

INTERNATIONAL STANDARD



**Field device integration (FDI) –
Part 103-1: Profiles – PROFIBUS**

International Standards
(<https://standards.iteh.ai>)
Document Preview

IEC 62769-103-1:2020

<https://standards.iteh.ai/catalog/standards/iec/1ec69d6bc-10c8-4412-9434-347bc0537c62/iec-62769-103-1-2020>

Withhold



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC 62769-103-1:2020

<https://standards.iteh.ai/catalog/standards/iec/1ec62769-103-1-2020>

INTERNATIONAL STANDARD



Field device integration (FDI) –
Part 103-1: Profiles – PROFIBUS

<https://standards.iteh.ai/>
<https://standards.iteh.ai/catalog/standards/iec/1c62d6cc-10c8-4412-9434-347bc0537c62/iec-62769-103-1-2020>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.40; 35.100.05

ISBN 978-2-8322-8290-8

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	4
1 Scope.....	7
2 Normative references	7
3 Terms, definitions, abbreviated terms and acronyms conventions.....	8
3.1 Terms and definitions.....	8
3.2 Abbreviated terms and acronyms	8
3.3 Conventions.....	8
3.3.1 EDDL syntax.....	8
3.3.2 XML syntax.....	8
3.3.3 Capitalizations.....	8
4 Profile for PROFIBUS	9
4.1 General.....	9
4.2 Catalog profile	9
4.2.1 Protocol support file.....	9
4.2.2 CommunicationProfile definition.....	10
4.2.3 Profile device.....	10
4.2.4 Protocol version information	10
4.3 Associating a Package with a device.....	11
4.3.1 Device type identification mapping.....	11
4.3.2 Device type revision mapping.....	12
4.4 Information Model mapping.....	13
4.4.1 ProtocolType definition	13
4.4.2 DeviceType mapping	14
4.4.3 FunctionalGroup identification definition.....	14
4.5 Topology elements.....	15
4.5.1 ConnectionPoint definition	15
4.5.2 Communication Device definition	17
4.5.3 Communication service provider definition	17
4.5.4 Network definition	18
4.6 Methods.....	19
4.6.1 Methods for FDI Communication Servers.....	19
4.6.2 Methods for Gateways	21
Annex A (normative) Topology Scan result schema	27
A.1 General.....	27
A.2 Network	27
A.3 ProfibusNetworkT	27
A.4 ProfibusConnectionPointT.....	27
A.5 ProfibusIdentificationT	28
A.6 ProfibusAddressT	29
Annex B (normative) Transfer service parameters.....	30
B.1 General.....	30
B.2 sendData	30
B.3 xsreceiveData	30
B.4 xsTransferSendDataT	30
B.5 TransferResultDataT.....	31

B.6 OperationT.....31
Bibliography.....32

Figure 1 – Version mapping problem.....12

Table 1 – ProtocolSupportFile for FDI Device Packages9
Table 2 – ProtocolSupportFile for FDI Communication Packages9
Table 3 – PROFIBUS CommunicationProfile definition schema10
Table 4 – Catalog values for profile devices.....10
Table 5 – Version mapping examples.....11
Table 6 – Device identification information mapping.....12
Table 7 – Protocol type Profibus_DP13
Table 8 – Protocol type Profibus_PA.....14
Table 9 – DeviceType property mapping14
Table 10 – PROFIBUS Device Types identification attributes.....14
Table 11 – ConnectionPoint type for Profibus_DP15
Table 12 – ConnectionPoint type for Profibus_PA.....16
Table 13 – Method Connect arguments.....19
Table 14 – Method Disconnect arguments20
Table 15 – Method Transfer arguments.....20
Table 16 – Method SetAddress arguments.....21
Table 17 – Connect service arguments22
Table 18 – Method Transfer arguments.....24
Table 19 – Method SetAddress arguments.....25
Table A.1 – Elements of ProfibusNetworkT27
Table A.2 – Attributes of ProfibusConnectionPointT28
Table A.3 – Elements of ProfibusConnectionPointT28
Table A.4 – Attributes of ProfibusIdentificationT.....29
Table B.1 – Attributes of TransferSendDataT31
Table B.2 – Attributes of TransferResultDataT31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE INTEGRATION (FDI) –

Part 103-1: Profiles – PROFIBUS

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 62769-103-1 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) support for generic protocol extension for faster adoption of other technologies;
- b) support for Package Developers to build EDDs targeted for today's EDD bases system under a single development tool.

The text of this International Standard is based on the following documents:

CDV	Report on voting
65E/622/CDV	65E/685A/RVC 65E/685/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

A list of all parts in the IEC 62769 series, published under the general title *Field Device Integration (FDI)*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

INTRODUCTION

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

- ~~a) method for the supplying and installation of device specific functionalities, see Patent Family DE10357276;~~
- ~~b) method and device for accessing a functional module of automation system, see Patent Family EP2182418;~~
- ~~c) methods and apparatus to reduce memory requirements for process control system software applications, see Patent Family US2013232186;~~
- ~~d) extensible device object model, see Patent Family US12/893,680.~~

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

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

- ~~a) ABB Research Ltd
Claes Ryttoft
Affolterstrasse 4
Zurich, 8050
Switzerland~~
- ~~b) Phoenix Contact GmbH & Co KG
Intellectual Property, Licenses & Standards
Flachsmarktstrasse 8, 32825 Blomberg
Germany~~
- ~~c) Fisher Controls International LLC
John Dilger, Emerson Process Management LLLP
301 S. 1st Avenue, Marshalltown, Iowa 50158
USA~~
- ~~d) Rockwell Automation Technologies, Inc.
1 Allen Bradley Drive
Mayfield Heights, Ohio 44124
USA~~

~~Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.~~

~~ISO (www.iso.org/patents) and IEC (<http://patents.iec.ch>) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up-to-date information concerning patents.~~

FIELD DEVICE INTEGRATION (FDI) –

Part 103-1: Profiles – PROFIBUS

1 Scope

This part of IEC 62769 specifies an FDI profile of IEC 62769 for IEC 61784-1_CP 3/1 (PROFIBUS DP)¹ and IEC 61784-1_CP3/2 (PROFIBUS PA)¹.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 61804 (all parts), *Function blocks (FB) for process control and Electronic Device Description Language (EDDL)*

IEC 62541-100:2015, *OPC Unified Architecture - Part 100: Device Interface*

IEC 62769-2², *Field Device Integration (FDI) – Part 2: FDI Client*

~~NOTE 1 – IEC 62769-2 is technically identical to FDI-2022.~~

IEC 62769-4³, *Field Device Integration (FDI) – Part 4: FDI Packages*

~~NOTE 2 – IEC 62769-4 is technically identical to FDI-2024.~~

IEC 62769-5⁴, *Field Device Integration (FDI) – Part 5: FDI Information Model*

~~NOTE 3 – IEC 62769-5 is technically identical to FDI-2025.~~

IEC 62769-7⁵, *Field Device Integration (FDI) – Part 7: FDI Communication Devices*

~~NOTE 4 – IEC 62769-7 is technically identical to FDI-2027.~~

PI Order No.: 2.122:2008, *Specification for PROFIBUS – Device Description and Device Integration – Volume 1: GSD, V5.1, July 2008: GSD*; available at <www.profibus.com> [viewed 2018-11-23]

¹ PROFIBUS is the trade name of the non-profit consortium PROFIBUS & PROFINET International. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance does not require use of the trade name. Use of the trade name requires permission of the trade name holder.

² Under preparation. Stage at the time of publication: IEC/RFDIS 62769-2:2020.

³ Under preparation. Stage at the time of publication: IEC/RFDIS 62769-4:2020.

⁴ Under preparation. Stage at the time of publication: IEC/RFDIS 62769-5:2020.

⁵ Under preparation. Stage at the time of publication: IEC/RFDIS 62769-7:2020.

3 Terms, definitions, abbreviated terms and ~~acronyms~~ conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61784-1, IEC 61804 (all parts), IEC 62541-100, IEC 62769-4, IEC 62769-5, IEC 62769-7 and PI Order No.: 2.122:2008 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.2 Abbreviated terms and acronyms

For the purposes of this document, the following abbreviations apply:

EDD Electronic Device Description
EDDL Electronic Device Description Language (see IEC 61804)
GSD General station description (see PI Order No.: 2.122:2008)
I&M Identification and maintenance function
~~UIP — User Interface Plug-in~~
UUID Universally unique identifier (see ISO/IEC 11578)
XML Extensible markup language (see REC-xml-20081126)

3.3 Conventions

3.3.1 EDDL syntax

This document specifies content for the EDD component that is part of FDI Communication Packages. The specification content using EDDL syntax uses the font Courier New. The EDDL syntax is used for method signature, variable, data structure and component declarations.

3.3.2 XML syntax

XML syntax examples use font Courier New. The XML syntax is used to describe XML document schema.

Example: `<xs:simpleType name="ExampleType">`

3.3.3 Capitalizations

IEC 62769 (all parts) use capitalized terms to emphasize that these terms have a FDI specific meaning.

Some of these terms using an acronym as a prefix, for example:

- FDI Client, or
- FDI Server.

Some of these terms are compound terms such as:

- Communication Servers, or
- Profile Package.

Parameter names or attributes are concatenated to a single term, where the original terms start in this term with a capital letter such as:

- ProtocolSupportFile, or
- ProtocolType.

Parameter names or attributes can also be constructed by using an underscore character to concatenate two or more terms such as:

- PROFILE_ID, or
- Profibus_PA_Network.

4 Profile for PROFIBUS

4.1 General

This profile document to the FDI specification in IEC 62769 specifies the protocol specifics needed for FDI Packages describing Communication Servers, Gateways, and Devices.

For Communication Servers, this document defines also protocol specifics as these need to be considered in the Communication Servers hosted Information Model.

4.2 Catalog profile

4.2.1 Protocol support file

4.2.1.1 FDI Device Package

Protocol specific attachments are mentioned in the Package Catalog as defined in IEC 62769-5. A communication feature list (GSD) file according to PI Order No.: 2.122:2008 is a mandatory attachment for FDI Device Packages representing PROFIBUS DP and PROFIBUS PA devices. Table 1 specifies the parameters of the ProtocolSupportFile in the FDI Device Package.

Table 1 – ProtocolSupportFile for FDI Device Packages

Parameter	Description
Content Type	text/plain
Root Namespace	empty
Source Relationship	http://fdi-cooperation.com/2010/relationship/attachment-protocol
Filename	According to PI Order No.: 2.122:2008

4.2.1.2 FDI Communication Packages

A GSD file as specified in PI Order No.: 2.122:2008 is an optional attachment for FDI Communication Packages representing PROFIBUS DP and PROFIBUS PA devices. Table 2 specifies the parameters of ProtocolSupportFile for FDI Communication Packages.

Table 2 – ProtocolSupportFile for FDI Communication Packages

Parameter	Description
Content Type:	text/plain
Root Namespace:	empty
Source Relationship:	http://fdi-cooperation.com/2010/relationship/attachment-protocol
Filename:	According to PI Order No.: 2.122:2008

4.2.2 CommunicationProfile definition

IEC 62769-4 defines a CommunicationProfileT-~~enumeration type~~ string for the Catalog XML schema. Table 3 defines the PROFIBUS specific values for this-~~enumeration~~ string.

Table 3 – PROFIBUS CommunicationProfile definition schema

Profile Identifier	Protocol
"profibus_dp"	PROFIBUS DP/V0; PROFIBUS DP/V1; PROFIBUS DP/V2
"profibus_pa"	PROFIBUS PA

4.2.3 Profile device

A Profile Package shall provide the catalog values for profile devices, enabling the FDI Server to leverage a generic device description, if a specific one is not available. The definitions in Table 4 focus on catalog content that is vendor independent.

Table 4 – Catalog values for profile devices

Element	Attribute	Content
PackageType	—	Profile
CommunicationProfile Manufacturer	—	Empty
DeviceModel	—	<p>The allowed profile Identifier values (PROFILE_ID) are provided by PROFIBUS & PROFINET International (PI). PI provides and maintains an XML file (Profile_ID_Table) containing the assignment of PROFILE_ID to profiles.</p> <p>It is available at <http://www.profibus.com/IM/Profile_ID_Table.xml></p> <p>The file can be downloaded by any engineering or service tool whenever it is connected to the Internet.</p> <p>NOTE More information is provided in PI Order No.: 3.502 (I&M Profile) and related profile definitions are referred therein.</p> <p>The string format shall be hexadecimal starting with 0x, e.g. '0x3D00'.</p>

4.2.4 Protocol version information

IEC 62769-4 defines an element type named InterfaceT for the Catalog XML schema. The element type InterfaceT contains an element named Version which is supposed to provide version information about the applied communication protocol profile. The value has to follow the IEC 62769-4 defined version information schema defined in the element type VersionT. Table 5 describes how to apply the currently known protocol versions defined by the non-profit consortium PROFIBUS & PROFINET International. The general rule is to apply the value "0" for parts of the version information according to IEC 62769-4 that are not used in currently known protocol versions.

Table 5 – Version mapping examples⁶

Protocol / Version	InterfaceT Version value
PROFIBUS DP/V0	0.0.0 ^a
PROFIBUS DP/V1	1.0.0 ^a
PROFIBUS DP/V2	2.0.0 ^a
PROFIBUS PA 3.02	3.2.0 ^b
<p>^a The protocols PROFIBUS DP/V0, PROFIBUS DP/V1 and PROFIBUS DP/V2 contain a single number. This number is considered to be the major version. The minor and built numbers are set to "0".</p> <p>^b The currently known PROFIBUS PA profile number is considered to provide major and minor version information. Leading zeros are not considered in version value evaluation since only the actual decimal values are relevant.</p>	

4.3 Associating a Package with a device

4.3.1 Device type identification mapping

The purpose of device type identification mapping is to enable FDI host systems to compare the scan result against the topology representation in the Information Model. FDI host systems shall also be enabled to determine the FDI Device Package that fits for a device entry contained in the scan result. This will enable the user of an FDI host system to synchronize the Information Model with the actual installation.

The Communication Server implemented scan service (defined in 4.6.1.7) provides the scan result through an XML document (the schema is defined in Clause A.5).

The Gateway implemented scan service (defined in 4.6.2.7) provides the scan result by means of the Information Model that contains data structures created from EDD content as specified in 4.6.2.7.

Common for both ways of presenting the scan result is that scan results contain device type identification and device instance identification.

FDI host systems comparing the actual network topology configuration against the topology representation in the Information Model shall be enabled to handle the following situations:

- The physical Device instance identified at a specific device address is not logically present in the Information Model (as Instance): Enable the FDI Host system to find the appropriate FDI Device package according to the device catalog information.
- The physical Device instance identified by the device address is logically present in the Information Model (as Instance): Enable the FDI Host system to compare device type information presented in scan result (see the identification in Clause A.5) and the device type specific information of the Instance present in the Information Model.

The FDI Device package contains device type identification information that can be compared to scan result based on the Catalog Schema in IEC 62769-4 defining the XML (simple) element types "DeviceModel" and "Manufacturer". Both types are used in the (complex) element types "Protocol" and "RegDeviceType".

As a result of the FDI Package deployment the FDI Package information is then present in the Information Model as the specified FunctionalGroup Identification containing Ident_Number and Manufacturer_ID (see 4.4.3). The Ident_Number matches with the GSD specified Ident_Number. Manufacturer_ID is specified through the I&M profile defined VendorID and DeviceID (see 4.4.3).

⁶ The given table can be considered to be an example only since this document cannot foresee how future protocol versions will be defined.

The mapping between different device identification data sources is described in Table 6. Since scan results provided by the Communication Server or Gateway can convey data that is produced by the device (firmware) the device type identification mapping shall be supported by providing corresponding data in the FDI Device Package contained Catalog and Information Model.

Table 6 – Device identification information mapping

FDI Device Package	Information Model	Communication Server provided scan result	Gateway provided scan result
Catalog specified type Manufacturer	FunctionalGroup: Identification Browse Name: Manufacturer_ID	Element (path): ConnectionPoint/Identification Attribute: Manufacturer_ID	COLLECTION ConnectionPoint. Identification. Manufacturer_ID
Catalog specified type DeviceModel	FunctionalGroup: Identification Browse Name: Ident_Number	Element (path): ConnectionPoint/Identification Attribute: Ident_Number	COLLECTION ConnectionPoint. Identification. Ident_Number

4.3.2 Device type revision mapping

IEC 62769-4 envisions a concept that allows to determine the compatibility between an FDI Device Package and a Device. IEC 62769-4 specifies a life cycle management process bearing on a single version information provided for the entire device.

NOTE PROFIBUS related specifications, for example PI Order No.: 2.122:2008 (GSD) and PI Order No.: 3.502:2009 (I&M) splits the device type revision into software and hardware related information. The GSD specifies the attributes Hardware_Release and Software_Release. The I&M specifies HARDWARE_REVISION and SOFTWARE_REVISION. Hardware_Release and HARDWARE_REVISION ~~must~~ will always match. Software_Release and SOFTWARE_REVISION ~~must~~ will always match.

The goal of 4.3.2 is to describe the translation rules between PROFIBUS related specifications, describing their way of providing the version information, and the IEC 62769-4 specified way of containing the version information that can be compared against the version read from the device. The purpose is to determine the compatibility between an FDI Device Package and a Device. Figure 1 depicts the problem.

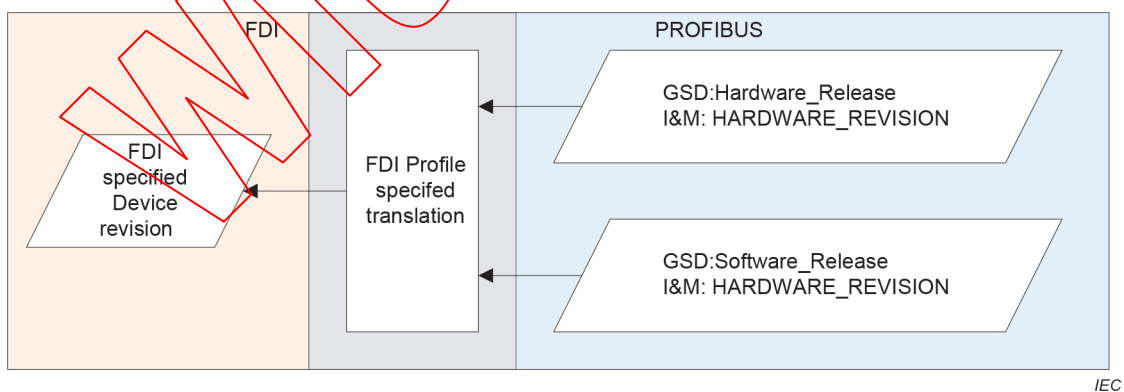


Figure 1 – Version mapping problem

The firmware of a device implements the data exchange interface which shall be described by means of the FDI Device Package content (EDD). A device firmware that implements the PROFIBUS PA profile enables the reading of the values SOFTWARE_REVISION and HARDWARE_REVISION. The access to these values shall be described in the EDD contained in the FDI Device Package.