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Ersatz für
DIN EN 61800-7-201:2008-11
Siehe Anwendungsbeginn

**Elektrische Leistungsantriebssysteme mit einstellbarer Drehzahl –
Teil 7-201: Generisches Interface und Nutzung von Profilen für
Leistungsantriebssysteme (PDS) –
Spezifikation von Profil-Typ 1
(IEC 61800-7-201:2015);
Englische Fassung EN 61800-7-201:2016**

Adjustable speed electrical power drive systems –
Part 7-201: Generic interface and use of profiles for power drive systems –
Profile type 1 specification
(IEC 61800-7-201:2015);
English version EN 61800-7-201:2016

Entraînements électriques de puissance à vitesse variable –
Partie 7-201: Interface générique et utilisation de profils pour les entraînements
électriques de puissance –
Spécification de profil de type 1
(IEC 61800-7-201:2015);
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Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2015-12-25 angenommene Europäische Norm als DIN-Norm ist 2016-11-01.

Für DIN EN 61800-7-201:2008-11 besteht eine Übergangsfrist bis 2018-12-25.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 61800-7-201:2015-02.

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

Die enthaltene IEC-Publikation wurde vom SC 22G „Adjustable speed electric drive systems incorporating semiconductor power converters“ erarbeitet.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem Datum (stability 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

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

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

Der Zusammenhang der zitierten Dokumente mit den entsprechenden Deutschen Dokumenten 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.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für die vorliegende Norm erfüllt.

Da sich die Anwender der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 61800-7-201 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für einige der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

Änderungen

Gegenüber DIN EN 61800-7-201:2008-11 wurden folgende Änderungen vorgenommen:

- a) Redaktionelle Überarbeitung des gesamten Dokuments.

Frühere Ausgaben

DIN EN 61800-7-201: 2008-11

Nationaler Anhang NA (informativ)

Auszugsweise Übersetzung^{N1)}

1 Anwendungsbereich

Dieser Teil der IEC 61800 beschreibt den Profil-Typ 1 für Leistungsantriebssysteme (PDS). Profil-Typ 1 kann auf verschiedene Technologien für Kommunikationsnetzwerke abgebildet werden.

Es ist nicht Zweck der in diesem Teil der IEC 61800 beschriebenen Funktionen, funktionale Sicherheit sicherzustellen. Dies erfordert zusätzliche Maßnahmen nach den maßgeblichen Normen, Vereinbarungen und Gesetzen.

3 Begriffe und Abkürzungen

3.1 Begriffe

Für die Anwendung dieses Dokuments gelten die folgenden Begriffe.

3.1.1

Istwert

(en: actual value)

Wert einer variablen Größe zu einem gegebenen Zeitpunkt

Anmerkung 1 zum Begriff: Der Istwert wird in diesem Dokument als Eingangsdatenwert des Programms zur Steuerung der Anwendung verwendet, um Variable des PDS (z. B. Rückführgrößen) zu überwachen.

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

3.1.2

Algorithmus

(en: algorithm)

vollständig bestimmte endliche Folge von Operationen, nach denen die Werte der Ausgangsdaten aus den Werten der Eingangsdaten berechnet werden können

[QUELLE: IEC 61800-7-1:2015, 3.2.1]

3.1.3

Anwendung

(en: application)

funktionales Element der Software, spezifisch für die Problemlösung bei industriellen Prozessen mit Messen und Regeln

Anmerkung 1 zum Begriff: Eine Anwendung kann über Ressourcen verteilt sein und kann mit anderen Anwendungen kommunizieren.

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

3.1.4

Anwendungsmodus

(en: application mode)

Art der Anwendung, die von einem PDS angefordert werden kann

Anmerkung 1 zum Begriff: Die verschiedenen Anwendungsmodi spiegeln den Regelkreis für die Regelung des Drehmoments, der Geschwindigkeit, der Position oder andere Anwendungen, wie z. B. das Referenzieren, wider.

^{N1)} Nationale Fußnote: Die Nummerierung aus IEC 61800-7-201:2015-11 wurde beibehalten.

[QUELLE: IEC 61800-7-1:2015, 3.3.1.2]

3.1.5

Attribut

(en: attribute)

Eigenschaft oder Charakteristik einer Funktionseinheit

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

3.1.6

Klasse

(en: class)

Beschreibung einer Menge von Objekten, die dieselben Attribute, Operationen, Methoden, Beziehungen und dieselbe Semantik haben

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

3.1.7

Befehle

(en: commands)

Menge an Befehlen von dem Programm zur Steuerung der Anwendung an das PDS, um das Verhalten des PDS oder der funktionalen Elemente des PDS zu steuern

Anmerkung 1 zum Begriff: Das Verhalten wird durch Zustände oder Betriebsarten wiedergegeben.

Anmerkung 2 zum Begriff: Die verschiedenen Befehle können jeweils durch ein Bit dargestellt werden.

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

3.1.8

Leiten

(en: control)

zweckmäßige Maßnahmen an oder in einem Prozess, um vorgegebene Ziele zu erreichen

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

3.1.9

Steuergerät

(en: control device)

Baueinheit, die – innerhalb eines Moduls/einer Baugruppe oder eines Geräts – ein Anwendungsprogramm zur Steuerung des PDS enthält

[QUELLE: IEC 61800-7-1:2015, 3.2.7]

3.1.10

Datentyp

(en: data type)

Menge von Werten mit einer Menge zulässiger Operationen

[QUELLE: IEC 61800-7-1:2015, 3.2.8]

3.1.11

Gerät

Feldgerät

(en: device; field device)

<Funktionsbausteine> vernetzte unabhängige physische Einheit eines industriellen Automatisierungssystems, die fähig ist, spezifische Funktionen in einem speziellen Kontext auszuführen, und die durch ihre Schnittstellen abgegrenzt ist

[QUELLE: IEC 61800-7-1:2015, 3.2.9]

3.1.12

Geräteprofil

(en: device profile)

Darstellung eines Geräts bezüglich seiner Parameter, Parametergruppen und seines Verhaltens gemäß eines Gerätemodells, das die Daten und das Verhalten des Geräts beschreibt, wie es durch ein Netzwerk gesehen wird, unabhängig von einer bestimmten Netzwerktechnologie

[QUELLE: IEC 61800-7-1:2015, 3.2.11]

3.1.13

Rückführgröße

(en: feedback variable)

variable Größe, die die Regelgröße abbildet und zum Vergleichsglied zurückgeführt wird

[QUELLE: IEC 61800-7-1:2015, 3.2.12]

3.1.14

funktionales Element

(en: functional element)

Einheit von Software oder von Software, die mit Hardware kombiniert ist, fähig, eine festgelegte Funktion eines Geräts zu erfüllen

Anmerkung 1 zum Begriff: Ein funktionales Element hat eine Schnittstelle zu anderen funktionalen Elementen und Funktionen.

Anmerkung 2 zum Begriff: Ein funktionales Element kann aus einem oder mehreren Funktionsbausteinen, Objekten oder Parameterlisten erstellt werden.

[QUELLE: IEC 61800-7-1:2015, 3.2.13]

3.1.15

Hochspannung

(en: high-level power)

Hauptstromversorgung des Antriebsgeräts

3.1.16

Eingangsdaten

(en: input data)

Daten, die von einer externen Quelle in ein Gerät, eine Ressource oder ein funktionales Element übertragen werden

[QUELLE: IEC 61800-7-1:2015, 3.2.14]

3.1.17

Schnittstelle

(en: interface)

Grenze zwischen zwei Einheiten, die durch funktionale Merkmale, Signalkenngrößen oder andere Merkmale als geeignet festgelegt ist

[QUELLE: IEC 61800-7-1:2015, 3.2.15]

3.1.18

logisches Leistungsantriebssystem

(en: logical power drive system)

Modell, welches das PDS und das Kommunikationsnetzwerk, das über die generische PDS-Schnittstelle zugänglich ist, umfasst

[QUELLE: IEC 61800-7-1:2015, 3.2.16]

3.1.19

Niederspannung

(en: low-level power)

Stromversorgung für den Steuerabschnitt des Antriebsgeräts

3.1.20

Modell

(en: model)

mathematische oder physikalische Darstellung eines Systems oder Prozesses, die das System oder den Prozess aufgrund bekannter Gesetzmäßigkeiten, einer Identifikation oder getroffener Annahmen genügend genau abbildet

[QUELLE: IEC 61800-7-1:2015, 3.2.17]

3.1.21

Betriebsart

(en: operating mode)

Kennzeichnung von Art und Umfang, wie der Mensch als Bediener in eine Leiteinrichtung eingreift

[QUELLE: IEC 61800-7-1:2015, 3.2.18]

3.1.22

Ausgabedaten

(en: output data)

Daten, die von einem Gerät, einer Ressource oder einem funktionalen Element kommen und von diesem/dieser zu externen Systemen übertragen werden

[QUELLE: IEC 61800-7-1:2015, 3.2.19]

3.1.23

Parameter

(en: parameter)

Datenelement, das Geräteinformationen darstellt, die aus einem Gerät gelesen oder in ein Gerät geschrieben werden können, z. B. durch ein Netzwerk oder ein lokales Bediengerät

Anmerkung 1 zum Begriff: Ein Parameter ist typischerweise durch einen Parameternamen, einen Datentyp und eine Zugriffsrichtung gekennzeichnet.

[QUELLE: IEC 61800-7-1:2015, 3.2.20]

3.1.24

Profil

(en: profile)

Darstellung einer PDS-Schnittstelle bezüglich ihrer Parameter, Parametergruppen und ihres Verhaltens nach einem Kommunikationsprofil und einem Geräteprofil

[QUELLE: IEC 61800-7-1:2015, 3.2.21, modifiziert – Anmerkung 1 zum Begriff wurde gestrichen.]

3.1.25

Führungsgröße

(en: reference variable)

aus der Zielgröße abgeleitete, den Sollwert der Regelgröße festlegende Eingangsgröße eines Vergleichsgliedes einer Regeleinrichtung

[QUELLE: IEC 61800-7-1:2015, 3.2.22]

3.1.26

Sollwert

(en: set-point)

Wert oder Variable, der/die als Ausgabedaten von dem Programm zur Steuerung der Anwendung verwendet wird, um das PDS zu steuern

[QUELLE: IEC 61800-7-1:2015, 3.3.1.5]

3.1.27

Zustand

(en: status)

Menge an Informationen von dem PDS an das Programm zur Steuerung der Anwendung, die den Zustand oder die Betriebsart des PDS oder eines funktionalen Elements des PDS wiedergibt

Anmerkung 1 zum Begriff: Die verschiedenen Zustandsinformationen können jeweils mit einem Bit kodiert werden.

[QUELLE: IEC 61800-7-1:2015, 3.3.1.6]

3.1.28

Typ

(en: type)

Hardware- oder Software-Element, das die gemeinsamen Attribute festlegt, die von allen Instanzen des Typs gemeinsam genutzt werden

[QUELLE: IEC 61800-7-1:2015, 3.2.23]

3.1.29

Anwendungsfall

(en: use case)

Festlegung der Klasse einer Folge von Aktionen, einschließlich Varianten, die ein System (oder eine andere Einheit) durchführen kann, wobei sie mit Aktoren des Systems zusammenwirken

[QUELLE: IEC 61800-7-1:2015, 3.2.24]

3.1.30

Variable

(en: variable)

Software-Einheit, die jeweils verschiedene Werte zu einer Zeit annehmen kann

Anmerkung 1 zum Begriff: Die Werte sowohl einer Variablen als auch eines Parameters sind üblicherweise auf einen bestimmten Datentyp festgelegt.

[QUELLE: IEC 61800-7-1:2015, 3.2.25]

3.2 Abkürzungen

AC	Wechselstrom (en: alternating current)
BL	bürstenlos (en: brush-less)
c	Konstante (en: constant)
CiA	CAN in Automation
COB	Kommunikationsobjekt (en: communication object)
csp	Modus „Cyclic Synchronous Profile“
cst	Modus „Cyclic Synchronous Torque“
cstca	Modus „Cyclic Synchronous Torque“ mit Kommutierungswinkel
csv	Modus „Cyclic Synchronous Velocity“
DC	Gleichstrom (en: direct current)
DIV	Teiler (en: divisor)
FC	Frequenzumrichter (en: frequency converter)
FE	funktionales Element (en: functional element)
FIFO	first in, first out
FSA	Automatisierung mit Zustandsmaschine (en: finite state automaton)
hm	Homing Mode
HMI	Mensch-Maschine-Schnittstelle (en: human machine interface)
I/O	Eingang/Ausgang (en: input/output)
ip	Modus „Interpolated Position“
LSB	niedrigstwertiges Bit/Byte (en: less significant bit/byte)
MSB	höchstwertiges Bit/Byte (en: most significant bit/byte)

MUL	Multiplikation
NMT	Netzwerkmanagement (en: network management)
PDO	Prozessdatenobjekt (en: process data object)
PDS	Leistungsantriebssystem (en: power drive system)
PM	Dauermagnet (en: permanent magnet)
pp	Modus „Profile Position“
pv	Modus „Profile Velocity“
r	reserviert
r.m.s.	Effektivwert (en: root mean square)
ro	nur Lesezugriff (en: read-only)
rw	Lese- und Schreibzugriff (en: read-write)
tq	Modus „Torque“
vl	Modus „Velocity“

– Leerseite –

English Version

Adjustable speed electrical power drive systems -
Part 7-201: Generic interface and use of profiles for power drive
systems - Profile type 1 specification
(IEC 61800-7-201:2015)

Entraînements électriques de puissance à vitesse variable -
Partie 7-201: Interface générique et utilisation de profils
pour les entraînements électriques de puissance -
Spécification de profil de type 1
(IEC 61800-7-201:2015)

Elektrische Leistungsantriebssysteme mit einstellbarer
Drehzahl - Teil 7-201: Generisches Interface und Nutzung
von Profilen für Leistungsantriebssysteme (PDS) -
Spezifikation von Profil-Typ 1
(IEC 61800-7-201:2015)

This European Standard was approved by CENELEC on 2015-12-25. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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



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

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European foreword

The text of document 22G/307/FDIS, future edition 2 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 approved by CENELEC as EN 61800-7-201:2016.

The following dates are fixed:

- latest date by which the document has to be (dop) 2016-09-25
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2018-12-25
standards conflicting with the
document have to be withdrawn

This document supersedes EN 61800-7-201:2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61800-7-201:2015 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.
IEC 61800 Series	NOTE	Harmonized as EN 61800 Series.
IEC 61800-7-1:2015	NOTE	Harmonized as EN 61800-7-1:2016 (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 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® 402¹, CIP Motion™², PROFIdrive³ and SERCOS®⁴ are mapped to the generic interface in the corresponding annex. The annexes have been submitted by open international network or fieldbus organizations which are responsible for the content of the related annex and use of the related trade marks.

This part of IEC 61800-7 specifies the profile type 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.

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

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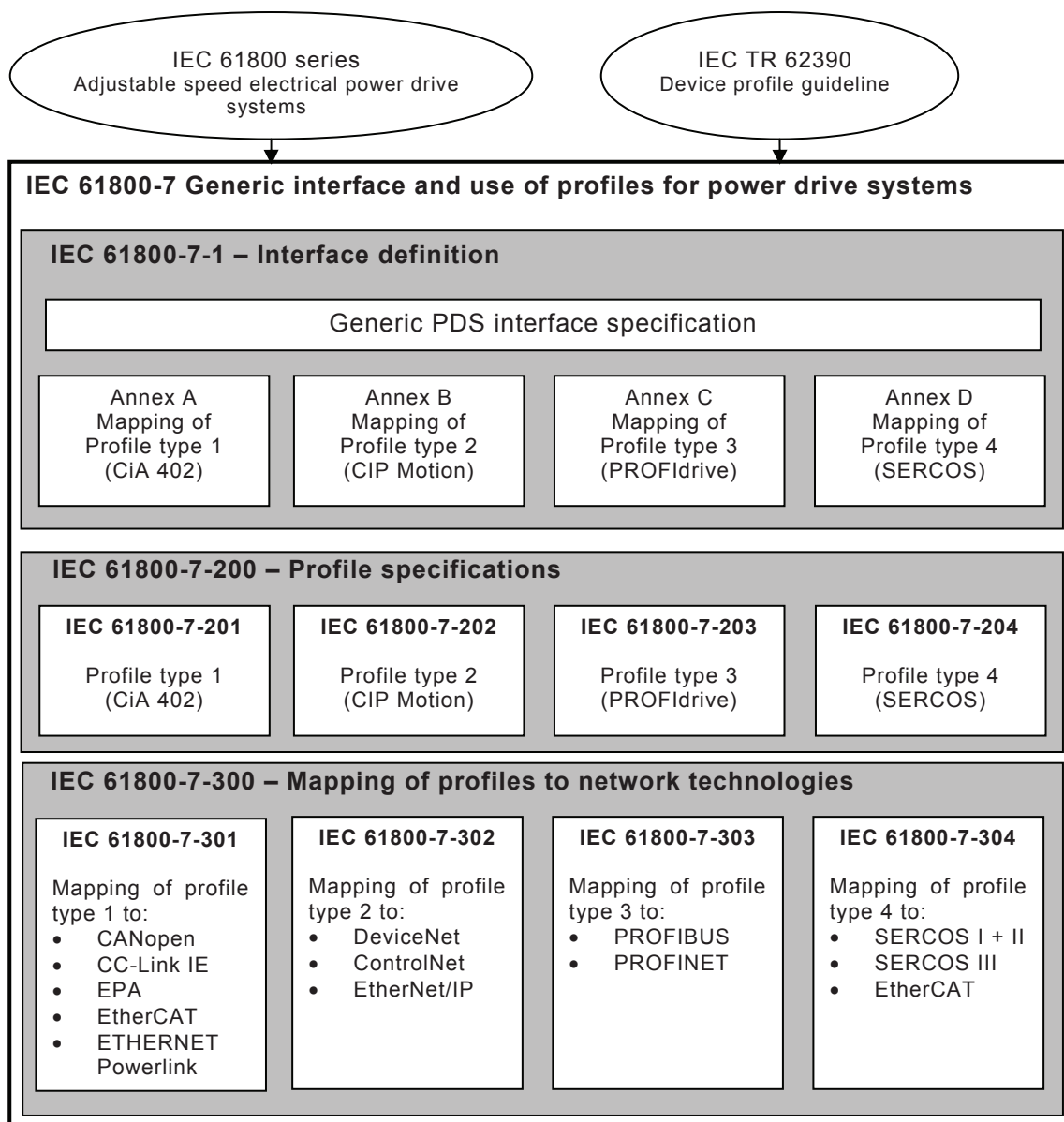


Figure 1 – Structure of IEC 61800-7

IEC

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

This part of IEC 61800 specifies profile type 1 for power drive systems (PDS). Profile type 1 can be mapped onto different communication network technologies.

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

2 Normative references

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

IEC 61800-7-301¹⁵, *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*

CiA 303-2:2012, *CANopen recommendation – Part 2: Representation of SI units and prefixes*¹⁶

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

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

¹⁵ To be published.

¹⁶ CiA 303-2 may be freely downloaded from www.can-cia.org. To avoid download misuse, the downloading person has to fill in a registration form, which does not arise some obligations to the specification user.

[SOURCE: IEC 61800-7-1:2015, 3.2.1]

3.1.3

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]

3.1.4

application mode

type of application that can be requested from a PDS

Note 1 to entry: The different application modes reflect the control loop for torque control, velocity control, position control or other applications such as homing.

[SOURCE: IEC 61800-7-1:2015, 3.3.1.2]

3.1.5

attribute

property or characteristic of an entity

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

3.1.6

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]

3.1.7

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]

3.1.8

control

purposeful action on or in a process to meet specified objectives

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

3.1.9

control device

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

[SOURCE: IEC 61800-7-1:2015, 3.2.7]

3.1.10

data type

set of values together with a set of permitted operations

[SOURCE: IEC 61800-7-1:2015, 3.2.8]

3.1.11

device

field device

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

[SOURCE: IEC 61800-7-1:2015, 3.2.9]

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 data and behaviour of the device as viewed through a network, independent from any network technology

[SOURCE: IEC 61800-7-1:2015, 3.2.11]

3.1.13

feedback variable

variable quantity, which represents the controlled variable and is returned to the comparing element

[SOURCE: IEC 61800-7-1:2015, 3.2.12]

3.1.14

functional element

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

Note 1 to entry: A functional element has an interface, associations to other functional elements and functions.

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

[SOURCE: IEC 61800-7-1:2015, 3.2.13]

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

[SOURCE: IEC 61800-7-1:2015, 3.2.14]

3.1.17

interface

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

[SOURCE: IEC 61800-7-1:2015, 3.2.15]

3.1.18

logical power drive system

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

[SOURCE: IEC 61800-7-1:2015, 3.2.16]

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

[SOURCE: IEC 61800-7-1:2015, 3.2.17]

3.1.21

operating mode

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

[SOURCE: IEC 61800-7-1:2015, 3.2.18]

3.1.22

output data

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

[SOURCE: IEC 61800-7-1:2015, 3.2.19]

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 to entry: A parameter is typically characterized by a parameter name, data type and access direction.

[SOURCE: IEC 61800-7-1:2015, 3.2.20]

3.1.24

profile

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

[SOURCE: IEC 61800-7-1:2015, 3.2.21, modified — Note 1 to entry is deleted.]

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

[SOURCE: IEC 61800-7-1:2015, 3.2.22]

3.1.26

set-point

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

[SOURCE: IEC 61800-7-1:2015, 3.3.1.5]

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 1 to entry: The different status information may be coded with one bit each.

[SOURCE: IEC 61800-7-1:2015, 3.3.1.6]

3.1.28

type

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

[SOURCE: IEC 61800-7-1:2015, 3.2.23]

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

[SOURCE: IEC 61800-7-1:2015, 3.2.24]

3.1.30

variable

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

Note 1 to entry: The values of a variable as well as of a parameter are usually restricted to a certain data type.

[SOURCE: IEC 61800-7-1:2015, 3.2.25]

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
cstca	cyclic synchronous torque mode with commutation angle
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
LSB	less significant bit/byte
MSB	most significant bit/byte
MUL	multiplication
NMT	network management
PDO	process data object
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 such as 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 synchronization 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 EN 50325-4 and IEC 61800-7-301.

The standardized 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 following object indices range shall be reserved for compatibility reasons with other standards: from 6200_h to 62FF_h and from 6600_h to 67EF_h.

The objects may be read respectively written via the network. Within this range of objects, up to 8 axes may be realized. 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

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
Interpolation time period	See Table 2
Interpolation data configuration	See Table 3
vl 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 – Interpolation time period

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

Table 3 – Interpolation data configuration

Index	Sub-index	Description	Data type
0081 _h	00 _h	Highest sub-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 sub-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.

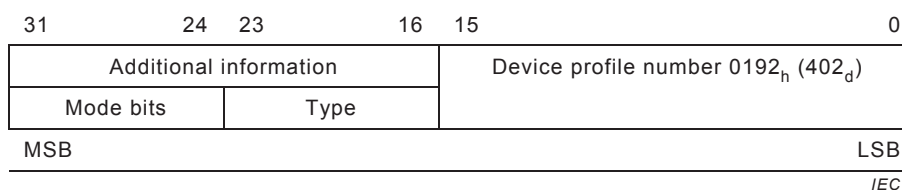


Figure 2 – Value definition

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.

The corresponding error code is readable 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	Manufacturer-specific

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 behavior

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 (device output side)
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
3122 _h	Mains under-voltage phase L2
3123 _h	Mains under-voltage phase L3
3130 _h	Phase failure

Error code	Meaning
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 device hardware
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
5115 _h	U5 = manufacturer-specific
5116 _h	U6 = manufacturer-specific
5117 _h	U7 = manufacturer-specific

Error code	Meaning
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 additional modules
7110 _h	Brake chopper
7111 _h	Failure brake chopper
7112 _h	Over current brake chopper
7113 _h	Protective circuit brake chopper
7120 _h	Motor
7121 _h	Motor blocked
7122 _h	Motor error or commutation malfunc.