

# SIEMENS

## SIMATIC

### DP/PA Link and Y Link Bus Couplings

#### Manual

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This manual has the order number:  
**6ES7157-0AA00-8BA0**

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## Safety Guidelines

This manual contains notices intended to ensure personal safety, as well as to protect the products and connected equipment against damage. These notices are highlighted by the symbols shown below and graded according to severity by the following texts:



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### Danger

indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

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### Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

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### Caution

indicates that minor personal injury can result if proper precautions are not taken.

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### Caution

indicates that property damage can result if proper precautions are not taken.

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### Notice

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

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## Qualified Personnel

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## Correct Usage

Note the following:



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This device and its components may only be used for the applications described in the catalog or the technical description, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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# Preface

## Purpose of the manual

This manual contains everything you need to know to configure, install, wire and commission the DP/PA link and Y link couplers.

## Required basic knowledge

The following basic knowledge is necessary to understand this manual:

- General knowledge in the field of automation technology
- Familiarity with the use of computers or PC-related equipment (e. g. programming devices) under the Windows 2000 or NT operating system
- Skills in the use of STEP 7. These are imparted in the manual entitled "Programming with STEP 7 V5.2".

## Scope of this manual

This manual applies for the following products:

- IM 157: 6ES7 157-0AA82-0XA0 (as of firmware version V4.0.0)
- DP/PA coupler Ex [i]: 6ES7 157-0AD81-0XA0
- DP/PA coupler: 6ES7 157-0AC80-0XA0
- Y coupler: 6ES7 197-1LB00-0XA0
- BM PS/IM bus module: 6ES7 195-7HA00-0XA0
- BM IM/IM: 6ES7 195-7HD80-0XA0 bus module
- BM DP/PA coupler bus module: 6ES7 195-7HF80-0XA0
- BM Y coupler bus module: 6ES7 654-7HY00-0XA0
- Complete package consisting of the above-mentioned components:  
6ES7 197-1LA01-0XA0

It describes the components valid at the time of the manual's publication. We reserve the right to enclose a product information document containing current information with new components and new releases of components.

## Changes since the previous version

The following changes have been made since the previous version of this manual, *DP/PA Bus Coupler Manual* (order number 6ES7 157-0AA00-8xA0, release 4):

- Integration of the description of the Y link coupler
- New components:
  - IM 157: 6ES7 157-0AA82-0XA0
  - DP/PA coupler Ex [i]: 6ES7 157-0AD81-0XA0
  - Y coupler: 6ES7 197-1LB00-0XA0

The IM 157 features the following new functions as of the firmware version cited above:

- DPV1 support with full diagnostics
- Interrupt processing is now possible for non-redundant operation as well
- System changes can be made during operation (also for non-redundant operation)
- Identification data are provided for the positive identification of the device in the system
- Firmware update via PROFIBUS-DP (not for redundant operation)
- The description of the parameter assignment and configuration frames is no longer part of this manual. It can now be found on the Internet:

<http://www.ad.siemens.de/simatic-cs>

## Configuration with STEP 7

The DP/PA link and Y link couplers can be configured with STEP 7 as of V5.2.

## Approvals

The DP/PA link and Y link couplers comply with the following approvals:

- Underwriters Laboratories, Inc.: UL 508  
(Industrial Control Equipment)
- Canadian Standards Association: CSA C22.2 Number 142,  
(Process Control Equipment)
- Factory Mutual Research: Approval Standard Class Number 3611

## C tick mark

The DP/PA link and Y link couplers meet the requirements of the AS/NZS 2064 standard (Australia and New Zealand).

## Standards

The DP/PA link and Y link couplers meet the requirements and criteria of the IEC 61784-1:2002 Ed1 CPF 3 PROFIBUS and PROFINet.

Additional information on the standards this equipment complies with and the issued approvals is found in Appendix B.

## Position in the information landscape

In addition to this manual, you will also require the following manuals, depending on the hardware you are using:

- The manual of the DP master being used, especially the following information:
  - Configuration and commissioning of a DP master system
  - Description of the DP master
- The manual entitled *SIMATIC NET, PROFIBUS Networks* (order no. 6GK1 970-5CA10-0xA0)
- The installation manual entitled *Automation System S7-300, Installation* (order no. 6ES7 398-8AA03-8xA0)
- The manual entitled *Automation Systems S7-300, M7-300, ET 200M Ex I/O Modules* (order no. 6ES7 398-8RA00-8xA0), especially the information on the subject of intrinsic safety and explosion protection.

## Manual guide

This manual is subdivided into the following topics:

- Product overview and description of components
- Installation, wiring and commissioning
- Operation and diagnostics
- Appendices
- Important terminology is explained in the glossary.
- The index will help you rapidly find the text passages associated with specific keywords.

## Recycling and disposal

The described components can be recycled on account of their low-emission materials. To recycle or dispose of your used equipment in an environmentally-compatible manner, turn to a disposal company certified for electronics scrap.

### **Additional support**

If you have any questions on the use of the product described in this manual that are not answered here, please contact your Siemens partner at your local representative or branch office.

<http://www.ad.siemens.de/partner>

If you require a device master file, it is available to you the Internet:

[http://www.ad.siemens.de/csi\\_e/gsd](http://www.ad.siemens.de/csi_e/gsd)

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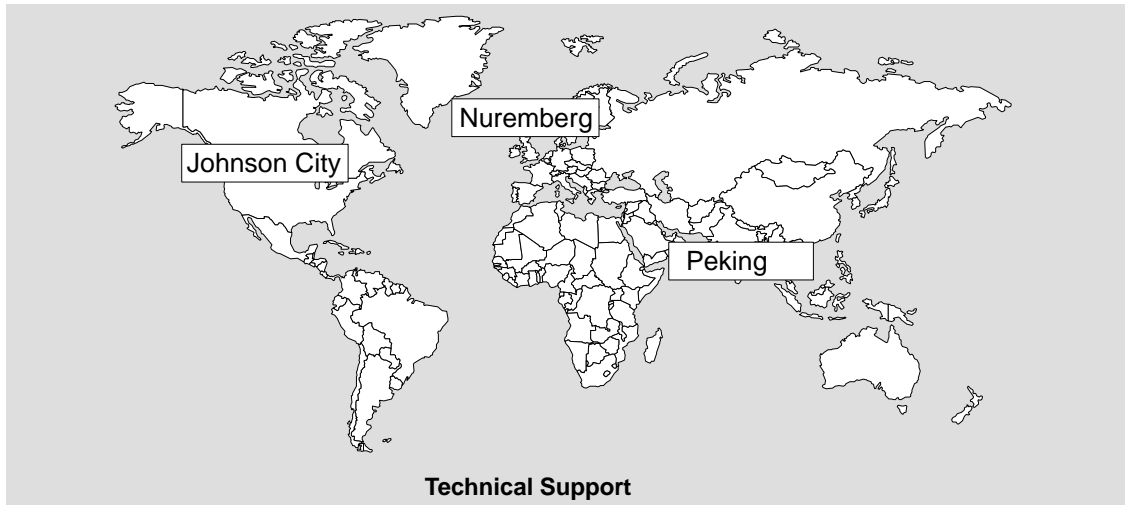
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<p>The languages spoken at Technical Support and Authorization are generally German and English.</p>		

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Here you will find the following:

- The newsletter that keeps you up-to-date with the latest information regarding your products.
- The documents you require, which can be found using the Search function in Service & Support.
- A forum for the exchange of information between users and specialists worldwide.
- Your local representative for Automation & Drives, available on our representatives database.
- Information on local service, repairs, spare parts. Still more information is available to you under "Services".



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# Product Overview

# 1

## Overview of contents

This section describes which components are included under bus couplings and how the bus couplings are integrated in the Siemens automation landscape.

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1.2	Integration in the automation landscape	1-2

## 1.1 Bus couplings

### DP/PA coupler

The DP/PA coupler is the physical link between the PROFIBUS-DP and PROFIBUS-PA. In stand-alone operation, it provides a simple means of communicating with PA field devices via PROFIBUS-DP. This does not require any additional components.

The DP/PA coupler is also employed in the DP/PA link for more demanding coupling tasks (see below).

In addition to the “normal” version, the DP/PA coupler is also available in an Ex [i] version for connecting PA field devices in potentially explosive environments.

### DP/PA link

The DP/PA link consists of one or two IM 157 interface modules and one to five DP/PA couplers that are interconnected either via passive bus connectors or via bus modules, as required.

The DP/PA link provides a gateway from a PROFIBUS-DP master system to PROFIBUS-PA. By means of the IM 157, the bus systems are decoupled both physically (electrically) and with respect to the protocol and time.

By employing two IM 157 interface modules, the underlying PROFIBUS-PA master system as a whole can be connected as a switched I/O system to a redundant DP master system of an S7-400H. For this purpose, the structure is always be configured with bus modules.

## Y link

The Y link consists of two IM 157 interface modules and a Y coupler that are interconnected via bus modules.

The Y link provides a gateway from the redundant DP master system of an S7-400H to a non-redundant DP master system. This permits devices with only one PROFIBUS-DP interface to be connected to an S7-400H as a switched I/O system.

## 1.2 Integration in the automation landscape

### 1.2.1 What is a distributed I/O system?

#### Distributed I/O devices – area of application

When a system is set up, the inputs and outputs to and from the process are often located centrally in the automation system.

If the inputs and outputs are located at a considerable distance from the automation system, this may lead to long and complex cable runs and electromagnetic interference may impair system reliability.

A distributed I/O is the ideal solution for such systems:

- The PROFIBUS-DP master is located centrally.
- The I/O devices (inputs and outputs) operate locally on a distributed basis.
- The high-performance PROFIBUS-DP bus system with its high transmission rates ensures that the controller CPU and I/O devices communicate smoothly.

#### What is PROFIBUS-DP?

PROFIBUS-DP is an open bus system according to IEC 61784-1:2002 Ed1 CP 3/1 with the “DP” transmission protocol (DP being the German abbreviation for distributed I/O).

Physically, PROFIBUS-DP is either an electrical network based on a shielded two-wire line or an optical network based on a fiber optic cable.

The “DP” transmission protocol allows very rapid, cyclic exchange of data between the controller CPU and the distributed I/O devices.



## What is PROFIBUS-PA?

PROFIBUS-PA is the communication-compatible enhancement of PROFIBUS-DP with transmission technology suitable for applications in potentially explosive areas. The transmission system of PROFIBUS-PA meets the international standard IEC 61784-1:2002 Ed1 CP 3/2.

With the PROFIBUS-PA bus system, the measuring transducer and actuators in the potentially explosive area can communicate over long distances with the programmable logic controller. With PROFIBUS-PA, the field devices can be fed simultaneously via the data line.

The following components are available for the transmission transition from PROFIBUS-DP (IEC 61784-1:2002 Ed1 CP 3/1) to PROFIBUS-PA (IEC 61784-1:2002 Ed1 CP 3/2):

- DP/PA coupler for stand-alone operation
- DP/PA link

## 1.2.2 DP/PA coupler

The DP/PA coupler is a gateway between PROFIBUS-DP and PROFIBUS-PA to which the PA field devices are connected. The figure below shows how the DP/PA coupler is integrated in the system.

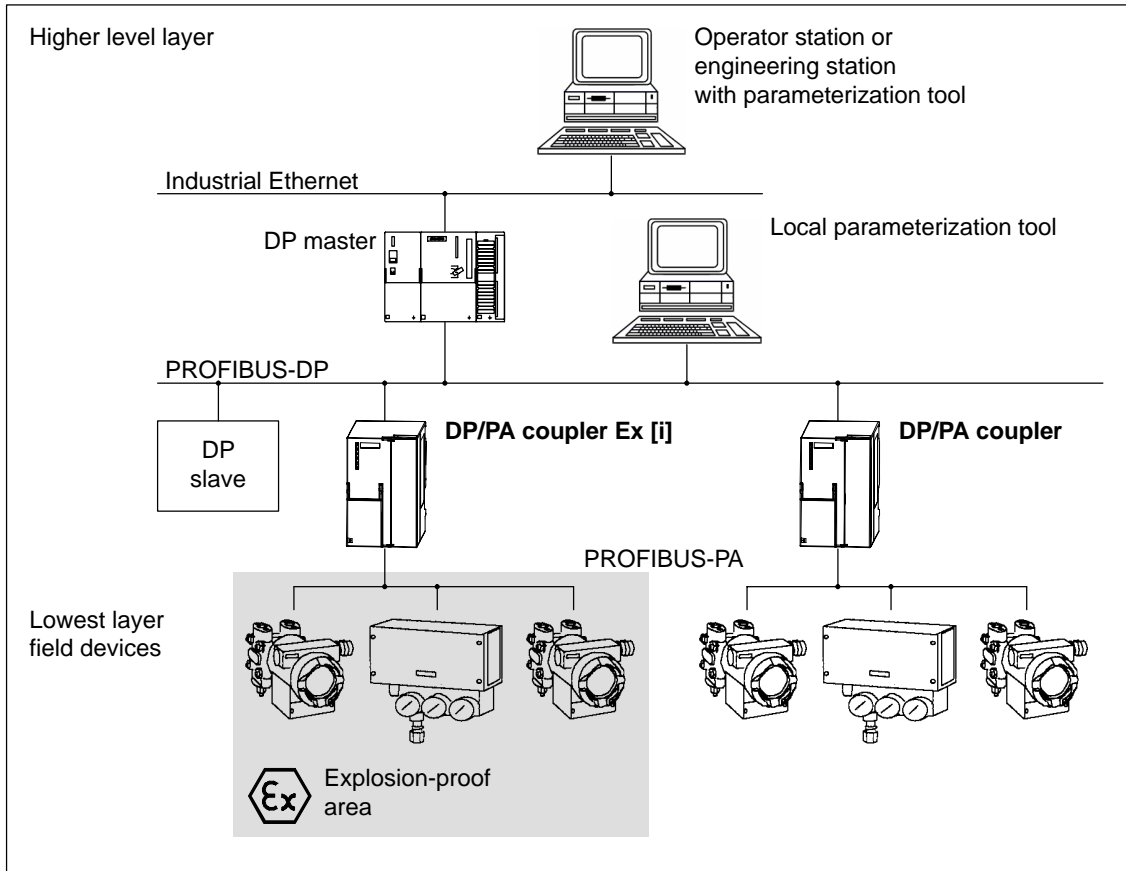


Figure 1-1 Integration of the DP/PA coupler in the system landscape

### 1.2.3 DP/PA link

To higher level systems, the DP/PA link is a DP slave (to the automation device) and to underlying systems it is a PA master. The figure below shows how the DP/PA link is integrated in the system.

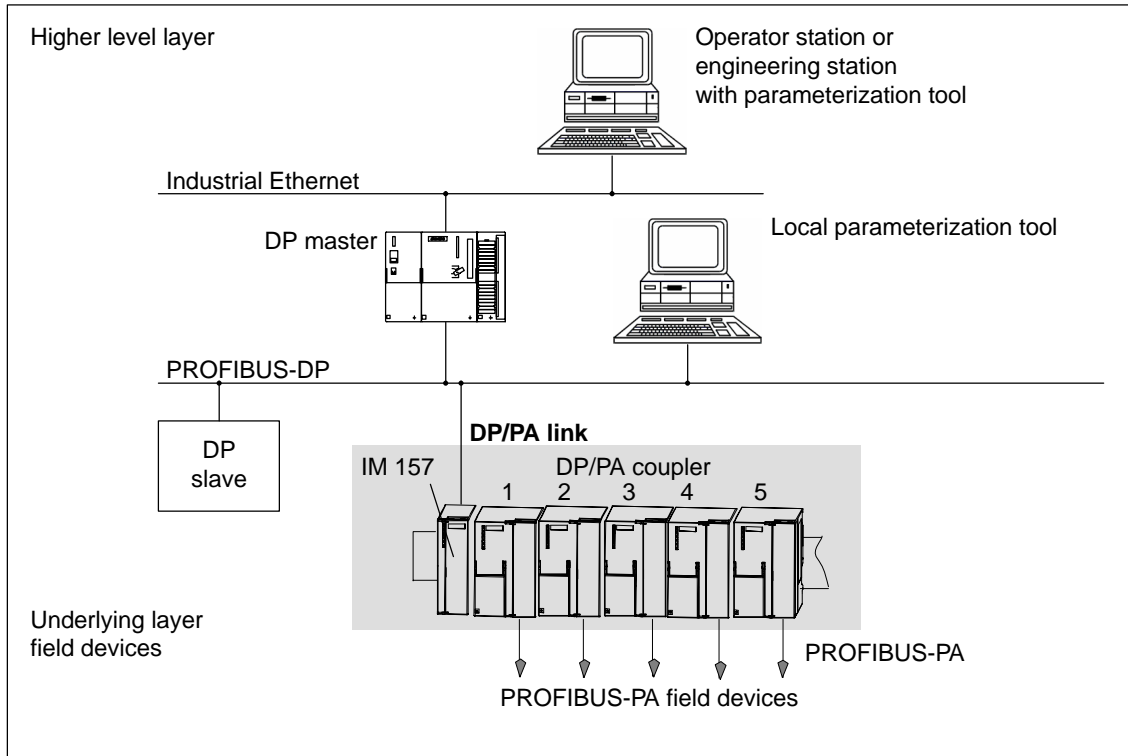


Figure 1-2 Integration of the DP/PA link in the system landscape

## 1.2.4 Y link

To higher level systems, the Y link is a switched DP slave (to the automation device) and to underlying systems it is a DP master. The figure below shows how the Y link is integrated in the system.

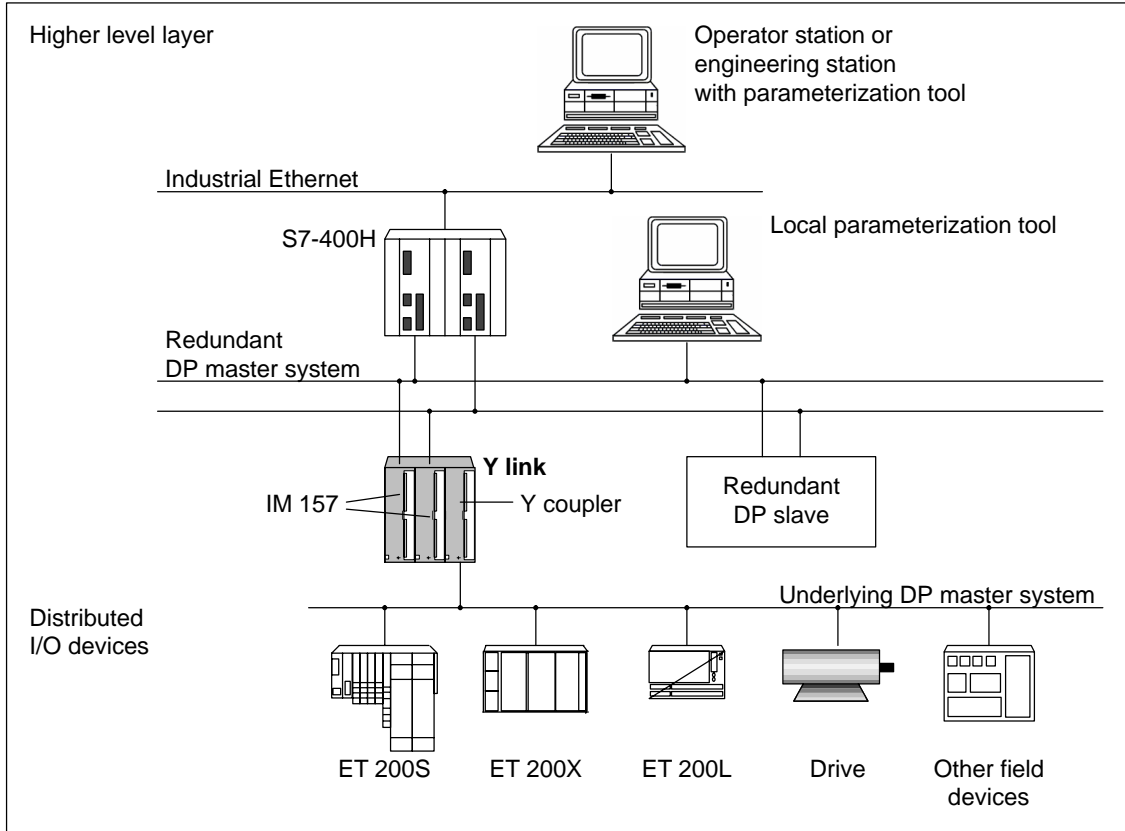


Figure 1-3 Integration of the Y link in the system landscape

# Description of Components

# 2

## Overview of contents

This section briefly describes the individual modules and the DP/PA link and Y link bus couplings that are assembled from the modules. In addition, a comparison is drawn to the precursor modules.

Section	Topic	Page
2.1	DP/PA coupler	2-2
2.2	Y coupler	2-3
2.3	IM 157	2-4
2.4	DP/PA link	2-5
2.5	Y link	2-8
2.6	Modifications with respect to precursor modules	2-10
2.7	Compatibility to precursor modules	2-10

## 2.1 DP/PA coupler

The DP/PA coupler is intended for the following applications:

- Stand-alone operation without additional components
- Operation in the DP/PA link on a simple DP master system or on an S7-400H

### Features

The DP/PA coupler has the following features:

- Isolation between PROFIBUS-DP and PROFIBUS-PA
- Implementation of the physical transmission system between RS 485 and the synchronous physical bus level according to IEC 61784-1:2002 Ed1 CP 3/2
- Diagnosis by means of LEDs
- Transmission rate to PROFIBUS-DP of 45.45 kBaud
- Transmission rate to PROFIBUS-PA of 31.25 kBaud
- Integrated supply unit for PROFIBUS-PA
- Integrated bus termination for PROFIBUS-PA
- Extended range of environmental conditions

### Special features of the DP/PA coupler Ex [i]

Version Ex [i] (6ES7 157-0AD81-0XA0) of the DP/PA coupler has the following additional features:

- Suitable equipment for potentially explosive areas, zone 0, 1 and 2
- Intrinsic safety for the underlying PROFIBUS-PA
- Integrated intrinsically safe supply unit for PROFIBUS-PA interface and integrated barrier

### Configuration

The DP/PA coupler can be used as a stand-alone device in all DP masters that support 45.45 kBaud.

The DP/PA coupler does not have to be configured. You only have to set the transmission rate of 45.45 kBaud for the corresponding DP master system and configure and parameterize the PA field devices.

---

#### Note

If you use the IM 157 together with the DP/PA couplers as the DP/PA link, the PROFIBUS-DP connections on the DP/PA couplers are not required. The IM 157 and the DP/PA couplers are connected via the S7 backplane bus.

---

## 2.2 Y coupler

The Y coupler is only intended for operation in the Y link for use on an S7-400H.

The Y coupler cannot be operated without an IM 157.

### Features

- Connection of DP standard slaves
- Transmission rate of 45.45 kBaud to 12 MBaud
- Isolation between IM 157 and the underlying PROFIBUS-DP
- The power supply of the Y coupler is provided via the backplane bus.

### Configuration

The Y coupler is a component of the Y link and is not configured separately.

## 2.3 IM 157

As an interface module, the IM 157 is intended for the following applications:

- Operation in the DP/PA link on a non-redundant DP master system or on an S7-400H
- Operation in the Y link on an S7-400H

### Features

- All transmission rates from 9.6 kBaud to 12 MBaud for the higher-level DP master system
- Diagnosis by means of LEDs and the user program
- Bumpless switchover of active channel when in redundancy mode on the S7-400H
- Support of system changes during operation both in the S7 standard mode and in the redundancy mode.
- Can be operated as a DPV0 or DPV1 slave depending on the higher level DP master.



## 2.4 DP/PA link

The DP/PA link is intended for the following applications:

- S7 standard mode on the S7-300 or S7-400
- Redundancy mode on the S7-400H
- DP standard master mode

Some of the following details apply to both the S7 standard mode and to the DP normal master mode. In these cases, the term “non-redundant operation” is used.

### Operating principle

- On the higher level DP master system, the DP/PA link is a DP slave and acts as a proxy for the nodes connected to the underlying bus system (PA field devices).
- The DP/PA link forms an independent underlying bus system that is decoupled from the higher level DP master system with respect to communication.
- The use of several DP/PA couplers increases the current carrying capacity of the PA master system.
- Together with the connected PA field devices, the DP/PA couplers of a DP/PA link form **a single** common bus system.

### Configuration options

DP/PA links can be used to extend a DP master system as follows:

- The number of DP/PA links on a DP master system is only limited by the maximum number of bus nodes of 126.
- Up to five DP/PA couplers can be operated in each DP/PA link. Y couplers cannot be operated in the DP/PA link.
- The number of nodes in each PA master system is limited to 64. The sum of slots (see Section 10.2.2) is limited to (236 – number of PA slaves) in each case.
- The configuration frame and the user data frame of the DP/PA link are both derived from the frame contents of the underlying PA field devices.
- The maximum length of the frames for configuration data, parameter assignment data, diagnostics data and I/O data is 244 bytes in each case.

### Configuration

The DP/PA link can be configured with STEP 7 as of V5.2.

### Parameter assignment for the PA field devices

With the aid of a suitable tool such as SIMATIC PDM, the parameters for the PA field devices can be assigned on a programming device/PC that is connected to the higher level PROFIBUS-DP. For more information, please refer to the documentation of your parameterization tool.

### User data of the DP/PA link

The DP user data frame of the DP/PA link is dependent on the number of configured PA field devices. It consists of the data blocks of the configured PA field devices arranged one next to the other. The data blocks are sorted in ascending order by PA address.

According to the *PROFIBUS-PA Profile for Process Control Devices, General Requirements*, each process variable is accompanied by a status byte that contains information on the status of the process variable.

In the event of the failure of a PA field device, the associated input data and status byte in the user data frame of the DP/PA link are reset first. The corresponding information is then entered in the diagnostic frame.

When the PA field device is restored, the corresponding information is entered into the diagnostic frame. At almost the same time, the valid input data of the PA field device in the user data frame of the DP/PA link become available again. The status byte indicates that the data is valid.

---

#### Note

To obtain the status of the PA field devices as quickly as possible, it is advisable to regularly evaluate the status byte in the user program.

---

### Switchover time on PROFIBUS-PA in redundancy mode

In the case of a master-standby switchover or failure of the active IM 157, the PA field devices are processed via the standby IM 157.

The switchover is bumpless, i.e. the statuses of the inputs/outputs are retained during the switchover.

The switchover time is defined as the time between activation of the standby IM and the availability of new input data.

Condition/prerequisite	Switchover time
Switchover time given an unchanged PA configuration	Typ.: 70 ms + number of PA field devices x 51 ms
	Max.: 820 ms + number of PA field devices x 50 ms
Switchover time after configuration changes during operation	Typ.: 80 ms + number of PA field devices* x 67 ms
	Max.: 800 ms + number of PA field devices* x 130 ms

\* With unchanged PA field device addresses

### Communication links from the programming device/PC to the PA field devices

Up to 10 communication links to PA field devices can be set up simultaneously from a programming device/PC via the DP/PA link.

In the redundancy mode, all communication links from the programming device/PC to the PA field devices remain intact when the active channel is switched over from one IM 157 to another.

## 2.5 Y link

The Y link is only intended for use in the redundancy mode on S7-400H.

### Operating principle

- On the higher level DP master system, the Y link is a DP slave and acts as a proxy for the nodes connected to the underlying bus system (DP slaves).
- The Y link forms an independent underlying bus system that is decoupled from the higher level DP master system with respect to communication.

### Configuration options and limitations

Y links can be used to extend a redundant DP master system as follows:

- The number of Y links on a S7-400H is only limited by the maximum number of bus nodes of 126.
- Only **one** Y coupler can be operated per Y link. DP/PA couplers cannot be operated in the Y link.
- The number of nodes in each underlying DP master system is limited to 64. The sum of slots (see Section 10.2.2) is limited to (236 – number of PA slaves) in each case.
- The configuration frame and the user data frame of the Y link are both derived from the frame contents of the underlying slaves.
- The maximum length of the frames for configuration data, parameterization data, diagnostics data and I/O data is 244 bytes in each case.
- It is **not** permissible to cascade Y links.
- A direct exchange of data and synchronicity is not possible in the underlying DP master system.

### Configuration

The Y link can be configured with STEP 7 as of V5.2.

For the calculation of bus parameters by STEP 7, the nodes connected to the underlying DP master system and the Y link itself are included in the calculation.

Slaves on the underlying DP master system are only operated in the DPV1 mode if they are suitable for a bumpless switchover when a system change takes place during operation.

STEP 7 can identify a slave's suitability by an entry in its device master file:

```
PrmCmd_supp=1
```

If this entry is not present, the slave is operated in DPV0 mode.

### **Parameter assignment for the DP slave**

The parameters for the DP slave in the underlying DP master system are assigned on the S7-400H via the Y link.

### **User data of the Y link**

The DP user data frame of the Y link is dependent on the number of configured PA slaves. It consists of the data blocks of the configured DP slaves arranged one next to the other. The data blocks are sorted in ascending order by DP address.

In the event of the failure of a DP slave, the associated input data in the user data frame of the DP/PA link are reset first. The corresponding information is then entered in the diagnostic frame.

When the DP slave is restored, the corresponding information is entered into the diagnostic frame. At almost the same time, the valid input data of the DP slave in the user data frame of the Y link become available again.

### **Diagnostics data of the DP slaves**

The processing of the diagnostic frames by DP slaves depends on whether the IM 157 is operated as a DPV0 slave or as a DPV1 slave. For details, see Chapter 10.

In STEP 7, the diagnostic frames of the underlying DP slaves can be displayed in the online view of the HW Config.

### **Communication links from the programming device/PC to the DP slaves**

Up to 10 communication links to DP slaves can be set up simultaneously from a programming device/PC via the Y link.

Communication links can only be passed from the S7-400H to the underlying DP master system.

All communication links from the programming device/PC to the DP slaves remain intact when the active channel is switched over from one IM 157 to another.

## 2.6 Modifications with respect to precursor modules

### IM 157

- DPV1 support with full diagnostics
- Interrupt processing is now possible for non-redundant operation as well
- System changes are possible during operation (also for non-redundant operation)
- Identification data are provided for the positive identification of the device in the system
- Firmware update via PROFIBUS-DP (not for redundant operation)

### DP/PA coupler Ex [i]

- Approved for potentially explosive areas in accordance with FM 3610 for Cl.I, Div.1
- Approved for installation in the potentially explosive area Zone 2

### Y coupler

- Integrated RS 485 repeater

## 2.7 Compatibility to precursor modules

### Compatibility of the IM 157

The IM 157 with order number -0AA82- can be used as a spare part for all precursor modules. In this case, the configuration can also be performed with an older version of STEP 7. The information provided in the documentation of the failed IM 157 apply.

### Compatibility of the Y coupler

Y coupler 6ES7 197-1LB00-0XA0 **cannot** be used as a spare part for Y coupler 6ES7 654-0YK00-0AB0.

### Compatibility of the bus modules

Bus module BM IM/IM 6ES7 195-**7HD80**-0XA0 can only be used in conjunction with 6ES7 157-0AA82-0XA0 and **cannot** be used as a spare part for 6ES7 195-**7HE80**-0XA0.

# Installation

## Overview of contents

Section	Topic	Page
3.1	Installation principles	3-1
3.2	Installing the DP/PA coupler for stand-alone operation	3-3
3.3	Installing the DP/PA link for non-redundant operation	3-4
3.4	Installing the DP/PA link for redundant operation	3-6
3.5	Installing the Y link	3-9

## 3.1 Installation principles

### Installation orientation

The IM 157, DP/PA coupler and Y coupler modules can be installed either vertically or horizontally.

### Open equipment

The IM 157, DP/PA coupler and Y coupler modules are open equipment. This means they may only be installed in housings, cabinets or electrical operating areas and must only be accessible by key or special tool. Only trained or authorized personnel should have access to the housings, cabinets or electrical operating areas.

### Mounting system

The IM 157, DP/PA coupler and Y coupler modules are installed on rails for the S7 mounting system. A clearance of at least 40 mm both above and below the module must be maintained for unhindered installation.

For more information on installing S7 modules, refer to the *S7-300 Programmable Controller, Installation* manual.

## Installation location

The DP/PA coupler Ex [i] or the DP/PA link with DP/PA couplers Ex [i] can be operated in potentially explosive areas classified as Zone 2 if they are installed in a suitable housing. The bus cable for PROFIBUS-PA may be extended out of the potentially explosive area into Zone 0.

## Housing for Zone 2

The DP/PA coupler Ex [i] or the DP/PA link with DP/PA couplers Ex [i] must be mounted in a housing with the IP 54 degree of protection. The housing must be accompanied by a manufacturer's declaration for Zone 2 (in accordance with EN 50021).

Use the following cable fittings:

- Power supply and PROFIBUS-DP Ex i: Cable fitting with manufacturer's declaration for Zone 2
- PROFIBUS-PA Ex i: Type of protection EEx i



### **Danger**

Under certain circumstances, ignitable sparks or inadmissible surface temperatures may occur.

**Never install the equipment under explosive conditions!**

---



## 3.2 Installing the DP/PA coupler for stand-alone operation

### Required components

- Rail for the S7 mounting system
- DP/PA coupler

You can find the order numbers for these components in Appendix D.

### Installing the DP/PA coupler

---

#### Note

If you operate several DP/PA couplers in a rack in stand-alone mode, it is not permissible to connect the DP/PA couplers via bus connectors or bus modules.

---

Step	Activity
1	Hook the DP/PA coupler onto the S7 rail and swing it downward.
2	Screw the DP/PA coupler on securely.
3	Wire the DP/PA coupler as described in Section 4.2.1.

### Removing the DP/PA coupler

To remove the DP/PA coupler, proceed as above but in reverse order.

If the DP/PA coupler is already in operation, switch off the 24V DC power supply for the DP/PA coupler prior to removal.

### 3.3 Installing the DP/PA link for non-redundant operation

#### Required components

- Rail for the S7 mounting system
- IM 157
- 1 to 5 DP/PA couplers
- One bus connector per DP/PA coupler (included)
- Options for module exchange during operation:
  - BM PS/IM or BM IM/IM bus module
  - BM DP/PA coupler bus modules

You can find the order numbers for these components in Appendix D.

#### Typical configuration of the DP/PA link

The figure below shows the typical configuration of the DP/PA link with two DP/PA couplers. The front doors are open.

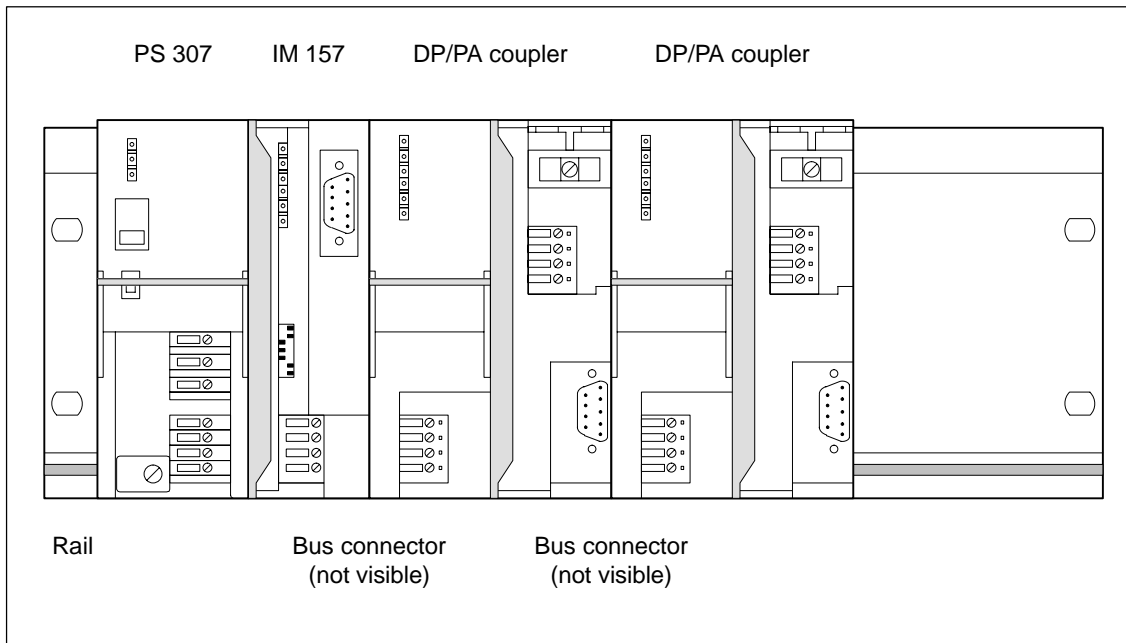


Figure 3-1 Typical configuration of the DP/PA link for non-redundant operation

## Installing the DP/PA link

Step	Activity
1	Insert the bus connector included with the DP/PA coupler onto the IM 157.
2	Hook the IM 157 onto the S7 rail and swing it downward.
3	Tighten the bolts of the IM 157 to secure it.
4	If applicable, insert the bus connector of the next DP/PA coupler on the right side of the DP/PA coupler.
5	Hook the DP/PA coupler onto the S7 rail to the right of the IM 157 and swing it downward.
6	Screw the DP/PA coupler on securely.
7	Repeat steps 4 to 6 for the subsequent DP/PA couplers. For the last DP/PA coupler (of a maximum of 5), do not insert a bus connector prior to installation.
8	Wire the IM 157 and the DP/PA coupler(s) as described in Section 4.2.2.

## Inserting/Removing DP/PA Couplers

If you would like to remove/insert DP/PA couplers during operation, bus modules must be used in the configuration rather than bus connectors (see Section 3.4).

## Removing the DP/PA link

To remove the DP/PA link, proceed as above but in reverse order. Begin with the DP/PA coupler mounted at the far right.

If the DP/PA link is already in operation, switch off the 24V DC power supply prior to removal.

### 3.4 Installing the DP/PA link for redundant operation

#### Configuration with bus modules

For redundant operation, the DP/PA link must be configured with bus modules.

#### Required components

- Rail for configuration with active bus modules ("Rail for module change during operation")
- 2 x IM 157
- BM IM/IM bus module
- 1 to 5 x DP/PA coupler
- One BM DP/PA coupler bus module for each DP/PA coupler

You can find the order numbers for these components in Appendix D.

#### Typical configuration

The figure below shows the typical configuration of a DP/PA link for redundant operation with two power supply modules. The front doors are open.

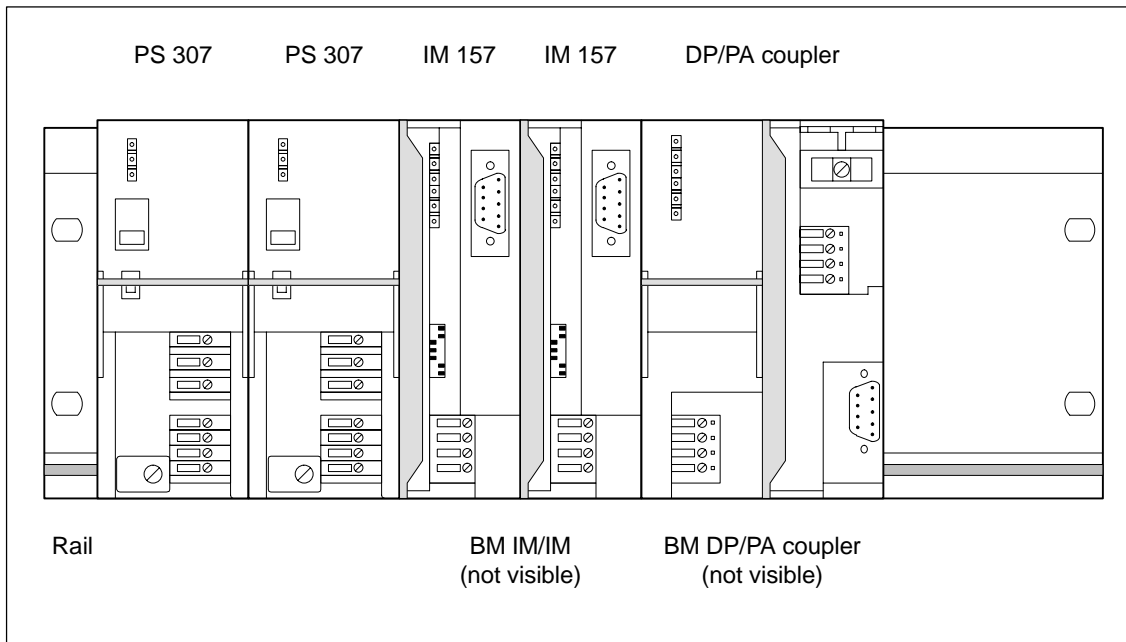


Figure 3-2 Typical configuration of the DP/PA link for redundancy operation

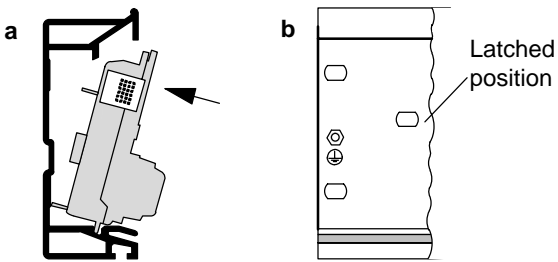
## IM 157 product release

For redundant operation, both IM 157 modules must have the same order number and the same product release.

If the IM 157 (-0AA82-) is employed as a spare part for a precursor module, it can also be used in the DP/PA link together with an IM 157 with the order number -0AA81- or -0AA80-.

## Installing bus modules and modules

Install and remove the bus modules in a deenergized state as follows:

Step	Activity
1	<p>Hook the lower edge of the BM IM/IM bus module onto the rail, press it into the rail (a) and push it to the left until it engages (b).</p> <p>If you are using the 530 mm DIN rail and position the BM IM/IM in the right-hand latched position, you can install two additional PS 307; 2A or one PS 307; 5A to the left of the bus module.</p> 
2	Hook the BM DP/PA coupler bus modules onto the rail and press them down onto the rail.
3	Push the bus modules together so that the module connectors are in contact.
4	Insert both IM 157 modules in the BM IM/IM bus module.
5	Insert the DP/PA couplers in the BM DP/PA coupler bus modules. Use the side guides of the bus modules to do so.
6	Tighten the bolts of the modules to secure them. This also fixes the bus modules to the rail.

### **Removing and inserting modules**

The modules can be inserted and removed during operation in redundancy mode on the S7-400H. The following special characteristics should be noted:

- The insertion and removal of an IM 157 is only permissible if it is deenergized. Switch off the 24V DC power supply of the IM 157 to deenergize it. To prevent failure of the underlying master system, the DP/PA link should be configured with power supplies for the two IM 157 that can be switched independently of each other (e. g. by using two power supply modules).
- The DP/PA couplers can be inserted/removed without restrictions. However, this will cause the connected nodes to fail.

### **Removing bus modules and modules**

To remove the DP/PA link, proceed as above but in reverse order.

If the device is already in operation, switch off the 24V DC power supply prior to removal.

## 3.5 Installing the Y link

### Configuration with bus modules

The Y link must always be configured with bus modules.

### Required components

- Rail for configuration with active bus modules ("Rail for module change during operation")
- 2 x IM 157
- BM IM/IM bus module
- Y coupler
- BM Y coupler bus module

You can find the order numbers for these components in Appendix D.

### Typical configuration

The figure below shows the typical configuration of a Y link with two power supply modules. The front doors are open.

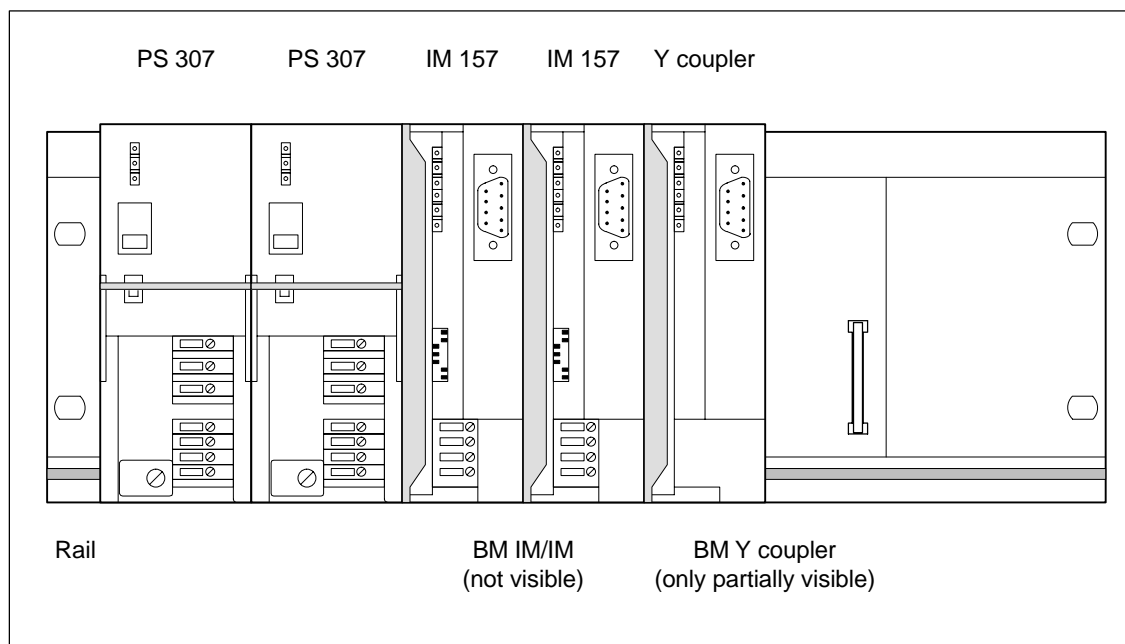


Figure 3-3 Typical configuration of the Y link

### IM 157 product release

For redundant operation, both IM 157 modules must have the same order number and the same product release.

If the IM 157 (-0AA82-) is employed as a spare part for a precursor module, it can also be used in the Y link together with an IM 157 with the order number -0AA81-.

### Installing bus modules and modules

Install and remove the bus modules in a deenergized state as follows:

Step	Activity
1	<p>Hook the lower edge of the BM IM/IM bus module onto the rail, press it into the rail (a) and push it to the left until it engages (b).</p> <p>If you are using the 530 mm DIN rail and position the BM IM/IM in the right-hand latched position, you can install two additional PS 307; 2A or one PS 307; 5A to the left of the bus module.</p> <div data-bbox="673 913 1226 1165" style="text-align: center;"> <p>The diagram consists of two parts, (a) and (b). Part (a) shows a perspective view of a bus module being inserted into a rail. An arrow points to the lower edge of the module where it meets the rail. Part (b) shows a side view of the rail with the module latched. A label 'Latched position' points to the module's position on the rail. The rail has several circular features, some with plus signs, representing different types of modules that can be installed.</p> </div>
2	Hook the BM Y coupler bus module onto the rail and press it down onto the rail.
3	Push the bus modules together so that the module connectors are in contact.
4	Insert both IM 157 in the BM IM/IM bus module.
5	Insert the Y coupler in the BM Y coupler bus module. Use the side guides of the bus modules to do this.
6	Tighten the bolts of the modules to secure them. This also fixes the bus modules to the rail.



### **Removing and inserting modules**

The modules can be inserted and removed during operation in redundancy mode on the S7-400H. The following special characteristics should be noted:

- The insertion and removal of an IM 157 is only permissible if it is deenergized. Switch off the 24V DC power supply of the IM 157 to deenergize it. To prevent failure of the underlying master system, the Y link should be configured with power supplies for the two IM 157 that can be switched independently of each other (e. g. by using two power supply modules).
- The Y coupler can be inserted/removed without restrictions. However, this will cause the connected nodes to fail.

### **Removing bus modules and modules**

To remove the Y link, proceed as above but in reverse order.

If the device is already in operation, switch off the 24V DC power supply prior to removal.



# Wiring

# 4

## Overview of contents

This section contains general information on what to watch out for when you wire the described modules and discusses the connections you will require.

How to wire the individual connections is described in subsections 4.3 to 4.5.

Section	Topic	Page
4.1	Electrical isolation and grounding	4-1
4.2	Connections	4-7
4.3	Connecting the power supply	4-11
4.4	Connecting PROFIBUS-DP	4-12
4.5	Connecting PROFIBUS-PA	4-12

## 4.1 Electrical isolation and grounding

### Introduction

You can wire the 24V power supply for the described modules as a grounded or ungrounded configuration, depending on the requirements of your system configuration.

### Features of the IM 157

- The S7 backplane bus and the 24V power supply are electrically connected
- The PROFIBUS-DP interface is electrically isolated from the 24V power supply and the S7 backplane bus

### Features of the DP/PA coupler

- PROFIBUS-DP and PROFIBUS-PA are electrically isolated from the 24V power supply of the DP/PA coupler
- PROFIBUS-DP and PROFIBUS-PA are electrically isolated from each other

## Features of the Y coupler

- The PROFIBUS-DP master system is electrically isolated from the S7 backplane bus

### 4.1.1 General rules and regulations for operation

#### Introduction

When the described modules are used in a system, certain rules and regulations must be followed that depend on the area of application.

This section provides an overview of the most important rules that must be observed for safe integration in a system.

#### Specific applications

Please comply with the safety and accident prevention regulations (e.g. machine protection guidelines) that are valid for specific applications.

#### Emergency stop devices

Emergency stop functions in accordance with IEC 6204 (which corresponds to DIN VDE 113) must remain effective in all of the system's operating modes.

#### Start-up of the system following specific events

The following table shows what you have to look out for when the system starts up after certain events.

In the case of ...	...
The system starts up after a voltage dip or power failure Start-up of the system after interruption of bus communication	Dangerous operating states must not be permitted to occur. If necessary, force an emergency stop!
The system starts up after the emergency stop system is reset Start-up of the system without the DP master addressing the slaves	An uncontrolled or undefined start-up must not be permitted to occur.

#### 24V DC power supply

The following table shows what you have to look out for in the case of the 24V supply.

In the case of ...	You must remember ...	
Buildings	External lightning protection	Lightning protection measures (e.g. lightning conductors)
24V DC power supply cables, signal cables	Internal lightning protection	
24V supply	Safety extra-low voltage with safe electrical isolation (SELV)	

### Protection from external electrical influences

The following table shows what you have to look out for to ensure protection against electrical influences or faults.

In the case of ...	You must ensure that ...
All systems in which the modules are integrated	... The system is connected to the protective conductor so that electromagnetic interference can be discharged.
Connecting, signal and bus lines	... The cable has been routed and installed correctly.
Signal and bus lines	... Line or conductor strand breaks do not lead to undefined system states.

### Braided screen of the PROFIBUS cable

The braided screen of the PROFIBUS cable must be connected to a grounded shield bus.

- Affix the braided screen with metal cable clips.
- The clip must cover a large portion of the screen and provide good contact.
- Connect the screen to a shield bus directly after the point where the cable enters the cabinet.

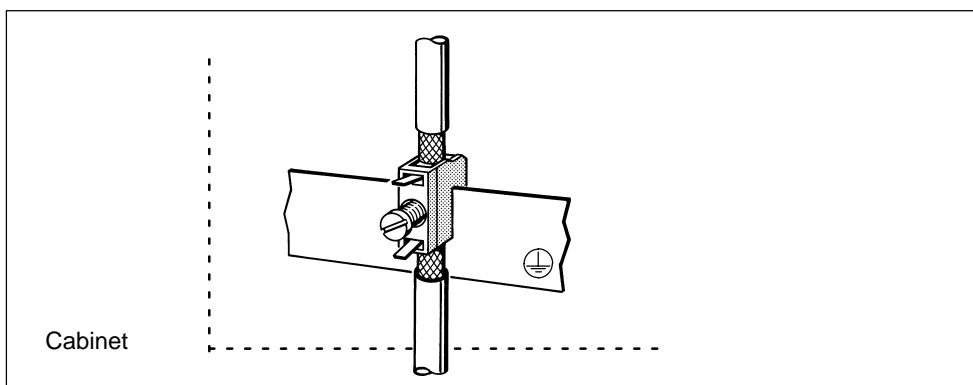


Figure 4-1 Braided screen of the PROFIBUS cable on the grounded shield bus

## 4.1.2 Operation with a grounded supply

### Definition: Grounded supply

In grounded supplies, the neutral conductor is grounded. A simple short-circuit to ground between a voltage-carrying conductor and ground or a grounded part of the system leads to the protective devices being used.

### Components and protective measures

Various components and protective measures are required for an overall system. The type of components used and the degree to which the protective measures are mandatory depend on which regulations (e.g. DIN VDE in Germany) are valid for your system configuration.

- Main switch (in Figure 4-2, ): DIN VDE 0100 Part 460
- Isolator (in Figure 4-2, ): DIN VDE 0113 Part 1

### Operation with a grounded supply

Figure 4-2 shows the position of the modules in the overall configuration when power is supplied from a TN-S network. When the DP/PA coupler is configured with a grounded reference potential, any interference current is discharged to the protective conductor.

Note: The arrangement of the power connections shown does not correspond to the actual arrangement on the modules; it was selected in the interest of clarity.

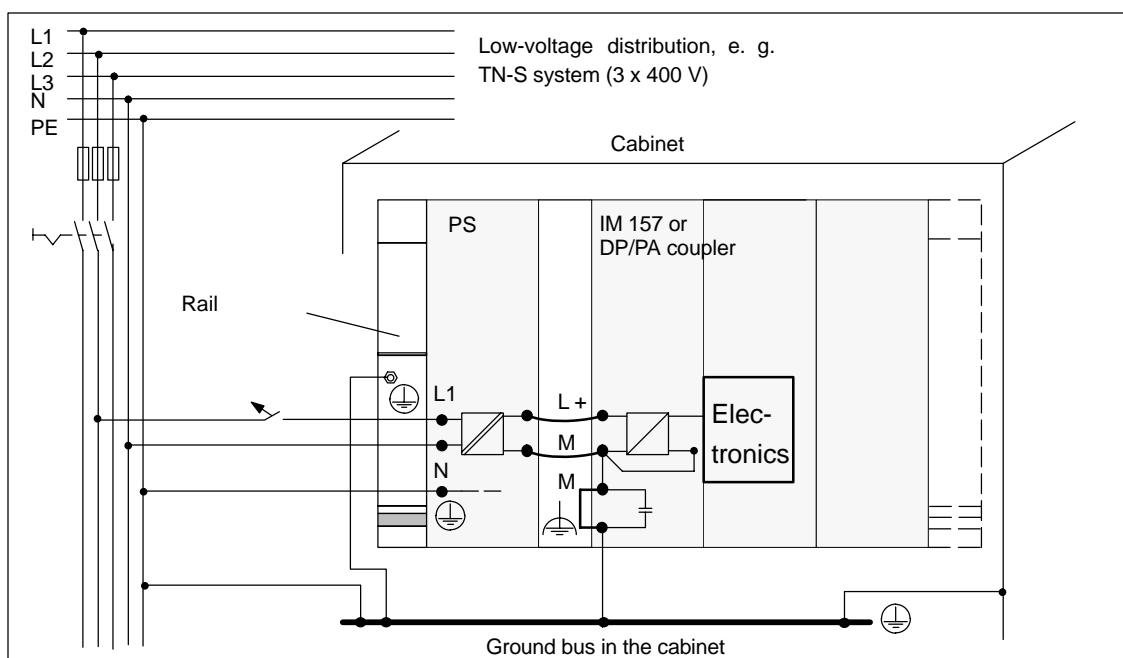


Figure 4-2 Configuration with a grounded supply

### 4.1.3 Operation with ungrounded reference potential

#### Application

In extended systems, it may be necessary to operate the modules with ungrounded reference potential for the purposes of ground fault monitoring, for example. This is the case in the chemical engineering industry or in power stations.

### Diverting interference current

When modules are operated with ungrounded reference potential, any interference current is discharged to the protective conductor via RC networks that are integrated in the IM 157 and the DP/PA coupler (see Figure 4-3).

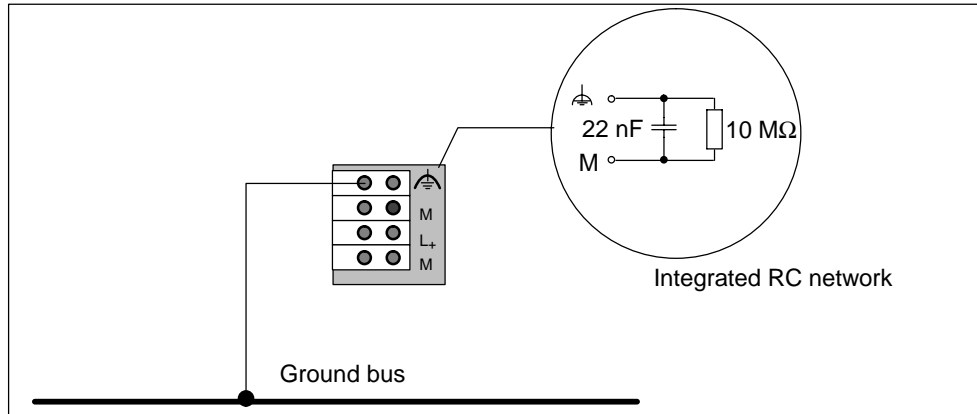


Figure 4-3 Configuration with ungrounded reference potential



## 4.2 Connections

### 4.2.1 Wiring the DP/PA coupler for stand-alone operation

#### DP/PA coupler connections

The following figure shows all connections that must be established to and from the DP/PA coupler for stand-alone operation:

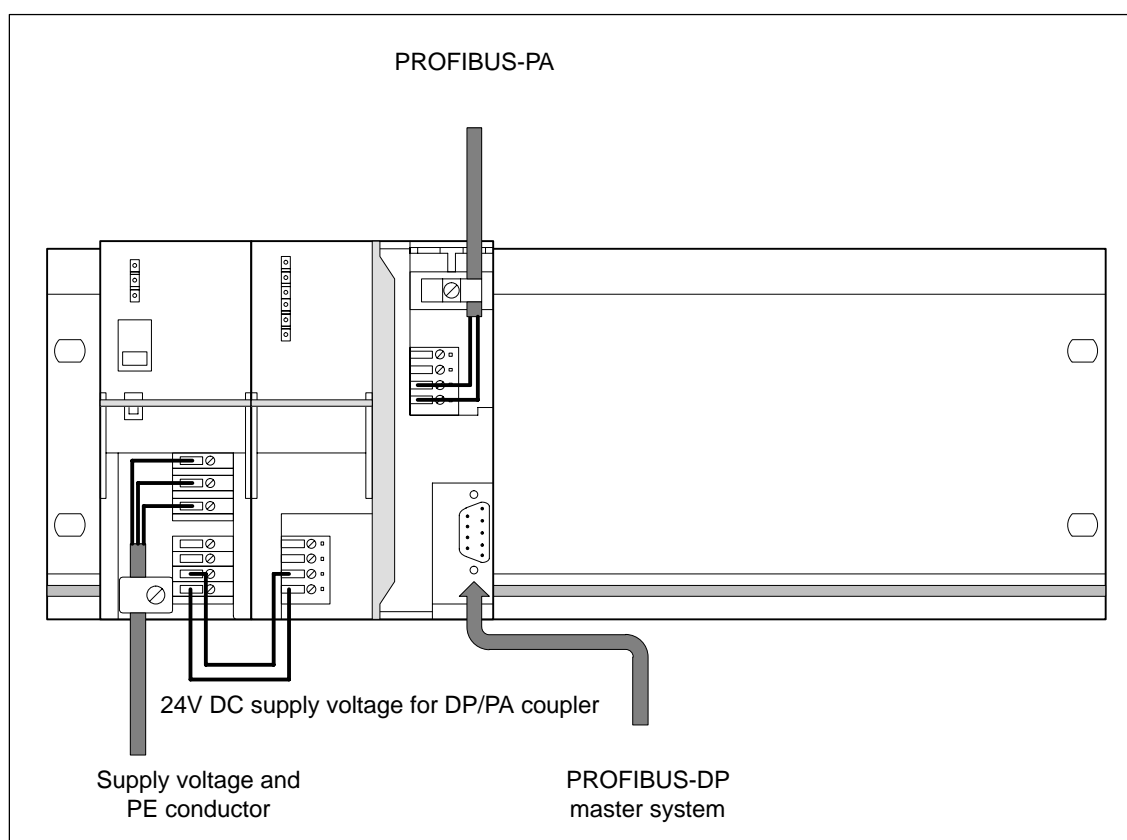


Figure 4-4 DP/PA coupler connections for stand-alone operation

## 4.2.2 Wiring the DP/PA link for non-redundant operation

### DP/PA link connections

The following figure shows all connections that must be established to and from the DP/PA link for non-redundant operation:

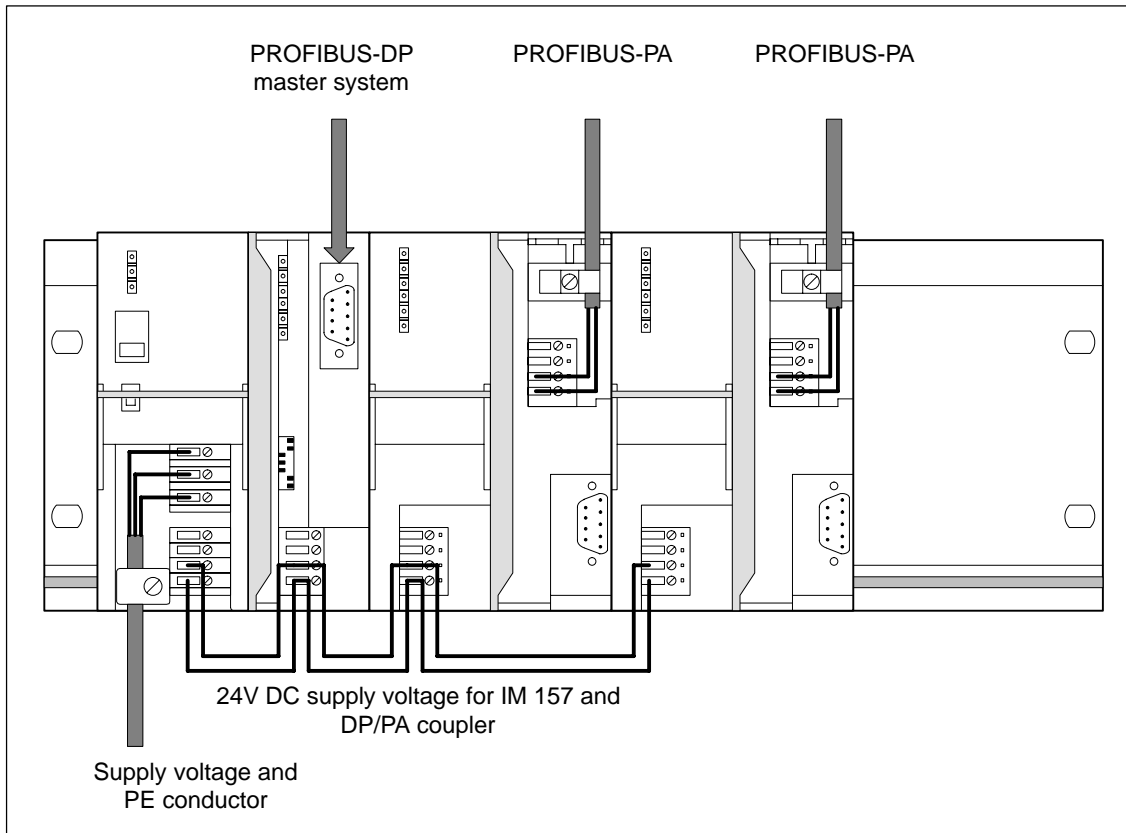


Figure 4-5 DP/PA link connections for non-redundant operation

### Power supply

In the DP/PA link, power supplies are required for the IM 157 and for each DP/PA coupler.

## 4.2.3 Wiring the DP/PA link for redundant operation

### DP/PA link connections

The following figure shows all connections that must be established to and from the DP/PA link for redundant operation:

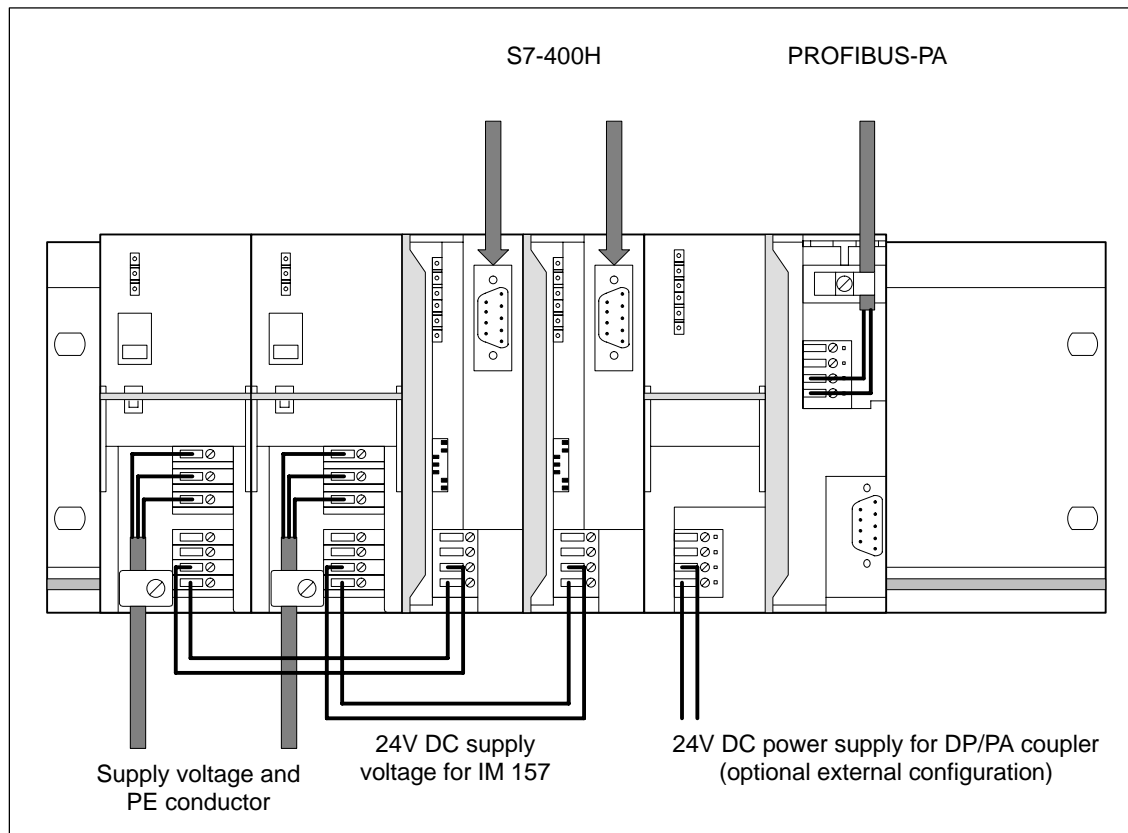


Figure 4-6 DP/PA link connections for redundancy operation

### Power supply

In the DP/PA link, power supplies are required for both IM 157 and for each DP/PA coupler.

### PROFIBUS-DP

In the DP/PA link, PROFIBUS-DP connections to S7-400H are required for both IM 157.

## 4.2.4 Wiring the Y link

### Y link connections

The following figure shows all connections that must be established to and from the Y link:

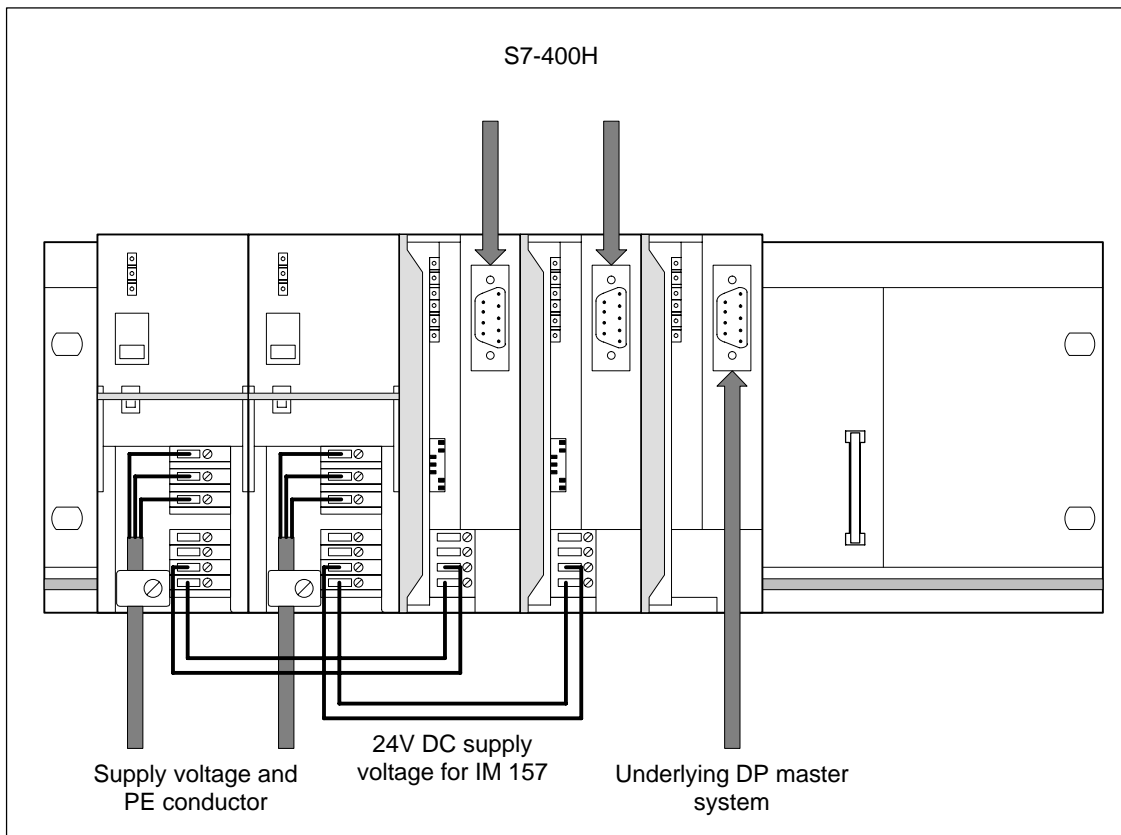


Figure 4-7 Y link connections

### Power supply

In the Y-Link, power supplies are required for both IM 157.

### PROFIBUS-DP

The following PROFIBUS-DP connections are required in the Y link:

- To the S7-400H on both IM 157
- To the underlying DP master system on the Y coupler

## Bus terminating resistors

The Y coupler does not contain integrated bus terminating resistors. When the Y coupler is arranged at the beginning or end of a bus segment, the bus terminating resistors on the bus connector must be connected.

## 4.3 Connecting the power supply

The power supply is connected in the same manner for all described modules.

The connections that must be established between a power supply and components are described in the subsections 4.2.1 to 4.2.4.

### Required tool

To connect the power supply, you require a 3 mm screwdriver.

### Power supply unit

You can only use power supply units of the type SELV with safe, electrically isolated functional, extra-low ( $\leq 60V$  DC) voltage.

The size of the power supply unit depends on the current consumption of the connected components (see Appendix B, Technical Data).

### Power supply connection

The 4 pin screw-type terminal for the 24V voltage supply is found on the IM 157 behind the front door at the bottom. The connections have the following functions:

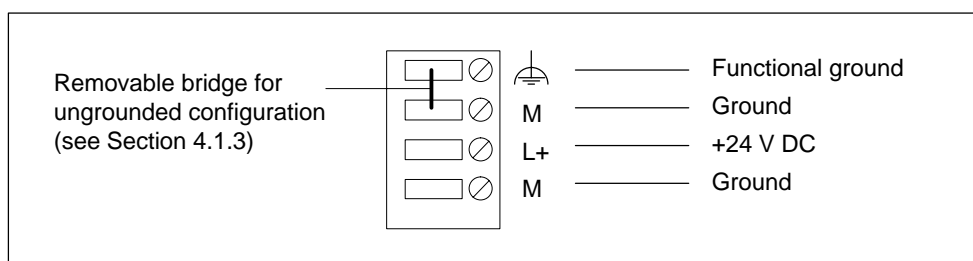


Figure 4-8 Power supply for IM 157

The maximum conductor cross-section is  $2.5 \text{ mm}^2$ . There is no cable grip.

## 4.4 Connecting PROFIBUS-DP

The PROFIBUS-DP is connected in the same manner for all described modules.

The connections that must be established between a PROFIBUS-DP and components are described in the subsections 4.2.1 to 4.2.4.

### Required tool

To attach the bus connector to the IM 157, you require a 3 mm screwdriver.

### Bus cable and connector

Only use the accessories specified in Appendix D for PROFIBUS-DP.

All of the information you will require on handling bus cables and connectors is provided in the *Distributed I/O System ET 200* handbook.

### Procedure

Connect PROFIBUS-DP as follows:

1. Insert the bus connector into the PROFIBUS socket.
2. Tighten the screws on the bus connector.

## 4.5 Connecting PROFIBUS-PA

### Important information

The following documentation is binding when installing the PROFIBUS-PA:

- Untersuchungen zur Eigensicherheit bei Feldbus-Systemen (investigations into the intrinsic safety of field bus fail-safe systems); PTB report W-53, Braunschweig, March 1993 (only relevant for installation in potentially explosive areas).
- PROFIBUS-PA Installation Guidelines (notes on using the IEC 1158-2 technology for PROFIBUS, German item no. 2.091, English item no. 2.092) PROFIBUS-Nutzerorganisation e. V., Haid-und-Neu-Straße 7, D-76131 Karlsruhe

Further information is available on the Internet:

<http://www.profibus.com>.

- IEC 60079-14 stipulations on setting up electrical systems in potentially explosive areas

## Required tool

To connect PROFIBUS-PA, you require a 3 mm screwdriver.

We recommend that you use the PROFIBUS FastConnect tool to prepare the cables and lines (see Appendix D).

## Bus cable

Use the bus cable specified in Appendix D for PROFIBUS-PA.

## PROFIBUS-PA connection

The 4-pin screw-type terminal for the PROFIBUS-PA connection is found at the top of the DP/PA coupler under the right-hand front door. The connections have the following functions:

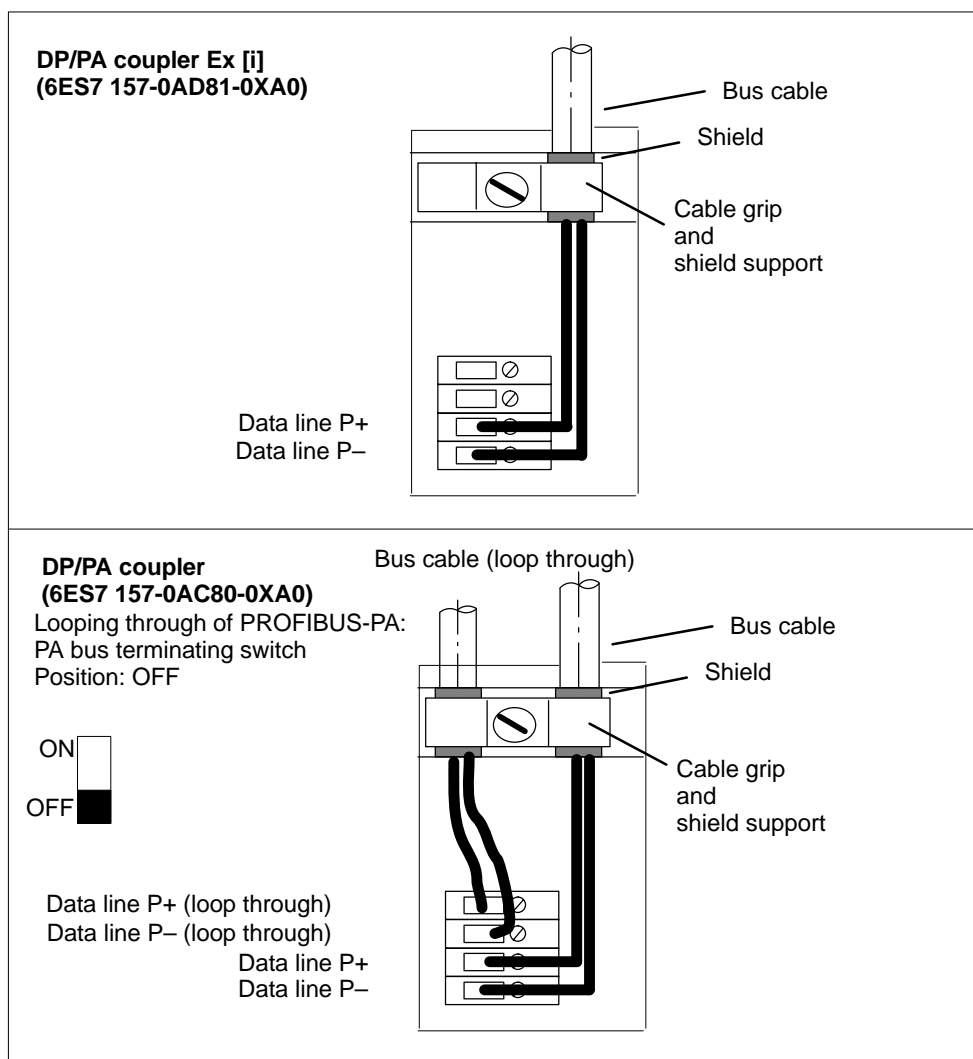


Figure 4-9 PROFIBUS-PA connection

## PA Bus terminating switch

The PA bus terminating switch is only provided on the DP/PA coupler (6ES7 157-0AC80-0XA0). You can loop through the PROFIBUS-PA on this DP/PA coupler only.

The bus terminating resistor cannot be deactivated in the DP/PA coupler Ex [i], i. e. the DP/PA coupler Ex [i] must be located at the beginning or end of a PA segment.

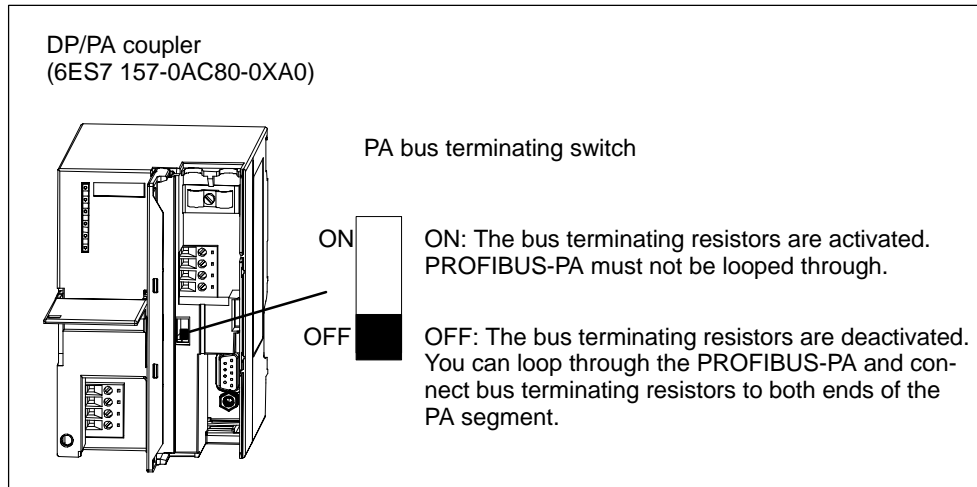


Figure 4-10 PA bus terminating switch

## Procedure

Connect PROFIBUS-PA as follows:

1. Strip the insulation from the cable, turning the braided screen back over the insulation as shown below.

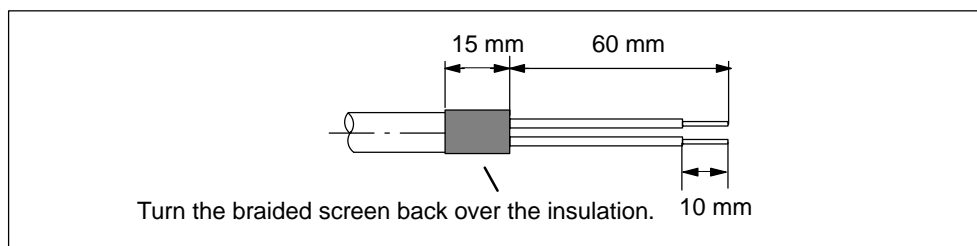


Figure 4-11 Length of insulation stripped

2. Clamp the shield of the bus cable under the cable grip and screw it tight.
3. Secure the conductors of the bus cable in the screw-type terminals P+ and P-. Be sure to get the polarity of the conductors right.



# Commissioning the DP/PA Coupler for Stand-Alone Operation

# 5

The DP/PA coupler is ready for operation when you have completed the setup and wiring of the coupler as described in Sections 3 and 4 and have switched on the power supply.

A transmission rate of 45.45 kBaud should be set for the DP master.



# 6

## Commissioning the DP/PA Link

### Overview of contents

This chapter describes the steps involved in commissioning the DP/PA link. A detailed explanation of these steps is found in the individual subsections.

Section	Topic	Page
6.1	Commissioning the DP/PA link	6-2
6.2	Configuration for the S7 standard operation or redundancy operation	6-3
6.3	Configuration for the DP standard master operation	6-6
6.4	Setting the PROFIBUS address of the IM 157	6-10

## 6.1 Commissioning the DP/PA link

### Prerequisites

The following prerequisites must be met before you commission the DP/PA link:

- You must have completed the setup and wiring of the DP/PA link as described in Sections 3 and 4.
- You must have completed the setup of PROFIBUS-DP. PROFIBUS-DP must be ready for operation.
- You must have completed the setup of PROFIBUS-PA. PROFIBUS-PA must be ready for operation.

### Commissioning the DP/PA link

Step	Activity
1	Configure the DP/PA link.
2	Set the PROFIBUS address of the IM 157.
3	Switch on the power supply for the DP/PA link.
4	Load the configuration into the target system.

### Configuring the DP/PA link

- The DP/PA link is configured with STEP 7 for S7 standard operation and for redundant operation.
- For the DP standard master operation, the DP/PA link is configured via the device master file, e.g. with COM PROFIBUS.

The DP/PA couplers are gateways between the S7 backplane bus of the IM 157 and PROFIBUS-PA with the PA field devices. Therefore, the DP/PA coupler does not have to be configured.

## 6.2 Configuration for S7 standard operation or redundant operation

The DP/PA link is configured with STEP 7 for S7 standard operation and for redundant operation.

### 6.2.1 Configuring the DP/PA link

Step	Activity
1	Start STEP 7 and open your SIMATIC station or SIMATIC H station (for the redundant operation) in HW Config.
2	From the <b>PROFIBUS-DP\DP/PA-Link</b> directory in the hardware catalog, drag an IM 157 (MLFB: 6ES7 157-0AA82-0XA0) to a DP master system (for S7 standard operation) or to the redundant DP master system of an S7-400H (for redundant operation).  Result: The properties dialog for the PROFIBUS interface of the IM 157 is displayed.
3	Change the suggested IM 157 address in the higher level DP master system if necessary.  Result: After closing this dialog, another dialog appears for selecting the underlying master system.
4	Select PROFIBUS-PA and confirm with OK.  Result: The DP/PA link is inserted in the higher level DP master system along with the underlying PA master system.

#### DPV0 or DPV1 slave

The IM 157 can only be operated as a DPV1 slave in combination with a DPV1 master. The additional functions (acyclical services) of a DPV1 slave can only be used if this is the case.

If necessary, the operating mode for the DP master in use can be selected in STEP 7/HW Config under object properties: "compatible to S7" or "DPV1")

#### Switchover time in redundant operation

---

##### Notice

Due to changes in the bus parameters in STEP 7 V5.2, longer switchover times in the H system may result when the IM 157 is used as a redundant DP slave.

---

Example of the configuration of a DP/PA link for redundant operation

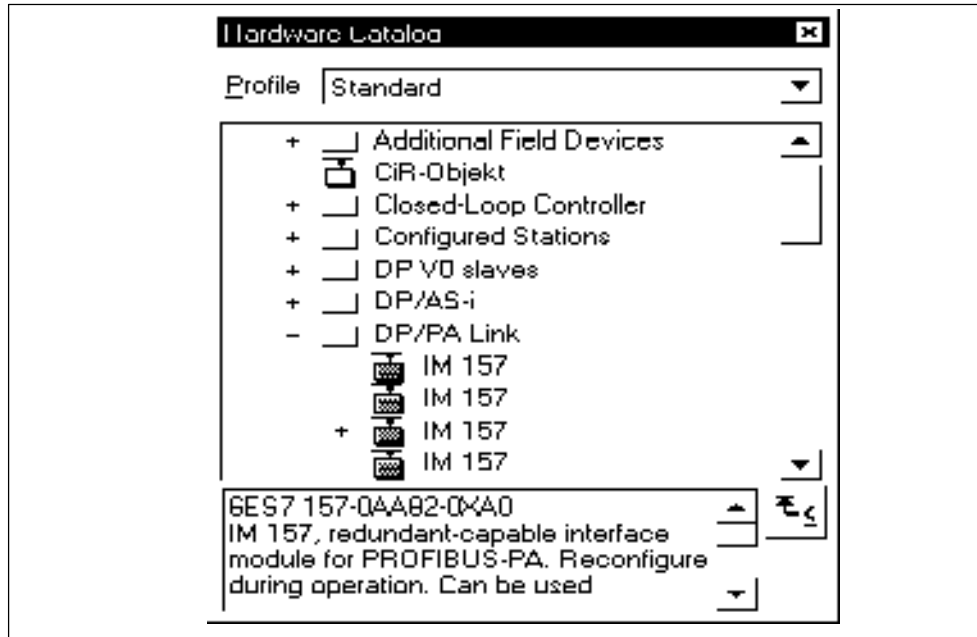


Figure 6-1 HW Config: DP/PA link in hardware catalog

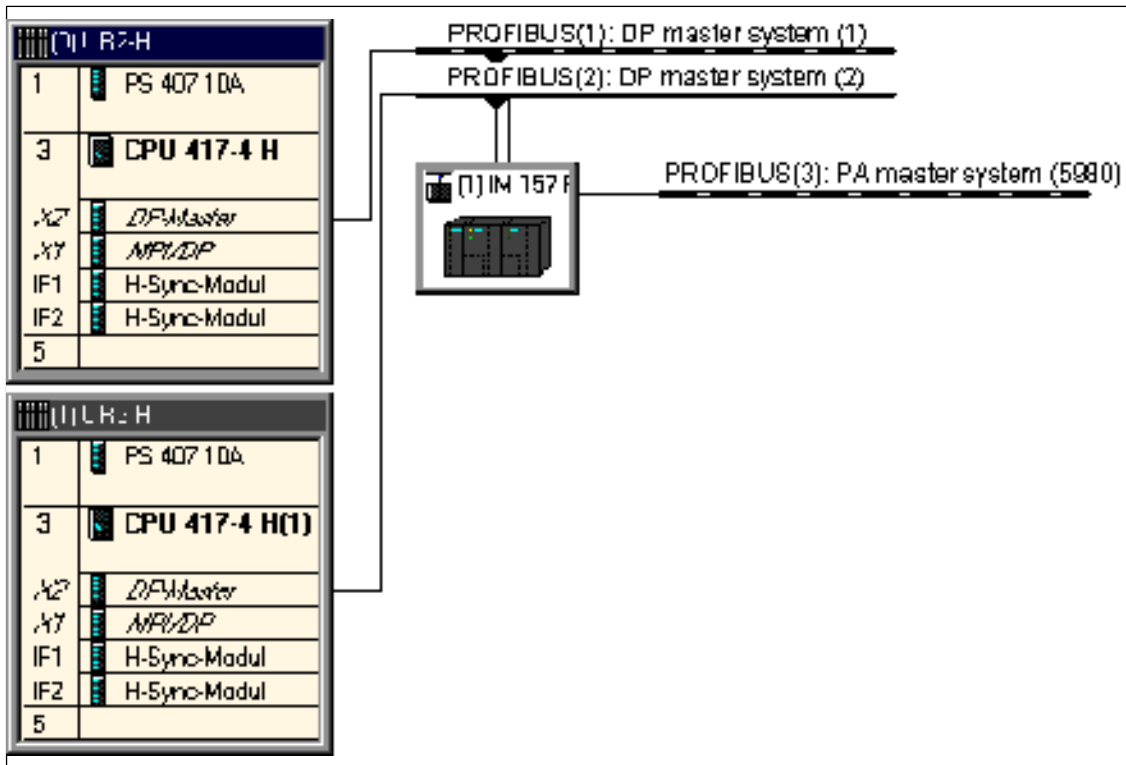


Figure 6-2 HW Config: Minimum configuration of an S7-400H with a DP/PA link

## 6.2.2 Configuring the PROFIBUS-PA master system

The PA field devices can be integrated as standard slaves in the SIMATIC PDM or in STEP 7 via their device master files.

### Configuration with STEP 7

Step	Activity
1	If you have not already done so, start STEP 7 and open your SIMATIC station or SIMATIC H station (for redundant operation) in HW Config.
2	If the required field devices do not appear in the <b>PROFIBUS-PA</b> directory in the hardware catalog: Import the device master files of the PA field devices using the <b>Extras &gt; Install new GSD</b> menu command.
3	Drag the required PA field devices from the hardware catalog to the PA master system that appears behind the IM 157.

When the PA field devices are configured, HW Config checks that the quantity structure is adhered to and outputs an error message if the permitted quantities are exceeded.

### PROFIBUS address of the IM 157 in the PA master system

- For S7 standard operation, the IM 157 uses the address 2.
- For redundant operation, the two IM 157 modules use addresses 1 and 2. In addition, address 125 is blocked for PA field devices.

The first possible address for a PA field device is 3 in both cases.

### Editing the PA field devices in the user program

The process data of the PA field devices should only be accessed in the user program through the process images.

## 6.3 Configuration for DP standard master operation

For DP standard master operation, the DP/PA link and the PA field devices are configured using device master files, e.g. with COM PROFIBUS.

### 6.3.1 Device master files

A template file that can be used to generate the finished device master file was created for the DP/PA link. This template does not yet contain any module IDs for PA field devices.

Module IDs must be entered in the device master file for every PA field device that you wish to use in the DP/PA link. A software tool ("GSD tool for IM 157") is available for this purpose.

You can download the `imlinkv1.dat` template and the GSD tool free of charge at the following Internet address:

[http://www.ad.siemens.de/csi\\_e/gsd](http://www.ad.siemens.de/csi_e/gsd)

There you will also find the device master files of the PA field devices offered by Siemens AG.

### Creating a device master file

Load the `imlinkv1.dat` template and the GSD tool from the Internet address given above and follow the accompanying instructions.

For the DP/PA link, the GSD tool creates a device master file, `sir48052.gsd`, from the `imlinkv1.dat` template and from the device master files you added for the PA field devices to be used.



### 6.3.2 Configuring the DP/PA link

Configure the DP/PA link with your configuration tool (e. g. COM PROFIBUS) as you would any other DP slave on PROFIBUS-DP.

To do so, load the complete device master file for the DP/PA link into your configuration tool.

#### Parameter assignment and configuration frame

The frame length for the parameter assignment depends on the number of PA field devices in use and must not exceed 214 bytes.

The frame length for the configuration depends on the number and extent of PA field devices in use and must not exceed 244 bytes.

The structure of the parameter assignment and configuration frames is found in Article No. 13406349 on the Internet:

<http://www.ad.siemens.de/simatic-cs>

#### Restrictions

Functions based on reading the configuration before parameters are initially assigned to the DP/PA link are not supported. For this reason the CP 5431, for example, cannot be used as a DP master. Likewise, variables cannot be controlled with the COM PROFIBUS before parameters have been assigned for the DP/PA link.

### 6.3.3 Configuring PROFIBUS-PA field devices

#### Prerequisite

The product names of the required PA field devices must be entered in the device master file of the IM 157.

#### Configuration principles

To configure the DP/PA link, select the manufacturer's details for the PA field devices (product description and, possibly, the module description) from your configuration tool. Enter the information on the PA field devices according to their addresses without any gaps and in ascending order.

Figure 6-3 shows you an example of a configuration.

#### Procedure

Step	Activity
1	Switch to the DP slave configuration in your configuration tool.
2	In the "Order number" or "Module" field, enter the manufacturer ID (e.g. SIEMENS SITRANS P) for the first PA field device and accept it in the first slot. Set the PROFIBUS address for the PA field device. Repeat this procedure for all PA field devices in use.
3	Terminate the entry and close the configuration. The remaining steps (e.g. save, compile ...) are the same as for other DP slaves.

#### PROFIBUS address of the IM 157 in the PA master system

In the PA master system, the IM 157 uses the address 2. The first possible address for PA field devices is 3.

#### Suitable measuring transducers

Measuring transducers that accept a parameter assignment frame of 10 bytes can be used.

## Configuration using COM PROFIBUS

For SIMATIC S5, the PA field devices are integrated as standard slaves in COM PROFIBUS (as of V3.1) by means of their device master files.

Step	Activity
1	Copy the device master file of the IM 157 to the COM PROFIBUS directory ...COMPBxx\GSD.
2	Start COM PROFIBUS and select the <b>File &gt; Read in GSD file</b> menu command. Result: The IM 157 appears in the hardware catalog under the slave configuration.
3	Configure the PA field devices with COM PROFIBUS.

## Example: Display of the configuration in COM PROFIBUS

The following figure shows an example of a configuration display for the DP/PA link with COM PROFIBUS.

	Kennung	Modul	Kommentar	E-Adresse	A-Adresse
0	001	Begin of Device	Adr 3 => Parameter		
1	148	== Standard_804B	SITRANS P	P000	
2	001	Begin of Device	Adr 20 => Parameter		
3	066,132	== Flow Rate Block_1505	PROMAG 33, Teil 1	P006	
4	066,132	== Total Volume Block_1505	PROMAG 33, Teil 2	P012	
5	8DA	== Control Block_1505	PROMAG 33, Teil 3		P000
6	001	Begin of Device	Adr 33 => Parameter		
7	148	== Standard_804B	SITRANS P		
8					
9					
10					
11					
12					
13					
14					
15					
16					

Figure 6-3 Example of a configuration with COM PROFIBUS

### Setting the PROFIBUS address

1. In the **Module** column, select the **Begin of Device** item for the respective PA field device and select the **Parameters...**
2. button
3. In the **Value** column, enter the required PROFIBUS address and confirm with **OK**.

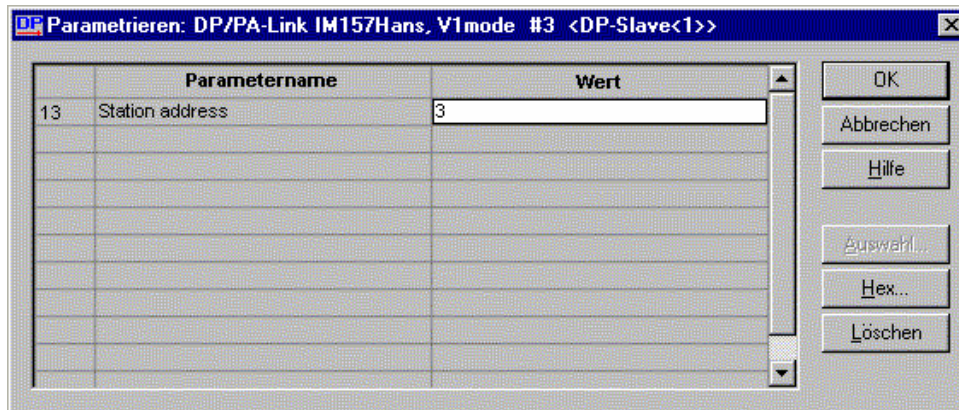


Figure 6-4 Entering the PROFIBUS address

## 6.4 Setting the PROFIBUS address of the IM 157

### Definition

Each bus node must receive a PROFIBUS address so that it can be uniquely identified on PROFIBUS-DP.

### Rules

The following rules apply to the PROFIBUS address of the IM 157 in the higher level DP master system:

- The valid PROFIBUS addresses are: 1 to 125.
- Each PROFIBUS address can only be assigned once in a DP master system.
- For redundant operation, the same PROFIBUS address must be set for both IM 157 modules.

### Required tool

To set the PROFIBUS address, you require a 3 mm screwdriver.

## Procedure

1. Open the front doors of the IM 157.
2. Set the required PROFIBUS address with a screwdriver. The PROFIBUS address is the sum of the values of all switches that are in the "ON" position (switch set to the right).

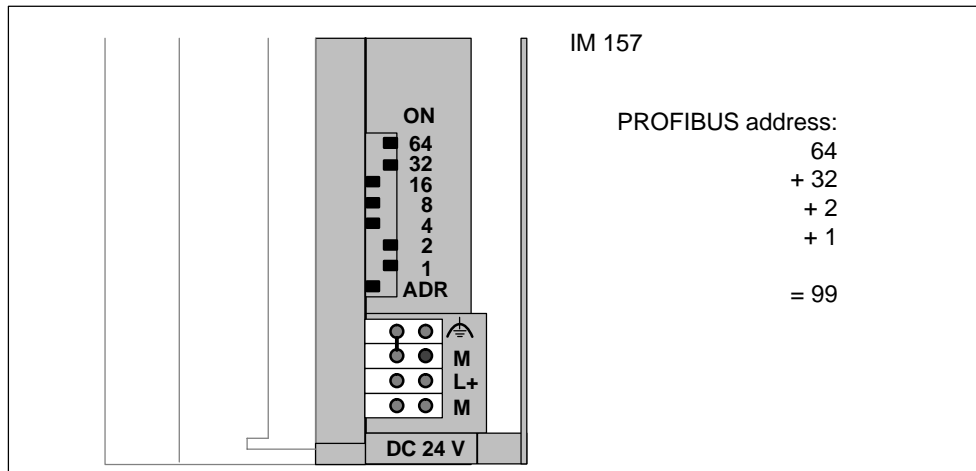


Figure 6-5 Example for setting the PROFIBUS address

### “ADR” switch

The “ADR” switch is reserved for setting the address with software in future firmware versions. In the current firmware version, the switch must always be set to “OFF”.

### Changing the PROFIBUS address

You can change the set PROFIBUS address at any time. The IM 157 will accept the setting after the 24V DC power supply has been turned off and on again.



# Commissioning the Y Link

## Overview of contents

This chapter describes the steps involved in commissioning the Y link. A detailed explanation of these steps is found in subsections 7.2 and 7.3

Section	Topic	Page
7.1	Commissioning the Y link	7-1
7.2	Configuring the Y link	7-2
7.3	Configuring the underlying DP slaves	7-4

## 7.1 Commissioning the Y link

### Prerequisites

The following prerequisites must be met before you commission the Y link:

- You must have completed the setup and wiring of the DP/PA link as described in Sections 3 and 4.
- You must have completed the setup of the H system and the redundant DP master system. PROFIBUS-DP must be ready for operation.
- You must have completed the setup of the underlying DP master system and have connected it to the Y coupler. PROFIBUS-DP must be ready for operation.

### Commissioning the Y link

Step	Activity
1	Configure the Y link.
2	Configure the underlying DP slaves.
3	Switch on the power supply for the Y link.
4	Set the PROFIBUS address of the IM 157 (see Section 6.4).
5	Load the configuration into the target system.

## 7.2 Configuring the Y link

The Y link is configured in STEP 7.

Step	Activity
1	Start STEP 7 and open your SIMATIC H station in HW Config.
2	From the <b>PROFIBUS-DP\DP/PA-Link</b> directory in the hardware catalog, drag an IM 157 (MLFB: 6ES7 157-0AA82-0XA0) to the redundant DP master system of an S7-400H. Result: The properties dialog for the PROFIBUS interface of the IM 157 is displayed.
3	Change the suggested address of the IM 157 in the higher level DP master system if necessary. Result: After closing this dialog, another dialog appears for selecting the underlying master system.
4	Select PROFIBUS-DP and confirm with OK. Result: The Y link is inserted in the redundant DP master system. The transmission rate of the underlying DP master system is preset to 1.5 MBaud.
5	If you wish to change the transmission rate of the underlying DP master system, double click on the system. Result: A dialog with the properties for the underlying master system is displayed. Select the <b>Properties...</b> button. Result: The <b>PROFIBUS properties</b> dialog appears. In the <b>Network settings</b> tab, select a transmission rate between 45.45 kBaud and 12 MBaud and confirm with OK.

### DPV0 or DPV1 slave

The IM 157 can only be operated as a DPV1 slave in combination with a DPV1 master. The additional functions (acyclical services) of a DPV1 slave can only be used if this is the case.

### Switchover time in redundant operation

---

#### Notice

Due to changes to the bus parameters in STEP 7 V5.2, longer switchover times in the H system may result when the IM 157 is used as a redundant DP slave.

---



Example of a configuration of a Y link

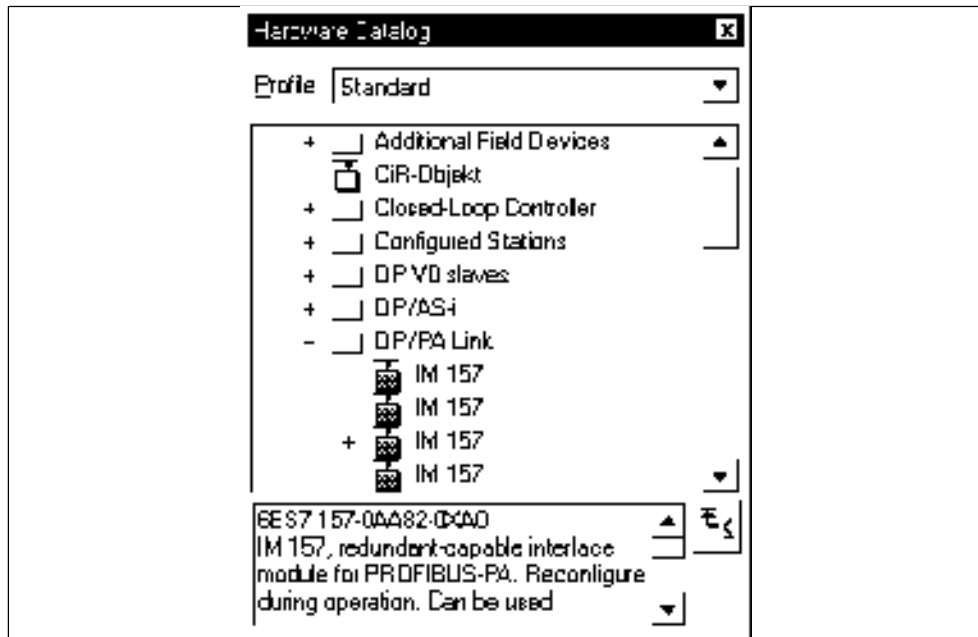


Figure 7-1 HW Config: Y link in hardware catalog

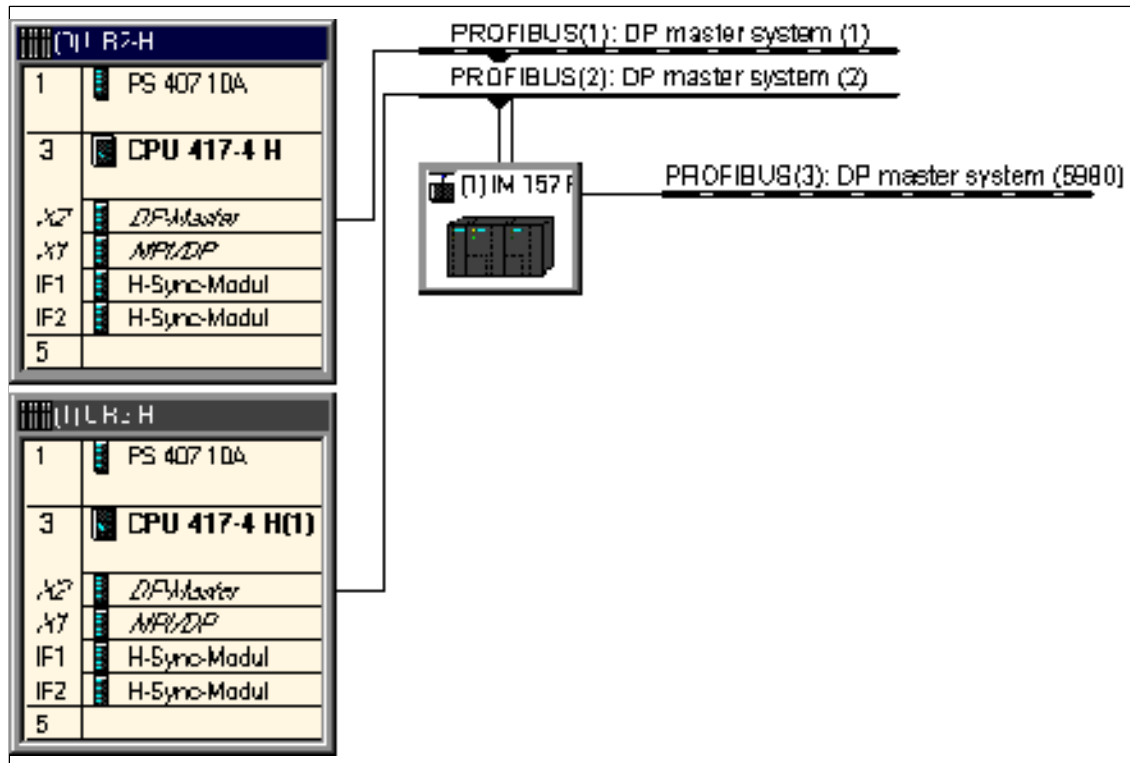


Figure 7-2 HW Config: Minimum configuration of an S7-400H with a Y link

## 7.3 Configuring underlying DP slaves

The underlying DP slaves are configured in STEP 7.

Step	Activity
1	If you have not yet done so, start STEP 7 and open your SIMATIC H station in HW Config.
2	If the required DP slaves are not directly configurable (see Appendix C), import the corresponding device master files using the <b>Extras &gt; Install new GSD</b> menu command.  Result: The DP slaves appears in the <b>PROFIBUS-DPAdditional field devices</b> directory in the hardware catalog
3	Drag the required DP slaves from the <b>PROFIBUS-DP</b> subdirectories in the hardware catalog to the underlying DP master system.
4	Configure the DP slaves with STEP 7.

When the underlying DP slaves are configured, HW Config checks that the quantity structure is adhered to and outputs an error message if the permitted quantities are exceeded.

### PROFIBUS address of the IM 157 in the underlying DP master system

In the underlying DP master system, the two IM 157 modules use addresses 1 and 2. In addition, address 125 is blocked for DP slaves. The first possible address for an underlying DP slave is 3.

### Editing the DP slaves in the user program

The process data of the DP slaves should only be accessed in the user program through the process images.

# Operation of the DP/PA Link and the Y Link

# 8

## Overview of contents

Section	Topic	Page
8.1	Start-up delay	8-1
8.2	Start-up characteristics	8-2
8.3	Behavior following specific events in redundant operation	8-6
8.4	Reading and writing records	8-7
8.5	Identification data	8-9
8.6	Replacing faulty modules	8-11
8.7	System changes during operation	8-11
8.8	IM 157 firmware update	8-12

Some of the following details apply to both the DP/PA link with its PA field devices and to the Y link with its underlying DP slaves. In these instances, the following terminology will be used in the interest of clarity:

- “Link” stands for both the DP/PA link and the Y link.
- “Slaves” stands for both the PA field devices and the underlying DP slaves.
- “Underlying master system” stands for both the PA master system and the underlying DP master system.

## 8.1 Start-up delay

During start-up, the link involves the slaves of the underlying master system in the data cycle. The slaves are parameterized and configured and the inputs of the slaves are read in.

To ensure a reproducible start-up and to avoid unintentional switching of the outputs, the link issues CLEAR frames on the underlying master system during this phase, i.e. the outputs of the slaves are put into a safe state.

Start-up behavior depends on the configured start-up characteristics of the system configuration:

Table 8-1 Configured start-up characteristics

Configured start-up characteristics	The output data is issued by the link if...
Start-up when the desired layout $\neq$ actual layout	<ul style="list-style-type: none"> <li>• All slaves are parameterized and configured, or</li> <li>• The startup delay has expired and fewer slaves were parameterized/configured than planned.</li> </ul>
Start-up when the desired layout = actual layout	<ul style="list-style-type: none"> <li>• All the slaves are parameterized and configured.</li> </ul> <p>Note: If not all slaves are configured or parameterized within the power-up delay time, the link automatically repeats start-up.</p>

The status of the start-up delay can be evaluated in the "Status Message" diagnostic block of the diagnostic frame.

## 8.2 Start-up characteristics

### Prerequisites for starting up the IM 157

- A valid PROFIBUS address must be set on the IM 157.
- The DP master on the higher level PROFIBUS-DP must be in operation.
- The link must be configured correctly.

The further behavior of the DP/PA link depends on whether it is in redundant or non-redundant operation.

#### 8.2.1 Start-up behavior of the DP/PA link in non-redundant operation

The flow chart below shows the start-up behavior of the IM 157 after the power is switched on.

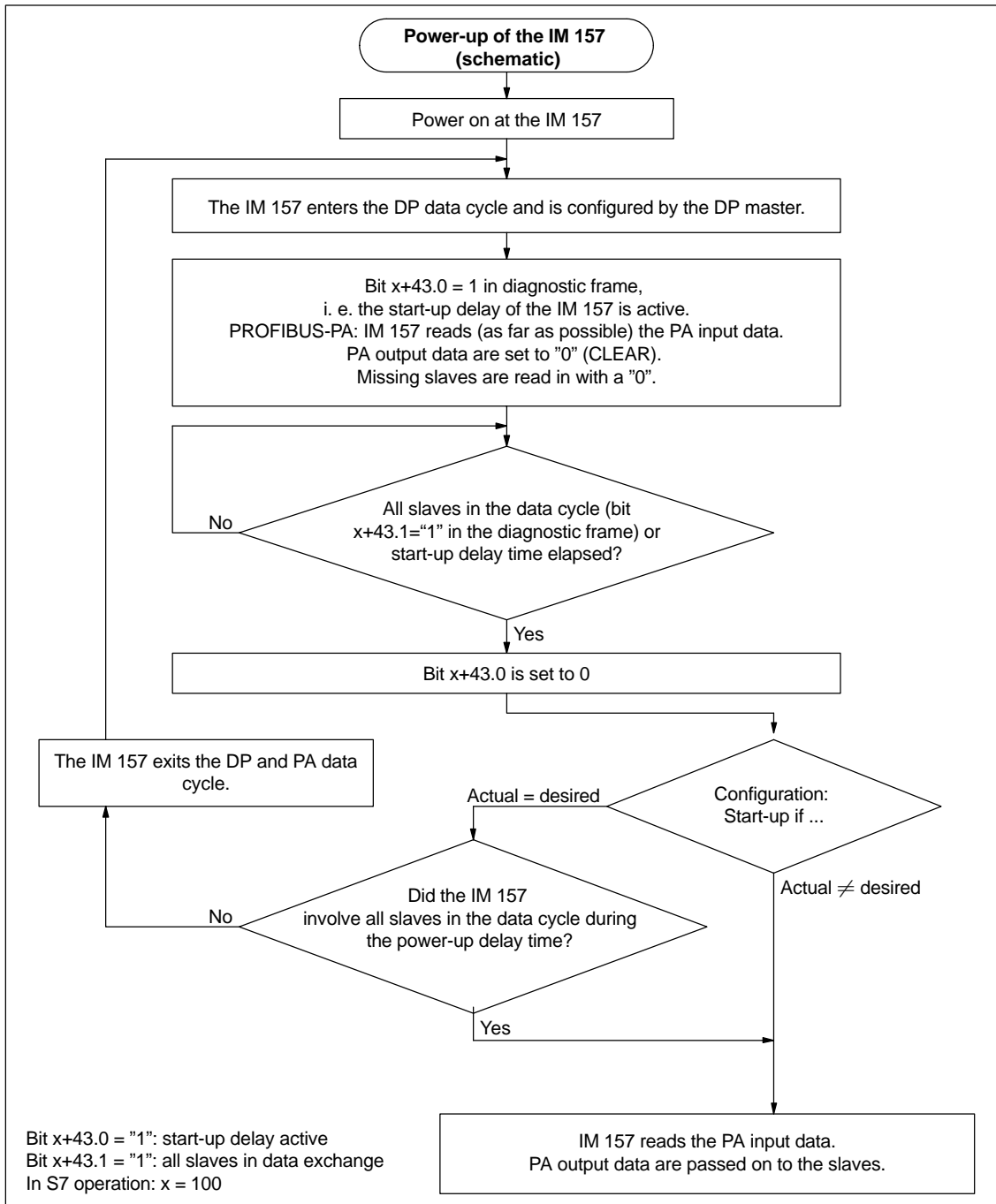


Figure 8-1 Start-up behavior of the IM 157 after power is switched on

## **8.2.2 Start-up behavior in redundant operation**

### **LED displays**

At the beginning of start-up, all LEDs of the IM 157 light up for approx. 1 second for test purposes.

### Startup diagram of the IM 157

During start-up, the two IM 157 modules are addressed independently of one another:

- Each DP master configures and parameterizes its IM 157 (independently of the other DP master) and sends the corresponding configuration.
- During error-free operation, the IM 157 that is connected to the subsystem of the master CPU is activated.
- As soon as the other DP master has also configured and parameterized its IM 157 without errors and sent the entire configuration, the IM 157 is made available on standby.

The IM 157 at the subsystem of the reserve CPU is passive. If the active IM 157 fails, it is still able to continue processing the slaves.

Figure 8-2 shows a simplified layout of the mutually independent behavior of the two IM 157.

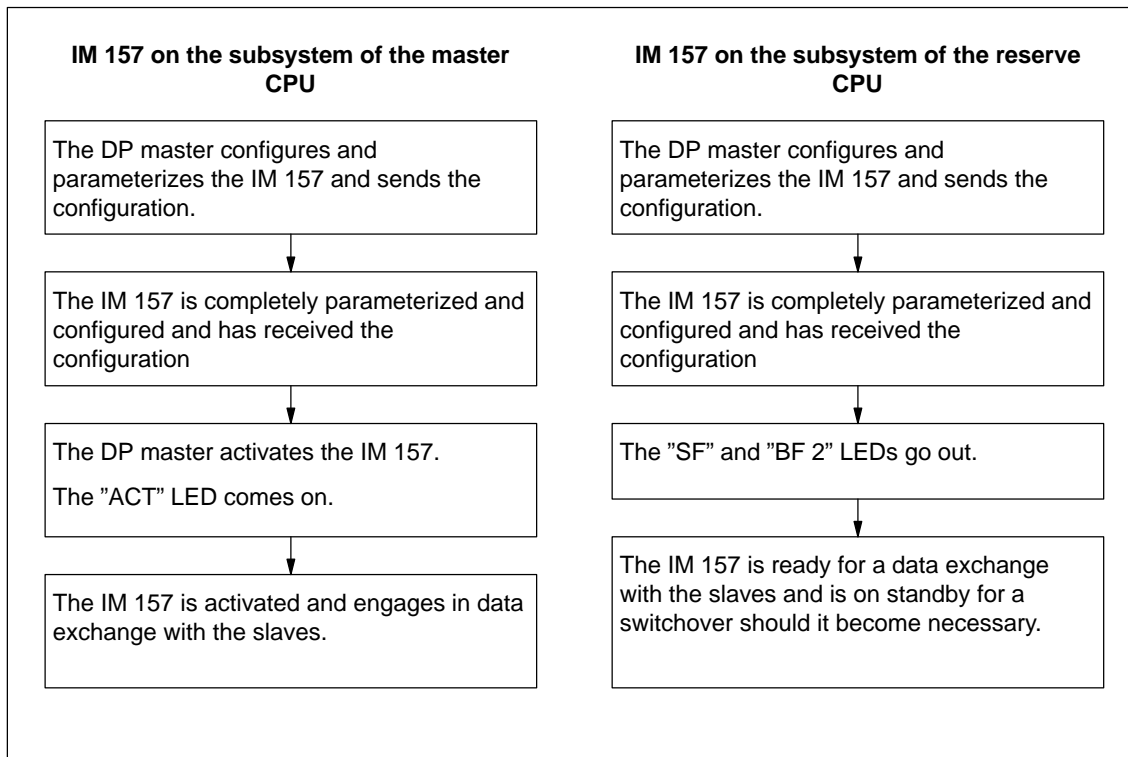


Figure 8-2 Start-up behavior of the two IM 157 modules in redundant operation

### 8.3 Behavior following specific events in redundant operation

The table below shows the behavior of the IM 157 following specific events in redundant operation.

Table 8-2 Behavior following specific events in redundant operation

Event	Reaction
Master-reserve switchover with a changed configuration	The link is switched over in a bumpless manner from the active channel to the channel that has up to now been passive.
Failure of a CPU	If this also causes the active channel of the redundant DP master system to fail: see Failure of the active channel. Otherwise: see Failure of the passive channel.
Failure of the active channel	The link is switched over in a bumpless manner from the active channel to the channel that has up to now been passive. The failed channel is indicated on the corresponding IM 157 by the "BF 1" LED.
Failure of the passive channel	No consequences for the link. The failed channel is indicated on the corresponding IM 157 by the "BF 1" LED.
Failure of an IM 157	A diagnostic message is generated in the system. If the active IM 157 fails, the link is switched over in a bumpless manner to the channel that has up to now been passive.



## 8.4 Reading and writing records

Depending on the operating mode of the DP master (S7-compatible or DPV1), records of the IM 157 and the underlying slaves can be read and written by different methods.

- Reading records with SFC 59 “RD\_REC” or SFB 52 “RDREC”
- Writing records with SFC 58 “WR\_REC” or SFB 53 “WRREC”
- Reading and writing records with a programming device/PC via communication links, e.g. with SIMATIC PDM

Table 8-3 Methods for reading and writing records

	<b>S7-compatible DP master</b>	<b>DPV1 master</b>
Records of the IM 157	<ul style="list-style-type: none"> <li>• SFC 59 “RD_REC”</li> <li>• Read with programming device/PC</li> </ul>	<ul style="list-style-type: none"> <li>• SFC 59 “RD_REC”, SFB 52 “RDREC”</li> <li>• SFC 58 “WR_REC”, SFB 53 “WRREC”</li> <li>• Read/write with programming device/PC</li> </ul>
Records of underlying slaves	<ul style="list-style-type: none"> <li>• Read/write with programming device/PC</li> </ul>	<ul style="list-style-type: none"> <li>• SFC 59 “RD_REC”, SFB 52 “RDREC”</li> <li>• SFC 58 “WR_REC”, SFB 53 “WRREC”</li> <li>• Read/write with programming device/PC</li> </ul>

### Records of the IM 157

Depending on the operating mode of the DP master (S7-compatible or DPV1), the IM 157 support reading and writing of the following records:

- On the DPV1 master:
  - Records 0 and 1 (diagnostic data, read only)
  - Records 248 ... (identification data, see Section 8.5)
- On the S7-compatible master
  - Records 0 and 1 (diagnostic data, read only)

### Parameters for SFC 58 "WR\_REC" and SFC 59 "RD\_REC"

The table below shows the required values for the call parameters, LADDR and REC\_NUM, and the error information that may be found in the return value, RET\_VAL.

Table 8-4 Call parameters for SFC 58 "WR\_REC" and SFC 59 "RD\_REC"

	LADDR	REC_NUM	Access
Diagnostic data of the IM 157	Diagnostic address of the IM 157	0 or 1	Read only
Identification data of the IM 157	Diagnostic address of the IM 157	248 ... (see Section 8.5)	Read/write
Buffered diagnostic data of an underlying slave (from the IM 157) <sup>1)</sup>	Diagnostic address of the IM 157	PROFIBUS address of the underlying slave	Read only
Any record of an underlying DPV1 slave	Logical address of the underlying slave or the underlying module	Record number <sup>2)</sup>	Read/write <sup>2)</sup>

- 1) Only on the DPV1 master and only for configured slaves  
 2) Depends on type of underlying slave or underlying module

Table 8-5 Error information of the IM 157

RET_VAL (W#16#...)	Description
0000	No error
80BB	Requested service is not supported
80BC	Node not available
80BD	Record number or faulty

The additional functions of the SFC 58 "WR\_REC", SFC 59 "RD\_REC", SFB 52 "RDREC" and SFB 53 "WRREC" are described in the STEP 7 online help.

## 8.5 Identification data

Identification data is the information that is stored in a module and that supports the user in the following tasks:

- Eliminating errors in a system
- Checking the system configuration
- Locating hardware changes in a system

The identification data can be used to positively identify modules online.

### Reading the identification data

You can access the identification data via “Read record”. The data is accessed in two steps:

1. A directory stored in record 248 lists the record numbers corresponding to the various indexes.
2. Part of the identification data is found under the respective index.

The identification data is assigned to the indexes as specified in Table 8-6.

In non-redundant operation, STEP 7 provides a convenient means of reading identification data.

Table 8-6 Identification data

Identification data	Access	Default setting	Explanation
<b>Index 1 (record 234)</b>			
Manufacturer	Read (2 bytes)	2A hex (= 42 dec)	The name of the manufacturer is stored here. (42 dec = Siemens AG)
Device name	Read (20 bytes)	6ES7 157-0AA82-0XA0	Module order number
Device serial number	Read (16 bytes)	Depends on product release	The module serial number is stored here. This allows positive identification of the module.
Hardware version	Read (2 bytes)		Provides information on the product release of the module. Is incremented if the product release and/or the firmware of the module changes.
Software version	Read (4 bytes)		Provides information on the firmware version of the module. If the firmware version is increment, the product release (hardware version) of the module also increases.
Statistical version no..	Read (2 bytes)	–	Provides information on parameterized changes on the module. The statistical version no. is incremented after each change.

Table 8-6 Identification data

Identification data	Access	Default setting	Explanation
<b>Index 2 (record 235)</b>			
TAG	Read/write (max. of 64 characters)	–	Module location identifier. Enter a code for the module that is unique throughout the entire system.
<b>Index 3 (record 236)</b>			
Installation date	Read/write (max. of 64 characters)	–	Contains the date on which the module was installed. Enter the date here. Format YYYY-MM-DD
<b>Index 4 (record 237)</b>			
Description	Read/write (max. of 64 characters)	–	Contains the module order number and space for text. You can enter additional information on the features of the module here. <b>Attention</b> Overwriting the order number may make it impossible to address the IM 157.

## 8.6 Replacing faulty modules

The table below show the steps necessary to replace a faulty IM 157, a faulty DP/PA coupler or a faulty Y coupler.

Step	Activity
1	Disconnect the power supply of the faulty module.
2	Unplug the bus connector from the PROFIBUS-DP interface of the faulty module. Or Disconnect the PROFIBUS-PA connection of the faulty DP/PA coupler.
3	Replace the faulty module.
4	Connect the bus connector with the PROFIBUS-DP interface of the new module. Or Connect the PROFIBUS-PA interface to the new DP/PA coupler.
5	Connect the power supply of the new module.

Information on compatibility regarding the exchange of modules is found in Appendix 2.7.

## 8.7 System changes during operation

### 8.7.1 System changes in S7 standard operation

The table below shows the steps necessary to add a completely new DP/PA link together with the underlying PA master system to an existing system during operation.

Step	Activity
1	Install the new DP/PA link.
2	Connect the power supply of all modules.
3	Connect the PROFIBUS-PA to the new DP/PA coupler.
4	Connect the bus connector of the DP master system to the PROFIBUS-DP interface of the new IM 157.

The overall procedure for making a system change and the prerequisites that must be met to do so are described in detail in the function manual, *System Changes during Operation via CiR*.

## 8.7.2 System changes in redundant operation

The table below shows the steps necessary to add a completely new DP/PA link or Y link together with the underlying master system to an existing system during operation.

Step	Activity	
1	Install the new link.	
2	Connect the power supply of all modules.	
3	<p><b>DP/PA link only</b></p> <p>Connect the PROFIBUS-PA to the new DP/PA coupler.</p>	<p><b>Y link only</b></p> <p>Connect the bus connector of the underlying DP master system to the PROFIBUS-DP interface of the new Y coupler.</p>
4	Connect the bus connector of the active channel of the redundant DP master system to the PROFIBUS-DP interface of one of the two IM 157 modules.	
5	Connect the bus connector of the passive channel to the PROFIBUS-DP interface of the other IM 157.	

This procedure is summarized under “Reconfiguring hardware” in the section entitled “System changes during operation” in the *S7-400H Automation System, High-Availability Systems* manual. Here you will also find a detailed description of the overall procedure for making a system change.

## 8.8 IM 157 firmware update

A firmware update is available for IM 157 as of order number 6ES7 157-0AA82-0XA0. You will require STEP 7, version V5.2 or higher.

A firmware update is **not** possible in the DP/PA link in redundant operation and in the Y link.

### When should you upgrade the IM 157 firmware?

You should upgrade the IM 157 to the newest firmware version after a (compatible) enhancement of functions or after improvements to the performance.

## Where can you acquire the newest firmware version?

The newest firmware version is available from your Siemens partner or on the Internet:

<http://www.siemens.com/automation/service&support>

Tip: Note down the version of the current firmware

- Note down the previous firmware version before updating it.
- Should you encounter problems with the new firmware, you can then download the previous firmware version from the Internet and reload it onto the IM 157.

## Prerequisites

- The IM 157 that is to be updated must be operated on a DPV1 master.
- The IM 157 must be accessible online from the programming device/PC. The following methods are available:
  - Directly via PROFIBUS-DP (accessible nodes)
  - Via MPI to the CPU and then via PROFIBUS-DP
- The files with the new firmware version must be available in the file system of your programming device/PC.

## Procedure

The update procedure depends on the communication path that is used:

### Directly via PROFIBUS-DP

In the SIMATIC manager, select the “Target system > Accessible nodes” menu command. Highlight the required IM 157 in the displayed list and select the “Target system > PROFIBUS > Update firmware” menu command.

### Via MPI to the CPU and then via PROFIBUS-DP

Open the HW Config and highlight the required IM 157. Select the “Target system > Update firmware” menu command.

The rest of the procedure is described in the STEP 7 online help.

You can select whether the new firmware should be activated immediately after a successful update or not until after the power is switched off and on.

After a successful update, apply a label with the new IM 157 firmware version over the old version.

## Update not successful

If the update fails, the IM 157 will always start up with the previous (“old”) firmware after the power supply is switched off and on.

## Example of a configuration

### Update directly via PROFIBUS-DP

The programming device/PC with the update files is connected directly to the PROFIBUS interface of the IM 157 (see Figure 8-3).

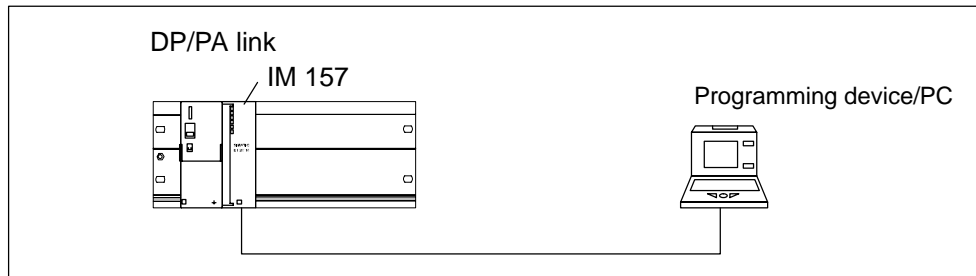


Figure 8-3 Update directly via PROFIBUS-DP (programming device/PC is connected directly to the IM 157)

### Update via MPI to CPU and then via PROFIBUS-DP

The programming device/PC with the update files is connected to the MPI interface of the CPU. The IM 157 is connected to the second interface of the CPU via PROFIBUS-DP (see Figure 8-4). The IM 157 must be integrated in the STEP 7 project on the CPU.

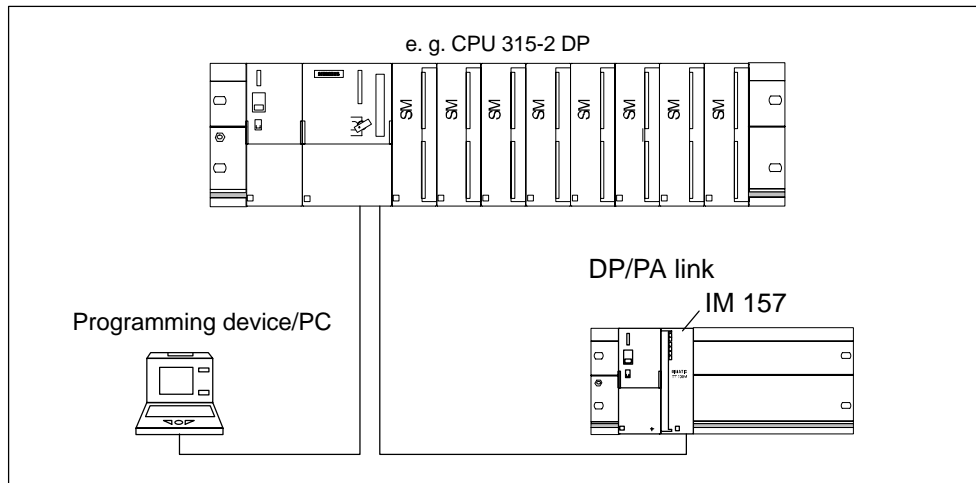


Figure 8-4 Update via MPI to the CPU and then via PROFIBUS-DP (programming device/PC is connected to the CPU)



## Diagnostics Using LEDs

### Overview of contents

This chapter describes the meanings of the LED displays on the IM 157, the DP/PA coupler and the Y coupler. If the LEDs indicate an error condition, the possible causes and suggested corrective measures are provided in tables.

Section	Topic	Page
9.1	LED displays of the IM 157	9-2
9.2	LED displays of the DP/PA coupler	9-5
9.3	LED displays of the Y coupler	9-6

## 9.1 LED displays of the IM 157

PA field devices and DP slaves communicate on the same basis. Therefore, we will use the following simplified terminology in this section:

- “Slaves” stands for both the PA field devices and the underlying DP slaves.
- “Underlying master system” stands for both the PA master system and the underlying DP master system.






Table 9-1 Status and error messages of the IM 157

LEDs					Meaning	What to do
SF	BF 1	BF 2	ACT	ON		
Off	Off	Off	Off	Off	<ul style="list-style-type: none"> <li>• No voltage present at IM 157.</li> <li>• Applied supply voltage is not within permissible range.</li> <li>• Hardware error in IM 157</li> </ul>	<ul style="list-style-type: none"> <li>• Switch the power supply module on.</li> <li>• Check the applied voltage.</li> <li>• Replace the IM 157.</li> </ul>
*	*	*	*	On	Voltage present at IM 157.	–
On	On	On	On	On	All LEDs come on for approximately 1 second. The IM 157 is starting up.	–
Flashes (quickly)	Flashes (quickly)	Flashes (quickly)	Flashes (quickly)	Flashes (quickly)	Error within IM 157.	Set the DIP switch of the IM 157 to address 127 (see Chapter 6.4) and read out bytes 102 to 117 from the diagnostic frame. Contact your Siemens partner and have this information on hand.
Off	Off	Off	Off	On	In non-redundant operation: The IM 157 is engaged in data exchange with the DP master and the underlying slaves.	–
Off	Off	Off	Off	On	Redundant operation: The IM 157 is passive and can be switched over.	–
Off	Off	Off	On	On	Non-redundant operation only: The IM 157 is active and engaged in data exchange with the DP master and the underlying slaves.	–

Table 9-1 Status and error messages of the IM 157

LEDs					Meaning	What to do
SF	BF 1	BF 2	ACT	ON		
SF		SF:	Group error (red)			
BF 1		BF 1:	Bus fault in higher level PROFIBUS-DP (red)			
BF 2		BF 2:	Bus fault in underlying PROFIBUS (red)			
ACT		ACT:	IM 157 has an active channel (yellow)			
ON		ON:	24V power supply IM 157 (green)			
Off	Off	Flashes (quickly)	*	On	Power-up delay is active on the IM 157.	If the IM 157 does not complete startup within 20 seconds, check in the configuration whether start-up is enabled for desired layout $\neq$ actual layout.
*	Off	On	Off	On	Non-redundant operation: IM 157 configuration missing	Check whether the CPU or the DP master are in RUN mode.
					Redundant operation: The IM 157 is passive and cannot be switched over yet.	Check whether the H system is in redundancy mode.**
*	On	*	Off	On	No connection to the DP master. Possible causes: <ul style="list-style-type: none"> <li>The bus communication to the IM 157 has been interrupted.</li> <li>The DP master is not in operation.</li> </ul>	<ul style="list-style-type: none"> <li>Check that the bus connector is correctly inserted.</li> <li>Check if the interconnecting cable to the DP master has been interrupted.</li> <li>Switch the 24V DC switch on the power supply module off and then on again.</li> </ul>
*	Flashes	*	Off	On	There is no data exchange between the DP master and the IM 157.	<ul style="list-style-type: none"> <li>Check the configuration.</li> <li>Check the PROFIBUS address.</li> </ul>

Table 9-1 Status and error messages of the IM 157

SF		SF:	Group error (red)
BF 1		BF 1:	Bus fault in higher level PROFIBUS-DP (red)
BF 2		BF 2:	Bus fault in underlying PROFIBUS (red)
ACT		ACT:	IM 157 has an active channel (yellow)
ON		ON:	24V power supply IM 157 (green)

LEDs					Meaning	What to do
SF	BF 1	BF 2	ACT	ON		
On	Off	Off	Off	On	<p>Non-redundant operation: All slaves are engaged in data exchange. At least one slave has reported an error.</p> <p>Or</p> <p>Invalid PROFIBUS address</p>	<p>Evaluate the diagnosis of the IM 157 and check the reported slaves.</p> <p>DP/PA link only: Check the status bytes in the slave user data. Read the slave device mode with a configuration tool (e. g. SIMATIC PDM).</p> <p>Or</p> <p>Set a valid PROFIBUS address for the IM 157.</p>
					<p>Redundant operation: The IM 157 is passive and can be switched over. There is an error on the active IM 157.</p>	<p>Evaluate the LED on the active IM 157.</p>
On	Off	Off	On	On	<p>Redundant operation only: The IM 157 is active. All slaves are engaged in data exchange. At least one slave has reported an error.</p>	<p>Evaluate the diagnosis of the IM 157 and check the reported slaves.</p> <p>Evaluate the diagnosis of the underlying slaves in the on-line view of the HW Config.</p> <p>DP/PA link only: Check the status bytes in the slave user data. Read the slave device mode with a configuration tool (e. g. SIMATIC PDM).</p>
On	Off	Flashes	*	On	<p>The configured structure of the link does not correspond to the actual structure.</p> <p>Or</p> <p>The IM 157 has no cyclical data exchange to at least configured one slave.</p>	<p>Check the configuration and structure of the links.</p> <p>Or</p> <p>Evaluate the diagnosis of the IM 157 and check the reported slaves (connection, address, parameter assignment, configuration).</p>

\* Not applicable

\*\* The "SF" LED continues flashing for another 20 seconds after the system has switched into redundancy mode.

## 9.2 LED displays of the DP/PA coupler

Table 9-2 Status and error messages of the DP/PA coupler

LEDs			Meaning	What to do
DP	PA	ON		
DP	PA	ON	DP: PROFIBUS-DP bus monitoring (yellow) PA: PROFIBUS-PA bus monitoring (yellow)  ON: 24V power supply DP/PA coupler (green)	
*	*	On	Power is supplied to the DP/PA coupler. The DP/PA coupler is ready for operation.	–
*	*	Off	Voltage not present at DP/PA coupler, Or Error in the DP/PA coupler.	Check the 24V power supply to the DP/PA coupler, Or Get in touch with your Siemens partner.
*	*	Flashes	PROFIBUS-PA overload	Check the number of connected PA field devices and their total current.
Flashes	*	On	PROFIBUS-DP frames are being received.	–
Off	*	On	PROFIBUS-DP frames are not being received. Causes: <ul style="list-style-type: none"> <li>• The DP master is not in operation.</li> <li>• The bus cable is damaged.</li> <li>• The bus modules are not properly connected.</li> <li>• Connector for backplane bus is defective.</li> </ul>	<ul style="list-style-type: none"> <li>• Check whether the bus connector is properly connected.</li> <li>• Check if the interconnecting cable to the DP master has been interrupted.</li> <li>• Check whether the bus modules are properly connected.</li> <li>• Check the 24V power supply to the DP/PA coupler.</li> </ul>
*	Flashes	On	PROFIBUS-PA frames are being received.	–
*	Off	On	PROFIBUS-PA frames are not being received. For example: <ul style="list-style-type: none"> <li>• The voltage on the PROFIBUS-PA is not within the permissible range (short circuit, overload).</li> <li>• No response from a PA field device. Possibly the PA field device is not being addressed.</li> </ul>	<ul style="list-style-type: none"> <li>• Check the PA field devices on the PROFIBUS-PA.</li> <li>• Check whether the bus segments are properly terminated.</li> </ul>

\* Not applicable

### 9.3 LED displays of the Y coupler

Table 9-3 Status messages of the Y coupler

LEDs			Meaning	What to do
BF 1	BF 2	ON		
Off	Off	Off	No voltage present at Y coupler.	Switch on the IM 157 power supply. If the <b>ON</b> LED does not light up when the IM 157 power supply is switched on: Replace the IM 157 due to a faulty internal power supply.
Off	Off	On	Voltage at Y coupler. The Y coupler is ready for operation. There is no data exchange between the internal and underlying DP master system.	<ul style="list-style-type: none"> <li>• Check whether the bus connector is properly connected.</li> <li>• Check if the bus cable to the underlying DP master system has been interrupted.</li> <li>• Check whether the bus modules are properly connected.</li> </ul>
On	Off	On	Frames from the underlying DP master system are not being received, e. g.: <ul style="list-style-type: none"> <li>• The connection to the underlying DP master system is interrupted.</li> <li>• DP slaves are not responding.</li> </ul>	<ul style="list-style-type: none"> <li>• Check whether the underlying DP master system is properly connected (the bus connector is attached and the two bus terminating resistors are connected in if necessary).</li> <li>• Check the connected DP slaves.</li> </ul>
*	On	On	Data is being exchanged between the internal and underlying DP master systems (at a high transmission rate).	–
On	*	On		
*	Flashes	On	Data is being exchanged between the internal and underlying DP master systems (at a low transmission rate).	–
Flashes	*			

\* Not applicable

# Diagnostics Using the User Program

# 10

## Overview of contents

This chapter describes the structure of the IM 157 diagnosis. An example is used to illustrate the evaluation of a diagnostic frame.

Section	Topic	Page
10.1	Structure of the slave diagnosis	10-2
10.2	Structure of the diagnostic blocks	10-4
10.3	Reading out the diagnosis from the underlying slaves	10-17
10.4	Example of a diagnosis in redundant operation	10-18

Some of the following details apply to both the DP/PA link with its PA field devices and to the Y link with its underlying DP slaves. In these instances, the following terminology will be used in the interest of clarity:

- “Link” stands for both the DP/PA link and the Y link.
- “Slaves” stands for both the PA field devices and the underlying DP slaves.
- “Underlying master system” stands for both the PA master system and the underlying DP master system.

## Slave diagnosis

Slave diagnosis is performed in accordance with IEC 61784-1:2002 Ed1 CP 3/1. Depending on the DP master, it can be read out with STEP 7, SIMATIC PDM or other configuration tools.

In STEP 7, the diagnostic frames of the underlying DP slaves can be displayed in the online view of the HW Config. See “Diagnosing hardware” in the STEP 7 online help.

Additional methods of reading out diagnostic information are described in the *SIMATIC Software; Programming with STEP 7 V5.x* manual.

## 10.1 Structure of the slave diagnosis

### Influencing factors

The structure of the slave diagnosis depends on whether the IM 157 is in S7 standard operation, in redundant operation on an S7-400H or in DP standard master operation.

### Diagnostic blocks in S7 standard operation and in redundant operation

The table below shows the length of the diagnostic blocks and their start addresses in the diagnostic frame.

Table 10-1 Length and start addresses of the diagnostic blocks in S7 standard operation and in redundant operation

Diagnostic block	Length in bytes	Start address in non-redundant mode	Start address in redundant mode
Standard diagnosis	6	0	0
Module diagnosis	31	6	6
Module status	63	37	37
Status message	60	100	100
H Status	8	–	160
Interrupt section	(max. 63*)	(160*)	(168*)
Total length		160 (max. 223*)	168 (max. 231*)

\*) Only if interrupts are reported

### Diagnostic blocks in DP standard master operation

As of version 4, when the IM 157 is being configured via the device master file, each diagnostic block (except for the standard diagnosis) can be selected to be present or not. The sequence of the diagnostic blocks is fixed. The start address of the individual diagnostic blocks in the diagnostic frame depends on which diagnostic blocks have been selected.

The table below shows the length of the diagnostic blocks and examples of their start addresses in the diagnostic frame for certain configurations.



Table 10-2 Length and start addresses of the diagnostic blocks in DP standard master operation

Diagnostic block	Length in bytes	Example 1		Example 2	
		Selected	Start address	Selected	Start address
Standard diagnosis	6	Always	0	Always	0
Module diagnosis	31	X	6	–	–
Module status	63	X	37	X	6
Status message	60	–	–	–	–
Interrupt section	(max. 63*)	–	–	X	(69*)
Total length	160 (max. 223*)	100		69 (max. 132*)	

\*) Only if interrupts are reported

## 10.2 Structure of the diagnostic blocks

### 10.2.1 Standard diagnosis

The standard diagnosis consists of 6 bytes and is subdivided as follows:

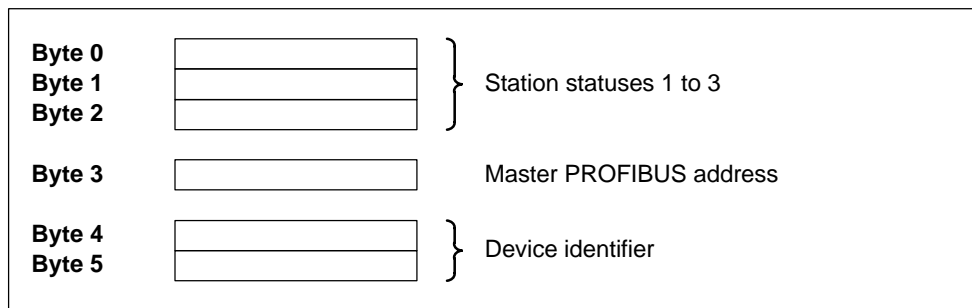


Figure 10-1 Structure of the standard diagnosis

#### Station status 1 to 3

Station statuses 1 to 3 provide an overview of the status of the IM 157.

Table 10-3 Structure of station status 1

Bit	Meaning	Cause/remedy
0	1: The IM 157 cannot be addressed by the DP master.	<ul style="list-style-type: none"> <li>• Has the correct PROFIBUS address been set on the IM 157?</li> <li>• Is the bus connector connected?</li> <li>• Voltage present at the IM 157?</li> </ul>
1	1: The IM 157 is not yet ready to exchange data.	<ul style="list-style-type: none"> <li>• Wait while the IM 157 starts up.</li> </ul>
2	1: The configuration data sent by the DP master to the IM 157 does not correspond to the configuration of the IM 157.	<ul style="list-style-type: none"> <li>• Is the correct station type or correct configuration of the IM 157 entered in the configuration software?</li> </ul>
3	1: External diagnosis available. (Group diagnosis display)	<ul style="list-style-type: none"> <li>• Evaluate the module diagnosis, the module status and/or the status message. Bit 3 is reset as soon as all faults have been rectified. The bit is reset when there is a new diagnostic message in the bytes of the above-mentioned diagnoses.</li> </ul>
4	1: The function requested is not supported by the IM 157 (e.g. SYNC and FREEZE).	<ul style="list-style-type: none"> <li>• Check the configuration.</li> </ul>

Table 10-3 Structure of station status 1, continued

Bit	Meaning	Cause/remedy
5	1: The DP master cannot interpret the response from the IM 157.	<ul style="list-style-type: none"> <li>Check the bus configuration.</li> </ul>
6	1: The configured station type does not correspond to the IM 157.	<ul style="list-style-type: none"> <li>Is the correct station type entered in the configuration software?</li> </ul>
7	1: The parameters have been assigned to the IM 157 by a different DP master (not by the DP master that currently has access to the IM 157).	<ul style="list-style-type: none"> <li>The bit is always set to 1 when, for instance, you are accessing the IM 157 using the programming device or another DP master. The PROFIBUS address of the DP master that parameterized the IM 157 is contained in the "master PROFIBUS address" diagnostic byte.</li> </ul>

Table 10-4 Structure of station status 2

Bit	Meaning
0	1: Parameters have to be reassigned to the IM 157.
1	0: This bit is always set to "0".
2	1: This bit is always set to "1" when the IM 157 with this PROFIBUS address is present.
3	1: The response monitor has been enabled for the IM 157.
4	0: This bit is always set to "0".
5	0: This bit is always set to "0".
6	0: This bit is always set to "0".
7	1: The IM 157 is disabled, i.e. it has been removed from current processing.

Table 10-5 Structure of station status 3

Bit	Meaning
0 to 7	0: These bits are always set to "0".

### Master PROFIBUS address

Byte 3 of the standard diagnosis contains the PROFIBUS address of the DP master that parameterized the IM 157 and that has read and write access to the IM 157.

## Device identifier

The device identifier is a code that uniquely identifies the DP slave (PROFIBUS ID number).

Table 10-6 Structure of the device identifier

Byte 4	Byte 5	Designation
80 <sub>H</sub>	52 <sub>H</sub>	IM 157

### 10.2.2 Module diagnosis

The module diagnosis identifies the IM 157 slots for which there is a diagnosis.

#### The terms slave, module and slot

A slave is a bus node that can be accessed via a separate PROFIBUS address. It can physically or logically consist of one or more modules. The slaves and their modules are depicted in the module diagnosis in virtual slots:

- A non-modular slave always occupies two slots.  
The first slot represents a “virtual header module” and the second a “virtual module”.
- A modular slave that consists of x modules occupies x+1 slots.  
The first slot is assigned to the header module; the remaining slots are assigned in ascending order to the individual modules.

#### Example of a slot assignment

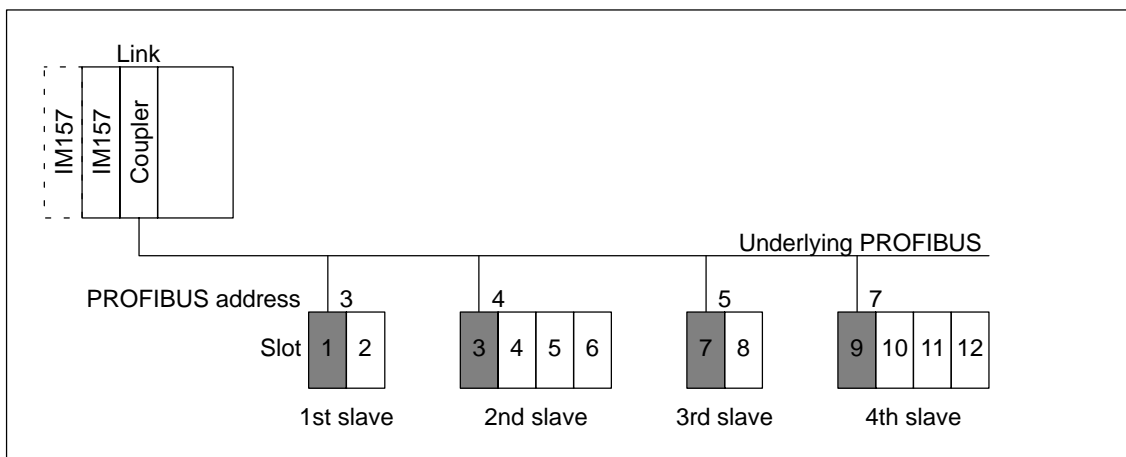


Figure 10-2 Example of a slot assignment

### Structure of the module diagnosis

The module diagnosis comprises 31 bytes.

Each slave slot occupies one bit. The slaves are arranged in ascending order by their PROFIBUS addresses.

A bit is set if:

- the corresponding slave for the respective slot delivers a module diagnosis, or
- the corresponding configured slave is not engaged in data exchange with the DP master.

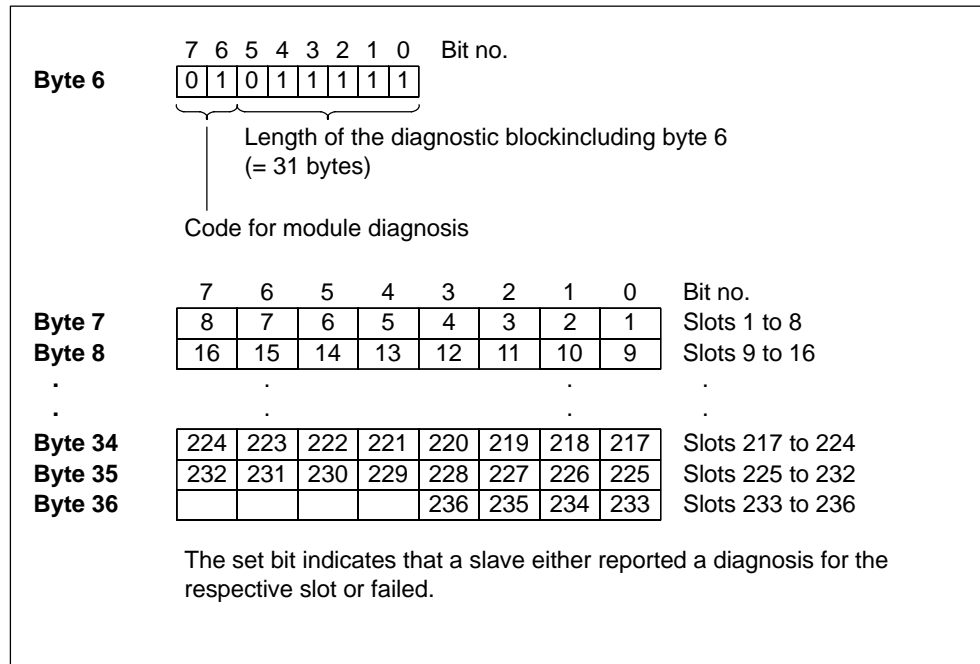


Figure 10-3 Structure of the module diagnosis

### 10.2.3 Module status

The module status is part of the station diagnosis and indicates the status of the configured modules.

#### Structure of the module status

The module status consists of 63 bytes.

In the module status, the status is encoded by means of two bits for each slot (see Section 10.2.2).

The following applies to the entry in the module status:

- If an underlying slave delivers its own module status in its diagnosis, this status is copied to the appropriate location.
- If an underlying slave delivers a module diagnosis but not the module status, the status 01<sub>B</sub> "Module fault" is entered for a faulty identifier.
- If an underlying slave delivers neither its own module status nor a module diagnosis, the status is entered as follows:
  - For error-free operation: 00<sub>B</sub> "Module OK"
  - For configuration error: 10<sub>B</sub> "Incorrect module"
  - For missing slave: 11<sub>B</sub> "No module"
  - For all other errors (e.g. "Prm\_Fault"): 01<sub>B</sub> "Module faulty"

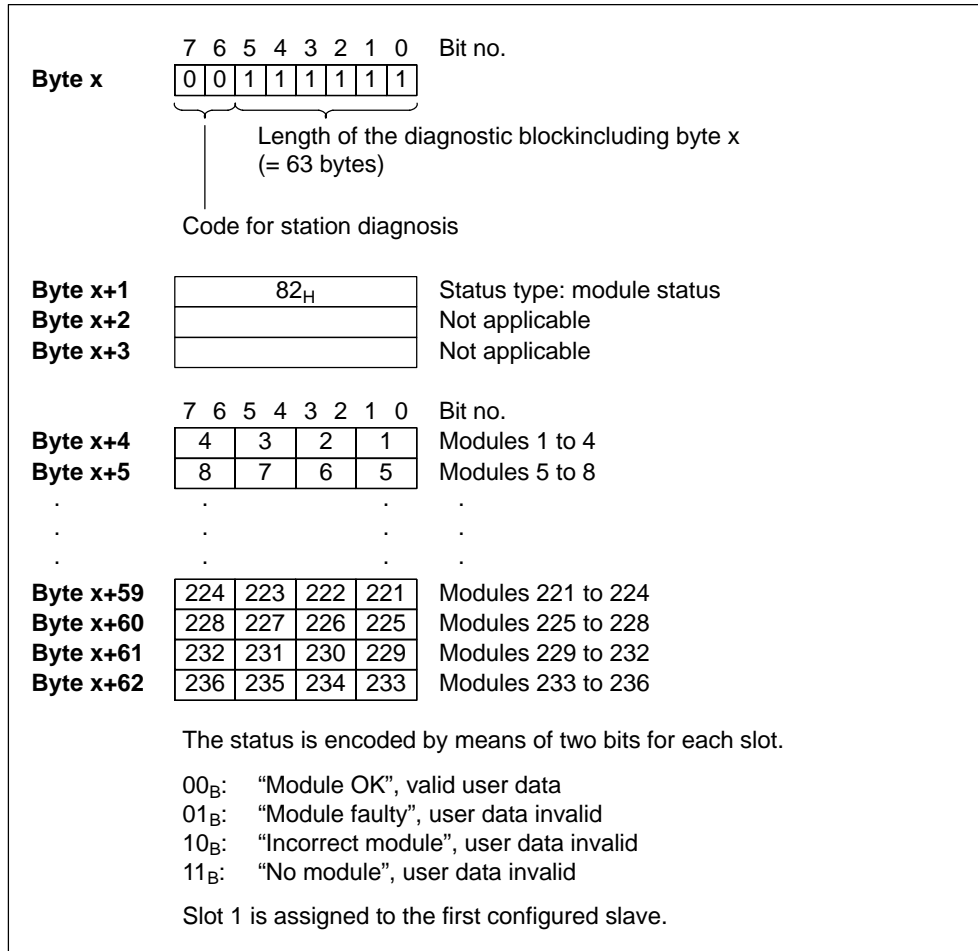


Figure 10-4 Structure of the module status

Start address x is 37 for both S7 standard operation and redundant operation; in DP standard master operation, it is dependent on which diagnostic blocks are present (see Table 10-2).

### 10.2.4 Status message

The status message is part of the station diagnosis and delivers the following information:

- Underlying slaves that have reported diagnosis
- Underlying slaves that are engaged in data exchange
- State of the IM 157 as master of the underlying PROFIBUS

## Structure of the status message

The status message consists of 60 bytes.

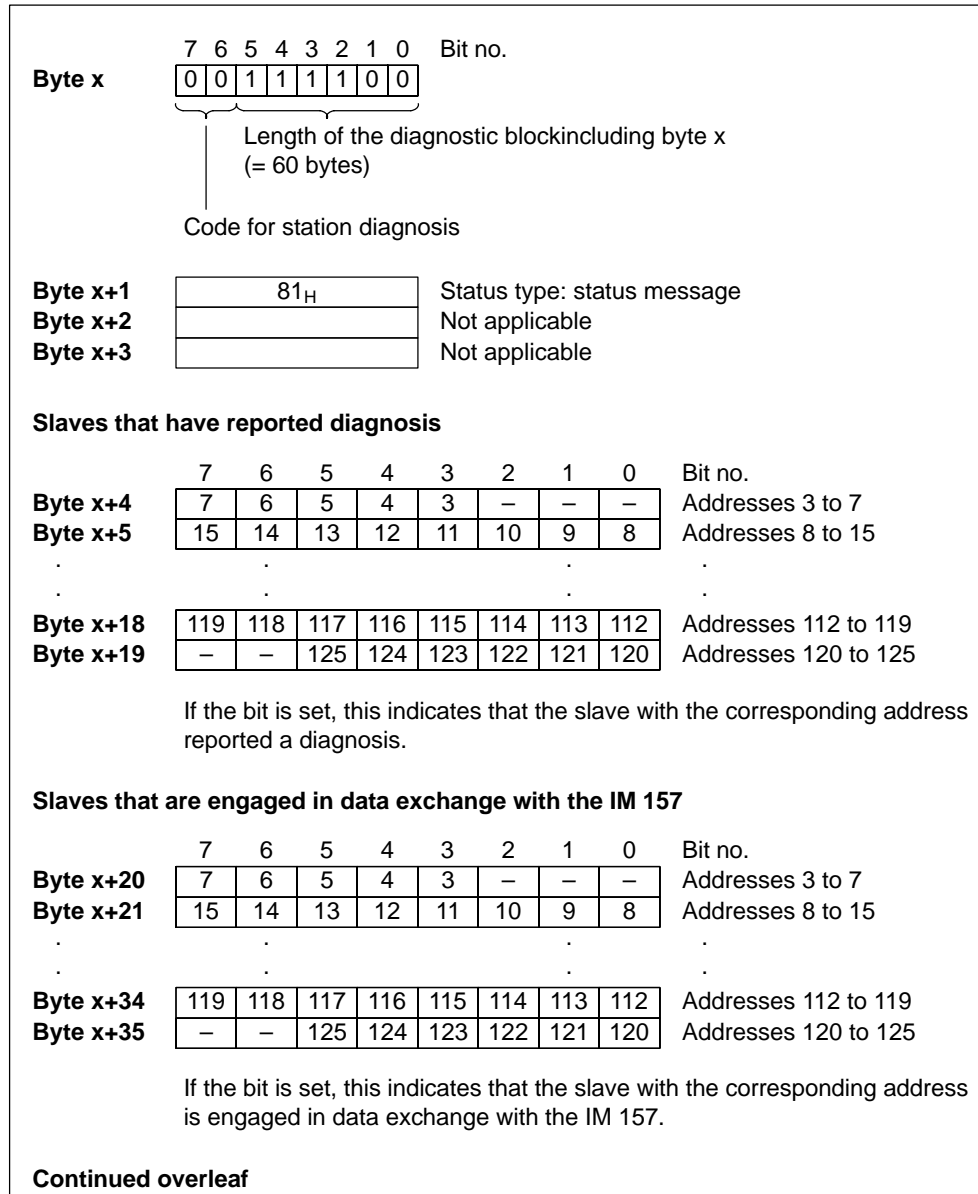


Figure 10-5 Structure of the status message

Start address x is 100 for both S7 standard operation and redundant operation; in DP standard master operation, it is dependent on which diagnostic blocks are present (see Table 10-2).



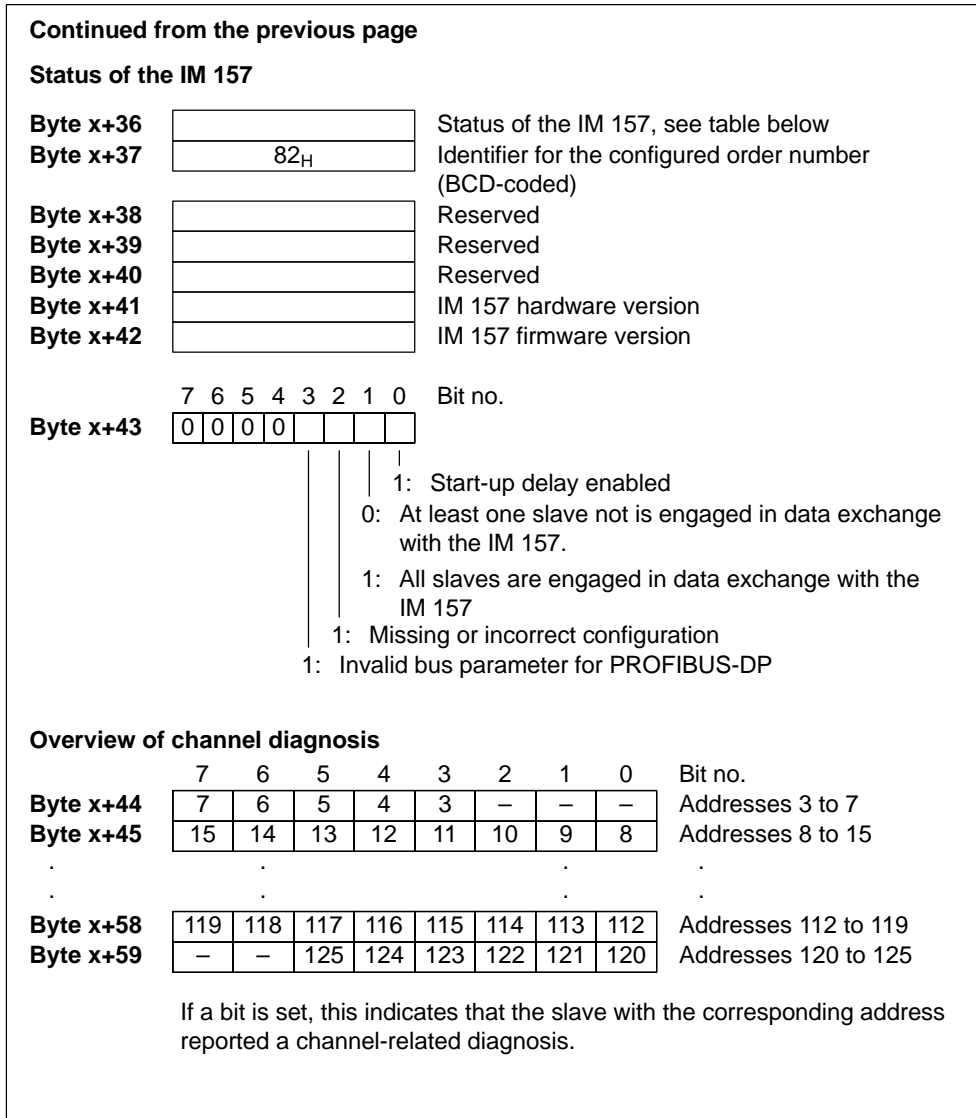


Figure 10-6 Structure of the status message, continued

Table 10-7 Meaning of byte x+36 in the status message

Byte x+36	Status	Meaning
00 <sub>H</sub>	OFF	There is no data exchange between the IM 157 and the underlying slaves. The IM 157 can neither receive nor forward the token.
40 <sub>H</sub>	STOP	There is no data exchange between the IM 157 and the underlying slaves. The IM 157 can receive and forward the token
80 <sub>H</sub>	CLEAR	The IM 157 reads the input data cyclically. Output data are kept in a safe status or are set to "0". The IM 157 can receive and forward the token.
C0 <sub>H</sub>	RUN (OPERATE)	The IM 157 reads the input data of the slaves cyclically and forwards the output data to the slaves. The IM 157 can receive and forward the token.

## 10.2.5 H status

The IM 157 delivers the H status only if it is connected to the redundant DP master system of an S7-400H. The H status reports on the status of the active and passive IM 157. The H status consists of 8 bytes.

### Structure of the H status

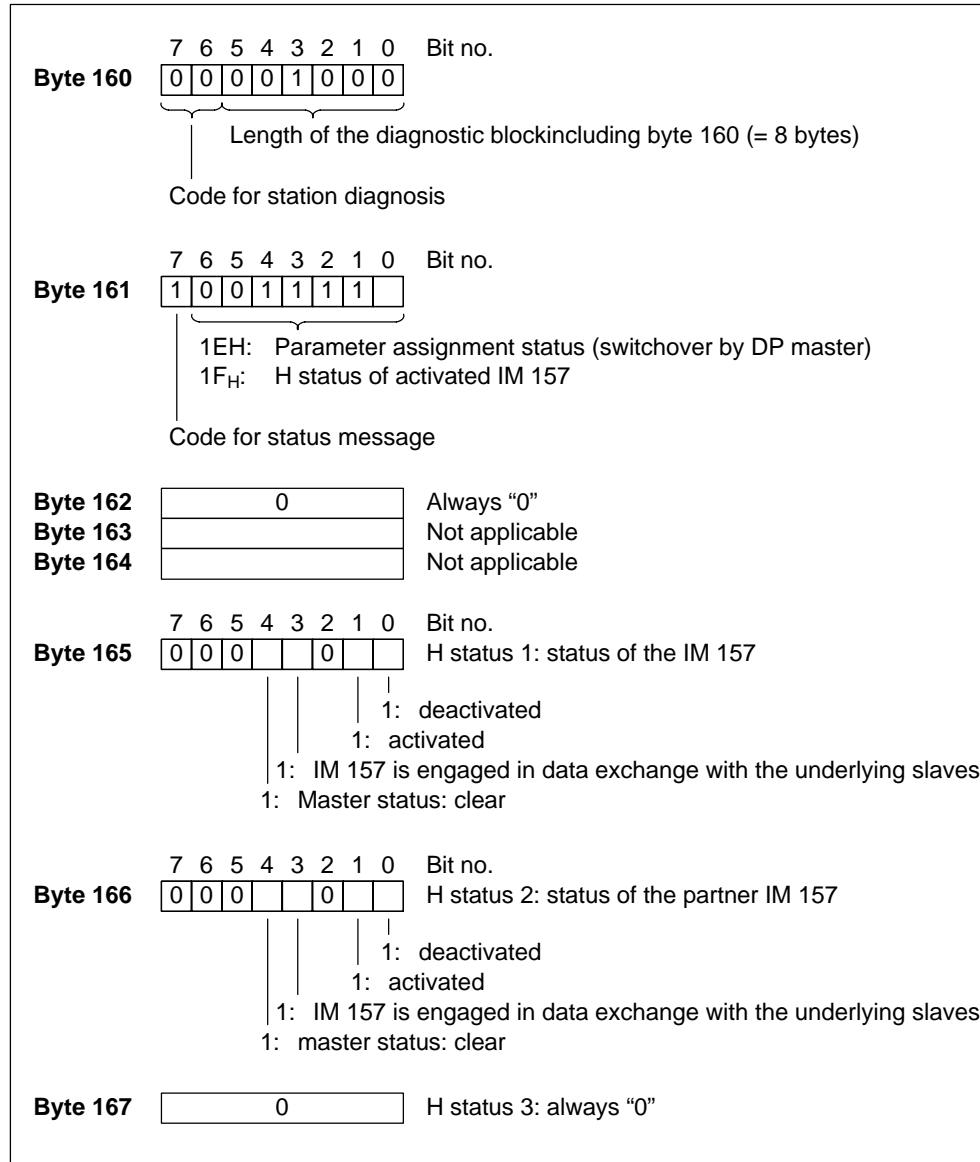


Figure 10-7 Structure of the H status of the IM 157 in redundant operation on the S7-400H

## 10.2.6 Interrupts

The interrupt section provides information on the interrupt type and the event that triggered the interrupt. The interrupt section is only transmitted if an interrupt is present

### Structure of the interrupt section

The structure of the interrupt section depends on which DP master the IM 157 is being operated on:

- On a DPV1-capable DP master, the interrupt section consists of a maximum of 63 bytes.
- On a redundant S7 master **not** capable of DPV1, the interrupt section consists of 20 bytes.

### Structure of the interrupt section on the redundant S7 master that is not capable of DPV1

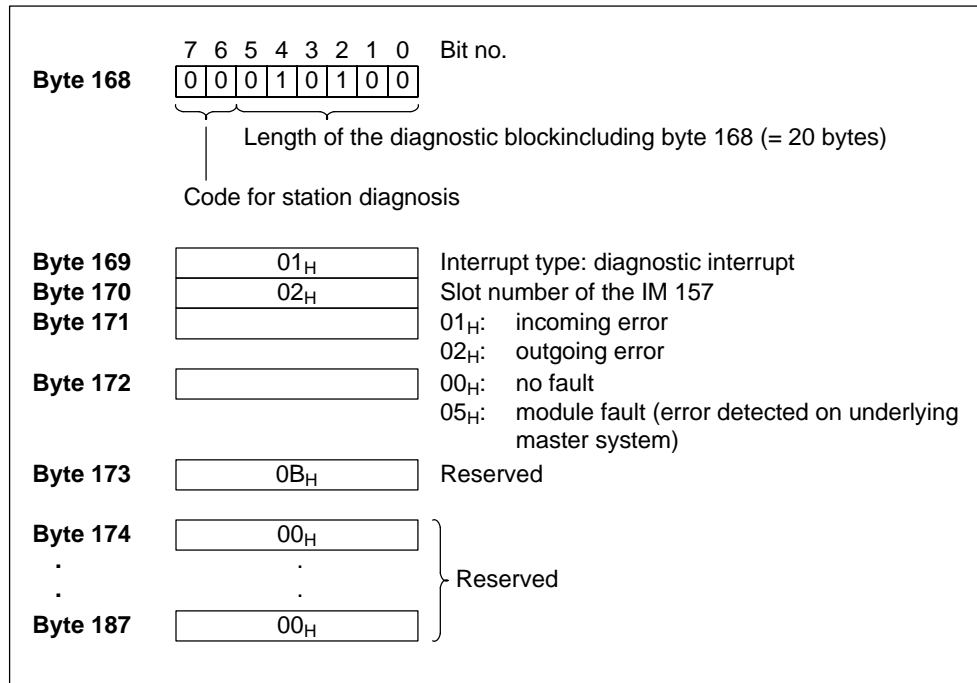


Figure 10-8 Structure of the interrupt section on the redundant S7 master that is not capable of DPV1

### Structure of the interrupt section on the DPV1-capable DP master

The interrupt section consists of an interrupt header and the additional interrupt function. The interrupt header always consists of four bytes. The structure of the additional interrupt function depends on the interrupt type. Its length is a maximum of 59 bytes.

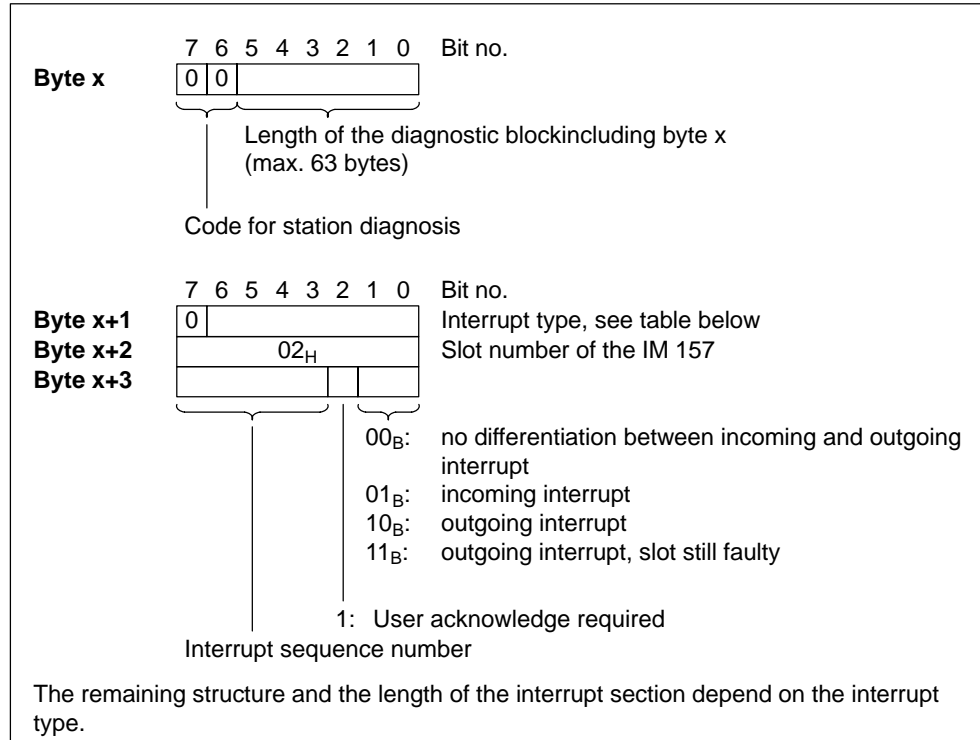


Figure 10-9 Structure of the interrupt header on the DPV1-capable DP master

Start address x is 168 in redundant operation and 160 in DP standard master operation.

### Interrupt type

Table 10-8 Interrupt m type (byte x+1 in interrupt section)

Byte x+1	Interrupt type	Byte x+1	Interrupt type
00 <sub>H</sub>	Reserved	05 <sub>H</sub>	Status interrupt *)
01 <sub>H</sub>	Diagnostic interrupt	06 <sub>H</sub>	Update interrupt *)
02 <sub>H</sub>	Process interrupt *)	07 <sub>H</sub> to 1F <sub>H</sub>	Reserved
03 <sub>H</sub>	Removal interrupt	20 <sub>H</sub> to 7E <sub>H</sub>	Manufacturer-specific interrupt *)
04 <sub>H</sub>	Insertion interrupt	7F <sub>H</sub>	Reserved

\*) These interrupt types only occur if they are generated by an underlying DPV1 slave and passed on by the IM 157 (interrupt routing, see below).

### Diagnostic interrupt

When a DPV0 slave or a DPV1 slave not capable of interrupts reports a diagnosis on the underlying master system, the IM 157 initiates a diagnosis interrupt on the higher level DP master system ("proxy diagnosis interrupt").

The diagnostic frame of the slave is stored in the additional interrupt information. If this frame is longer than 59 bytes, the information beginning with the 60th byte is discarded. In addition, bit 7 (Ext\_Diag\_Overflow) is set in the third passed byte (byte x+6).

The diagnosis of an interrupt-capable DPV1 slave that is operated in the DPV1 mode does not lead to a diagnostic interrupt.

### Insertion/removal interrupt

If a slave fails or is restored on the underlying master system, the IM 157 initiates an insertion or removal interrupt on the higher level DP master system.

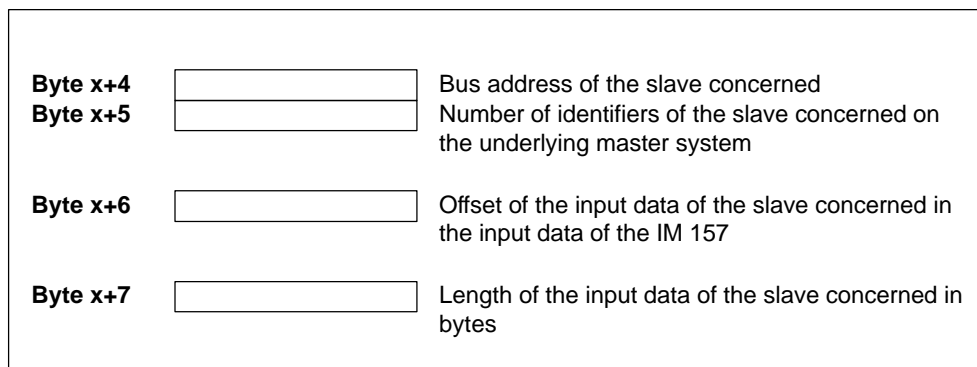


Figure 10-10 Structure of the additional interrupt information for the insertion/removal interrupt

Start address x is 168 in redundant operation and 160 in DP standard master operation.

For modular slaves, the additional interrupt information refers to the entire slave and not to the individual modules.

Insertion/removal interrupts are not reported until after the start-up delay has elapsed. Removal interrupts that occur before that point are processed later, whereas insertion interrupts are discarded.

## Interrupt routing

If an interrupt-capable DPV1 slave initiates an interrupt on the underlying master system, the interrupt is passed on to the higher level DP master system by the IM 157.

The interrupt header and additional interrupt information of the slave are stored in the interrupt section of the IM 157. With the exception of slot number and sequence number, this information remains unchanged.

## 10.3 Reading out the diagnosis from the underlying slaves

The diagnostic data of underlying slaves capable of diagnostics that is buffered in the IM 157 can be read out via the SFC 59 "RD\_REC".

### Prerequisites

The link must be operated on a DPV1 master.

### Parameters for SFC 59 "RD\_REC"

The table below shows the required values for the call parameters of the SFC 59 "RD\_REC".

Table 10-9 Call parameters for SFC 59 "RD\_REC"

Parameters	Value, meaning
IOID	B#16#54 (I/O input PE)
LADDR	Diagnostic address of the IM 157 from the HW Config
RECNUM	Node number of the slave whose diagnosis is to be read

The error information that may be found in the RET\_VAL return value are listed in Table 8-5.

## 10.4 Example of a diagnosis in redundant operation

### Introduction

This example shows the call of a typical diagnosis of the active IM 157 in redundant operation.

### 10.4.1 Task

The following assumptions have been made for this example:

- Both IM 157 have the diagnostic address 3FE<sub>H</sub>.
- The underlying PROFIBUS master system consists of 4 configured slaves
- Slaves have the addresses 4, 8, 12 and 20
- Configuration of the slaves:
  - Slave 4 is a non-modular slave
  - Slave 8 consists of one header module and 6 modules
  - Slave 12 consists of one header module and 2 modules
  - Slave 20 consists of one header module and 3 modules
- All configured slaves are engaged in data exchange with the active IM 157.
- Slave 8 reports a diagnosis:
  - Modules 1 and 3 report diagnoses
  - Module 1 reports a limit violation
  - Module 3 reports an incorrect configuration



## 10.4.2 Solution with STEP 7

### Call of the SFC 13

Call up the OB 1 SFC 13 (DPNRM\_DG) in OB 1 and thereby read out the diagnostic data from the IM 157.

Table 10-10 Call of the SFC 13 (DPNRM\_DG) in the OB 1

STL	Explanation
CALL SFC 13	
REQ :=TRUE	//Request to read the diagnostic data
LADDR :=W#16#3FE	//Diagnostic address of the IM 157
RET_VAL :=MW0	//RET_VAL of SFC 13
RECORD :=P#DB10.DBX 0.0 BYTE 190	//Data mailbox for the diagnosis in DB10
BUSY :=M2.0	//Read operation runs through several OB1 cycles

With this call, the diagnostic data are stored in DB 10.

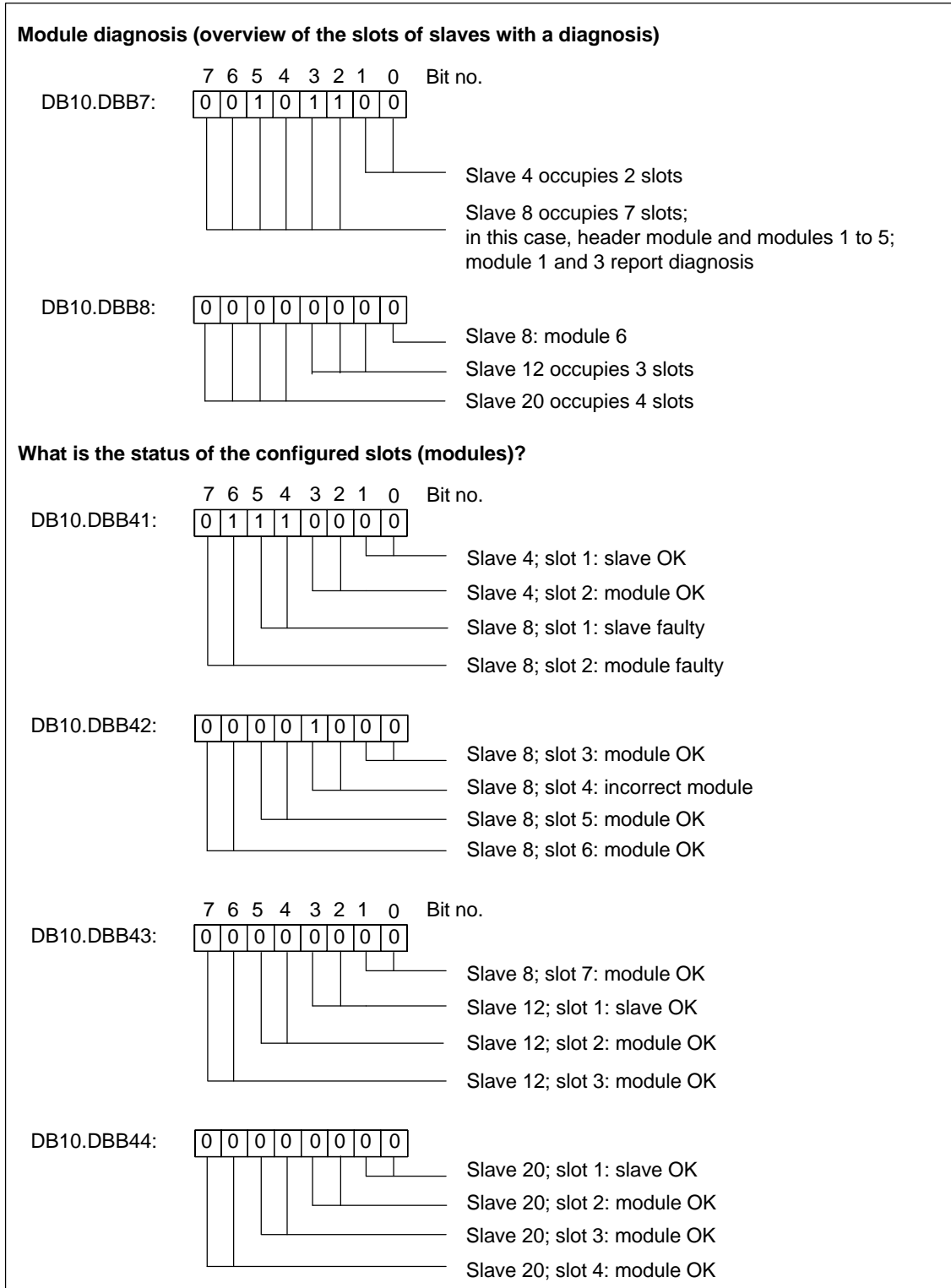
### Appearance of DB 10

Define the following structure for DB 10:

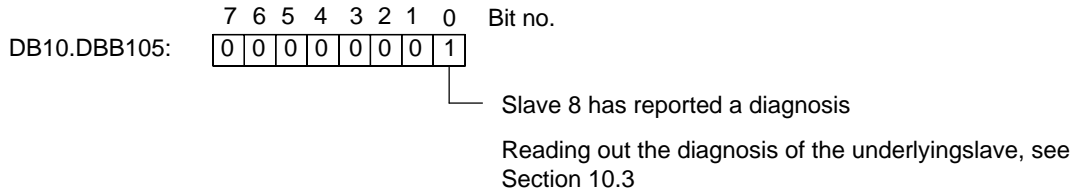
Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	Norm_Diag	ARRAY [1..6]		Standard diagnosis
*1.0		BYTE		
+6.0	Kenn_Diag	ARRAY[1..31]		Module diagnosis
*1.0		BYTE		
+38.0	Modul_Diag	ARRAY[1..63]		Module status
*1.0		BYTE		
+102.0	Status_Message	ARRAY[1..60]		Status message
*1.0		BYTE		
+162.0	H_Status	ARRAY [1..8]		H Status
*1.0		BYTE		
+170.0	Interrupt section	ARRAY [1..20]		Interrupts
*1.0		BYTE		
=190.0		END_STRUCT		

### 10.4.3 Evaluation of the diagnostic data

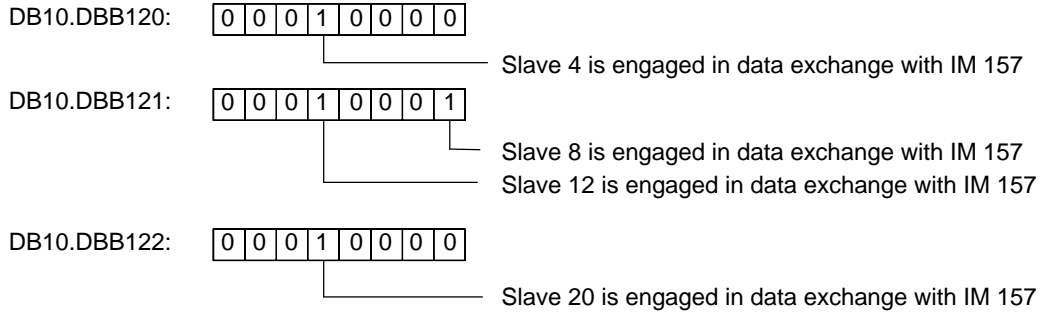
The relevant diagnostic data in DB 10 have the following meanings:



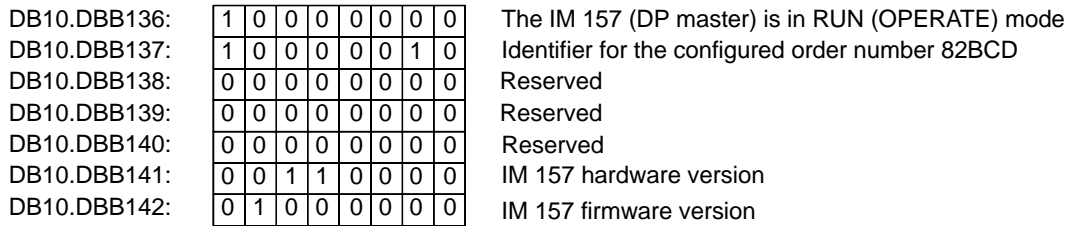
**Which slaves are reporting a diagnosis?**



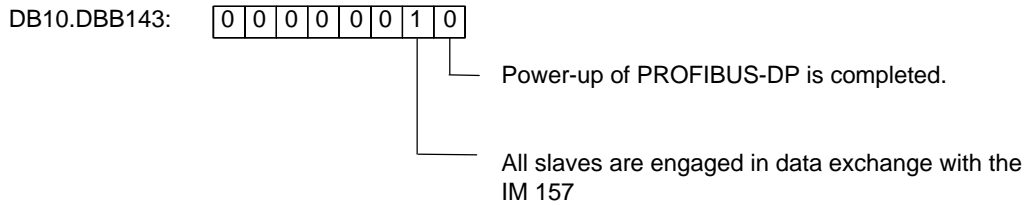
**Which configured slaves are involved in data exchange with the DP master?**



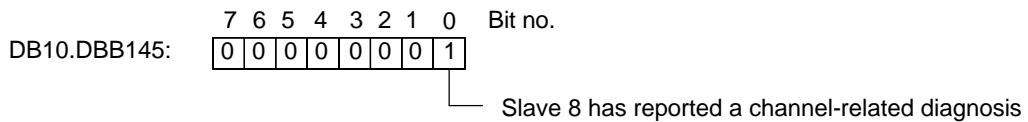
**What status does the DP master have?**

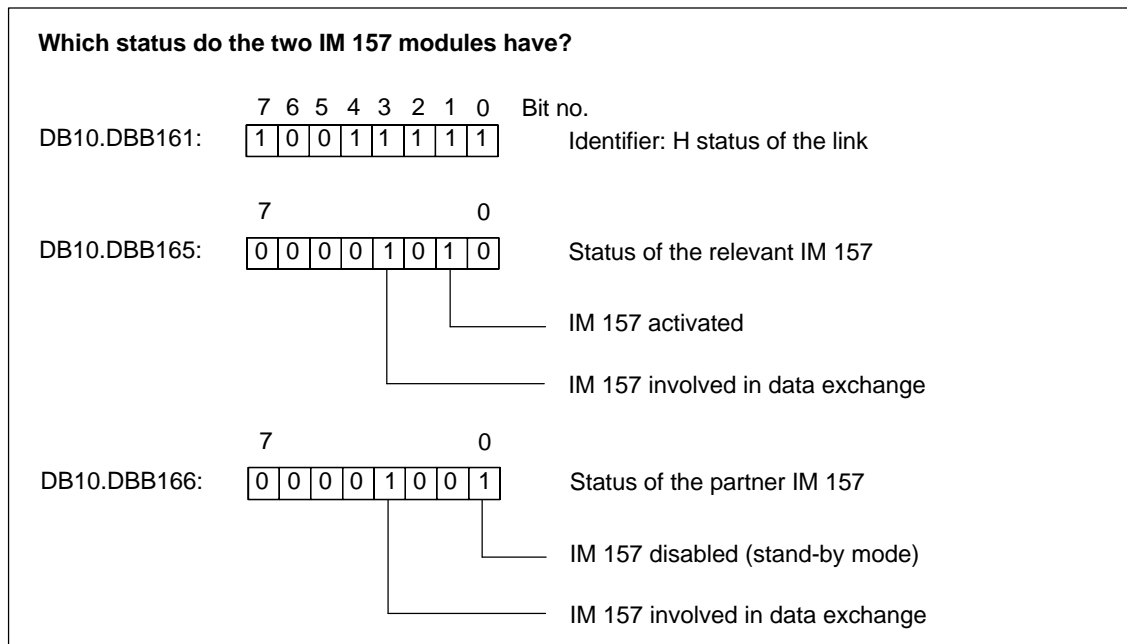


**What status does the underlying DP master system have?**



**Which slaves are reporting a channel-related diagnosis?**





The SIMATIC H station always reads only the active IM 157. Therefore, changing the active channel has no effect on the H status.

# Fundamentals of PROFIBUS-PA

# A

## PROFIBUS-PA

PROFIBUS-PA is the PROFIBUS for **P**rocess **A**utomation (PA) and is based on IEC 61784-1:2002 Ed1 CP 3/2 with regard to transmission technology and protocol and on the PA profile.

PROFIBUS-PA = PROFIBUS-DP communication protocol  
+  
Synchronous transmission technology

Any field device that is suitable for the PROFIBUS-PA can be connected to the DP/PA link bus connection.

- Measuring transducers, valves, actuators, etc.
- Networked by a serial bus system
- For use in chemical and process engineering
- With field device supply via the data line
- Also for explosion-proof applications (EEx [ia] ignition protection)

## Chapter overview

Section	Topic	Page
A.1	Intrinsic safety	A-2
A.2	Field device supply via PROFIBUS-PA	A-3
A.3	Extending PROFIBUS-PA with the DP/PA link coupler	A-4
A.4	Partyline and Star-type topology	A-5

## A.1 Intrinsic safety

### Intrinsic safety

The intrinsic safety type of ignition protection is based on the fact that a certain minimum ignition energy is required to ignite an explosive atmosphere. In an intrinsically safe electric circuit, this minimum ignition energy does not exist in the explosion-proof area either during normal operation or in the event of a malfunction. The intrinsic safety of a circuit is achieved by limiting the current and voltage in order to prevent sparking and high temperatures as possible ignition sources. The intrinsic safety type of ignition protection is thus limited to circuits with relatively low performance.

### Spark ignition

The so-called spark ignition is eliminated because sparks, which usually occur when a circuit is opened and closed either during operation or in the event of a short circuit or ground fault, are ruled out by limiting the current and voltage and avoiding large inductivities.

### Thermal ignition

Thermal ignition is not possible either during normal operation or in the event of a malfunction, since the equipment and lines in the intrinsically safe circuit cannot overheat.

### Further information

You will find further information on the subjects of intrinsic safety and explosion protection in the following publications:

- The manual entitled *Automation Systems S7-300, M7-300, ET 200M Ex-I/O Modules* (Order no. 6ES7 398-8RA00-8xA0)
- PTB report W-53, Brunswick, March 1993 (Investigations into the intrinsic safety of field bus systems)
- PROFIBUS-PA Installation guide, Information on the use of IEC 1158-2 technology for PROFIBUS, (German Art. No. 2.091, English Art. No. 2.092) PROFIBUS-Nutzerorganisation e. V., Haid-und-Neu-Straße 7, D-76131 Karlsruhe
- On the Internet under [www.profibus.com](http://www.profibus.com)

## A.2 Field device supply via PROFIBUS-PA

### Operating principle

When the DP/PA link coupler is used, the field devices can be supplied via the data line of PROFIBUS-PA.

### Structure

The total current of all the field devices must not exceed the maximum output current of the DP/PA coupler. The maximum output current thus limits the number of field devices that can be connected to PROFIBUS-PA.

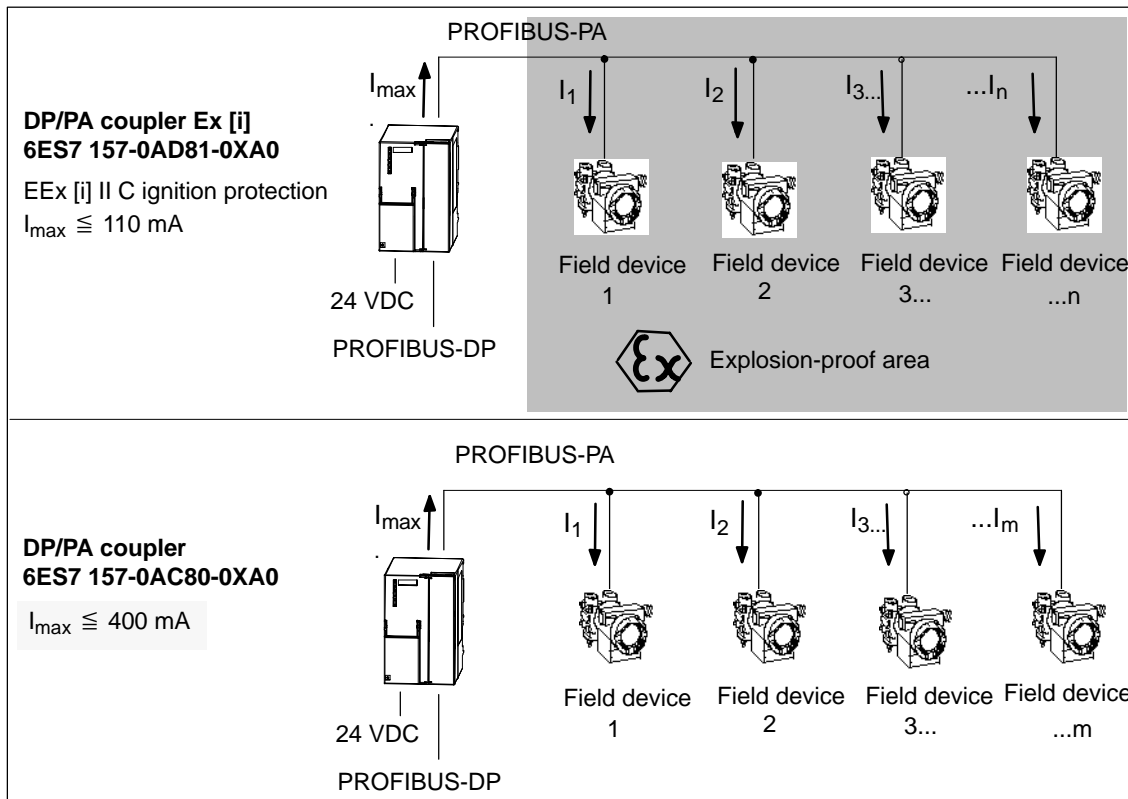


Figure A-1 Field device supply

### Extension

You must install an additional DP/PA coupler if you exceed the maximum output current of the DP/PA coupler (see Section A.3).

## A.3 Extending PROFIBUS-PA with the DP/PA link coupler

### Extension

The figure below shows the configuration of a PROFIBUS-PA system with a DP master:

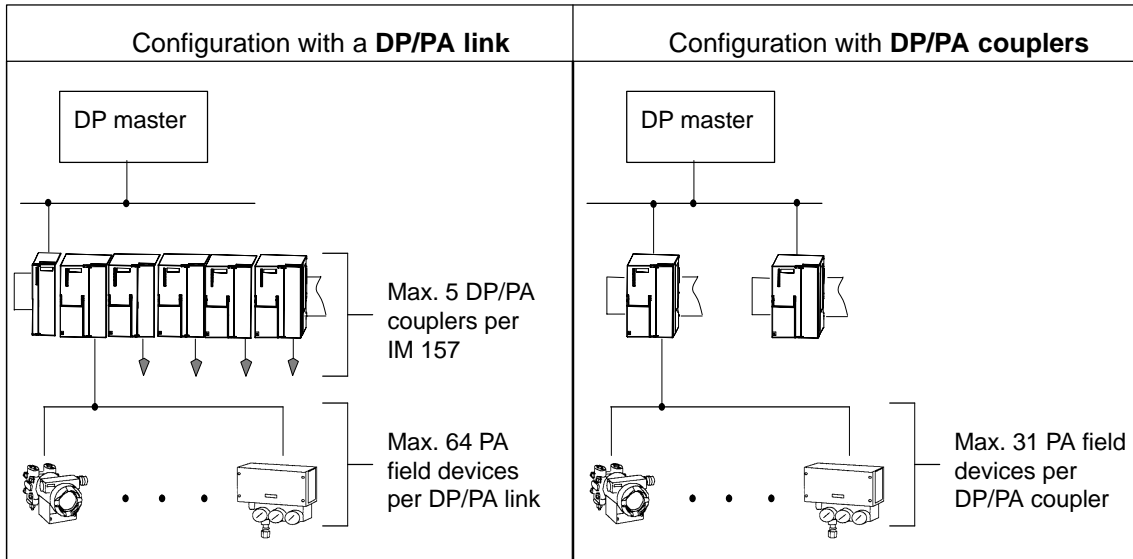


Figure A-2 Extension of PROFIBUS-PA with a DP/PA link or DP/PA couplers

### Rules

The following rules apply to PROFIBUS-PA extensions:

- There can be no more than 31 PA field devices in a physical PROFIBUS-PA segment.
- Not more than **one supply device** (= DP/PA coupler) can be connected in one physical PROFIBUS-PA segment.
- No more than 64 PA field devices can be connected to a DP/PA link. The maximum number of PA field devices that can be connected in each physical PROFIBUS-PA segment and each DP/PA coupler is limited by the maximum output current of the DP/PA coupler and the I/O data to be transferred (see Appendix B).



## A.4 Partyline and star-type topology

### Topology

PROFIBUS-PA can have a partyline or star-type topology.

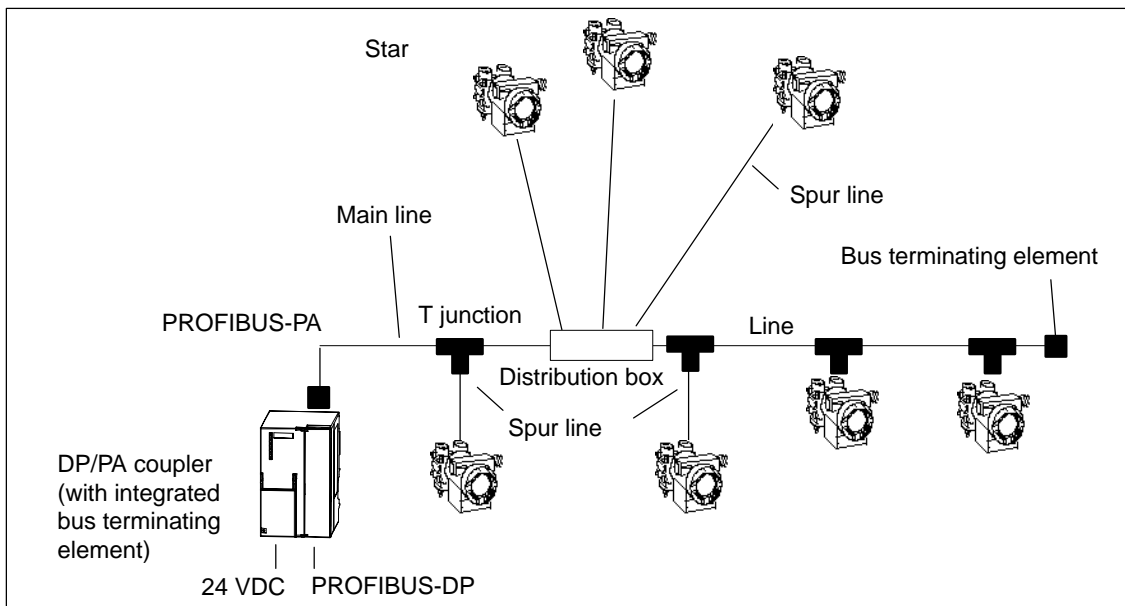


Figure A-3 Partyline and star-type topology

### Network extension

For a standard PROFIBUS-PA cable (cable type A as per PNO), the maximum length of the trunk and spur lines is as follows given maximum power consumption from the DP/PA coupler:

- 560 m for the DP/PA coupler (6ES7 157-0AC80-0XA0)
- 920 m for the DP/PA coupler Ex [i] (6ES7 157-0AD81-0XA0)

#### Note

Longer cables are possible if the overall power consumption of the PA field devices is low and if they are distributed.

### Bus terminating element for PROFIBUS-PA

To ensure trouble-free operation, the end of a PROFIBUS-PA line must have a bus terminating element.

Use an RC element in series connection for the bus terminating element ( $R = 100 \Omega \pm 2 \%$ ;  $C = 1 \mu\text{F} \pm 20 \%$ ). For components, see Appendix D.

### Spur line

The maximum permissible spur line lengths are listed in Table A-1. Note also the maximum length of the aggregate line (see above).

Table A-1 Spur line length for the DP/PA coupler

Number of spur lines	Maximum length of a spur line	
	DP/PA coupler	DP/PA coupler Ex [i]
1 to 12	Max. 120 m	Max. 30 m
13 to 14	Max. 90 m	Max. 30 m
15 to 18	Max. 60 m	Max. 30 m
19 to 24	Max. 30 m	Max. 30 m

# Technical Specifications

# B

## Overview of contents

This chapter contains the following data on the components of the DP/PA link and Y link couplers (subsequently referred to as the “described components”):

Section	Topic	Page
B.1	General technical specifications	B-2
B.2	Use of the DP/PA link coupler in a Zone 2 hazardous area (in all official EU languages)	B-13
B.3	Technical specifications of the IM 157 (6ES7 157-0AA82-0XA0)	B-36
B.4	Technical specifications of the DP/PA coupler Ex [i] (6ES7 157-0AD81-0XA0)	B-37
B.5	Technical specifications of the DP/PA coupler (6ES7 157-0AC80-0XA0)	B-38
B.6	Technical specifications of the Y coupler (6ES7 197-1LB00-0XA0)	B-39

## B.1 General technical specifications

### What are general technical specifications?

The general technical specifications consist of:

- the standards and test values that the described components must comply with and fulfill.
- the test criteria by which the described components were tested.

Section	Topic	Page
B.1.1	Standards and approvals	B-2
B.1.2	Standards and approvals for the DP/PA coupler Ex [i]	B-5
B.1.3	Electromagnetic compatibility	B-7
B.1.4	Transportation and storage conditions	B-9
B.1.5	Mechanical and climatic ambient conditions for operation	B-9
B.1.6	Data on insulation tests, protection class and degree of protection	B-12
B.1.7	Rated voltage	B-13

### B.1.1 Standards and approvals

All of the described components with the exception of the DP/PA coupler Ex [i] comply with the standards and approvals specified below. How the DP/PA coupler Ex [i] deviates from the standards and approvals specified here is described in Appendix B.1.2.

#### CE approval



The described components fulfill the requirements and safety objectives of the following EC Directives and comply with the harmonized European standards (EN) published for programmable logic controllers in the official journals of the European Communities:

- 73/23/EEC Low Voltage Directive (for electrical equipment)
- 89/336/EEC Electromagnetic Compatibility Directive (EMC Directive)
- Directive 94/9/EC on protective devices and systems for use in potentially explosive areas (explosion protection directive)

### ATEX approval



#### **KEMA 02ATEX1096 X**

in accordance with EN 50021:1999 (Electrical apparatus for potentially explosive atmospheres; Type of protection “n”)



II 3 G EEx nA II Tx

The EC Declarations of Conformity are available for the relevant authorities at the following address:

Siemens Aktiengesellschaft  
Bereich Automatisierungs- und Antriebstechnik  
A&D AS RD42  
Postfach 1963  
D-92209 Amberg

### UL/CSA approval



Underwriters Laboratories Inc. in accordance with

#### **Ordinary locations**

- HAZ. LOC.**
- UL 508 (Industrial Control Equipment)
  - CSA C22.2 No. 142 (Process Control Equipment)

#### **Hazardous locations**

- UL 1604
- CSA-213

APPROVED for use in  
Class I, Division 2, Group A, B, C, D Tx;  
Class I, Zone 2, Group IIC Tx

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#### **Note**

The approvals currently effective are found on the type label of each module.

---

### FM approval



Factory Mutual Research (FM) in accordance with  
Approval Standard Class Number 3611 (1999)

Class I, Division 2, Group A, B, C, D Tx;  
Class I, Zone 2, Group IIC Tx



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### Warning

There is a risk of injury and damage to property.

In areas where there is a risk of explosion, injuries and damage may be caused if you remove connectors during operation.

In areas where there is a risk of explosion, always deenergize all components in order to remove the connectors.

---

### Certification in Australia



The described components comply with the requirements of the AS/NZS 2064 (Class A) standard.

### IEC 61131

The described components comply with the requirements and criteria of the IEC 61131-2 standard (programmable logic controllers, Part 2: Equipment requirements and tests).

### PROFIBUS standard

The described components are based on the standard IEC 61784-1:2002 Ed1 CP 3/1.

### PROFIBUS-PA

The DP/PA coupler meets the requirements and criteria of the PROFIBUS-PA directive.

### Use in industrial environments

SIMATIC products are designed for use in industrial environments.

Table B-1 Use in industrial environments

Area of application	Requirements	
	Emitted interference	Noise immunity
Industry	EN 50081-2 : 1993	EN 50082-2 : 1995

## Use in residential areas

If you use the described components in residential areas, you must ensure that they comply with the limit value class B to EN 55011 with regard to the emission of radio interference.

Measures suitable for achieving the radio interference level required by limit value class B are:

- Installation in a grounded switching cabinet/switchbox
- Use of filters in supply lines

## Overview of issued approvals

The following table contains an overview of the approvals and the areas of use for the components of the DP/PA link and Y link couplers.

### B.1.2 Standards and approvals for the DP/PA coupler Ex [i]

The DP/PA coupler Ex [i] complies with the standards and approvals specified in Appendix B.1.1 with the following deviations:

#### ATEX approval



**KEMA 01ATEX1028 X**

in accordance with EN 50014:1997, EN 50020:1994, EN 50021:1999 and EN 50284:1999

 II 3 (1) G EEx nA [ia] IIC T4

The EC Declarations of Conformity are available for the relevant authorities at the following address:

Siemens Aktiengesellschaft  
 Bereich Automatisierungs- und Antriebstechnik  
 A&D AS RD42  
 Postfach 1963  
 D-92209 Amberg

## UL/CSA approval



Underwriters Laboratories Inc. in accordance with

### HAZ. LOC.

#### Ordinary locations

- UL 508 (Industrial Control Equipment)
- CAN/CSA C22.2 No. 14-M91 (Process Control Equipment)

#### Hazardous locations

- UL 1604, Third Edition
- UL 913, Sixth Edition
- UL 2279, First Edition
- CAN/CSA C22.2 No. 213-M1987
- CAN/CSA C22.2 No. 157-92
- E79-11 und E79-15

APPROVED for use in  
Class I, Division 2, Group A, B, C, D T4  
Class I, Zone 2, Group IIC T4  
AIS Class I, Division 1, Group A, B, C, D  
[AExia] IIC, Class I, Zone 0, 1, 2, Group IIC

## FM approval



Factory Mutual Research (FM) in accordance with

Approval Standard Class Numbers 3600 (1998), 3610 (1999), 3611 (1999),  
3810 (1989),

Class I, Division 2, Group A, B, C, D T4  
Class I, Zone 2, Group IIC T4  
AIS Class I, Division 1, Group A, B, C, D  
[AExia] IIC, Class I, Zone 0, 1, 2, Group IIC



### Warning

There is a risk of injury and damage to property.

In areas where there is a risk of explosion, injuries and damage may be caused if you remove connectors during operation.

In areas where there is a risk of explosion, always deenergize all components in order to remove the connectors.

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## B.1.3 Electromagnetic compatibility

### Introduction

This chapter contains data on the interference immunity of the described components and on RFI suppression.

The described components meet the requirements of the European EMC legislation for the single market.

### Definition of “EMC”

Electromagnetic compatibility (EMC) is the capacity of a piece of electrical equipment to function in a satisfactory manner in its electromagnetic environment without affecting this environment.

### Pulse-type interference

The table below shows the electromagnetic compatibility of the described components with respect to pulse-type interference. The prerequisite for this is that the system meets and complies with the relevant requirements and guidelines relating to electrical equipment.

Table B-2 Pulse-type interference

Pulse-type interference	Tested at	Corresponds to severity of
Electrostatic discharge in accordance with IEC 61000-4-2	8 kV 4 kV	3 (air discharge) 2 (contact discharge)
Burst impulse (rapid transient interference) in accordance with IEC 61000-4-4	2 kV (supply line) 2 kV (signal line)	3
High energy single pulse (surge) in accordance with IEC 61000-4-5 External RC circuit is required (see installation manual entitled <i>Automation System S7-300, Installation</i> , Section “Lightning protection and surge protection”)		
<ul style="list-style-type: none"> <li>Asymmetric interference</li> </ul>	2 kV (supply line) 2 kV (signal line/ data line)	3
<ul style="list-style-type: none"> <li>Symmetric interference</li> </ul>	1 kV (supply line) 1 kV (signal line/ data line)	

### Sinusoidal interference

The table below shows the EMC behavior of the described components with respect to sinusoidal interference.

Table B-3 Sinusoidal interference

Sinusoidal interference	Test values	Corresponds to severity of
RF radiation (electromagnetic fields) in accordance with IEC 61000-4-3	10 V/m with 80 % amplitude modulation of 1 kHz in the range 80 MHz to 1000 MHz 10 V/m with 50 % pulse modulation at 900 MHz	3
RF interference on cables and cable shields in accordance with IEC 61000-4-6	Test voltage of 10 V with 80 % amplitude modulation of 1 kHz in the range 9 kHz to 80 MHz	3

### Emission of radio interference

Emitted interference from electromagnetic fields in accordance with EN 55011: limit value class A, group 1

From 30 to 230 MHz	< 30 dB ( $\mu\text{V}/\text{m}$ )Q
From 230 to 1000 MHz	< 37 dB ( $\mu\text{V}/\text{m}$ )Q
Measured at 30 m distance	

Emitted interference via a.c. supply in accordance with EN 55011: limit value class A, group 1

From 0.15 to 0.5 MHz	< 79 dB ( $\mu\text{V}$ )Q < 66 dB ( $\mu\text{V}$ )M
From 0.5 to 5 MHz	< 73 dB ( $\mu\text{V}$ )Q < 60 dB ( $\mu\text{V}$ )M
From 5 to 30 MHz	< 73 dB ( $\mu\text{V}$ )Q < 60 dB ( $\mu\text{V}$ )M

## B.1.4 Transportation and storage conditions

### Transport and storage of modules

The described components exceed the requirements of IEC 61131, Part 2, as regards transportation and storage requirements. The following values apply to modules that are transported or stored in the original packaging.

Table B-4 Transportation and storage conditions

Type of condition	Permissible range
Free fall (in transport packaging)	≤ 0.3 m
Temperature	From –40 °C to + 70 °C
Air pressure	From 1080 to 660 hPa (corresponds to a height of –1000 to 3500 m)
Relative air humidity	From 10 to 95 %, without condensation
Sinusoidal vibrations in accordance with IEC 60068-2-6	5 - 9 Hz: 3.5 mm
	9 - 150 Hz: 9.8 m/s <sup>2</sup>
Shock in accordance with IEC 60068-2-29	250 m/s <sup>2</sup> , 6 ms, 1000 shocks

## B.1.5 Mechanical and climatic ambient conditions for operation

### Operating conditions

The described components are designed for use in a fixed, sheltered location. The operating conditions exceed the requirements of IEC 61131 Part 2.

The described components meet the operating conditions of Class 3C3 in accordance with DIN EN 60721 Part 2.

### Use with additional measures

Without additional measures, the described components may **not** be used:

- in locations with a high proportion of ionizing radiation
- in locations with operating conditions that are severe on account of the following, for example:
  - dust
  - corrosive vapors or gases
  - strong electrical or magnetic fields
- in systems that require special monitoring, such as:
  - lift systems
  - electrical systems in especially endangered areas

An additional measure could be, for example, the installation in a cabinet or in an enclosure.

### Mechanical ambient conditions

The mechanical ambient conditions for the described components are specified for sinusoidal vibrations in the following table.

Table B-5 Mechanical ambient conditions

Frequency range in Hz	Continuous	Occasional
$10 \leq f \leq 58$	0.0375 mm amplitude	0.075 mm amplitude
$58 \leq f \leq 150$	0.5 g constant acceleration	1 g constant acceleration

### Vibration reduction

When the described components are subjected to major shocks or vibrations, you must take suitable action to reduce the acceleration or amplitude.

We recommend mounting the described components on damping material (e.g. on rubber-metal connections).

### Tests for mechanical ambient conditions

The following table provides information on the type and scope of the tests for mechanical ambient conditions.

Table B-6 Test for mechanical ambient conditions

Test for ...	Test standard	Comments
Vibrations	Oscillations tested in accordance with IEC 60068, Parts 2–6 (sine)	Vibration type: frequency sweeps with a rate of change of 1 octave per minute. 10 Hz ≤ f ≤ 58 Hz, constant amplitude 0.075 mm 58 Hz ≤ f ≤ 150 Hz, constant acceleration 1 g Vibration duration: 10 frequency sweeps per axis in each of the 3 vertically arranged axes
Shock	Shock test in accordance with IEC 60068 Part 2-29	Type of shock: half-sine Strength of shock: 15 g peak value, 11 ms duration Shock direction: 3 shocks in both + and – direction in each of the 3 vertically arranged axes

### Climatic environmental conditions

The described components may be used under the following climatic ambient conditions:

Table B-7 Climatic ambient conditions

Ambient conditions	Permissible range	Comments
Temperature: horizontal installation vertical installation	From 0 to 60 °C From 0 to 40 °C	Y coupler 6ES7 197-1LB00-0XA0 BM Y coupler bus module 6ES7 654-7HY00-0XA0
Temperature: horizontal installation vertical installation	From –25 to 60 °C From –25 to 40 °C	IM 157 6ES7 157-0AA82-0XA0 DP/PA coupler 6ES7 157-0AC80-0XA0 DP/PA coupler Ex [i] 6ES7 157-0AD81-0XA0 BM IM/IM bus module 6ES7 195-7HD80-0XA0 BM DP/PA coupler bus module 6ES7 195-7HF80-0XA0
Relative air humidity	From 10 to 95 %,	Without condensation, corresponds to a relative humidity (RH) of 2 in accordance with IEC 61131 Part 2

Table B-7 Climatic ambient conditions

Ambient conditions	Permissible range	Comments
Air pressure	From 1080 to 795 hPa	Corresponds to a height of -1000 to 2000 m
Contaminant concentration	SO <sub>2</sub> : < 0.5 ppm; RH < 60 %, no condensation H <sub>2</sub> S: < 0.1 ppm; RH < 60 %, no condensation	Test: 10 ppm; 4 days  Test: 1 ppm; 4 days

### B.1.6 Data on insulation tests, protection class and degree of protection

#### Test voltages

The insulating properties are verified in individual testing with the following test voltages:

Table B-8 Test voltages

Circuits with a rated voltage of $U_e$ against other circuits or ground	Test voltage
$0 V < U_e \leq 50 V$	600 VDC, 1 s

#### Protection class

Protection class I in accordance with IEC 60536, i. e. PE connection to rail is required!

#### Protection against solid bodies and water

Protection type IP 20 in accordance with IEC 60529; i.e., protection against contact with standard probes.

There is not protection against the intrusion of water.

## B.1.7 Rated voltage

### Rated voltages for operation

The described components work with a rated voltage of 24 VDC. The tolerance range lies between 20.4 and 28.8 VDC.

## B.2 Use of the DP/PA link coupler in the Zone 2 hazardous area (in all official EU languages)

In the following sections you will find important information in all official EU languages.

### Chapter overview

Section	Topic	Page
B.2.1	Einsatz der Buskopplung DP/PA im explosionsgefährdeten Bereich Zone 2	B-14
B.2.2	Use of the DP/PA coupler in a zone 2 hazardous area	B-16
B.2.3	Utilisation du coupleur de bus DP/PA dans un environnement à risque d'explosion en zone 2	B-18
B.2.4	Aplicación del acoplamiento de bus DP/PA en áreas con peligro de explosión, zona 2	B-20
B.2.5	Impiego dell'accoppiamento di bus DP/PA nell'area a pericolo di esplosione zona 2	B-22
B.2.6	Gebruik van de buskoppeling DP/PA in het explosieve gebied zone 2	B-24
B.2.7	Brug af buskoblingen DP/PA i det eksplosionfarlige område zone 2	B-26
B.2.8	Väyläkytöiden DP/PA käyttö räjähdysvaarannetuilla alueilla, vyöhyke 2	B-28
B.2.9	Användning av bussanslutning DP/PA i explosionsriskområde zon 2	B-30
B.2.10	Uso do acoplamento de bus DP/PA em área exposta ao perigo de explosão, zona 2	B-32
B.2.11	Χρήση της συσκευής διαλου DP/PA σε ...	B-34

## B.2.1 Einsatz der Buskopplung DP/PA im explosionsgefährdeten Bereich Zone 2

### Zone 2

Explosionsgefährdete Bereiche werden in Zonen eingeteilt. Die Zonen werden nach der Wahrscheinlichkeit des Vorhandenseins einer explosionsfähigen Atmosphäre unterschieden.

Zone	Explosionsgefahr	Beispiel
2	explosive Gasatmosphäre tritt nur selten und kurzzeitig auf	Bereiche um Flanschverbindungen mit Flachdichtungen bei Rohrleitungen in geschlossenen Räumen
sicherer Bereich	nein	<ul style="list-style-type: none"> <li>außerhalb der Zone 2</li> <li>Standardanwendungen von dezentraler Peripherie</li> </ul>

Nachfolgend finden Sie wichtige Hinweise für die Installation der Komponenten der Buskopplung DP/PA im explosionsgefährdeten Bereich.


### Weitere Informationen

Weitere Informationen zur Buskopplung DP/PA und zu den verschiedenen Komponenten finden Sie im Handbuch.

### Fertigungsort


Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany

### Zulassung

 II 3 G EEx nA II T3 .. T6 nach EN 50021 : 1999  
 Prüfnummer: **KEMA 02ATEX1096 X**

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### Hinweis

Baugruppen mit der Zulassung  II 3 G EEx nA II T3 .. T6 dürfen nur in Automatisierungssysteme SIMATIC S5/S7 / DP-Slaves der Gerätekategorie 3 eingesetzt werden.

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## Instandhaltung

Für eine Reparatur muss die betroffene Komponente an den Fertigungsort geschickt werden. Nur dort darf die Reparatur durchgeführt werden.

## Besondere Bedingungen

1. Die Buskopplung DP/PA muss in einen Schaltschrank oder ein metallisches Gehäuse eingebaut werden. Diese müssen mindestens die Schutzart IP 54 (nach EN 60529) gewährleisten. Dabei sind die Umgebungsbedingungen zu berücksichtigen, in denen das Gerät installiert wird. Für das Gehäuse muss eine Herstellererklärung für Zone 2 vorliegen (gemäß EN 50021).
2. Wenn am Kabel bzw. an der Kabeleinführung dieses Gehäuses unter Betriebsbedingungen eine Temperatur > 70 °C erreicht wird oder wenn unter Betriebsbedingungen die Temperatur an der Aderverzweigung > 80 °C sein kann, müssen die Temperatureigenschaften der Kabel mit den tatsächlich gemessenen Temperaturen übereinstimmen.
3. Die eingesetzten Kabeleinführungen müssen der geforderten IP-Schutzart und dem Abschnitt 7.2 (gemäß EN 50021) entsprechen.
4. Alle Geräte, einschließlich Schalter etc., die an den Ein- und Ausgängen von Buskopplungen DP/PA angeschlossen werden, müssen für den Explosionsschutz Typ EEx nA oder EEx nC genehmigt sein.
5. Es müssen Maßnahmen getroffen werden, dass die Nennspannung durch Transienten um nicht mehr als 40 % überschritten werden kann.
6. Umgebungstemperaturbereich: 0° C bis 60° C
7. Innerhalb des Gehäuses ist an einem nach dem Öffnen gut sichtbaren Platz ein Schild mit folgender Warnung anzubringen:

### **Warnung**

Das Gehäuse darf nur kurze Zeit geöffnet werden, z. B. für visuelle Diagnose. Betätigen Sie dabei keine Schalter, ziehen oder stecken keine Baugruppen und trennen keine elektrischen Leitungen (Steckverbindungen). Diese Warnung kann unberücksichtigt bleiben, wenn bekannt ist, dass keine explosionsgefährdete Atmosphäre herrscht.

## Liste der zugelassenen Baugruppen

Die Liste mit den zugelassenen Baugruppen finden Sie im Internet:

<http://www4.ad.siemens.de/view/cs/>

unter der Beitrags-ID 13702947.

## B.2.2 Use of the DP/PA Bus Coupler in a Zone 2 Hazardous Area

### Zone 2

Hazardous areas are divided up into zones. The zones are distinguished according to the probability of the existence of an explosive atmosphere.

Zone	Explosion Hazard	Example
2	Explosive gas atmosphere occurs only seldom and for a short time	Areas around flange joints with flat gaskets in pipes in enclosed spaces
Safe area	No	<ul style="list-style-type: none"> <li>• Outside zone 2</li> <li>• Standard distributed I/O applications</li> </ul>

Below you will find important information on the installation of the components of the DP/PA bus coupler in a hazardous area.


### Further Information

You will find further information on the DP/PA bus coupler and the various components in the manual.

### Production Location

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany


### Certification

 II 3 G EEx nA II T3 .. T6 to EN 50021 : 1999

Test number: **KEMA 01ATEX1238 X**

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#### Note

Modules with  II 3 G EEx nA II T3 .. T6 certification can only be used in SIMATIC S7-300/ET 200M automation systems belonging to equipment category 3.

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## Maintenance

If repair is necessary, the affected component must be sent to the production location. Repairs can only be carried there.

## Special Conditions

1. The DP/PA bus coupler must be installed in a cabinet or metal housing. These must comply with the IP 54 degree of protection as a minimum. The environmental conditions under which the equipment is installed must be taken into account. There must be a manufacturer's declaration for zone 2 available for the housing (in accordance with EN 50021).
2. If a temperature of > 70 °C is reached in the cable or at the cable entry of this housing under operating conditions, or if a temperature of > 80 °C can be reached at the junction of the conductors under operating conditions, the temperature-related properties of the cables must correspond to the temperatures actually measured.
3. The cable entries used must comply with the required IP degree of protection and Section 7.2 (in accordance with EN 50021).
4. All devices (including switches, etc.) that are connected to the inputs and outputs of fail-safe signal modules must be approved for EEx nA or EEx nC explosion protection.
5. Steps must be taken to ensure that the rated voltage through transients cannot be exceeded by more than 40 %.
6. Ambient temperature range: 0° C to 60° C
7. A sign containing the following warning must be put up inside the housing in an easily visible position when the housing is opened:

### **Warning**

The housing can only be opened for a short time (e.g. for visual diagnostics). If you do this, do not operate any switches, remove or install any modules or disconnect any electrical cables (plug-in connections).

You can disregard this warning if you know that the atmosphere is not hazardous (i.e. there is no risk of explosion).

## List of Approved Modules

You will find the list of approved modules under the ID 13702947 on the Internet:

<http://www4.ad.siemens.de/view/cs/>.

### B.2.3 Utilisation du coupleur de bus DP/PA dans un environnement à risque d'explosion en zone 2

#### Zone 2

Les environnements à risque d'explosion sont répartis en zones. Les zones se distinguent par la probabilité de présence d'une atmosphère explosive.

Zone	Risque d'explosion	Exemple
2	Formation rare et brève d'une atmosphère gazeuse explosive	Environnement de raccords à joints plats dans le cas de conduites dans des locaux fermés
Zone sûre	Non	<ul style="list-style-type: none"> <li>• A l'extérieur de la zone 2</li> <li>• Utilisation standard de périphérie décentralisée</li> </ul>

Vous trouverez ci-après des remarques importantes pour l'installation des composantes du coupleur de bus DP/PA dans un environnement à risque d'explosion.


#### Informations complémentaires

Des informations complémentaires sur le coupleur de bus DP/PA et les diverses composantes se trouvent dans le manuel.

#### Lieu de production

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany


#### Homologation

 II 3 G EEx nA II T3 .. T6 selon EN 50021 : 1999

Numéro de contrôle : **KEMA 02ATEX1096 X**

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#### Nota

Les modules homologués  II 3 G EEx nA II T3 .. T6 ne peuvent être utilisés que dans des automates SIMATIC S7-300 / ET 200M de catégorie 3.

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## Entretien

Si une réparation est nécessaire, la composante concernée doit être expédiée au lieu de production. La réparation ne doit être effectuée qu'en ce lieu.

## Conditions particulières

1. Le couplage de bus DP/PA doit être installé dans une armoire ou un boîtier métallique. Ceux-ci doivent assurer au moins l'indice de protection IP 54. Il faut alors tenir compte des conditions d'environnement dans lesquelles l'appareil est installé. Le boîtier doit faire l'objet d'une déclaration de conformité du fabricant pour la zone 2 (selon EN 50021).
2. Si dans les conditions d'exploitation, une température > 70 °C est atteinte au niveau du câble ou de l'entrée du câble dans ce boîtier, ou bien si la température au niveau de la dérivation des conducteurs peut être > 80 °C, les capacités de résistance thermique des câbles doivent correspondre aux températures effectivement mesurées.
3. Les entrées de câbles utilisées doivent avoir le niveau de protection IP exigé et être conformes au paragraphe 7.2 (selon EN 50021).
4. Tous les appareillages (y compris les interrupteurs, etc.) raccordés aux entrées et sorties de modules de signaux à sécurité intrinsèque doivent être homologués pour la protection antidéflagrante type EEx nA ou EEx nC.
5. Il faut prendre des mesures pour que la tension nominale ne puisse pas être dépassée de plus de 40% sous l'influence de transitoires.
6. Plage de température ambiante : 0° C à 60° C
7. A l'intérieur du boîtier, il faut placer, à un endroit bien visible après ouverture, une plaquette comportant l'avertissement suivant :

### **Avertissement**

Ouvrir le boîtier le moins longtemps possible, par exemple pour effectuer un diagnostic visuel. Ce faisant, n'actionnez aucun commutateur, ne déconnectez aucun module et ne débranchez pas de câbles électriques (connexions).

Le respect de cet avertissement n'est pas impératif s'il est certain que l'environnement ne présente pas de risque d'explosion.

## Liste des modules homologués

Vous trouverez sur Internet la liste des modules homologués :

<http://www4.ad.siemens.de/view/cs/>

référence ID 13702947.

## B.2.4 Aplicación del acoplamiento de bus DP/PA en áreas con peligro de explosión, zona 2

### Zona 2

Las áreas con peligro de explosión se clasifican en zonas. Las zonas se diferencian según la probabilidad de la existencia de una atmósfera capaz de sufrir una explosión.

Zona	Peligro de explosión	Ejemplo
2	La atmósfera explosiva de gas sólo se presenta rara vez y muy brevemente	Áreas alrededor de uniones abridadas con juntas planas en tuberías en locales cerrados
Área segura	no	<ul style="list-style-type: none"> <li>fuera de la zona 2</li> <li>Aplicaciones estándar de la periferia descentralizada</li> </ul>

A continuación encontrará importantes informaciones para la instalación de los componentes del acoplamiento de bus SP/PA en áreas con peligro de explosión.

### Otras informaciones

Encontrará otras informaciones relativas al acoplamiento de bus DP/PA y a los distintos componentes en el Manual.

### Lugar de fabricación

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany


### Homologación

 II 3 G EEx nA II T3 .. T6 según norma EN 50021 : 1999

Número de comprobación: **KEMA 02ATEX1096 X**

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#### Nota

Los módulos con la homologación  II 3 G EEx nA II T3 .. T6 pueden utilizarse únicamente en los autómatas programables SIMATIC S7-300 / ET 200M de la categoría de equipo 3.

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## Mantenimiento

Para una reparación se ha de remitir el componente afectado al lugar de fabricación. Sólo allí se puede realizar la reparación.

## Condiciones especiales

1. El acoplamiento de bus DP/PA se ha de montar en un armario eléctrico de distribución o en una carcasa metálica. Éstos deben garantizar como mínimo el grado de protección IP 54. Para ello se han de tener en cuenta las condiciones ambientales, en las cuales se instala el equipo. La caja deberá contar con una declaración del fabricante para la zona 2 (conforme a EN 50021).
2. Si durante la operación se alcanzara una temperatura > 70° C en el cable o la entrada de cables de esta caja o bien una temperatura > 80° C en la bifurcación de hilos, deberán adaptarse las propiedades térmicas de los cables a las temperaturas medidas efectivamente.
3. Las entradas de cable utilizadas deben cumplir el grado de protección IP exigido y lo expuesto en el apartado 7.2 (conforme a EN 50021).
4. Todos los dispositivos –inclusive interruptores, etc.– conectados a las entradas y salidas de módulos de señales de alta disponibilidad deben estar homologados para la protección contra explosiones del tipo EEx nA o EEx nC.
5. Es necesario adoptar las medidas necesarias para evitar que la tensión nominal pueda rebasar en más del 40 % debido a efectos transitorios.
6. Margen de temperatura ambiente: 0° C hasta 60° C
7. Dentro de la caja deberá colocarse en un lugar perfectamente visible tras su apertura un rótulo con la siguiente advertencia:

### **Precaución**

Abrir la caja sólo brevemente, p.ej. para el diagnóstico visual. Durante este tiempo Ud. no deberá activar ningún interruptor, desenchufar o enchufar módulos ni separar conductores eléctricos (conexiones enchufables).

Esta advertencia puede ignorarse si Ud. sabe que en la atmósfera existente no hay peligro de explosión.

## Lista de los módulos homologados

En la internet hallará Ud. una lista con los módulos homologados:

<http://www4.ad.siemens.de/view/cs/>

bajo el ID de asignación 13702947.

## B.2.5 Impiego dell'accoppiamento di bus DP/PA nell'area a pericolo di esplosione zona 2

### Zona 2

Le aree a pericolo di esplosione vengono suddivise in zone. Le zone vengono distinte secondo la probabilità della presenza di un'atmosfera esplosiva.

Zona	Pericolo di esplosione	Esempio
2	L'atmosfera esplosiva si presenta solo raramente e brevemente	Aree intorno a collegamenti a flange con guarnizioni piatte nelle condotte in ambienti chiusi
Area sicura	No	<ul style="list-style-type: none"> <li>Al di fuori della zona 2</li> <li>Applicazioni standard di periferia decentrata</li> </ul>

Qui di seguito sono riportate delle avvertenze importanti per l'installazione dei componenti dell'accoppiamento di bus DP/PA nell'area a pericolo di esplosione.


### Ulteriori informazioni

Ulteriori informazioni sull'accoppiamento di bus DP/PA e sui diversi componenti si trovano nel manuale.

### Luogo di produzione

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany


### Autorizzazione

 II 3 G EEx nA II T3 .. T6 secondo EN 50021 : 1999

Numero di controllo: **KEMA 02ATEX1096 X**

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### Avvertenza

Le unità con l'autorizzazione  II 3 G EEx nA II T3 .. T6 possono essere impiegate solo nei sistemi di controllori programmabili SIMATIC S7-300 / ET 200M della categoria di apparecchiature 3.

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## Manutenzione

Per una riparazione, il componente interessato deve essere inviato al luogo di produzione. La riparazione può essere effettuata solo lì.

## Condizioni particolari

1. L'accoppiamento di bus DP/PA deve essere montata in un armadio elettrico o in un contenitore metallico. Questi devono assicurare almeno il tipo di protezione IP 54. In questo caso bisogna tenere conto delle condizioni ambientali nelle quali l'apparecchiatura viene installata. Per il contenitore deve essere presente una dichiarazione del costruttore per la zona 2 (secondo EN 50021).
2. Se nei cavi o nel loro punto di ingresso in questo contenitore viene raggiunta in condizioni di esercizio una temperatura  $> 70\text{ °C}$  o se in condizioni di esercizio la temperatura nella derivazione dei fili può essere  $> 80\text{ °C}$ , le caratteristiche di temperatura dei cavi devono essere conformi alla temperatura effettivamente misurata.
3. Gli ingressi dei cavi usati devono essere conformi al tipo di protezione richiesto e alla sezione 7.2 (secondo EN 50021).
4. Tutte le apparecchiature, inclusi interruttori, ecc. che vengono collegati agli ingressi/uscite di unità di segnale ad elevata sicurezza, devono essere stati omologati per la protezione da esplosione tipo EEx nA o EEx nC.
5. Devono essere prese delle misure per evitare che la tensione nominale possa essere superata per più del 40% da parte di transienti.
6. Campo termico ambientale: da  $0\text{ °C}$  a  $60\text{ °C}$
7. All'interno del contenitore va appostata, in un luogo ben visibile dopo l'apertura, una targhetta con il seguente avvertimento:

### Attenzione

Il contenitore può rimanere aperto solo per breve tempo, ad esempio per una diagnostica a vista. In tal caso non azionare alcun interruttore, non disinnestare o innestare unità e non staccare connessioni elettriche (connettori).

Non è necessario tenere conto di questo avvertimento se è noto che non c'è un'atmosfera a rischio di esplosione.

## Elenco delle unità abilitate

La lista con le unità omologate si trova in Internet al sito:

<http://www4.ad.siemens.de/view/cs/>

all'ID di voce 13702947.

## B.2.6 Gebruik van de buskoppeling DP/PA in het explosieve gebied zone 2

### Zone 2

Explosieve gebieden worden ingedeeld in zones. Bij de zones wordt onderscheiden volgens de waarschijnlijkheid van de aanwezigheid van een explosieve atmosfeer.

Zone	Explosiegevaar	Voorbeeld
2	Een explosieve gasatmosfeer treedt maar zelden op en voor korte duur	Gebieden rond flensverbindingen met pakkingen bij buisleidingen in gesloten vertrekken
Veilig gebied	neen	<ul style="list-style-type: none"> <li>Buiten de zone 2</li> <li>Standaardtoepassingen van decentrale periferie</li> </ul>

Hierna vindt u belangrijke aanwijzingen voor de installatie van de componenten van de buskoppeling DP/PA in een explosief gebied.


### Verdere informatie

In het handboek vindt u verdere informatie over de buskoppeling DP/PA en over de verschillende componenten.

### Productieplaats

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Strasse 50  
 92224 Amberg  
 Germany


### Vergunning

 II 3 G    EEx nA II T3 .. T6    conform EN 50021 : 1999

Keuringsnummer: **KEMA 02ATEX1096 X**

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### Opmerking

Modulen met de vergunning  II 3 G EEx nA II T3 .. T6 mogen slechts worden gebruikt in automatiseringssystemen SIMATIC S7-300 / ET 200M van de apparaatcategorie 3.

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## Instandhouding

De te herstellen component moet voor reparatie naar de plaats van vervaardiging worden gestuurd. Alleen daar mag de reparatie worden uitgevoerd.

## Speciale voorwaarden

1. De buskoppeling DP/PA moet worden ingebouwd in een schakelkast of in een behuizing van metaal. Deze moeten minstens de veiligheidsgraad IP 54 waarborgen. Hierbij dient rekening te worden gehouden met de omgevingsvoorwaarden waarin het apparaat wordt geïnstalleerd. Voor de behuizing dient een verklaring van de fabrikant voor zone 2 te worden ingediend (volgens EN 50021).
2. Als aan de kabel of aan de kabelinvoering van deze behuizing onder bedrijfsomstandigheden een temperatuur wordt bereikt  $> 70\text{ °C}$  of als onder bedrijfsomstandigheden de temperatuur aan de adervertakking  $> 80\text{ °C}$  kan zijn, moeten de temperatureigenschappen van de kabel overeenstemmen met de werkelijk gemeten temperaturen.
3. De aangebrachte kabelinvoeringen moeten de vereiste IP-veiligheidsgraad hebben en in overeenstemming zijn met alinea 7.2 (volgens EN 50021).
4. Alle apparaten, schakelaars enz. inbegrepen, die worden aangesloten op de in- en uitgangen van tegen fouten beveiligde signaalmodulen, moeten zijn goedgekeurd voor de explosiebeveiliging type EEx nA of EEx nC.
5. Er dienen maatregelen te worden getroffen, zodat de nominale spanning door transiënten met niet meer dan 40 % kan worden overschreden.
6. Omgevingstemperatuurbereik:  $0\text{ °C}$  tot  $60\text{ °C}$
7. Binnen de behuizing dient op een na het openen goed zichtbare plaats een bord te worden aangebracht met de volgende waarschuwing:

### **Waarschuwing**

De behuizing mag slechts voor korte tijd worden geopend, bijv. voor een visuele diagnose. Bedien hierbij geen schakelaar, trek of steek geen modulen en ontkoppel geen elektrische leidingen (steekverbindingen).

Deze waarschuwing kan buiten beschouwing blijven, indien bekend is dat er geen explosieve atmosfeer heerst.

## Lijst van de toegelaten modulen

De lijst met de toegelaten modulen vindt u in het internet:

<http://www4.ad.siemens.de/view/cs/>

onder de bijdrage-ID 13702947.

## B.2.7 Brug af buskoblingen DP/PA i det eksplosionsfarlige område zone 2

### Zone 2

Eksplodingsfarlige områder inddeles i zoner. Zonerne adskiller sig indbyrdes efter hvor sandsynligt det er, at der er en eksplosiv atmosfære.

Zone	Eksplodingsfare	Eksempel
2	Ekspløsiv gasatmosfære optræder kun sjældent og varer kort	Områder rundt om flangeforbindelser med flade pakninger ved rørledninger i lukkede rum
Sikkert område	Nej	<ul style="list-style-type: none"> <li>• Uden for zone 2</li> <li>• Standardanvendelser decentral periferi</li> </ul>

I det følgende findes vigtige henvisninger vedr. installation af komponenterne til buskoblingen DP/PA i det eksplosionsfarlige område.


### Yderligere informationer

Yderligere informationer om buskoblingen DP/PA og de forskellige komponenter findes i manualen.

### Produktionssted

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany


### Godkendelse

 II 3 G EEx nA II T3 .. T6 efter EN 50021 : 1999

Kontrolnummer: **KEMA 02ATEX1096 X**

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### Bemærk

Komponenter med godkendelsen  II 3 G EEx nA II T3 .. T6 må kun monteres i automatiseringssystemer SIMATIC S7-300 / ET 200M - udstyrskategori 3.

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## Vedligeholdelse

Skal den pågældende komponent repareres, bedes De sende den til produktionsstedet. Reparation må kun udføres der.

## Særlige betingelser

1. Buskoblingen DP/PA skal monteres i et kontrolskab eller et metalkabinet. Disse skal mindst kunne sikre beskyttelsesklasse IP 54. I denne forbindelse skal der tages højde for de omgivelsestemperaturer, i hvilke udstyret er installeret. Der skal være udarbejdet en erklæring fra fabrikanten for kabinettet for zone 2 (iht. EN 50021).
2. Hvis kablet eller kabelindføringen på dette hus når op på en temperatur på  $> 70^{\circ}\text{C}$  under driftsbetingelser eller hvis temperaturen på åreforegningen kan være  $> 80^{\circ}\text{C}$  under driftsbetingelser, skal kablernes temperaturegenskaber stemme overens med de temperaturer, der rent faktisk måles.
3. De benyttede kabelindføringer skal være i overensstemmelse med den krævede IP-beskyttelsestype og afsnittet 7.2 (iht. EN 50021).
4. Alle apparater, inkl. kontakter osv., der forbindes med ind- og udgangene til fejlsikre signalkomponenter, skal være godkendt til eksplosionsbeskyttelse af type EEx nA eller EEx nC.
5. Der skal træffes foranstaltninger, der sørger for, at den nominelle spænding via transienter ikke kan overskrides mere end 40 %.
6. Omgivelsestemperaturområde:  $0^{\circ}\text{C}$  til  $60^{\circ}\text{C}$
7. I kabinettet skal der anbringes et skilt, der skal kunne ses, når kabinettet åbnes. Dette skilt skal have følgende advarsel:  
**Advarsel**  
Kabinettet må kun åbnes i kort tid, f.eks. til visuel diagnose. Tryk i denne forbindelse ikke på kontakter, træk eller isæt ikke komponenter og afbryd ikke elektriske ledninger (stikforbindelser).  
Denne advarsel skal der ikke tages højde for, hvis man ved, at der ikke er nogen eksplosionsfarlig atmosfære.

## Liste over godkendte komponenter

Listen med de godkendte komponenter findes på internettet:

<http://www4.ad.siemens.de/view/cs/>

under bidrags-ID 13702947.

## B.2.8 Väyläkytkennän DP/PA käyttö räjähdysvaarannetuilla alueilla, vyöhyke 2

### Vyöhyke 2

Räjähdysvaarannetut alueet jaetaan vyöhykkeisiin. Vyöhykkeet erotellaan räjähdyskelpoisen ilmakehän olemassa olon todennäköisyyden mukaan.

Vyöhyke	Räjähdysvaara	Esimerkki
2	Räjähävä kaasuilmakehä ilmaantuu vain harvoin ja lyhytaikaisesti	Alueet putkistojen lattatiivisteillä varustetuilla laippaliitoksilla suljetuissa tiloissa
turvallinen alue	ei	<ul style="list-style-type: none"> <li>vyöhykkeen 2 ulkopuolella</li> <li>Hajautetun ulkopiirin vakiosovellukset</li> </ul>

Seuraavasta löydätte tärkeitä ohjeita väyläkytkennän DP/PA asennukseen räjähdysvaarannetuilla alueilla.


### Lisätietoja

Lisätietoja väyläkytkentään DP/PA ja erilaisiin komponentteihin löydätte ohjekirjasta.

### Valmistuspaikka

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany


### Hyväksyntä

 II 3 G EEx nA II T3 .. T6 EN 50021 mukaan: 1999

Tarkastusnumero: **KEMA 02ATEX1096 X**

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### Ohje

Rakenneryhmät hyväksynnän  II 3 G EEx nA II T3 .. T6 kanssa saadaan käyttää ainoastaan laitekategorian 3 automatisointijärjestelmissä SIMATIC S7-300 / ET 200M.

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## Kunnossapito

Korjausta varten täytyy kyseinen komponentti lähettää valmistuspaikkaan. Korjaus voidaan suorittaa ainoastaan siellä.

## Erityiset vaatimukset

1. Väyläkytkentä DP/PA täytyy asentaa kytkentäkaappiin tai metalliseen koteloon. Näiden täytyy olla vähintään kotelointiluokan IP 54 mukaisia. Tällöin on huomioitava ympäristöolosuhteet, johon laite asennetaan. Kotelolle täytyy olla valmistajaselvitys vyöhykettä 2 varten (EN 50021 mukaan).
2. Kun johdolla tai tämän kotelon johdon sisäänviennillä saavutetaan  $> 70^{\circ}\text{C}$  lämpötila tai kun käyttöolosuhteissa lämpötila voi pihhajaotuksella olla  $> 80^{\circ}\text{C}$ , täytyy johdon lämpötilaominaisuuksien vastata todellisesti mitattuja lämpötiloja.
3. Käytettyjen johtojen sisäänohjauksien täytyy olla vaaditun IP-kotelointiluokan ja kohdan 7.2 (EN 50021 mukaan) mukaisia.
4. Kaikkien laitteiden, kytkimet jne. mukaan lukien, jotka liitetään virheiltä suojattujen signaalirakenneryhmien tuloille ja lähdöille, täytyy olla hyväksytyjä tyyppin EEx nA tai EEx nC räjähdysuojausta varten.
5. Toimenpiteet täytyy suorittaa, ettei nimellisjännite voi transienttien kautta ylittyä enemmän kuin 40 %.
6. Ympäristölämpötila-alue:  $0^{\circ}\text{C} \dots 60^{\circ}\text{C}$
7. Kotelon sisälle, avauksen jälkeen näkyvälle paikalle, on kiinnitettävä kilpi, jossa on seuraava varoitus:

### **Varoitus**

Kotelo saadaan avata ainoastaan lyhyeksi ajaksi, esim. visuaalista diagnoosia varten. Älä tällöin käytä mitään kytkimiä, vedä tai liitä mitään rakenneryhmiä, äläkä erota mitään sähköjohtoja (pistoliittimiä).

Tätä varoitusta ei tarvitse huomioida, kun on tiedossa, että minkäänlaista räjähdysvaarannettua ilmakehää ei ole olemassa.

## Hyväksytyjen rakenneryhmien lista

Lista hyväksytyistä rakennesarjoista löytyy internetistä osoitteesta:

<http://www4.ad.siemens.de/view/cs/>

käyttäjätunnuksella 13702947.

## B.2.9 Användning av bussanslutning DP/PA i explosionsriskområde zon 2

### Zon 2

Explosionsriskområden delas in i zoner. Zonerna delas in enligt sannolikheten att en atmosfär med explosionsfara föreligger.

Zon	Explosionsfara	Exempel
2	Explosiv gasatmosfär uppstår endast sällan eller kortvarigt	Områden kring flänsförbindelser med packningar vid rörledningar i slutna utrymmen
Säkert område	Nej	<ul style="list-style-type: none"> <li>• Utanför zon 2</li> <li>• Standardanvändning av decentral periferi</li> </ul>

Nedan följer viktiga anvisningar om installationen av DP/PA-bussanslutningens komponenter i ett explosionsriskområde.


### Ytterligare information

Ytterligare information om DP/PA-bussanslutningen och de olika komponenterna finner du i handboken.

### Tillverkningsort

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany


### Godkännande

 II 3 G EEx nA II T3 .. T6 enligt EN 50021 : 1999

Kontrollnummer: **KEMA 02ATEX1096 X**

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### Anvisning

Komponentgrupper med godkännande  II 3 G EEx nA II T3 .. T6 får endast användas i automatiseringssystemen SIMATIC S7-300 / ET°200M från apparatgrupp 3.

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## Underhåll

Vid reparation måste den aktuella komponenten insändas till tillverkaren. Reparationer får endast genomföras där.

## Särskilda villkor

1. Busskopplingen DP/PA måste monteras i ett kopplings-skåp eller metallhus. Dessa måste minst vara av skyddsklass IP 54. Därvid ska omgivningsvillkoren där enheten installeras beaktas. För skåpet måste en tillverkardeklaration för zon 2 föreligga (enligt EN 50021).
2. Om en temperatur på  $> 70^{\circ}\text{C}$  uppnås vid husets kabel resp kabelinföring under driftvillkor eller om temperaturen vid trådföringen kan vara  $> 80^{\circ}\text{C}$  under driftvillkor, måste kabelns temperaturegenskaper överensstämma med den verkliga uppmätta temperaturen.
3. De använda kabelinföringarna måste uppfylla kraven i det krävda IP-skyddsutförandet och i avsnitt 7.2 (enligt EN 50021).
4. Alla apparater, inklusive brytare osv, som ansluts till felsäkrade signalenheters in- och utgångar, måste vara godkända för explosionsskydd av typ EEx nA eller EEx nC.
5. Åtgärder måste vidtas så, att märkspänningen ej kan överskridas med mer än 40% genom transienter.
6. Omgivningstemperatur:  $0^{\circ}\text{C}$  till  $60^{\circ}\text{C}$
7. När huset öppnats ska en skylt med följande varning monteras på ett tydligt synligt ställe huset:  
**Varning**  
Huset får endast öppnas under kort tid, t ex för visuell diagnos. Använd därvid inga brytare, lossa eller anslut inga enheter och frånskilj inga elektriska ledningar (insticksanslutningar).  
Ingen hänsyn måste tas till denna varning om det är säkert att det inte råder någon explosionsfarlig atmosfär.

## Lista över godkända komponentgrupper

Lista över godkända enheter återfinns i Internet:

<http://www4.ad.siemens.de/view/cs/>

under bidrags-ID 13702947.

## B.2.10 Uso do acoplamento de bus DP/PA em área exposta ao perigo de explosão, zona 2

### Zona 2

As áreas expostas ao perigo de explosão são divididas em zonas. As zonas são diferenciadas de acordo com a probabilidade da existência de uma atmosfera explosiva.

Zona	Perigo de explosão	Exemplo
2	Só raramente e por um breve período de tempo surgem atmosferas explosivas	Áreas em torno de ligações flangeadas com vedações chatas em tubulações em recintos fechados
Área segura	não	<ul style="list-style-type: none"> <li>fora da zona 2</li> <li>Aplicações descentralizadas de periferia descentralizada</li> </ul>

A seguir, o Sr. encontrará avisos importantes para a instalação do acoplamento de bus DP/PA em área exposta ao perigo de explosão.


### Mais informações

Para obter mais informações sobre o acoplamento de bus DP/PA e sobre os diversos componentes, consulte o manual.

### Local de produção

Siemens AG, Bereich A&D  
 Werner-von-Siemens-Straße 50  
 92224 Amberg  
 Germany


### Licença

 II 3 G EEx nA II T3 .. T6 seg. EN 50021 : 1999

Número de ensaio: **KEMA 02ATEX1096 X**

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### Aviso

Componentes com a licença  II 3 G EEx nA II T3 .. T6 só podem ser aplicados em sistemas de automação SIMATIC S7-300 / ET 200M da categoria de aparelho 3.

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## Reparo

Os componentes em questão devem ser remetidos para o local de produção a fim de que seja realizado o reparo. Apenas lá deve ser efetuado o reparo.

## Condições especiais

1. O acoplamento do bus DP/PA deve ser montado em um armário de distribuição ou em uma caixa metálica. Estes devem garantir no mínimo o tipo de proteção IP 54. Durante este trabalho deverão ser levados em consideração as condições locais, nas quais o aparelho será instalado. Para a caixa deverá ser apresentada uma declaração do fabricante para a zona 2 (de acordo com EN 50021).
2. Caso no cabo ou na entrada do cabo desta carcaça sob as condições operacionais seja atingida uma temperatura de  $> 70^{\circ}\text{C}$ , ou caso sob condições operacionais a temperatura na ramificação do fio poderá atingir  $> 80^{\circ}\text{C}$ , as características de temperatura deverão corresponder às temperaturas realmente medidas.
3. As entradas de cabo utilizadas devem corresponder ao tipo exigido de proteção IP e à seção 7.2 (de acordo com o EN 50021).
4. Todos os aparelhos, inclusive as chaves, etc., que estejam conectadas em entradas e saídas de módulos de sinais protegidos contra erro, devem possuir a licença para a proteção de explosão do tipo EEx nA ou EEx nC.
5. Precisam ser tomadas medidas para que a tensão nominal através de transitórios não possa ser ultrapassada em mais que 40 %.
6. Área de temperatura ambiente:  $0^{\circ}\text{C}$  até  $60^{\circ}\text{C}$
7. No âmbito da carcaça deve ser colocada, após a abertura, em um ponto bem visível uma placa com a seguinte advertência:

### **Advertência**

A carcaça deve ser aberta apenas por um breve período de tempo, por ex. para diagnóstico visual. Não acione nenhum interruptor, não retire ou conecte nenhum módulo e não separe nenhum fio elétrico (ligações de tomada).

Esta advertência poderá ser ignorada caso se saiba que não há nenhuma atmosfera sujeita ao perigo de explosão.

## Lista dos componentes autorizados

A lista com os módulos autorizados encontram-se na Internet:

<http://www4.ad.siemens.de/view/cs/>

sob o número de ID 13702947.

## B.2.11 Χρήση της σύζευξης διαύλου DP/PA σε επικίνδυνη για έκρηξη περιοχή, ζώνη 2

### Ζώνη 2

Οι επικίνδυνες για έκρηξη περιοχές χωρίζονται σε ζώνες. Οι ζώνες διαφέρουν σύμφωνα με την πιθανότητα ύπαρξης ενός ικανού για έκρηξη περιβάλλοντος.

Ζώνη	Κίνδυνος έκρηξης	Παράδειγμα
2	Εκρηκτικό περιβάλλον αερίου παρουσιάζεται μόνο σπάνια και για σύντομο χρονικό διάστημα	Περιοχές γύρω από φλαντζωτές συνδέσεις με τσιμούχες σε σωληνώσεις σε κλειστούς χώρους
Ασφαλής περιοχή	όχι	<ul style="list-style-type: none"> <li>Εκτός της ζώνης 2</li> <li>Τυπικές εφαρμογές αποκεντρωμένης περιφέρειας</li> </ul>

Στη συνέχεια θα βρείτε σημαντικές υποδείξεις για την εγκατάσταση των εξαρτημάτων της σύζευξης διαύλου DP/PA σε επικίνδυνη για έκρηξη περιοχή.

### Επιπλέον πληροφορίες

Επιπλέον πληροφορίες για τη σύζευξη διαύλου DP/PA και για τα διάφορα εξαρτήματα θα βρείτε στο εγχειρίδιο.

### Τόπος κατασκευής


Siemens AG, Bereich A&D  
Werner-von-Siemens-Straße 50  
92224 Amberg  
Germany

### Άδεια

 II 3 G EEx nA II T3 .. T6 σύμφωνα με το πρότυπο EN 50021 : 1999

Αριθμός ελέγχου: **KEMA 02ATEX1096 X**

### Υπόδειξη

Τα δομικά συγκροτήματα με την άδεια  II 3 G EEx nA II T3 .. T6 επιτρέπεται να τοποθετηθούν μόνο σε συστήματα αυτοματισμού SIMATIC S7-300 / ET 200M της κατηγορίας συσκευής 3.

## Συντήρηση

Για μια επισκευή πρέπει να σταλθεί το αντίστοιχο εξάρτημα στον τόπο κατασκευής. Μόνο εκεί επιτρέπεται να γίνει η επισκευή.

## Ιδιαίτερες προϋποθέσεις

1. Η σύζευξη διαύλου DP/PA πρέπει να ενσωματωθεί σε ένα ερμάριο ζεύξης ή σε ένα μεταλλικό περίβλημα. Αυτά πρέπει να εξασφαλίζουν το λιγότερο το βαθμό προστασίας IP 54. Σε αυτήν την περίπτωση πρέπει να ληφθούν υπόψη οι περιβαλλοντικές συνθήκες, στις οποίες θα εγκατασταθεί η συσκευή. Για το περίβλημα πρέπει να προβλέπεται δήλωση του κατασκευαστή για τη ζώνη 2 (σύμφωνα με το πρότυπο EN 50021).
2. Εάν στο καλώδιο ή στην είσοδο του καλωδίου αυτού του περιβλήματος κάτω από συνθήκες λειτουργίας η θερμοκρασία ξεπεράσει τους 70 °C ή όταν κάτω από συνθήκες λειτουργίας η θερμοκρασία στη διακλάδωση του σύρματος μπορεί να είναι μεγαλύτερη από 80 °C, πρέπει οι θερμοκρασιακές ιδιότητες των καλωδίων να ταυτίζονται με τις πραγματικά μετρημένες θερμοκρασίες.
3. Οι χρησιμοποιούμενες εισόδους καλωδίων πρέπει να συμμορφώνονται με το βαθμό προστασίας IP 54 στην ενότητα 7.2 (σύμφωνα με το πρότυπο EN 50021).
4. Όλες οι συσκευές, συμπεριλαμβανομένων διακοπών κ.α., που συνδέονται στις εισόδους και εξόδους δομικών συγκροτημάτων ασφαλών σημάτων, πρέπει να φέρουν εγκριμένη προστασία κατά έκρηξης τύπου EEx nA ή EEx nC.
5. Πρέπει να ληφθούν μέτρα, να μην μπορεί να γίνει υπέρβαση της ονομαστικής τάσης μέσω αιφνίδιας μεταβολής της τάσης πάνω από 40 %.
6. Περιοχή θερμοκρασίας περιβάλλοντος: 0° C έως 60° C
7. Πρέπει να τοποθετηθεί μέσα στο περίβλημα σε ευδιάκριτο σημείο μετά το άνοιγμα μία πινακίδα με την ακόλουθη προειδοποίηση:

### **Προειδοποίηση**

Το περίβλημα επιτρέπεται να ανοίγει μόνο για μικρό χρονικό διάστημα, π.χ. για τη διενέργεια οπτικής διάγνωσης. Μην κάνετε χρήση διακοπών, μην τραβάτε ή εμβυσατώνετε δομικά συγκροτήματα και μη διαχωρίζετε ηλεκτροφόρους αγωγούς (εμβυσατώσιμες συνδέσεις).

Η προειδοποίηση αυτή δε χρειάζεται να ληφθεί υπ' όψιν, εάν είναι γνωστό ότι δεν υφίσταται ατμόσφαιρα παρουσιάζουσα κίνδυνο έκρηξης.

## Κατάλογος των εγκεκριμένων δομικών συγκροτημάτων

Η λίστα με τα εγκεκριμένα δομικά συγκροτήματα υπάρχει στο διαδίκτυο:

<http://www4.ad.siemens.de/view/cs/>

με τον κωδικό συνδρομής 13702947.

### B.3 Technical specifications of the IM 157 (6ES7 157-0AA82-0XA0)

Dimensions and weight			
Dimensions W × H × D (mm)	40 × 125 × 130	Insulation tested at	500 VDC
Weight	Approx. 350 g	Use in DP/PA link	
Module-specific data		<ul style="list-style-type: none"> <li>Power input (24 VDC) Max. 100 mA</li> <li>Power loss Typically 2 W</li> </ul>	
Transmission rate of higher level DP master system	9,6; 19,2; 45,45; 93,75; 187,5; 500 kBaud 1,5; 3, 6, 12 MBaud	Use in Y link	
Bus protocol	PROFIBUS-DP	<ul style="list-style-type: none"> <li>Power input (24 VDC) Max. 200 mA</li> <li>Power loss Typically 4 W</li> </ul>	
Frame length of I/O data	Max. 244 bytes	Status, interrupts, diagnostics	
Configuration frame length	Max. 244 bytes	Status display	No
Diagnostic frame length	Max. 231 bytes	Interrupts	Yes
Parameter assignment frame length	Max. 214 bytes	Diagnostic function	Yes
Suitable for system changes during operation:	Yes	<ul style="list-style-type: none"> <li>Group error Red "SF" LED</li> <li>Bus error on higher level DP master system Red "BF 1" LED</li> <li>Bus error on underlying bus system Red "BF 2" LED</li> <li>IM has an active channel Yellow "ACT" LED</li> <li>24 V supply monitoring Green "ON" LED</li> </ul>	
Voltages, currents, potentials		Data on connection of underlying bus components	
Rated supply voltage	24 VDC (20.4 V ... 28.8 V)	Connectable DP/PA coupler	Max. 5
<ul style="list-style-type: none"> <li>Polarity reversal protection Yes</li> <li>Power failure bridging 20 ms</li> </ul>		Connectable Y coupler	1
Isolation		Connectable underlying slaves	Max. 64
<ul style="list-style-type: none"> <li>To underlying DP master system Yes</li> <li>To DP/PA or Y coupler No</li> </ul>		Number of slots in underlying slaves	Max. 236 or (244 – number of PA field devices)

## B.4 Technical specifications of the DP/PA coupler Ex [i] (6ES7 157-0AD81-0XA0)

Dimensions and weight		Ex [i] characteristic data	
Dimensions W × H × D (mm)	80 × 125 × 130	• $U_o$	= 15 V
Weight	Approx. 515 g	• $I_o$	= 249 mA
<b>Module-specific data</b>		• $P_o$	= 1.95 W
Transmission rate on PROFIBUS-DP	45.45 kbps	• $U_m$	= 60 VDC/30 VAC
Transmission rate on PROFIBUS-PA	31.25 kbps	• $T_a$	= -25 to +60 °C
Bus protocol	PROFIBUS-DP	<b>Connectable cables (PA)</b>	
Ignition protection type as associated equipment for:	⊕ II 3 (1) G EEx nA [ia] IIC T4	• $R'$	15 ... 150 Ω /km
<b>Voltages, currents, potentials</b>		• $L'$	0.4 ... 1 mH /km
Rated supply voltage	24 VDC (20.4 V ... 28.8 V)	• $C'$	80 ... 200 nF /km
• Polarity reversal protection	Yes	• Length	Max. 1000 m; for safety reasons (explosion protection)
• Power failure bridging	Min. 5 ms	<b>Data for selecting the PA field devices</b>	
PA interface		Connection to DP/PA coupler	• Field devices with certification for PROFIBUS-PA
• Output voltage	13 VDC ... 14 V		• Max. 31 PA field devices can be connected
• Output current for:	Max. 110 mA		• Power input of all PA field devices together max. 110 mA
Galvanic isolation of the 24 V power supply		Approval data of the PA field devices must correspond to Ex [i] characteristics of the DP/PA coupler:	
• To PROFIBUS-DP	Yes	• $U_o$	≥ 15 V
• To PROFIBUS-PA	Yes	• $I_o$	≥ 247 mA
Insulation tested at	500 VAC	• $P_o$	≥ 1.95 W
DP/PA coupler power input (24 VDC)	Max. 400 mA	• $U_m$	≥ 60 VDC/30 VAC
Power loss of the module	Typically 7 W	• $L_i$	< 10 μH
<b>Status, interrupts, diagnostics</b>		• $C_i$	< 5 nF
Status display	No	• $U_i$	≥ 15 V
Interrupts	None	• $I_i$	≥ 249 mA
Diagnostic function	Yes	• $P_i$	≥ 1.95 W
• PROFIBUS-DP bus monitoring	Yellow "DP" LED		
• PROFIBUS-PA bus monitoring	Yellow "PA" LED		
• 24 V supply monitoring	Green "ON" LED		

## B.5 Technical specifications of the DP/PA coupler (6ES7 157-0AC80-0XA0)

Dimensions and weight		Status, interrupts, diagnostics	
Dimensions W × H × D (mm)	80 × 125 × 130	Status display	No
Weight	Approx. 515 g	Interrupts	None
Module-specific data		Diagnostic function	Yes
Transmission rate on PROFIBUS-DP	45.45 kbps	• PROFIBUS-DP bus monitoring	Yellow "DP" LED
Transmission rate on PROFIBUS-PA	31.25 kbps	• PROFIBUS-PA bus monitoring	Yellow "PA" LED
Bus protocol	PROFIBUS-DP	• 24 V supply monitoring	Green "ON" LED
Voltages, currents, potentials		Data for selecting the PA field devices	
Rated supply voltage	24 VDC (20.4 V ... 28.8 V)	Connection to DP/PA coupler	<ul style="list-style-type: none"> <li>• Max. power input of the PA field devices together 400 mA</li> <li>• Field devices with certification for PROFIBUS-PA</li> <li>• Field devices are <b>outside</b> the hazardous area</li> <li>• Max. 31 PA field devices can be connected</li> </ul>
• Polarity reversal protection	Yes		
Output voltage for PA part:	Typically 19 VDC		
• Power failure bridging	Min. 5 ms		
Galvanic isolation of the 24 V power supply			
• To PROFIBUS-DP	Yes		
• To PROFIBUS-PA	Yes		
Insulation tested at	500 VDC		
DP/PA coupler power input (24 VDC)	Max. 0.75 A		
PA part output current (for sizing of the PA configuration)	400 mA		
Power loss of the module	Typically 7 W		



## B.6 Technical specifications of the Y coupler (6ES7 197-1LB00-0XA0)

Dimensions and weight		Status, interrupts, diagnostics	
Dimensions W × H × D (mm)	40 × 125 × 130	Status display	No
Weight	Approx. 200 g	Interrupts	None
Module-specific data		Diagnostic function	Yes
Transmission rate of the underlying DP master system	45,45; 93,75; 187,5; 500 kBaud 1,5; 3; 6; 12 MBaud	• Bus monitoring of internal PROFIBUS-DP	Yellow "DP 1" LED
Bus protocol	PROFIBUS-DP	• Bus monitoring of external PROFIBUS-DP	Yellow "DP 2" LED
Parameter assignment frame length	Max. 244 bytes	• Power supply monitoring	Green "ON" LED
Voltages, currents, potentials		Data on connection of DP slaves	
Power supply	Via bus module	Connectable DP slaves	Max. 64*)
Power input	Max. 300 mA	Termination of the underlying DP master system	Active terminating resistor (BUS TERMINATOR)
Power loss of the module	Typically 1 W	Use of RS 485 repeaters	Max. 8
Isolation to underlying DP master system	Yes	Use of OLM/OBT	Yes
Insulation tested at	500 VDC		

\*) Only with use of RS 485 repeaters or OLM/OBT, otherwise max. 31



# C

## DP Slaves Connectable to a Y Link

Using STEP 7 of version V5.2 or higher, many DP slaves can be directly configured in the underlying DP master system of a Y link.

Table C-1 Examples of directly configurable DP slaves

Group (path <sup>1)</sup> )	Configurable slaves	MLFB
Preconfigured stations	<ul style="list-style-type: none"> <li>PC station as a DP slave</li> <li>S7-300 CP 342-5 DP</li> </ul>	– All
DP/AS-i	<ul style="list-style-type: none"> <li>DP/AS-i Link</li> </ul>	6ES7 156-0AA00-0XA0
DP/AS-i	<ul style="list-style-type: none"> <li>DP/AS-i ILink 20</li> </ul>	6GK1415-2AA00
ENCODER	SIMODRIVE Sensor	6FX2001-5xPxx
ET 200B	Most components with the exception of S7 slaves ET 200B-4AI, ET 200B-4/8AI and ET 200B-4AO	<b>Not</b> 6ES7 134-0HF01-0XB0, 6ES7 134-0KH01-0XB0, 6ES7 135-0HF01-0XB0
ET 200L	Most components with the exception of the extendable module L-SC-...	
ET 200S	Most components with the exception of the IM 151 / CPU	<b>Not</b> 6ES7 151-7AA00-0AB0
Function modules	IM 178-4	6ES7 178-4BH00-0AE0
IPC	Direct control key module	
NC	IM 319N (slave)	6FC5012-0CA02-0AA0
Control unit	SIPART DR**	
Switchgear	<ul style="list-style-type: none"> <li>Interface module DP/RS 485</li> <li>SIMOCODE-DP</li> </ul>	3RK1000-0JC80-0BA1
SIMADYN	SIMADYN D SS52	6DD1688-0AE2

1) In hardware catalog based on "PROFIBUS-DP"

Nearly all of the components in the following groups are directly configurable: ET 200C, ET 200U, IDENT, SIMATIC, SIMODRIVE, SIMOREG, SIMOVERT and SIPOS.

DP slaves that are not allowed by STEP 7 can be configured as DPV0 standard slaves by means of the device master file, provided that they are not subject to the restrictions presented below.

## Restrictions

- In the underlying DP master system, operator panels and text displays can only be operated as DP slaves and not as active bus nodes.
- Slaves in the DPV1 mode cannot be operated in the underlying DP master system if the Y link is in DPV0 mode (DP master in “S7-compatible” mode).

## Configuration of S7-300/S7-400 stations as I slaves

The CPU for an S7-300 or S7-400 station cannot be used out of the “preconfigured stations” catalog directory but must be integrated via the device master file.

When configuring the S7-300/S7-400 station, a “dummy” DP system must be created that has the same bus settings (transmission rates, etc.) as the underlying DP master system of the Y link but not the same bus name. The station number of the S7-300/S7-400 must coincide with the slave address on the Y link.

## Examples of usable DP slaves

The table below shows a selection of field devices that can be defined via the device master file as DP slaves. It also presents all of the S7-CPU's that can be used as I slaves with various I/O ranges.

Table C-2 Examples of usable DP slaves

Slave name	Path <sup>1)</sup>	Device master file	Input bytes	Output bytes	Number of slaves <sup>2)</sup>
Gateway 3WN6	Switchgear	Siem8032.gs*	Max. 12	Max. 12	20 <sup>3)</sup>
ET 200X with BM147/CPU as I slave with various I/O ranges	I/OET200X	Siem804a.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
SIMOCODE-DP with the Type 1 Compact basic module	Switchgear \SIMOCODE	Siem8031.gs*	12	4	20
SIMODRIVE 611U with 1 axis, PPO Type 5	Drives \SIMODRIVE	Siem8055.gsd	28	28	8
SIMODRIVE 611U with 2 axes, PPO Type 5			56	56	4
SIMODRIVE POSMO A	Drives \SIMODRIVE	Siem8054.gsd	12	12	20
Heating control HS 724	General \OTHER	Siem002b.gsd	32	32	7

1) In the hardware catalog based on “PROFIBUS-DP\Additional FIELD DEVICES”

2) Number of slaves of the same kind that exhaust the capacity of the I/O quantity structure of the Y link

3) Applies when the maximum number of slaves is installed

Table C-3 CPUs that can be used as I slaves with various I/O ranges

Slave name	Path <sup>1)</sup>	Device master file	Input bytes	Output bytes	Number of slaves <sup>2)</sup>
S7-300 CPU 315-2DP (...-2AF01-... or ...-2AF02-...)	SPS\SIMATIC	Siem802f.gs*	Max. 122	Max. 122	1 <sup>3)</sup>
S7-300 CPU 315-2DP (...-2AF03-...)	SPS\SIMATIC	Sie3802f.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-300 CPU 316-2DP	SPS\SIMATIC	Siem806f.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-300 CPU 318-2DP	SPS\SIMATIC	Siem807f.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-400 CPU 412-1	SPS\SIMATIC	Siem80c5.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-400 CPU 412-2	SPS\SIMATIC	Siem80c6.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-400 CPU 414-2	SPS\SIMATIC	Siem80c7.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-400 CPU 414-3	SPS\SIMATIC	Siem80c8.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-400 CPU 416-2	SPS\SIMATIC	Siem80ca.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-400 CPU 416-3	SPS\SIMATIC	Siem80cb.gs*	Max. 244	Max. 244	1 <sup>3)</sup>
S7-400 CPU 417-4	SPS\SIMATIC	Siem80cc.gs*	Max. 244	Max. 244	1 <sup>3)</sup>

1) In the hardware catalog based on "PROFIBUS-DP\Additional FIELD DEVICES"

2) Number of slaves of the same kind that exhaust the capacity of the I/O quantity structure of the Y link

3) Applies when the maximum number of slaves is installed

### Configuration example

- An S7-300 with a CPU 315-2DP as an I slave with various I/O ranges
- Two SIMODRIVE 611U with two axes each, PPO Type 5
- One heating control HS 724

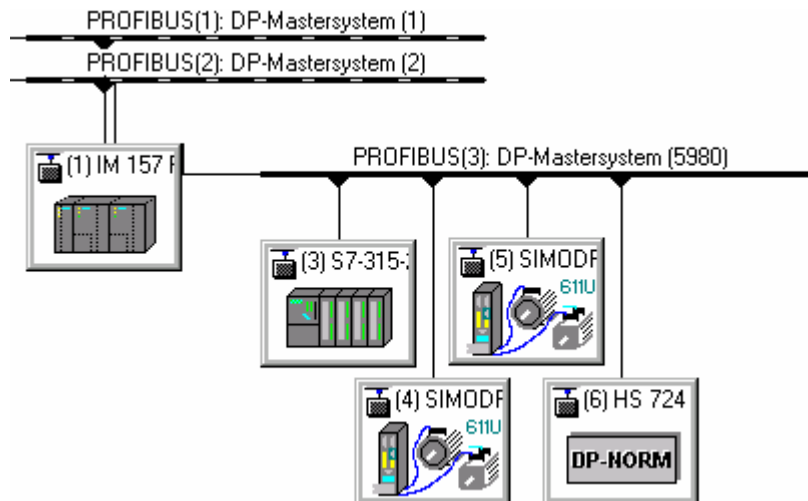


Figure C-1 Configuration example (excerpt from HW Config)

DP address	Slave	Input bytes	Output bytes
3	S7-300 with CPU 315-2DP <sup>1)</sup>	100	100
4	SIMODRIVE 611U with 2 axes, PPO Type 5	56	56
5	SIMODRIVE 611U with 2 axes, PPO Type 5	56	56
6	Heating control HS 724	32	32
	Total	244	244

<sup>1)</sup> The actual hardware configuration of the station is irrelevant here. The only factor that counts are the I/O ranges that are transparent to the H system.

Thus, the maximum frame length for the input data and output data has been reached for the underlying DP master system. No additional slaves can be operated on this DP master system.

# D

## Order Numbers and Accessories

### D.1 Coupler components

Table D-1 Order numbers for the coupler components

Component	Order number
IM 157	6ES7 157-0AA82-0XA0
DP/PA coupler Ex [i]	6ES7 157-0AD81-0XA0
DP/PA coupler	6ES7 157-0AC80-0XA0
Y coupler	6ES7 197-1LB00-0XA0
BM PS/IMm bus module	6ES7 195-7HA00-0XA0
BM IM/IM bus module	6ES7 195-7HD80-0XA0
BM DP/PA coupler bus module	6ES7 195-7HF80-0XA0
BM Y coupler bus module	6ES7 654-7HY00-0XA0
Complete Y link package, consisting of: <ul style="list-style-type: none"><li>• 2 x IM 157</li><li>• 1 x BM IM/IM bus module</li><li>• 1 x Y coupler</li><li>• 1 x BM Y coupler bus module</li></ul>	6ES7 197-1LA01-0XA0

Table D-2 Order numbers for the configuration accessories

Component	Order number
Rail for the "Module replacement during operation" function <ul style="list-style-type: none"><li>• 482.6 mm</li><li>• 530 mm</li><li>• 620 mm</li><li>• 2000 mm</li></ul>	6ES7 195-1GA00-0XA0 6ES7 195-1GF30-0XA0 6ES7 195-1GG30-0XA0 6ES7 195-1GC00-0XA0
Bus connector for S7 rail (included with every DP/PA coupler)	6ES7 390-0AA00-0AA0
Covers (contain 4 backplane bus covers and 1 bus module cover)	6ES7 195-1JA00-0XA0

## D.2 Accessories for PROFIBUS-DP

Table D-3 Order numbers for PROFIBUS-DP accessories

Accessories	Order number
PROFIBUS-DP bus connector (up to 12 MBaud)	
• Without programming port	6ES7 972-0BA12-0XA0
• With programming port	6ES7 972-0BB12-0XA0
PROFIBUS-DP FastConnect bus connector	
• Without programming port	6ES7 972-0BA50-0XA0
• With programming port	6ES7 972-0BB50-0XA0
PROFIBUS-DP bus cable	
• Normal (flexible)	6XV1 830-0AH10
• Drum cable (strong)	6XV1 830-3BH10
PROFIBUS-DP terminator	6ES7 972-0DA00-0XA0

## D.3 PROFIBUS-PA accessories

Table D-4 Order numbers for PROFIBUS-PA accessories

Accessories	Order number
PROFIBUS-PA bus cable (cable type A)	6XV1 830-5AH10

### Configuration using the SplitConnect connection system

Create the configuration using the SplitConnect connection system. Using the SplitConnect connection system, it is possible to install PROFIBUS-PA segments easily in accordance with IEC 61784-1:2002 Ed1 CP 3/2 with field device connecting points in both intrinsically safe and non-intrinsically safe areas. The SplitConnect system consists of the following components:

Accessories	Description	Order number
SplitConnect tap	T-connector for PA field device	6GK1 905-0AA00
SplitConnect M12 outlet	Connector for M12 connection	6GK1 905-0AB00
SplitConnect coupler	Connection element between the taps	6GK1 905-0AC00



Accessories	Description	Order number
SpliTConnect M12 terminator (Ex)	Terminating resistor for hazardous areas	6GK1 905-0AD00
SpliTConnect M12 terminator	Terminating resistor for non-hazardous areas	6GK1 905-0AE00

### Bus terminating element

The SpliTConnect tap can also be extended as a bus terminating element.

You can find further information in the ST PI catalog.

### Wiring with the fast installation cable (FastConnect cable)

Wire the PROFIBUS-PA segments with the fast installation cable (FastConnect cable):

Accessories	Description	Order number
FC PROFIBUS PA (blue)	Fast installation cable	6XV1 830-5CH10
FC PROFIBUS PA (black)		6XV1 830-5DH10

### Stripping

Strip the FastConnect cables with the FastConnect stripping tool. You can remove the outer covering and the braided screen with millimeter accuracy in one step using the FastConnect stripping tool.

Accessories	Description	Order number
FastConnect stripping tool	Stripping tool	6GK1 905-6AA00
Blade cassettes	Spare blade cassettes	6GK1 905-6AB00



# Glossary

## **Address**

The address of a node is used to localize it in the network. It must be unique throughout the entire system.

## **Aggregate current**

Aggregate current of all the PA field devices.

## **Automation system**

An automation system is a programmable logic controller that consists of at least one CPU, various input and output modules and human-machine interfaces.

## **Bus**

Shared transmission path to which all nodes are connected; possesses two defined ends.

## **Bus connector**

Physical connection between the bus node and the bus cable.

## **Coupler**

The DP/PA coupler connects a PROFIBUS-PA segment to a PROFIBUS-DP segment. PROFIBUS-PA and PROFIBUS-DP are linked in terms of data but are based on different types of transmission media.

## **Device master file**

All slave-specific characteristics are stored in a device master file (GSD file). The format of the device master file is provided in the PROFIBUS Guideline: Specification for PROFIBUS Device Description and Device Integration Vol.1: GSD V4.1, 07/2001 of the PROFIBUS Nutzerorganisation (PNO).

### **Diagnostic interrupt**

Diagnostics-capable modules use diagnostic interrupts to report system errors that they have detected to the central CPU.

In SIMATIC S7/M7: When an error is detected or disappears (e. g. wire break), the module triggers a diagnostic interrupt, provided the interrupt is enabled. The CPU interrupts the processing of the user program and lower priority classes, and processes the diagnostic interrupt block (OB 82).

In SIMATIC S5: The diagnostic interrupt appears in the station diagnosis. Using cyclical querying of the diagnostic bits in the station diagnosis, you can detect errors such as a wire break.

### **Diagnostics**

Diagnostics is the detection, localization, classification, display and evaluation of errors, faults and messages.

Diagnostics provides monitoring functions that run automatically while the system is in operation. This increases the availability of systems by reducing commissioning times and downtimes.

### **DP master**

A → master that behaves in accordance with IEC 61784-1:2002 Ed1 CP 3/1 is referred to as a DP master.

### **DP slave**

A → slave run on the PROFIBUS bus system with the PROFIBUS-DP protocol that behaves in accordance with the IEC 61784-1:2002 Ed1 CP 3/1 is referred to as a DP slave.

### **DP standard**

The DP standard is the bus protocol of the distributed I/O system in accordance with IEC 61784-1:2002 Ed1 CP 3/1.

### **DPV0**

- Cyclical data exchange between the higher level system and slaves
- Configuration by means of device master files
- Diagnostics

**DPV1**

Extension of the DPV0:

- Acyclical data exchange between the higher level system and slaves
- Integration in engineering systems via EDD or FDT/DTM
- Transferrable PLC software function blocks (IEC 61131-3)
- Fail-safe communication (PROFIsafe)
- Interrupts

**Electromagnetic compatibility**

Electromagnetic compatibility is the capability of electrical equipment to work free of problems in a defined environment without affecting its environment in an impermissible manner.

**Equipment, associated**

Electrical equipment that contains both intrinsically safe and non-intrinsically safe circuits and is designed so that the non-intrinsically safe circuits cannot damage the intrinsically safe circuits.

**Equipment, electric**

The components, electrical circuits or parts of electrical circuits in their entirety that are generally contained in a single housing.

**Equipment, intrinsically safe, electrical**

Electrical equipment in which all the circuits are intrinsically safe.

**Equipotential bonding**

An electrical connection (equipotential bonding conductor) that keeps the body of electrical equipment and external conductive bodies at the same or nearly the same potential in order to prevent interfering or dangerous voltages between these two bodies.

**Field bus**

The field bus is a serial bus system for the distributed integration of field devices in an automation system.

**Ground**

Ground refers to the entirety of all interconnected inactive parts of an equipment that cannot possess a dangerous contact voltage, even in the event of a malfunction.

**Ground**

The conductive mass of earth, the electrical potential of which can be set to zero at any point.

**Grounding**

Grounding means connecting an electrically conductive component to ground by means of a grounding system.

**Ground terminal PE**

Name of the connector on electrical equipment used in potentially explosive areas to which the potential bonding system is connected.

**Hazardous area**

An area in which the atmosphere could become explosive (i.e. there is a potential danger).

**H System**

System with high availability consisting of at least two central processing units or two separate devices, e.g. PCs (master/reserve). The user program is processed identically in the master and reserve PCs.

**HW Config**

Component of STEP 7 for configuring hardware.

**Ignition protection type**

This refers to the special measures taken with electrical equipment to prevent the ignition of an explosive atmosphere.

**Master**

Masters may, if they possess a token, send data to other nodes and request data from other nodes (= active node). DP master are e. g. the CPU 315-2 DP or the IM 308-C.

**Parameter assignment**

Parameter assignment is the handing over of slave parameters from the master to the slave.

**PNO**

PROFIBUS user organization

**Power supply unit**

A power supply unit supplies power to the field devices and the process I/Os connected to them.

**PROFIBUS**

PROcess Field BUS, process and field bus standard that is defined in the field bus standard (IEC 61784-1:2002 Ed1 CPF 3 PROFIBUS and PROFInet). It defines functional, electrical and mechanical properties for a bit-serial field bus system.

PROFIBUS is available with the following protocols: DP (for distributed I/O systems) and FMS (= Fieldbus Message Specification).

**PROFIBUS address**

Each bus node must receive a PROFIBUS address that uniquely identifies it on the PROFIBUS-DP.

The PC/programming device or the hand-held ET 200 have the PROFIBUS address "0".

DP master and DP slaves have a PROFIBUS address from 1 to 125.

**PROFIBUS-DP**

This is the PROFIBUS bus system with the DP protocol. DP stands for distributed I/O in German.

### **PROFIBUS-PA**

PA stands for process automation and extends the scope of the PROFIBUS-DP family to include process engineering. Process engineering includes both intrinsically safe applications in the chemical engineering industry as well as non-intrinsically safe applications such as power plant automation, food processing and sewage treatment.

### **Redundant systems**

Redundant systems are characterized by the fact that important automation components are duplicated (redundant). If a redundant component fails, there is no interruption in the program processing.

### **Reference potential**

The potential with respect to which the voltages of the circuits involved are viewed and/or measured.

### **Segment**

A segment or bus segment is a self-contained part of a serial bus system.

### **SELV**

Safety extra-low voltage (SELV) is voltage  $\leq 30$  VAC/60 VDC generated by means of a safety isolating transformer, battery, etc.

### **SIMATIC PDM**

SIMATIC PDM (Process Device Manager) is a universal tool that is not manufacturer-specific and is used for configuring, parameterizing, commissioning and diagnosing intelligent process devices. With SIMATIC PDM, a large variety of process devices can be configured with a single software on a standardized user interface.

### **Supply unit**

A supply unit supplies power to the line.

### **Terminating resistor**

A terminating resistor is a resistor that terminates the data transmission line to avoid reflections.



### **TN-S system**

In a TN-S system, the neutral conductor (N) and protective conductor (PE) are routed separately from each other. The neutral conductor is connected to the grounded protective conductor at a central point, and only there. The conductor can be grounded any number of times.

### **Token**

In the field of network technology, a token is defined as a bit pattern that is passed from one bus node to the next, giving that node access to the bus.

### **Transmission rate**

The transmission rate is the number of transmitted bits per second.

### **Ungrounded**

Without a conductive connection to ground.



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