

**DIN EN 61800-7-303**

ICS 29.200; 29.160.30

Einsprüche bis 2015-03-23  
Vorgesehen als Ersatz für  
DIN EN 61800-7-303:2008-11**Entwurf**

**Elektrische Leistungsantriebssysteme mit einstellbarer Drehzahl –  
Teil 7-303: Generisches Interface und Nutzung von Profilen für  
Leistungsantriebssysteme (PDS) – Abbildung von Profil-Typ 3 auf  
Netzwerktechnologien  
(IEC 22G/274/CDV:2014);  
Englische Fassung FprEN 61800-7-303:2014**

Adjustable speed electrical power drive systems –  
Part 7-303: Generic interface and use of profiles for power drive systems – Mapping of  
profile type 3 to network technologies  
(IEC 22G/274/CDV:2014);  
English version FprEN 61800-7-303:2014

Entraînements électriques de puissance à vitesse variable –  
Partie 7-303: Interface générique et utilisation de profils pour les entraînements électriques  
de puissance – Mise en correspondance du profil de type 3 avec les technologies de  
réseaux  
(CEI 22G/274/CDV:2014);  
Version anglaise FprEN 61800-7-303:2014

**Anwendungswarnvermerk**

Dieser Norm-Entwurf mit Erscheinungsdatum 2015-01-23 wird der Öffentlichkeit zur Prüfung und  
Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses  
Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal des DIN unter [www.entwuerfe.din.de](http://www.entwuerfe.din.de) bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter [www.entwuerfe.normenbibliothek.de](http://www.entwuerfe.normenbibliothek.de), sofern dort wiedergegeben;
- oder als Datei per E-Mail an [dke@vde.com](mailto:dke@vde.com) möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter [www.din.de/stellungnahme](http://www.din.de/stellungnahme) oder für Stellungnahmen zu Norm-Entwürfen der DKE unter [www.dke.de/stellungnahme](http://www.dke.de/stellungnahme) abgerufen werden;
- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE, Stresemannallee 15, 60596 Frankfurt am Main.

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten  
Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 114 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

## Nationales Vorwort

Die Englische Fassung des europäischen Dokuments FprEN 61800-7-303:2014 „Elektrische Leistungsantriebssysteme mit einstellbarer Drehzahl – Teil 7-303: Generisches Interface und Nutzung von Profilen für Leistungsantriebssysteme (PDS) – Abbildung von Profil-Typ 3 auf Netzwerktechnologien“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 22G/274/CDV:2014 „Adjustable speed electrical power drive systems – Part 7-303: Generic interface and use of profiles for power drive systems – Mapping of profile type 3 to network technologies“ unverändert in den Entwurf FprEN 61800-7-303:2014 übernommen worden.

Das internationale Dokument wurde vom SC 22G „Adjustable speed electric drive systems incorporating semiconductor power converters“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

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](http://www.dke.de)) zuständig.

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.

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 Benutzer des vorliegenden Normentwurfs der englischen Sprache als Fachsprache bedienen, wird die englische Fassung der FprEN 61800-7-303 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und deren Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Normentwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

Es wird auf die Möglichkeit hingewiesen, dass einige Elemente dieses Dokuments Patentrechte berühren können. ISO [und/oder] IEC sind nicht dafür verantwortlich, einige oder alle diesbezüglichen Patentrechte zu identifizieren.

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 61800-7-303:2008-11 wurden folgende Änderungen vorgenommen:

- a) Erweiterungen der Festlegungen für PROFINET E/A-Diagnose- und Alarm-Anwendungsdienstelemente (ASE);
- b) geringfügige Aktualisierungen bei der Abbildung des Base Mode Parameter Access zu PROFIBUS und PROFINET;
- c) redaktionelle Überarbeitung des gesamten Dokumentes.

## Nationaler Anhang NA (informativ)

Die deutschen Übersetzungen haben Empfehlungscharakter und können nur die ungefähre Begrifflichkeit in Deutsch wiedergeben. Unter Experten wird empfohlen, ausschließlich die englischen Fachbegriffe zu verwenden, um die Gefahr von Missverständnissen zu reduzieren.

### 1 Anwendungsbereich

IEC 61800-7 beschreibt Profile für Leistungsantriebssysteme (en: Power Drive Systems, PDS) und ihre Abbildung auf bestehende Kommunikationssysteme unter Verwendung eines generischen Schnittstellenmodells.

Es ist nicht Zweck der in diesem Teil der IEC 61800-7 beschriebenen Funktionen, funktionale Sicherheit zu gewährleisten. Dies erfordert zusätzliche Maßnahmen nach den maßgeblichen Normen, Vereinbarungen und Gesetzen.

Dieser Teil der IEC 61800-7 beschreibt die Abbildung des in IEC 61800-7-203 festgelegten Profil-Typs 3 (PROFIdrive) auf verschiedene Netzwerktechnologien.

- PROFIBUS DP, siehe Abschnitt 4,
- PROFINET IO, siehe Abschnitt 5.

### 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

[QUELLE: IEV 351-21-02]

Anmerkung 1 zum Begriff: Istwerte oder Ist-Größen werden in diesem Teil der Reihe IEC 61800-7 als Eingangsdaten des Programms zur Steuerung der Anwendung verwendet, um Rückführgrößen oder andere Prozessgrößen des PDS zu überwachen.

**3.1.2****Algorithmus****(en: algorithm)**

vollständig bestimmte endliche Folge von Anweisungen, nach denen die Werte der Ausgangsgrößen aus den Werten der Eingangsgrößen berechnet werden können

[QUELLE: IEC 351-21-37]

**3.1.3****Anwendung****(en: application)**

funktionales Element der Software, spezifisch für die Problemlösung beim Messen und Steuern in industriellen Prozessen

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

[QUELLE: IEC/TR 62390:2005, 3.1.2, modifiziert]

**3.1.4****Attribut****(en: attribute)**

Eigenschaft oder Charakteristik einer Einheit

[QUELLE: IEC/TR 62390:2005, 3.1.3]

**3.1.5****Achse****(en: axis)**

logisches Element eines Bewegungssteuerungssystems, das eine bestimmte Form der Bewegung darstellt

Anmerkung 1 zum Begriff: Achsen können rotatorisch oder linear, physikalisch oder virtuell, gesteuert oder nur beobachtet sein.

Anmerkung 2 zum Begriff: Eine physikalische Achse kann eine oder mehrere der folgenden Komponenten einschließen: einen Bewegungssensor, eine Bewegungssteuerungsstruktur, einen Leistungsverstärker und einen Bewegungsaktor.

**3.1.6****Klasse****(en: class)**

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

[QUELLE: ISO/IEC 19501, modifiziert]

**3.1.7****taktzyklussynchrone Anwendung****(en: clock cycle synchronous application)**

Synchronisation der Abtast- und Zykluszeiten in der Regelungssoftware in digitalen Antriebes und Steuerungssystemen

**3.1.8****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.

### 3.1.8

#### Leiten

(en: control)

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

[QUELLE: IEC 351-21-29]

### 3.1.9

#### Steuergerät

(en: control device)

physikalische Einheit, die – innerhalb eines Moduls/einer Baugruppe oder eines Gerätes – ein Anwendungsprogramm zur Steuerung des PDS enthält

### 3.1.10

#### Datentyp

(en: data type)

Menge von Werten mit einer Menge zulässiger Operationen

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

### 3.1.11

#### Gerät

(en: device)

Feldgerät

vernetzte unabhängige physikalische Einheit eines industriellen Automatisierungssystems, die fähig ist, spezifische Funktionen in einem bestimmten Kontext auszuführen und die durch ihre Schnittstellen begrenzt ist

[QUELLE: IEC 61499-1:2005, 3.30, modifiziert]

Einheit, die Steuerungs- und Regelfunktionen sowie Aktor- und/oder Sensorfunktionen ausführt und Schnittstellen zu anderen derartigen Einheiten innerhalb eines Automatisierungssystems hat

[QUELLE: ISO 15745-1:2003, 3.11]

### 3.1.12

#### Geräteprofil

(en: device profile)

Darstellung eines Gerätes bezüglich seiner Parameter, seiner Parametergruppen und seines Verhaltens nach einem Gerätemodell, das die Daten und das Verhalten des Gerätes beschreibt, wie es durch ein Netzwerk gesehen wird

Anmerkung 1 zum Begriff: Dies ist eine Definition aus IEC/TS 61915, die durch das Hinzufügen der funktionalen Gerätestruktur erweitert ist.

[QUELLE: IEC/TR 62390:2005, 3.1.9, modifiziert]

### 3.1.13

#### E/A-Daten des OD

(en: DO IO Data)

Sammlung aller Eingangs- und Ausgangsdaten (zyklische Übertragung) eines Antriebsobjekts (Antriebsachse)

### 3.1.14

#### Antriebsobjekt

(en: Drive Object)

funktionales Element einer Antriebseinheit

### 3.1.15

#### Kommunikation zwischen Antrieben

(en: Drive to Drive communication)

(zyklische) Kommunikation zwischen Antrieben aus der Sicht des Nutzers

**3.1.16****Antriebseinheit****(en: Drive Unit)**

logisches Gerät, das alle funktionalen Elemente bezogen auf eine zentrale Verarbeitungseinheit umfasst

**3.1.17****funktionales Element****(en: functional element)**

Einheit von Software oder von Hardware, die mit Hardware kombiniert ist, fähig, eine festgelegte Funktion eines Gerätes 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/TR 62390:2005, 3.1.12]

**3.1.18****Eingangsdaten****(en: Input Data)**

Daten, die zyklisch vom Gerät an den Regler zu senden sind

**3.1.19****Schnittstelle****(en: interface)**

Grenze zwischen zwei Einheiten, die durch funktionale Merkmale, Signal-Eigenschaften oder andere geeignete charakteristische Merkmale festgelegt ist

[QUELLE: IEC 351-21-35, modifiziert]

**3.1.20****E/A-Daten****(en: IO Data)**

Eingangs- und Ausgangsdaten eines Gerätes

**3.1.21****isochroner Modus****(en: Isochronous Mode)**

Dienst des Kommunikationssystems für die Taktzyklussynchronisation, der einen konstanten Bus(zeit)zyklus mit einem Taktzyklussignal am Anfang des Zyklus erzeugt

**3.1.22****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 351-21-36]

**3.1.23****Betriebsart****(en: operating mode)**

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

[QUELLE: IEC 351-31-01]

### 3.1.24

#### **Ausgangsdaten**

(en: **Output Data**)

Daten, die zyklisch vom Regler an das Gerät zu senden sind

### 3.1.25

#### **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: Aus IEC/TS 61915, angepasst.

Anmerkung 2 zum Begriff: Ein Parameter ist typischerweise durch einen Parameternamen, einen Datentyp und eine Zugriffsrichtung gekennzeichnet.

[QUELLE: IEC/TR 62390:2005, 3.1.22, modifiziert]

### 3.1.26

#### **Prozessdaten**

(en: **Process data**)

Daten in Verbindung mit dem Regelungs- bzw. Steuerungsprozess, z. B. Verstärkungsfaktor und Zustandsvariablen, typischerweise auf Parameter abgebildet

### 3.1.27

#### **Profil**

(en: **profile**)

Darstellung einer PDS-Schnittstelle hinsichtlich ihrer Parameter, Parametergruppierung und ihres Verhaltens nach einem Kommunikations- und einem Geräteprofil

### 3.1.28

#### **Sollwert**

(en: **setpoint**)

Wert oder Variable, der/die als Ausgangsdatenwert bzw. -variable von dem Programm zur Steuerung der Anwendung verwendet wird, um das PDS zu steuern

### 3.1.29

#### **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 Elementes des PDS wiedergibt

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

### 3.1.30

#### **technologische Funktionen**

(en: **technological functions**)

geschlossene Regelkreise und Ablaufsteuerungen für die Automatisierung von anwendungsspezifischen Prozessen

### 3.1.31

#### **Typ**

(en: **type**)

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

[QUELLE: IEC/TR 62390:2005, 3.1.25]

**3.1.32****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/TR 62390:2005, 3.1.27]

**3.2 Abkürzungen**

|       |                                                                                                                           |
|-------|---------------------------------------------------------------------------------------------------------------------------|
| AC x  | Anwendungsklasse x, wobei x die Nummer der Anwendungsklasse ist (en: Application Class)                                   |
| AP    | Anwendungsprozess (en: Application Process)                                                                               |
| AP    | Anwendungsprozesskennzeichner (en: Application Process Identifier)                                                        |
| AR    | Anwendungsbeziehung (en: Application Relationship)                                                                        |
| ASE   | Anwendungsdienstelement (en: Application Service Element)                                                                 |
| CM    | Kontextmanagement (en: Context Management)                                                                                |
| CO    | Kommunikationsobjekt (en: Communication Object)                                                                           |
| CR    | Kommunikationsbeziehung (en: Communication Relationship)                                                                  |
| C-LS  | Lebenszeichen des Reglers (en: Controller's Sign-Of-Life)                                                                 |
| DO    | Antriebsobjekt (en: Drive Object)                                                                                         |
| DO-LS | Lebenszeichen des Antriebsobjekts (en: Drive Object Sign-Of-Life)                                                         |
| DP    | dezentrale (verteilte) Peripherie (en: Decentralized (distributed) Periphery)                                             |
| DSC   | Dynamic Servo Control                                                                                                     |
| DU    | Antriebseinheit (en: Drive Unit)                                                                                          |
| DX    | Datenaustausch (en: Data_Exchange)                                                                                        |
| DXB   | Querverkehr (en: Data-eXchange-Broadcast)                                                                                 |
| f     | Frequenz (en: frequency)                                                                                                  |
| FDL   | Feldbus-Sicherungsschicht (Schicht 2) (en: Fieldbus Data Link (Layer 2))                                                  |
| GAP   | Bereich zwischen eigener Stationsadresse und der nächsten Stationsadresse (Versuch, neue aktive Stationen einzuschließen) |
| GC    | globales Steuerungstelegramm (en: Global Control Telegram)                                                                |
| GSD   | Gerätestammdaten-Datei (Gerätebeschreibung, Eingabe für ein Bus-Konfigurationstool) (en: Device Data File)                |
| HW    | Hardware                                                                                                                  |
| ID    | Kennzeichner (en: Identifier)                                                                                             |

|          |                                                                                                                     |
|----------|---------------------------------------------------------------------------------------------------------------------|
| IO AR    | E/A-Anwendungsbeziehung (en: IO Application Relationship)                                                           |
| IOCS     | E/A-Konsumentenstatus (en: IO Consumer Status)                                                                      |
| IOPS     | E/A-Produzentenstatus (en: IO Producer Status)                                                                      |
| IO Data  | E/A-Daten; zyklisch übertragen                                                                                      |
| IP       | Internet Protocol                                                                                                   |
| IRT      | Isochrones Echtzeit-Ethernet (en: Isochronous Realtime Ethernet)                                                    |
| I/O      | Eingang/Ausgang (en: Input/Output)                                                                                  |
| LS       | Lebenszeichen (en: Sign-Of-Life)                                                                                    |
| MAP      | Modulzugangspunkt (en: Module Access Point)                                                                         |
| MSG      | Azyklische Dienste (Nachricht) (en: Message)                                                                        |
| M CR     | Multicast-CR                                                                                                        |
| MS0 AR   | PROFIBUS-MS0-AR (zyklischer Datenaustausch zwischen Master (Klasse 1) und Slave)                                    |
| MS1 AR   | PROFIBUS-MS1-AR (azyklischer Datenaustausch zwischen Master (Klasse 1) und Slave)                                   |
| MS2 AR   | PROFIBUS-MS2-AR (azyklischer Datenaustausch zwischen Master (Klasse 2) und Slave)                                   |
| NAMUR    | Normenarbeitsgemeinschaft für Mess- und Regeltechnik in der Chemischen Industrie                                    |
| NC       | Numerische Steuerung (en: Numerical Control System) mit einem numerischen Steuerbefehlssatz                         |
| OP       | Bedienfeld (en: Operator Panel)                                                                                     |
| Pxxx     | Parameter (gekennzeichnet durch Nummer xxx)                                                                         |
| PAP      | Parameterzugangspunkt (en: Parameter Access Point)                                                                  |
| PC       | Personalcomputer                                                                                                    |
| PDS      | Leistungsantriebssystem (en: Power Drive System)                                                                    |
| P-Device | Peripheriegerät (PROFIdrive Base Model) (en: Peripheral Device)                                                     |
| PDU      | Protokolldateneinheit (en: Protocol Data Unit)                                                                      |
| PG       | Programmiergerät                                                                                                    |
| PLC      | speicherprogrammierbare Steuerung ohne einen Befehlssatz zur Bewegungssteuerung (en: Programmable Logic Controller) |
| PLL      | Phasenregelkreis (en: Phase Locked Loop)                                                                            |
| PNO      | PROFIBUS Nutzerorganisation                                                                                         |
| PNU      | Parameternummer (en: Parameter Number)                                                                              |
| PROFIBUS | Process Field Bus (siehe Typ-3-Elemente nach IEC 61158 sowie IEC 61784-1)                                           |

|                                   |                                                                            |
|-----------------------------------|----------------------------------------------------------------------------|
| PROFINET                          | Process Field Bus (siehe Typ-10-Elemente nach IEC 61158 sowie IEC 61784-2) |
| RES                               | reservieren                                                                |
| RT                                | Echtzeit-Ethernet (en: Realtime Ethernet)                                  |
| SAP                               | Dienstzugangspunkt (en: Service Access Point)                              |
| SW                                | Software                                                                   |
| SYNC                              | Synchronisation                                                            |
| SYNCH                             | Synchronisationstelegramm (globale Steuerung)                              |
| $T_{\text{BASE\_DP}}$             | Zeitbasis von $T_{\text{DP}}$                                              |
| $T_{\text{BASE\_IO}}$             | Zeitbasis von $T_{\text{I}}$ , $T_{\text{O}}$                              |
| $t_{\text{BIT}}$                  | Bitzeit                                                                    |
| TCA_Min                           | Verzögerungszeit für den Anwendungsprozess des Reglers                     |
| TCA_Valid                         | Zeit für verfügbare Eingangsdaten                                          |
| $T_{\text{DC}}$ , $T_{\text{DC}}$ | Datenzykluszeit (en: Data-Cycle-Time)                                      |
| $T_{\text{DP}}$                   | DP-Zykluszeit (en: DP-Cycle-Time)                                          |
| $T_{\text{DP\_MAX}}$              | Maximum von TDP                                                            |
| $T_{\text{DP\_MIN}}$              | Minimum von TDP                                                            |
| $T_{\text{DX}}$                   | Datenaustauschzeit (en: Data_Exchange-Time)                                |
| $T_{\text{J}}$                    | Jitter-Zeit                                                                |
| $T_{\text{I}}$                    | Eingangszeit (en: Input-Time)                                              |
| $T_{\text{I\_MIN}}$               | Minimum von TI                                                             |
| $T_{\text{ID1}}$                  | Leerlaufzeit 1                                                             |
| $T_{\text{ID2}}$                  | Leerlaufzeit 2                                                             |
| $T_{\text{input\_valid}}$         | Verzögerungszeit für den Erfassungsprozess                                 |
| T_IO_Input                        | Zeit für die Erfassung des Istwerts                                        |
| T_IO_InputMin                     | Verzögerungszeit für den Erfassungsprozess                                 |
| T_IO_Output                       | Zeit für die Übertragung des Sollwerts                                     |
| T_IO_OutputMin                    | Verzögerungszeit für den Prozess der Übertragung des Sollwerts             |
| TIO_OutputValid                   | Zeit für verfügbare Ausgangsdaten                                          |

|              |                                                                              |
|--------------|------------------------------------------------------------------------------|
| $T_M$        | Masterzeit                                                                   |
| $T_{MAPC}$   | Zykluszeit der Masteranwendung (en: Master_Application_Cycle-Time)           |
| $T_{MLS}$    | Zeit für Lebenszeichen des Masters (en: Master_Life_Sign-Time)               |
| $T_O$        | Ausgangszeit (en: Output-Time)                                               |
| $T_{O\_MIN}$ | Minimum von (TO–TDX)                                                         |
| $T_{PLL\_D}$ | PLL-Verzögerung (en: PLL-Delay)                                              |
| $T_{PLL\_W}$ | PLL-Fenster (en: PLL-Window)                                                 |
| $T_{SAPC}$   | Zykluszeit der Slave-Anwendung (en: Slave_Application_Cycle-Time)            |
| $T_{SC}$     | Abtastzeit des Drehzahlreglers (en: Speed Controller Sampling Time)          |
| $T_{SDR}$    | Zeitverzögerung für das Antworten der Station (Station_Delay_Responder Time) |
| $T_{TR}$     | Zielumdrehungszeit (en: Target_Rotation-Time)                                |
| $T_{WD}$     | Überwachungszeit (en: Watchdog-Time)                                         |
| UUID         | Universeller eindeutiger Kennzeichner (en: Universal Unique Identifier)      |
| TOK          | Tokenweitergabe (en: Token Passing)                                          |
| VIK          | Verband der Industriellen Energie- und Kraftwirtschaft                       |
| ZSW          | Statuswort (en: Status Word)                                                 |

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

**Part 7-303: Generic interface and use  
of profiles for power drive systems –  
Mapping of profile type 3 to network technologies**

## FOREWORD

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International Standard IEC 61800-7-303 has been prepared by subcommittee SC 22G: Adjustable speed electric drive systems incorporating semiconductor power converters, of IEC technical committee TC 22: Power electronic systems and equipment.

This second edition cancels and replaces the first edition published in 2007. This edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below.

- Enhanced definition of the using of PROFINET IO Diagnosis ASE and Alarm ASE.
- Minor updates in the mapping of the Base Mode Parameter Access to PROFIBUS and PROFINET.
- Editorial adjustments in relation with the new version of the IEC Directive Part 2.

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

|             |                  |
|-------------|------------------|
| FDIS        | Report on voting |
| 22G/XX/FDIS | 22G/XX/RVD       |

56  
57 Full information on the voting for the approval of this standard can be found in the report on  
58 voting indicated in the above table.

59 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

60 A list of all parts of the IEC 61800 series, under the general title *Adjustable speed electrical*  
61 *power drive systems*, can be found on the IEC website.

62 The committee has decided that the contents of this publication will remain unchanged until  
63 the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data  
64 related to the specific publication. At this date, the publication will be

- 65 • reconfirmed;  
66 • withdrawn;  
67 • replaced by a revised edition, or  
68 • amended.

69

70 The National Committees are requested to note that for this publication the stability date  
71 is 2019.

72 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE  
73 DELETED AT THE PUBLICATION STAGE.

74

75 **IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it**  
76 **contains colours which are considered to be useful for the correct understanding of its**  
77 **contents. Users should therefore print this document using a colour printer.**

78

## INTRODUCTION

### 0.1 General

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

IEC 61800-7 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 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.

- 125 IEC 61800-7-1 is divided into a generic part and several annexes as shown in Figure 1. The  
126 drive profile types for CiA® 402<sup>1</sup>, CIP Motion™<sup>2</sup>, PROFIdrive<sup>3</sup> and SERCOS®<sup>4</sup> are mapped  
127 to the generic interface in the corresponding annex. The annexes have been submitted by  
128 open international network or fieldbus organizations which are responsible for the content of  
129 the related annex and use of the related trade marks.
- 130 The different profile types 1, 2, 3 and 4 are specified in IEC 61800-7-201, IEC 61800-7-202,  
131 IEC 61800-7-203 and IEC 61800-7-204.
- 132 This part of IEC 61800-7 specifies how the profile type 3 (PROFIdrive) is mapped to the  
133 network technologies PROFIBUS<sup>5</sup> and PROFINET<sup>6</sup>.
- 134 IEC 61800-7-301, IEC 61800-7-302 and IEC 61800-7-304 specify how the profile types 1, 2  
135 and 4 are mapped to different network technologies (such as CANopen®<sup>7</sup>, CC-Link

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136 IE® Field Network<sup>8</sup>, EPA<sup>TM</sup><sup>9</sup>, EtherCAT®<sup>10</sup>, Ethernet Powerlink<sup>TM</sup><sup>11</sup>, DeviceNet<sup>TM</sup><sup>12</sup>,  
137 ControlNet<sup>TM</sup><sup>13</sup>, EtherNet/IP<sup>TM</sup><sup>14</sup>, and SERCOS®).

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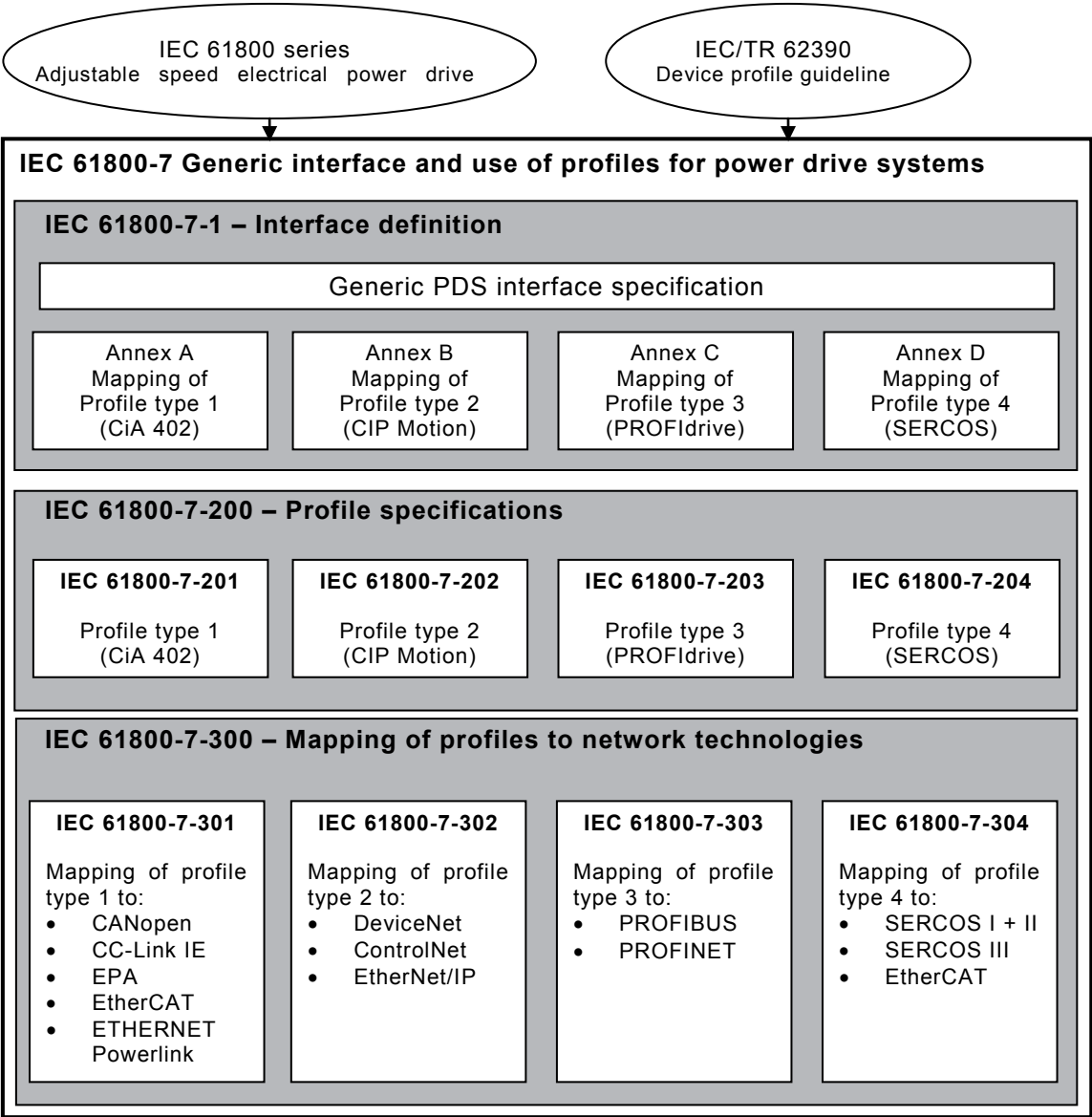


Figure 1 – Structure of IEC 61800-7

**0.2 Patent declaration**

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning the following.

| Publication /<br>Application serial<br>number | Holder | Title                                                                                                                                                          | Derwent<br>accession<br>Number | Derwent publication                                                                    |
|-----------------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------|
| EP844542                                      | [SI]   | Numerical control method and control structure for controlling of movement of objects whereby speed control is effected at a higher rate than position control | 1998-274369                    | EP844542-A1<br>27.05.1998;<br>DE59603496-G<br>02.12.1999;<br>EP844542-B1<br>27.10.1999 |

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

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## ADJUSTABLE SPEED ELECTRICAL POWER DRIVE SYSTEMS –

### Part 7-303: Generic interface and use of profiles for power drive systems – Mapping of profile type 3 to network technologies

#### 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 the mapping of the profile type 3 (PROFIdrive) specified in IEC 61800-7-203 onto different network technologies.

- PROFIBUS DP, see Clause 0,
- PROFINET IO, see Clause 5.

#### 2 Normative references

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

IEC 61158-5-3:2014<sup>15</sup>, *Industrial communication networks – Fieldbus specifications – Part 5-3: Application layer service definition – Type 3 elements*

IEC 61158-5-10:2014<sup>15</sup>, *Industrial communication networks – Fieldbus specifications – Part 5-10: Application layer service definition – Type 10 elements*

IEC 61158-6-3:2014<sup>15</sup>, *Industrial communication networks – Fieldbus specifications – Part 6-3: Application layer protocol specification – Type 3 elements*

IEC 61158-6-10:2014<sup>15</sup>, *Industrial communication networks – Fieldbus specifications – Part 6-10: Application layer protocol specification – Type 10 elements*

IEC 61784-1, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

IEC 61784-2, *Industrial communication networks – Profiles – Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3*

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

IEC 61800-7-203, *Adjustable speed electrical power drive systems – Part 7-203: Generic interface and use of profiles for power drive systems – Profile type 3 specification*

#### 3 Terms, definitions and abbreviated terms

##### 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

<sup>15</sup> To be published.

- 206 **3.1.1**  
207 **actual value**  
208 value of a variable at a given instant
- 209 [SOURCE: IEC 351-21-02]
- 210 Note 1 to entry: Actual value or actual variable are used in this part of the IEC 61800-7 series as input data of the  
211 application control program to monitor feedback variables or other process variables of the PDS.
- 212 **3.1.2**  
213 **algorithm**  
214 completely determined finite sequence of operations by which the values of the output data  
215 can be calculated from the values of the input data
- 216 [SOURCE: IEC 351-21-37]
- 217 **3.1.3**  
218 **application**  
219 software functional element specific to the solution of a problem in industrial-process  
220 measurement and control
- 221 Note 1 to entry: An application may be distributed among resources, and may communicate with other applications.  
222 [SOURCE: IEC/TR 62390:2005, 3.1.2, modified]
- 223 **3.1.4**  
224 **attribute**  
225 property or characteristic of an entity
- 226 [SOURCE: IEC/TR 62390:2005, 3.1.3]
- 227 **3.1.5**  
228 **axis**  
229 logical element of a motion control system that exhibits some form of movement
- 230 Note 1 to entry: Axes can be rotary or linear, physical or virtual, controlled or simply observed.  
231 Note 2 to entry: A physical *axis* may include one or more of the following components: a motion sensor, a motion  
232 control structure, a power amplifier, and a motion actuator.
- 233 **3.1.6**  
234 **class**  
235 description of a set of objects that share the same attributes, operations, methods,  
236 relationships, and semantics
- 237 [SOURCE: ISO/IEC 19501, modified]
- 238 **3.1.7**  
239 **clock cycle synchronous application**  
240 synchronization of sampling and cycle times in the closed-loop control software in digital  
241 drives and control systems
- 242 **3.1.8**  
243 **commands**  
244 set of commands from the application control program to the PDS to control the behaviour of  
245 the PDS or functional elements of the PDS
- 246 Note 1 to entry: The behaviour is reflected by states or operating modes.  
247 Note 2 to entry: The different commands may be represented by one bit each.

248 **3.1.8**249 **control**

250 purposeful action on or in a process to meet specified objectives

251 [SOURCE: IEC 351-21-29]

252 **3.1.9**253 **control device**254 physical unit that contains – in a module/subassembly or device – an application program to  
255 control the PDS256 **3.1.10**257 **data type**

258 set of values together with a set of permitted operations

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

260 **3.1.11**261 **device**

262 field device

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

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

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

268 [SOURCE: ISO 15745-1:2003, 3.11]

269 **3.1.12**270 **device profile**271 representation of a device in terms of its parameters, parameter assemblies and behaviour  
272 according to a device model that describes the device's data and behaviour as viewed  
273 through a network274 Note 1 to entry: This is a definition from IEC/TS 61915 which is extended by the addition of the device functional  
275 structure.

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

277 **3.1.13**278 **DO IO Data**

279 collection of all Input Data and Output Data (cyclic transmission) of a Drive Object (drive axis)

280 **3.1.14**281 **Drive Object**

282 functional element of a Drive Unit

283 **3.1.15**284 **Drive to Drive communication**

285 communication (cyclic) between drives from the user's perspective

286 **3.1.16**287 **Drive Unit**

288 logical device which comprises all functional elements related to one central processing unit

289 **3.1.17**290 **functional element**291 entity of software or software combined with hardware, capable of accomplishing a specified  
292 function of a device

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

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

295 SOURCE: [IEC/TR 62390:2005, 3.1.12]

- 296 **3.1.18**  
297 **Input Data**  
298 data to be sent cyclically from the device to the controller
- 299 **3.1.19**  
300 **interface**  
301 shared boundary between two entities defined by functional characteristics, signal  
302 characteristics, or other characteristics as appropriate
- 303 [SOURCE: IEC 351-21-35, modified]
- 304 **3.1.20**  
305 **IO Data**  
306 Input Data and Output Data of a device
- 307 **3.1.21**  
308 **Isochronous Mode**  
309 communication system service for clock cycle synchronism which generates a constant  
310 (timing) bus cycle with a clock cycle signal at the start of the cycle
- 311 **3.1.22**  
312 **model**  
313 mathematical or physical representation of a system or a process, based with sufficient  
314 precision upon known laws, identification or specified suppositions
- 315 [SOURCE: IEC 351-21-36]
- 316 **3.1.23**  
317 **operating mode**  
318 characterisation of the way and the extent to which the human operator intervenes in the  
319 control equipment
- 320 [SOURCE: IEC 351-31-01]
- 321 **3.1.24**  
322 **Output Data**  
323 data to be sent cyclically from the controller to the device
- 324 **3.1.25**  
325 **parameter**  
326 data element that represents device information that can be read from or written to a device,  
327 for example through the network or a local HMI
- 328 Note 1 to entry: Adapted from IEC/TS 61915.  
329 Note 2 to entry: A parameter is typically characterized by a parameter name, data type and access direction.  
330 [SOURCE: IEC/TR 62390:2005, 3.1.22, modified]
- 331 **3.1.26**  
332 **Process data**  
333 data related to the control process, for example gain factor and state variables, typically  
334 mapped to parameters
- 335 **3.1.27**  
336 **profile**  
337 representation of a PDS interface in terms of its parameters, parameter assemblies and  
338 behaviour according to a communication profile and a device profile
- 339 **3.1.28**  
340 **setpoint**  
341 value or variable used as Output Data of the application control program to control the PDS

342 **3.1.29**343 **status**

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

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

347 **3.1.30**348 **technological functions**

349 closed-loop controls and sequence controls for automation of application-specific processes

350 **3.1.31**351 **type**

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

354 [SOURCE: IEC/TR 62390:2005, 3.1.25]

355 **3.1.32**356 **variable**

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

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

359 [SOURCE: IEC/TR 62390:2005, 3.1.27]

360 **3.2 Abbreviated terms**

|     |       |                                                                         |
|-----|-------|-------------------------------------------------------------------------|
| 361 | AC x  | Application Class x, where x is the number of the AC                    |
| 362 | AP    | Application Process                                                     |
| 363 | API   | Application Process Identifier                                          |
| 364 | AR    | Application Relationship                                                |
| 365 | ASE   | Application Service Element                                             |
| 366 | CM    | Context Management                                                      |
| 367 | CO    | Communication Object                                                    |
| 368 | CR    | Communication Relationship                                              |
| 369 | C-LS  | Controller's Sign-Of-Life                                               |
| 370 | DO    | Drive Object                                                            |
| 371 | DO-LS | Drive Object Sign-Of-Life                                               |
| 372 | DP    | Decentralised (distributed) Periphery                                   |
| 373 | DSC   | Dynamic Servo Control                                                   |
| 374 | DU    | Drive Unit                                                              |
| 375 | DX    | Data_Exchange                                                           |
| 376 | DXB   | Data-eXchange-Broadcast                                                 |
| 377 | f     | frequency                                                               |
| 378 | FDL   | Fieldbus Data Link (Layer 2)                                            |
| 379 | GAP   | Area between own station address and the next one (attempt to include   |
| 380 |       | new active stations)                                                    |
| 381 | GC    | Global Control Telegram                                                 |
| 382 | GSD   | Device Data File (device description, input for a bus configuring tool) |
| 383 | HW    | Hardware                                                                |
| 384 | ID    | Identifier                                                              |
| 385 | IO AR | IO Application Relationship                                             |
| 386 | IOCS  | IO Consumer Status                                                      |
| 387 | IOPS  | IO Producer Status                                                      |

|     |                                   |                                                                                  |
|-----|-----------------------------------|----------------------------------------------------------------------------------|
| 388 | IO Data                           | IO Data; is transmitted cyclically                                               |
| 389 | IP                                | Internet Protocol                                                                |
| 390 | IRT                               | Isochronous Realtime Ethernet                                                    |
| 391 | I/O                               | Input/Output                                                                     |
| 392 | LS                                | Sign-Of-Life                                                                     |
| 393 | MAP                               | Module Access Point                                                              |
| 394 | MSG                               | Acyclic services (Message)                                                       |
| 395 | M CR                              | Multicast CR                                                                     |
| 396 | MS0 AR                            | PROFIBUS MS0 AR (cyclic data exchange between master (class1) and slave)         |
| 397 |                                   |                                                                                  |
| 398 | MS1 AR                            | PROFIBUS MS1 AR (acyclic data exchange between master (class1) and slave)        |
| 399 |                                   |                                                                                  |
| 400 | MS2 AR                            | PROFIBUS MS2 AR (acyclic data exchange between master (class2) and slave)        |
| 401 |                                   |                                                                                  |
| 402 | NAMUR                             | Standards Working Group for Instrumentation and Control in the Chemical Industry |
| 403 |                                   |                                                                                  |
| 404 | NC                                | Numerical control system with a numeric control command set                      |
| 405 | OP                                | Operator Panel                                                                   |
| 406 | Pxxx                              | Parameter (identified by number xxx)                                             |
| 407 | PAP                               | Parameter Access Point                                                           |
| 408 | PC                                | Personal Computer                                                                |
| 409 | PDS                               | Power Drive System                                                               |
| 410 | P-Device                          | Peripheral Device (PROFIdrive Base Model)                                        |
| 411 | PDU                               | Protocol Data Unit                                                               |
| 412 | PG                                | Programming device                                                               |
| 413 | PLC                               | Programmable Logic Controller without a Motion Control command set               |
| 414 | PLL                               | Phase Locked Loop (phase control loop)                                           |
| 415 | PNO                               | PROFIBUS User Organization                                                       |
| 416 | PNU                               | Parameter Number                                                                 |
| 417 | PROFIBUS                          | Process Field Bus (see IEC 61158 Type 3 elements and IEC 61784-1)                |
| 418 | PROFINET                          | Process Field Bus (see IEC 61158 Type 10 and IEC 61784-2)                        |
| 419 | RES                               | Reserve                                                                          |
| 420 | RT                                | Realtime Ethernet                                                                |
| 421 | SAP                               | Service Access Point                                                             |
| 422 | SW                                | Software                                                                         |
| 423 | SYNC                              | Synchronization                                                                  |
| 424 | SYNCH                             | Synchronization Telegram (global control)                                        |
| 425 | T <sub>BASE_DP</sub>              | Time base of TDP                                                                 |
| 426 | T <sub>BASE_IO</sub>              | Time base of TI, TO                                                              |
| 427 | t <sub>BIT</sub>                  | Bit-Time                                                                         |
| 428 | TCA <sub>Min</sub>                | Lacktime for the Controller application process                                  |
| 429 | TCA <sub>Valid</sub>              | Time for Input Data available                                                    |
| 430 | T <sub>DC</sub> , T <sub>DC</sub> | Data-Cycle-Time                                                                  |
| 431 | T <sub>DP</sub>                   | DP-Cycle-Time                                                                    |

|     |                       |                                                                        |
|-----|-----------------------|------------------------------------------------------------------------|
| 432 | $T_{DP\_MAX}$         | Maximum of TDP                                                         |
| 433 | $T_{DP\_MIN}$         | Minimum of TDP                                                         |
| 434 | $T_{DX}$              | Data_Exchange-Time                                                     |
| 435 | $T_J$                 | Jitter-Time                                                            |
| 436 | $T_I$                 | Input-Time                                                             |
| 437 | $T_{I\_MIN}$          | Minimum of TI                                                          |
| 438 | $T_{ID1}$             | Idle-Time 1                                                            |
| 439 | $T_{ID2}$             | Idle-Time 2                                                            |
| 440 | $T_{input\_valid}$    | Lack time for the acquisition process                                  |
| 441 | $T_{IO\_Input}$       | Time for <i>actual value</i> acquisition                               |
| 442 | $T_{IO\_InputMin}$    | Lack time for the acquisition process                                  |
| 443 | $T_{IO\_Output}$      | Time for setpoint transfer                                             |
| 444 | $T_{IO\_OutputMin}$   | Lack time for the setpoint transfer process                            |
| 445 | $T_{IO\_OutputValid}$ | Time for Output Data available                                         |
| 446 | $T_M$                 | Master-Time                                                            |
| 447 | $T_{MAPC}$            | Master_Application_Cycle-Time                                          |
| 448 | $T_{MLS}$             | Master_Life_Sign-Time                                                  |
| 449 | $T_O$                 | Output-Time                                                            |
| 450 | $T_{O\_MIN}$          | Minimum of (TO-TDX)                                                    |
| 451 | $T_{PLL\_D}$          | PLL-Delay                                                              |
| 452 | $T_{PLL\_W}$          | PLL-Window                                                             |
| 453 | $T_{SAPC}$            | Slave_Application_Cycle-Time                                           |
| 454 | $T_{SC}$              | Speed Controller Sampling Time                                         |
| 455 | $T_{SDR}$             | Station_Delay_Responder Time                                           |
| 456 | $T_{TR}$              | Target_Rotation-Time                                                   |
| 457 | $T_{WD}$              | Watchdog-Time                                                          |
| 458 | UUID                  | Universal Unique Identifier                                            |
| 459 | TOK                   | Token passing                                                          |
| 460 | VIK                   | Association of the Industrial Customers and Industrial Power Producers |
| 461 | ZSW                   | Status Word                                                            |
| 462 |                       |                                                                        |

## 4 Mapping to PROFIBUS DP

### 4.1 General

This clause defines the mapping of the PROFIdrive Base Model on the PROFIBUS DP Communication System (see IEC 61158 Type 3 elements).

### 4.2 Mapping to PROFIBUS data types

Table 1 shows the mapping of the PROFIdrive standard data types to the PROFIBUS DP specific data types.

**Table 1 – Mapping of data types**

| Data types used in Profile PROFIdrive  | Equivalent data types in PROFIBUS DP   | Reference to the definition |
|----------------------------------------|----------------------------------------|-----------------------------|
| Boolean                                | Boolean                                | IEC 61158-5-3               |
| Integer8                               | Integer8                               | IEC 61158-5-3               |
| Integer16                              | Integer16                              | IEC 61158-5-3               |
| Integer32                              | Integer32                              | IEC 61158-5-3               |
| Unsigned8                              | Unsigned8                              | IEC 61158-5-3               |
| Unsigned16                             | Unsigned16                             | IEC 61158-5-3               |
| Unsigned32                             | Unsigned32                             | IEC 61158-5-3               |
| FloatingPoint                          | FloatingPoint                          | IEC 61158-5-3               |
| VisibleString                          | VisibleString                          | IEC 61158-5-3               |
| OctetString                            | OctetString                            | IEC 61158-5-3               |
| TimeOfDay (with date indication)       | TimeOfDay (with date indication)       | IEC 61158-5-3               |
| TimeDifference                         | TimeDifference                         | IEC 61158-5-3               |
| Date                                   | Date                                   | IEC 61158-5-3               |
| TimeOfDay without date indication      | TimeOfDay without date indication      | IEC 61158-5-3               |
| TimeDifference with date indication    | TimeDifference with date indication    | IEC 61158-5-3               |
| TimeDifference without date indication | TimeDifference without date indication | IEC 61158-5-3               |

### 4.3 Base Model at PROFIBUS DP

#### 4.3.1 Communication Devices

When using PROFIBUS DP as Communication Network, the PROFIdrive Devices are mapped to the following PROFIBUS DP objects:

##### Controller

The PROFIdrive Controller is represented by the PROFIBUS **DP-master (class 1)**. For example, this may be a PLC, NC or PC.

##### P-Device

The PROFIdrive P-Device is represented by the PROFIBUS **DP-slave**. The P-Device is related to one or more Axis of the automation system.

##### Supervisor

The PROFIdrive Supervisor is represented by the PROFIBUS **DP-master (class 2)**. For example this may be a PG or OP.

Figure 2 shows the topology of a typical PROFIdrive drive system using PROFIBUS DP as Communication Network.

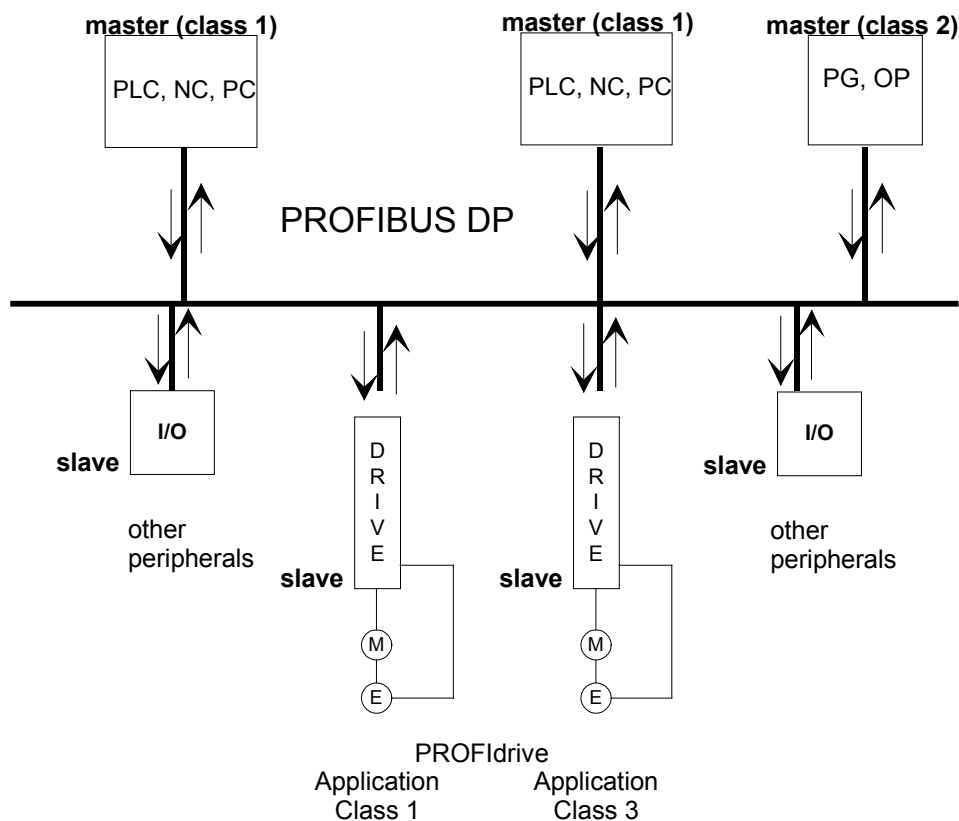


Figure 2 – PROFIBUS DP Devices in a PROFIdrive drive system

#### 4.3.2 Communication Relationship

The PROFIdrive Communication Relationships between the Devices are mapped to PROFIBUS DP in the following way:

##### Controller – P-Device

Relationship is represented by **MS0 AR plus MS1 AR**

##### Supervisor – P-Device

Relationship is represented by **MS2 AR**

##### P-Device – P-Device

Relationship is represented by **cyclic data exchange between DP-slaves (DXB)**

Figure 3 shows the PROFIdrive Devices and their relationships on PROFIBUS DP.

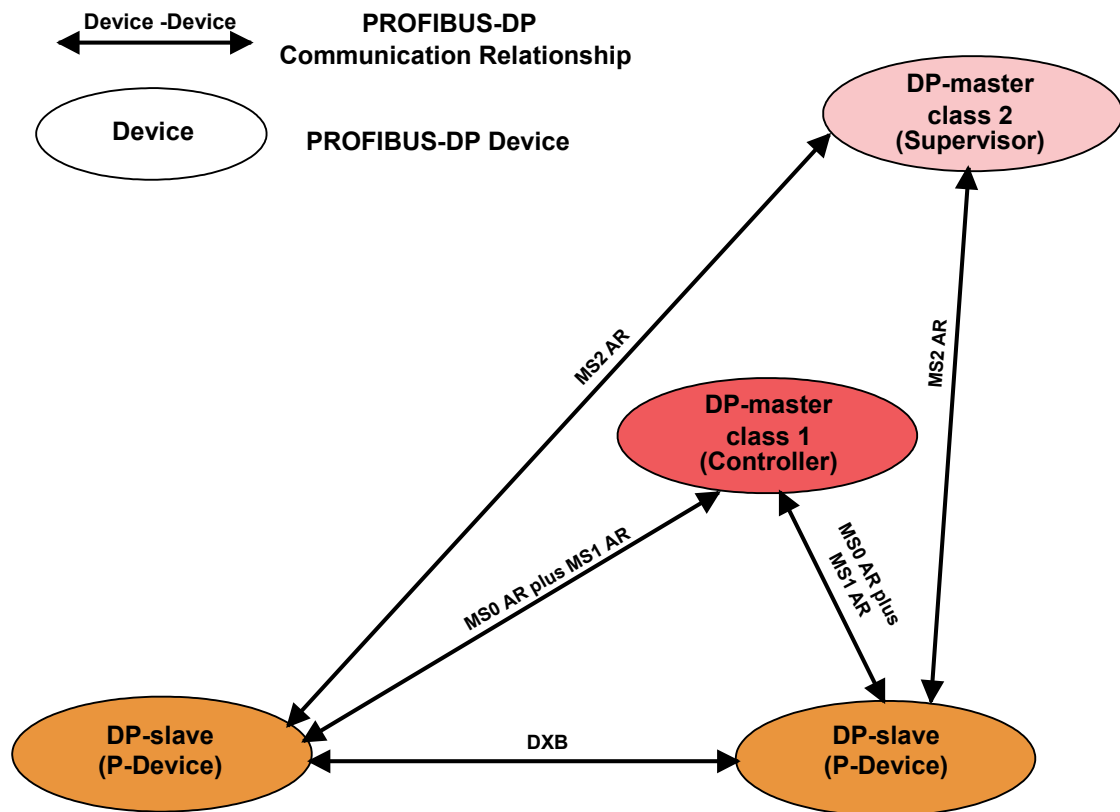


Figure 3 – PROFIdrive Devices and their Relationship for PROFIBUS DP

#### 4.3.3 Communication Network

For PROFIBUS DP as Communication System for PROFIdrive, the PROFIdrive General Communication Model is shown in Figure 4. With PROFIBUS DP, having different Network Interfaces (master- or slave-Interface) means also having different Stations. Therefore, the Station and Device Objects in the General Communication Model are the same.

With PROFIBUS, a maximum of 126 devices – that is, masters or slaves – may be connected to one bus in single- or multi-master operation. Thus, PROFIdrive P-Devices with different Drive Objects as well as other peripherals (such as I/O) may be operated on one bus.

Therefore, the PROFIdrive Device at PROFIBUS DP is precisely defined by the following address information:

- Network (PROFIBUS bus/domain)
- Device (PROFIBUS node address)

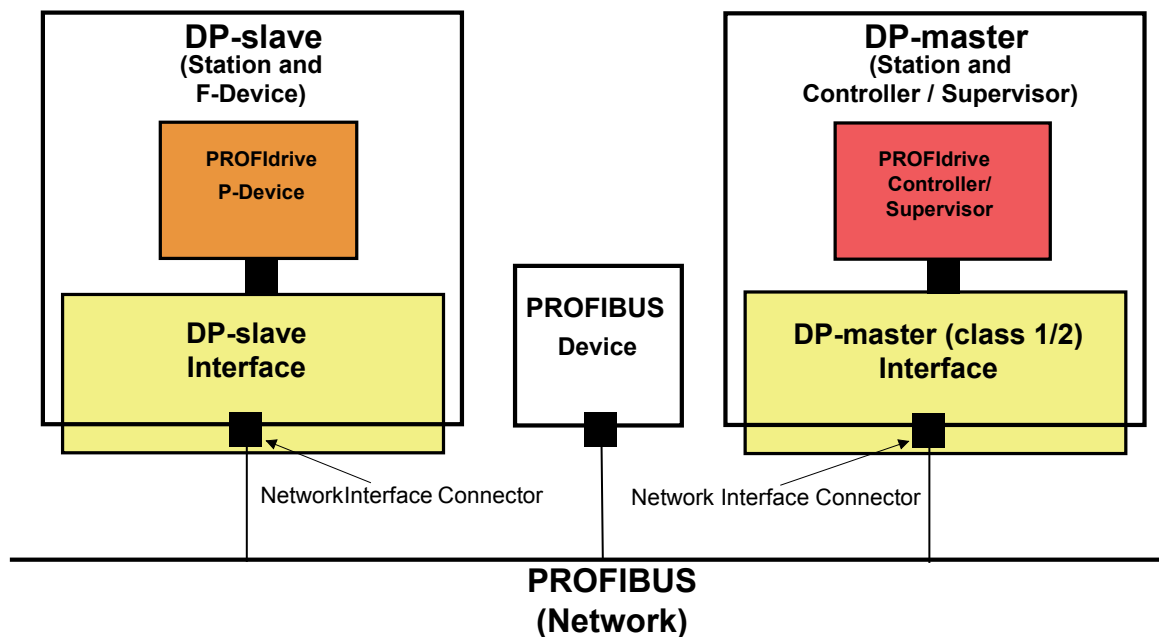


**Figure 4 – General Communication Model for PROFIdrive at PROFIBUS DP**

#### 4.3.4 Communication Services

##### 4.3.4.1 General

The PROFIdrive Base Model Communication Services are provided by the following PROFIBUS DP mechanisms:

##### 4.3.4.2 Cyclic Data Exchange

The Cyclic Data Exchange service for PROFIBUS DP is realised by two different PROFIBUS DP communication mechanisms, depending on the communication relationship.

- For the master/slave (Controller/P-Device) relationship, the Cyclic Data Exchange is realised by use of simple transfer of user data via the Data\_Exchange telegram (DX).
- For the slave/slave (P-Device/P-Device) relationship, the Cyclic Data Exchange is realised by use of the cyclic data exchange between DP-slaves (DXB) mechanism. The so-called Publisher-Subscriber-Model is based on a publisher (passive station) which provides its actual values not only to the DP master but also to all other stations (subscribers), so that the other slaves may access and process this data. Therefore, by the configuration of the PROFIBUS DP system, the DXB relationships between the DP slaves are configured and contain the information on which subscriber accesses to which publisher data. The DXB communication is coupled to the cyclic user data exchange of DP. Figure 5 shows the mechanism of the DXB communication.

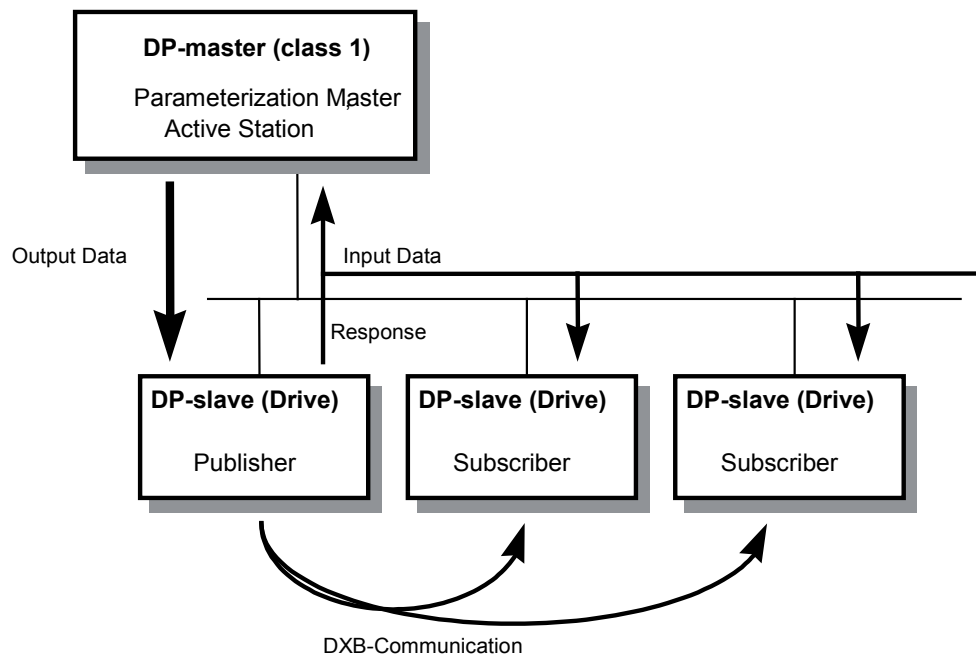


**Figure 5 – PROFIBUS DP DXB communication designations**

#### 4.3.4.3 Acyclic Data Exchange

The Acyclic Data Exchange service is realised by the MS1 AR or MS2 AR of PROFIBUS DP.

Acyclic communication uses the MS1 AR and MS2 AR mechanism READ and WRITE of data block.

This allows start-up tools to be connected as DP-master (class 2) on PROFIBUS DP and a series of functions, for example reading out the DO IO Data normalisation through the control.

#### 4.3.4.4 Alarm Mechanism

With PROFIdrive on PROFIBUS DP, the Alarm Mechanism is not used. Diagnosis and Fault management is done by use of PROFIdrive mechanism based on standard Parameter Access and the cyclic PROFIdrive control and status words.

#### 4.3.4.5 Clock Synchronous Operation

Clock Synchronous Operation at PROFIBUS DP is done by using the PROFIBUS DP-V2 Isochronous Mode. Clock cycle synchronous operation in the PROFIBUS DP Isochronous Mode is implemented by using an isochronous clock signal. This cyclic, isochronous clock signal is transmitted as Global Control telegram from the DP-master (class 1) to all PROFIBUS slaves. Thus, the slaves supporting isochronous operation may synchronise their applications (internal/Slave Clock) with the Master Clock (see IEC 61158 Type 3 elements).

Special error mechanisms in each station make sTable communication possible, even if there is a sporadic failure of the Master Clock.

For PROFIdrive, the PROFIBUS Isochronous Mode is the basis for drive synchronization. Not only message interchange on the bus system is implemented in an isochronous time frame, but also the internal control algorithms – such as closed loop speed and current controllers in the drive, or the controller in the higher level automation system – are synchronised (see Figure 6).