition. The transition shall be terminated after the action has been performed.

Table 26 – Transition events and actions

Transition	Event(s)	Action(s)
0	Automatic transition after power-on or reset application	Drive device self-test and/or self initialisation shall be performed.
1	Automatic transition	Communication shall be activated.
2	Shutdown command from control device or local signal	None
3	Switch on command received from control device or local signal	The high-level power shall be switched on, if possible.
4	Enable operation command received from control device or local signal	The drive function shall be enabled and all internal set-points cleared.
5	Disable operation command received from control device or local signal	The drive function shall be disabled.
6	Shutdown command received from control device or local signal	The high-level power shall be switched off, if possible.
7	Quick stop or disable voltage command from control device or local signal	None
8	Shutdown command from control device or local signal	The drive function shall be disabled, and the high-level power shall be switched off, if possible.
9	Disable voltage command from control device or local signal	The drive function shall be disabled, and the high-level power shall be switched off, if possible.
10	Disable voltage or quick stop command from control device or local signal	The high-level power shall be switched off, if possible.
11	Quick stop command from control device or local signal	The quick stop function shall be started.
12	Automatic transition when the quick stop function is completed and quick stop option code is 1, 2, 3 or 4, or disable voltage command received from control device (depends on the quick stop option code)	The drive function shall be disabled, and the high-level power shall be switched off, if possible.
13	Fault signal (see also IEC 61800-7-301)	The configured fault reaction function shall be executed.
14	Automatic transition	The drive function shall be disabled; the high-level power shall be switched off, if possible.
15	Fault reset command from control device or local signal	A reset of the fault condition is carried out, if no fault exists currently on the drive device; after leaving the Fault state, the Fault reset bit in the controlword shall be cleared by the control device.
16	Enable operation command from control device, if the quick stop option code is 5, 6, 7, or 8	The drive function shall be enabled.

NOTE It is not recommended to support transition 16.

If a state transition is requested, the related actions shall be processed completely before transitioning to the new state. Example: In *operation enabled* state, when the *disable operation* command is received, the drive device shall stay in the *operation enabled* state until the disable operation function (see object 605C₁) is completed.

Drive devices able to control the contactor for the mains may switch the high-level power. If the high-level power is switched-off, the motor shall be free to rotate if not braked.

Drive function is disabled implies no energy shall be supplied to the motor. Target or set-point values (e.g. torque, velocity, position) shall be not processed.

Drive function is enabled implies that energy may be supplied to the motor. Target or set-point values shall be processed.

If a fault is detected in the drive device, there shall be a transition to the *fault reaction active* state. In this state, the PDS shall execute a special fault reaction. After the execution of this fault reaction, the drive device shall switch automatically to the *fault* state. This state shall only be left by the fault reset command, but only if the fault is not active any more.

In case of fatal error, the drive device is not longer able to control the motor, so that an immediate switch-off of the drive device is necessary.

The behaviour of drive disabling, quick stop, halt, and fault reaction functions is configurable by means of configuration objects defined in 8.4.

NOTE If a brake is present, the high-level power is switched off after a delay time in order to apply the brake.

8.3 Modes of operation

The PDS behaviour depends on the activated mode of operation. The PDS may implement several modes of operation. Since it is not possible to operate the modes in parallel, the user is able to activate the required function by selecting a mode of operation.

The control device writes to the *modes of operation* object in order to select the operation mode. The drive device provides the *modes of operation display* object to indicate the actual activated operation mode. Controlword, statusword, and set-points are used mode-specific. This implies the responsibility of the control device to avoid inconsistencies and erroneous behaviour. The switching between the modes of operation implies no automatic reconfiguration of COBs for real-time data transmission.

Therefore, the PDS may limit mode switching in one or some PDS FSA state(s). Mode switching may also be limited to the 'local control' function; this means it is not possible to select the operation mode via the network.

The following modes of operation are described in this part of the IEC 61800-7 series:

- Profile position mode
- Homing mode
- Interpolated position mode
- Profile velocity mode (e.g. servo drives)
- Torque profile mode
- Velocity mode (e.g. frequency converter)
- Cyclic sync position mode
- Cyclic sync velocity mode
- Cyclic sync torque mode

With the exception of the 'Homing mode', the listed modes of operation deal with set-points. In addition to this, manufacturer-specific modes of operation may also be implemented. These are not limited to set-points.

Figure 5 shows the general relations between target, reference, effort, and actual values.

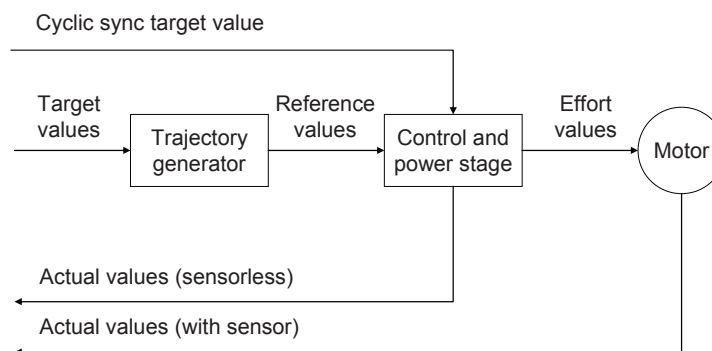


Figure 5 – Relation between different value parameters

8.4 Detailed object specifications

8.4.1 Object 6040_n: Controlword

This object shall indicate the received command controlling the PDS FSA. It shall be structured as defined in Figure 6. The bits 7, 3, 2, 1, and 0 shall be supported. The other bits may be supported. The commands shall be coded as given in Table 27.

15	11	10	9	8	7	6	4	3	2	1	0
<i>ms</i>	<i>r</i>	<i>oms</i>	<i>h</i>	<i>fr</i>	<i>oms</i>	<i>eo</i>	<i>qs</i>	<i>ev</i>	<i>so</i>		
MSB											LSB

LEGEND: ms = manufacturer-specific; r = reserved; oms = operation mode specific; h = halt; fr = fault reset; eo = enable operation; qs = quick stop; ev = enable voltage; so = switch on

Figure 6 – Value definition

Table 27 – Command coding

Command	Bits of the <i>controlword</i>					Transitions
	Bit 7	Bit 3	Bit 2	Bit 1	Bit 0	
Shutdown	0	X	1	1	0	2,6,8
Switch on	0	0	1	1	1	3
Switch on + enable operation	0	1	1	1	1	3 + 4 (NOTE)
Disable voltage	0	X	X	0	X	7,9,10,12
Quick stop	0	X	0	1	X	7,10,11
Disable operation	0	0	1	1	1	5
Enable operation	0	1	1	1	1	4,16
Fault reset		X	X	X	X	15
NOTE Automatic transition to Enable operation state after executing SWITCHED ON state functionality.						

Bits 9, 6, 5, and 4 of the controlword are operation mode specific. The halt function (bit 8) behaviour is operation mode specific. If the bit is 1, the commanded motion shall be interrupted, the PDS shall behave as defined in the halt option code. After releasing the halt function, the commanded motion shall be continued if possible.

The bit 10 is reserved for further use; it shall be set to 0. The bits 11, 12, 13, 14, and 15 are manufacturer-specific.

Table 28 specifies the object description, and Table 29 specifies the entry description.

Table 28 – Object description

Attribute	Value
Index	6040 _h
Name	Controlword
Object Code	Variable
Data Type	Unsigned16
Category	Mandatory

Table 29 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	See IEC 61800-7-301
Value Range	See Table 27
Default Value	Device and operation mode specific

8.4.2 Object 6041_h: Statusword

This object shall provide the status of the PDS FSA. The object shall be structured as defined in Figure 7. The bits 10, 9, and 6 to 0 shall be supported. The other bits may be supported. The bit combinations defined in Table 30 shall code the PDS FSA states.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<i>ms</i>		<i>oms</i>		<i>ila</i>	<i>tr</i>	<i>rm</i>	<i>ms</i>	<i>w</i>	<i>sod</i>	<i>qs</i>	<i>ve</i>	<i>f</i>	<i>oe</i>	<i>so</i>	<i>rtso</i>
MSB								LSB							

LEGEND: ms = manufacturer-specific; oms = operation mode specific; ila = internal limit active; tr = target reached; rm = remote; w = warning; sod = switch on disabled; qs = quick stop; ve = voltage enabled; f = fault; oe = operation enabled; so = switched on; rtso = ready to switch on

Figure 7 – Value definition

Table 30 – State coding

Statusword	PDS FSA state
xxxx xxxx x0xx 0000 _b	Not ready to switch on
xxxx xxxx x1xx 0000 _b	Switch on disabled
xxxx xxxx x01x 0001 _b	Ready to switch on
xxxx xxxx x01x 0011 _b	Switched on
xxxx xxxx x01x 0111 _b	Operation enabled
xxxx xxxx x00x 0111 _b	Quick stop active
xxxx xxxx x0xx 1111 _b	Fault reaction active
xxxx xxxx x0xx 1000 _b	Fault

If bit 4 (voltage enabled) of the statusword is 1, this shall indicate that high voltage is applied to the PDS.

If bit 5 (quick stop) of the statusword is 0, this shall indicate that the PDS is reacting on a quick stop request.

If bit 7 (warning) of the statusword is 1, this shall indicate the presence of a warning condition. Warning is not an error or fault (examples: temperature limit exceeded, job refused). The status of the PDS FSA shall not be changed. The cause of the warning may be given in the *fault code parameter* object (603F_h).

If bit 9 (remote) of the statusword is 1, this shall indicate that the controlword is processed. If it is 0 (local), this shall indicate that the controlword is not processed. Nevertheless, the PDS may provide actual values, and the PDS may accept COB for configuration data transmission for other parameter objects.

If bit 10 (target reached) of the statusword is 1, this shall indicate that the PDS has reached the set-point. The set-point is operation mode specific and is defined in detail in the corresponding clauses of this part of the IEC 61800-7 series. Bit 10 shall also be set to 1, if the operation mode has been changed. The change of a target value by software shall alter this bit. If quick stop option code is 5, 6, 7 or 8, bit 10 shall be set to 1, when the quick stop operation is finished and the PDS is halted. If halt occurred and the PDS has halted then bit 10 shall be set to 1, too.

If bit 11 (internal limit active) of the statusword is 1, this shall indicate that an internal limit is active (example: position range limit). The internal limits are manufacturer-specific.

Bit 13 and bit 12 of the statusword are operation mode specific.

Bit 14 and bit 15 are manufacturer-specific.

Table 31 specifies the object description, and Table 32 specifies the entry description.

Table 31 – Object description

Attribute	Value
Index	6041 _h
Name	Statusword
Object Code	Variable
Data Type	Unsigned16
Category	Mandatory

Table 32 – Entry description

Attribute	Value
Sub-Index	00 _h
Access	ro
PDO Mapping	See IEC 61800-7-301
Value Range	See Table 30
Default Value	No

8.4.3 Object 603F_h: Error code

This object shall provide the error code of the last error which occurred in the drive device. Table 24 specifies the value definition, Table 33 specifies the object description, and Table 34 specifies the entry description.