VIPA System 200V

IM | Manual

HB97E_IM | RE_253-xDPxx | Rev. 14/18

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VIPA
A YASKAWA COMPANY

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Note

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Contents

About this manual

This manual describes the System 200V PROFIBUS DP slave modules IM 253-xDPxx from VIPA. Here you may find every information for commissioning and operation.

Overview

Chapter 1: Basics and Assembly

The focus of this chapter is on the introduction of the VIPA System 200V. Here you will find the information required to assemble and wire a controller system consisting of System 200V components.

Besides the dimensions the general technical data of System 200V will be found.

Chapter 2: Hardware description

Here the hardware components of the IM 253-xDPxx are described.

The technical data are at the end of the chapter.

Chapter 3: Deployment IM 253DP

This chapter contains a description of the PROFIBUS DP slave modules IM 253-xDPxx under PROFIBUS. A short introduction and presentation of the system is followed by the project design and configuration of the PROFIBUS slave modules that are available from VIPA.
The chapter concludes with a number of communication examples and the technical data.

Objective and contents

This manual describes the System 200V PROFIBUS DP slave modules IM 253-xDPxx from VIPA. It contains a description of the construction, project implementation and usage.

This manual is part of the documentation package with order number HB97E_IM and relevant for:

Product	Order number	as of state: HW
IM 253DP	VIPA 253-xDPxx	01

Target audience

The manual is targeted at users who have a background in automation technology.

Structure of the manual

The manual consists of chapters. Every chapter provides a self-contained description of a specific topic.

Guide to the document

The following guides are available in the manual:

- an overall table of contents at the beginning of the manual
- an overview of the topics for every chapter

Availability

The manual is available in:

- printed form, on paper
- in electronic form as PDF-file (Adobe Acrobat Reader)

Icons Headings

Important passages in the text are highlighted by following icons and headings:

Danger!
Immediate or likely danger.
Personal injury is possible.

Attention!
Damages to property is likely if these warnings are not heeded.

Note!
Supplementary information and useful tips.

Safety information

Applications conforming with specifications

The IM 253DP is constructed and produced for:

- all VIPA System 200V components
- communication and process control
- general control and automation applications
- industrial applications
- operation within the environmental conditions specified in the technical data
- installation into a cubicle

Danger!

This device is not certified for applications in

- in explosive environments (EX-zone)

Documentation

The manual must be available to all personnel in the

- project design department
- installation department
- commissioning
- operation

The following conditions must be met before using or commissioning the components described in this manual:

- Hardware modifications to the process control system should only be carried out when the system has been disconnected from power!
- Installation and hardware modification only by properly trained personnel.
- The national rules and regulations of the respective country must be satisfied (installation, safety, EMC ...)

Disposal

National rules and regulations apply to the disposal of the unit!

Chapter 1 Basics and Assembly

Overview

The focus of this chapter is on the introduction of the VIPA System 200V. Here you will find the information required to assemble and wire a controller system consisting of System 200V components.

Besides the dimensions the general technical data of System 200V will be found.

Contents

Safety Information for Users

Handling of electrostatic sensitive modules

VIPA modules make use of highly integrated components in MOS-Technology. These components are extremely sensitive to over-voltages that can occur during electrostatic discharges.

The following symbol is attached to modules that can be destroyed by electrostatic discharges.

The Symbol is located on the module, the module rack or on packing material and it indicates the presence of electrostatic sensitive equipment.

It is possible that electrostatic sensitive equipment is destroyed by energies and voltages that are far less than the human threshold of perception. These voltages can occur where persons do not discharge themselves before handling electrostatic sensitive modules and they can damage components thereby, causing the module to become inoperable or unusable.

Modules that have been damaged by electrostatic discharges can fail after a temperature change, mechanical shock or changes in the electrical load.

Only the consequent implementation of protection devices and meticulous attention to the applicable rules and regulations for handling the respective equipment can prevent failures of electrostatic sensitive modules.

Shipping of electrostatic sensitive modules

Modules must be shipped in the original packing material.

Measurements and alterations on electrostatic sensitive modules

When you are conducting measurements on electrostatic sensitive modules you should take the following precautions:

- Floating instruments must be discharged before use.
- Instruments must be grounded.

Modifying electrostatic sensitive modules you should only use soldering irons with grounded tips.

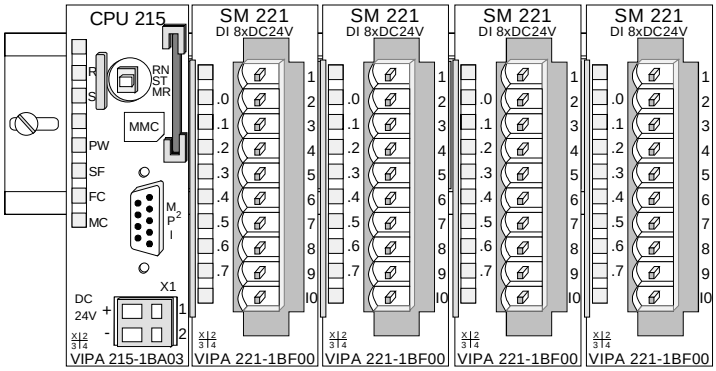
Attention!

Personnel and instruments should be grounded when working on electrostatic sensitive modules.

System conception

Overview

The System 200V is a modular automation system for assembly on a 35mm profile rail. By means of the peripheral modules with 4, 8 and 16 channels this system may properly be adapted matching to your automation tasks.

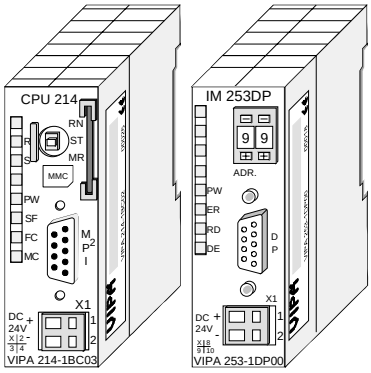


Components

The System 200V consists of the following components:

- *Head modules* like CPU and bus coupler
- *Periphery modules* like I/O, function und communication modules
- *Power supplies*
- *Extension modules*

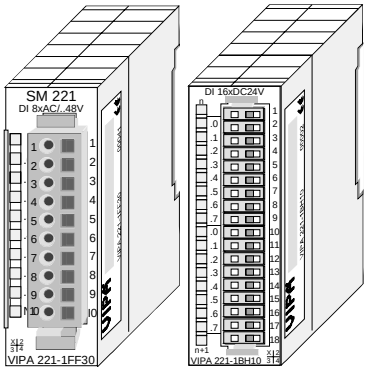
Head modules



With a head module CPU respectively bus interface and DC 24V power supply are integrated to one casing.

Via the integrated power supply the CPU respectively bus interface is power supplied as well as the electronic of the connected periphery modules.

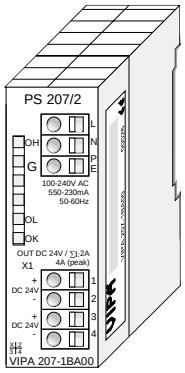
Periphery modules



The modules are direct installed on a 35mm profile rail and connected to the head module by a bus connector, which was mounted on the profile rail before.

Most of the periphery modules are equipped with a 10pin respectively 18pin connector. This connector provides the electrical interface for the signaling and supplies lines of the modules.

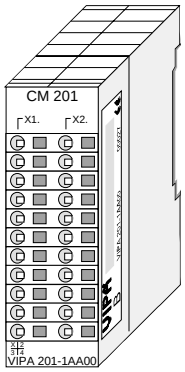
Power supplies



With the System 200V the DC 24V power supply can take place either externally or via a particularly for this developed power supply.

The power supply may be mounted on the profile rail together with the System 200V modules. It has no connector to the backplane bus.

Expansion modules



The expansion modules are complementary modules providing 2- or 3wire connection facilities.

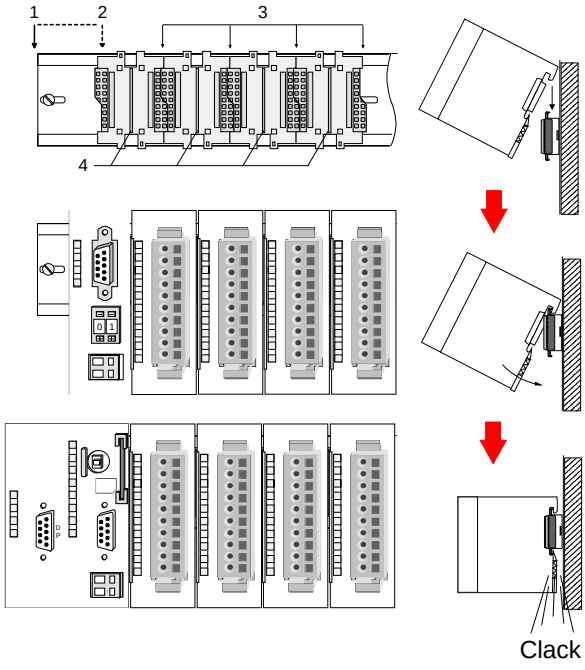
The modules are not connected to the backplane bus.

Structure/ dimensions

- Profile rail 35mm
- Dimensions of the basic enclosure:
  1tier width: (HxWxD) in mm: 76x25.4x74 in inches: 3x1x3
  2tier width: (HxWxD) in mm: 76x50.8x74 in inches: 3x2x3

Installation

Please note that you can only install head modules, like the CPU, the PC and couplers at slot 1 or 1 and 2 (for double width modules).



[1]	Head module (double width)
[2]	Head module (single width)
[3]	Periphery module
[4]	Guide rails

Note

Information about the max. number of pluggable modules and the max. current at the backplane bus can be found in the "Technical Data" of the according head module.

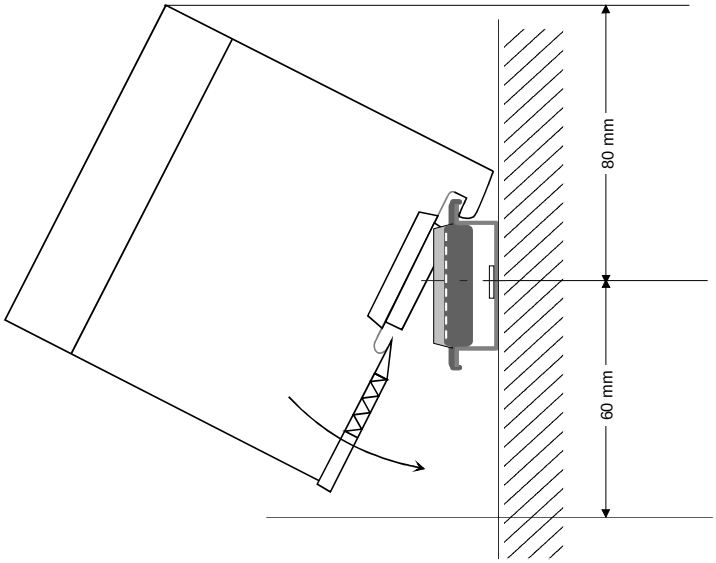
Please install modules with a high current consumption directly beside the head module.

Dimensions

Dimensions Basic enclosure

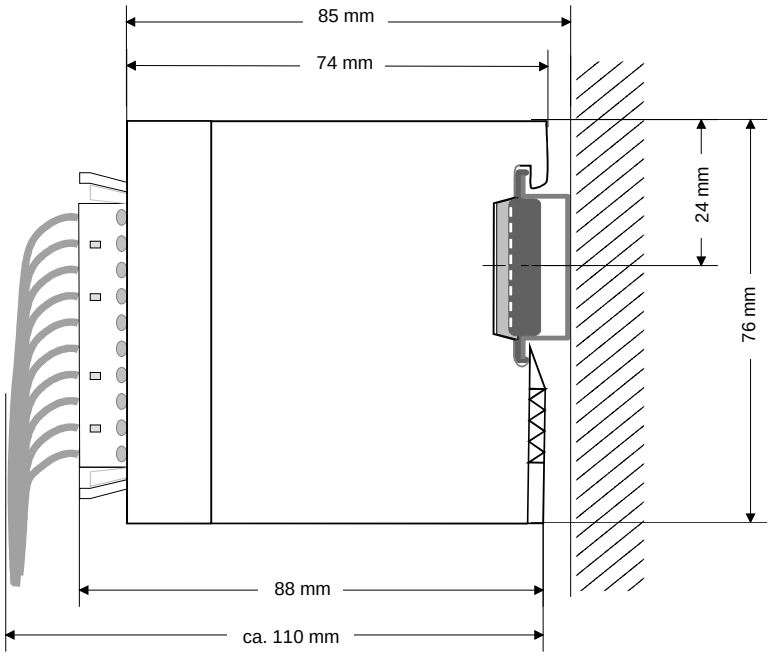
1tier width (HxWxD) in mm: 76 x 25.4 x 74
2tier width (HxWxD) in mm: 76 x 50.8 x 74

Installation dimensions

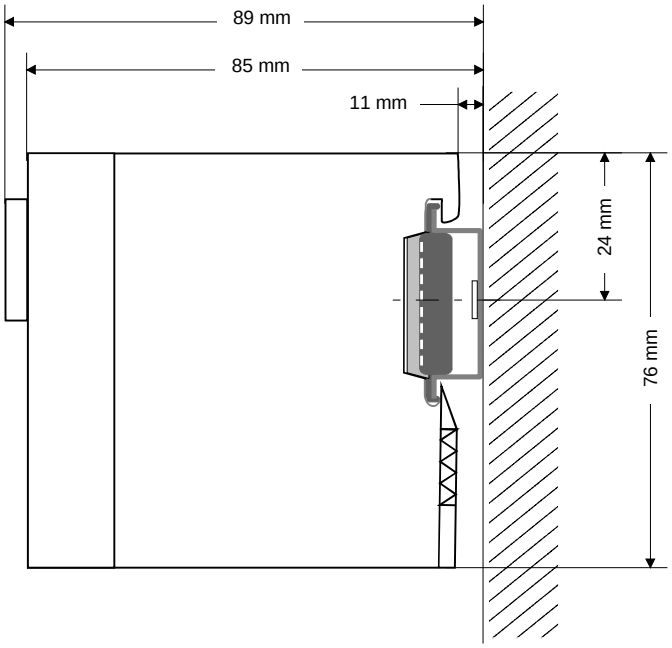


Installed and wired dimensions

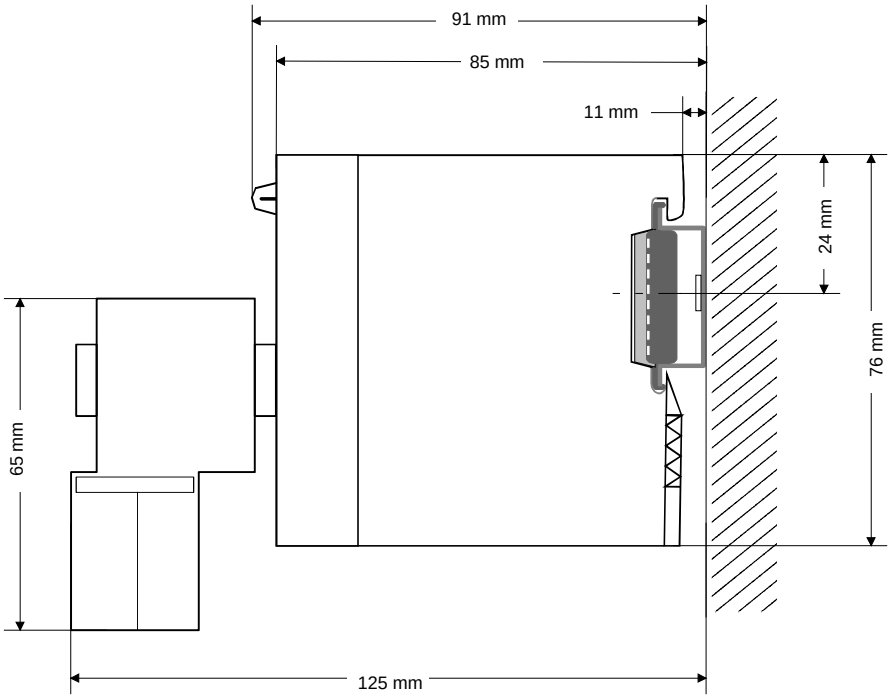
In- / Output modules



Function modules/
Extension modules



CPUs (here with
EasyConn from
VIPA)



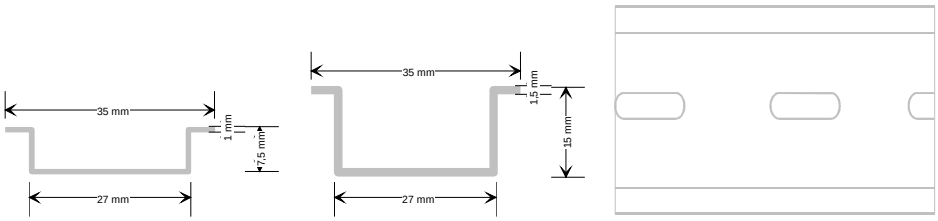
Installation

General

The modules are each installed on a 35mm profile rail and connected via a bus connector. Before installing the module the bus connector is to be placed on the profile rail before.

Profile rail

For installation the following 35mm profile rails may be used:

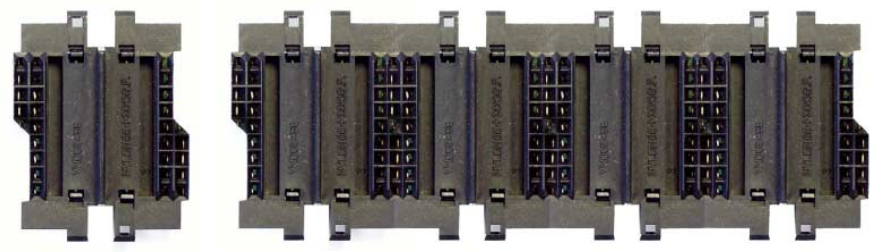


Order number	Label	Description
290-1AF00	35mm profile rail	Length 2000mm, height 15mm
290-1AF30	35mm profile rail	Length 530mm, height 15mm

Bus connector

System 200V modules communicate via a backplane bus connector. The backplane bus connector is isolated and available from VIPA in of 1-, 2-, 4- or 8tier width.

The following figure shows a 1tier connector and a 4tier connector bus:



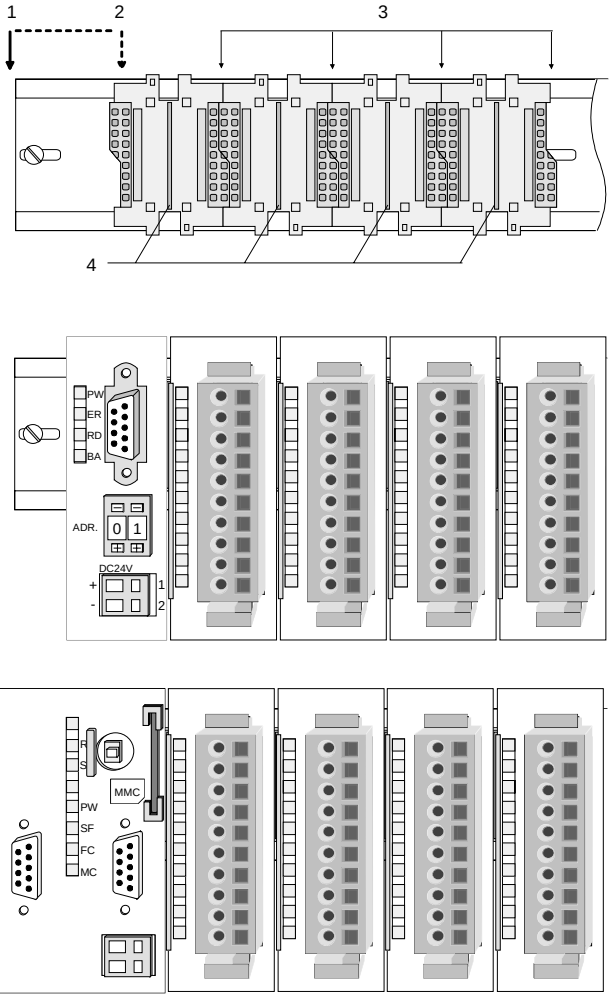
The bus connector is to be placed on the profile rail until it clips in its place and the bus connections look out from the profile rail.

Order number	Label	Description
290-0AA10	Bus connector	1tier
290-0AA20	Bus connector	2tier
290-0AA40	Bus connector	4tier
290-0AA80	Bus connector	8tier

Installation on a profile rail

The following figure shows the installation of a 4tier width bus connector in a profile rail and the slots for the modules.

The different slots are defined by guide rails.



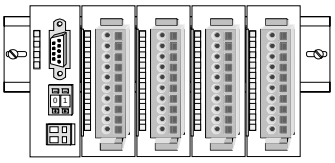
[1] Head module (double width)
[2] Head module (single width)
[3] Peripheral module
[4] Guide rails

Assembly regarding the current consumption

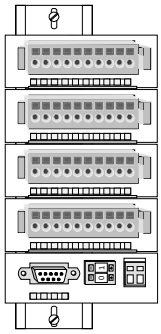
- Use bus connectors as long as possible.
- Sort the modules with a high current consumption right beside the head module. In the service area of www.vipa.com a list of current consumption of every System 200V module can be found.

Assembly possibilities

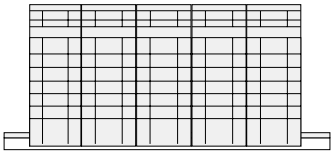
hoizontal assembly



vertical assembly



lying assembly

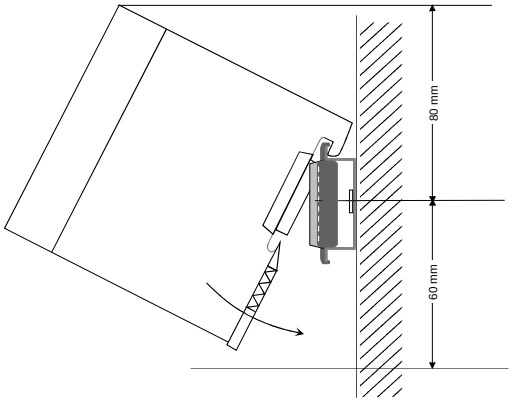


Please regard the allowed environmental temperatures:

- horizontal assembly: from 0 to 60°C
- vertical assembly: from 0 to 40°C
- lying assembly: from 0 to 40°C

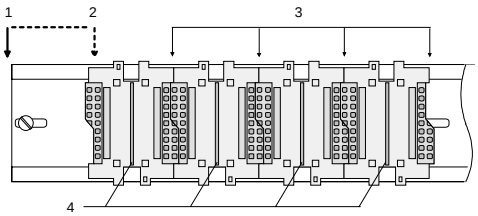
The horizontal assembly always starts at the left side with a head module, then you install the peripheral modules beside to the right.

You may install up to 32 peripheral modules.



Please follow these rules during the assembly!

- Turn off the power supply before you install or remove any modules!
- Make sure that a clearance of at least 60mm exists above and 80mm below the middle of the profile rail.



- Every row must be completed from left to right and it has to start with a head module.

  [1] Head module (double width)
  [2] Head module (single width)
  [3] Peripheral modules
  [4] Guide rails

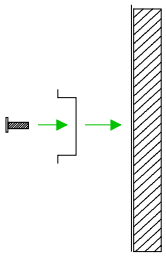
- Modules are to be installed side by side. Gaps are not permitted between the modules since this would interrupt the backplane bus.
- A module is only installed properly and connected electrically when it has clicked into place with an audible click.
- Slots after the last module may remain unoccupied.

Note!

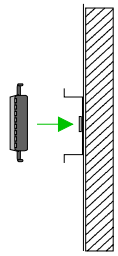
Information about the max. number of pluggable modules and the max. current at the backplane bus can be found in the "Technical Data" of the according head module.

Please install modules with a high current consumption directly beside the head module.

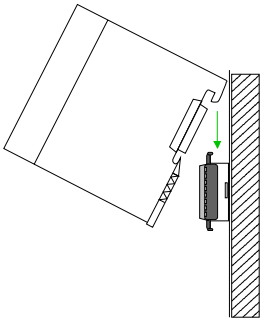
Assembly procedure



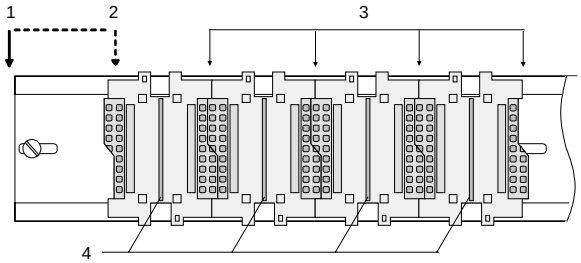
- Install the profile rail. Make sure that a clearance of at least 60mm exists above and 80mm below the middle of the profile rail.



- Press the bus connector into the profile rail until it clips securely into place and the bus-connectors look out from the profile rail. This provides the basis for the installation of your modules.



- Start at the outer left location with the installation of your head module and install the peripheral modules to the right of this.

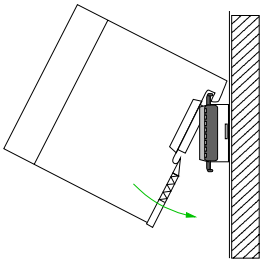


[1] Head module (double width)

[2] Head module (single width)

[3] Peripheral module

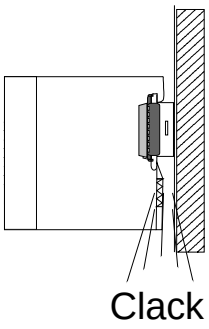
[4] Guide rails



- Insert the module that you are installing into the profile rail at an angle of 45 degrees from the top and rotate the module into place until it clicks into the profile rail with an audible click. The proper connection to the backplane bus can only be guaranteed when the module has properly clicked into place.

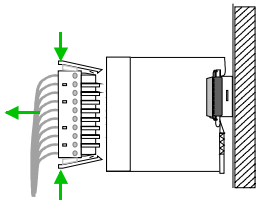
Attention!

Power must be turned off before modules are installed or removed!



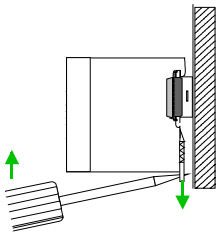
Demounting and module exchange

1



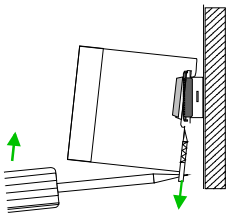
- Remove if exists the wiring to the module, by pressing both locking lever on the connector and pulling the connector.

2



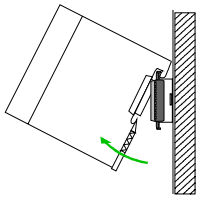
- The casing of the module has a spring loaded clip at the bottom by which the module can be removed.

3



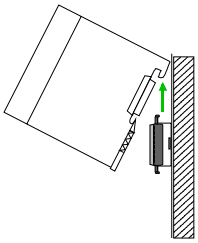
- The clip is unlocked by pressing the screwdriver in an upward direction.

4



- Withdraw the module with a slight rotation to the top.

5



Attention!

Power must be turned off before modules are installed or removed!

Please regard that the backplane bus is interrupted at the point where the module was removed!

Wiring

Overview

Most peripheral modules are equipped with a 10pole or a 18pole connector. This connector provides the electrical interface for the signaling and supply lines of the modules.

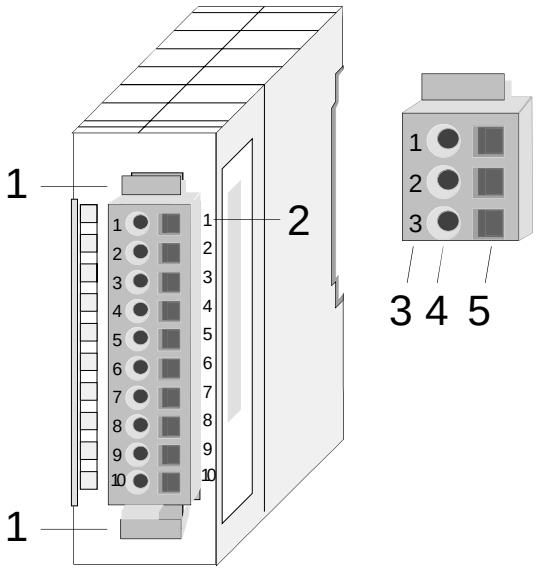
The modules carry spring-clip connectors for interconnections and wiring.

The spring-clip connector technology simplifies the wiring requirements for signaling and power cables.

In contrast to screw terminal connections, spring-clip wiring is vibration proof. The assignment of the terminals is contained in the description of the respective modules.

You may connect conductors with a diameter from 0.08mm^2 up to 2.5mm^2 (max. 1.5mm^2 for 18pole connectors).

The following figure shows a module with a 10pole connector.



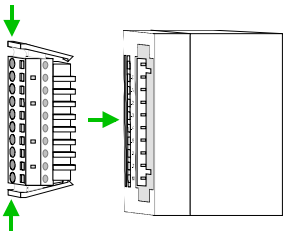
[1] Locking lever
[2] Pin no. at the module
[3] Pin no. at the connector
[4] Wiring port
[5] Opening for screwdriver

Note!

The spring-clip is destroyed if you push the screwdriver into the wire port!

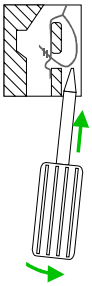
Make sure that you only insert the screwdriver into the square hole of the connector!

Wiring procedure

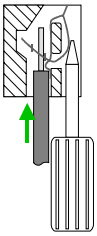


- Install the connector on the module until it locks with an audible click. For this purpose you press the two clips together as shown.
  The connector is now in a permanent position and can easily be wired.

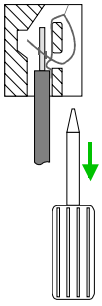
The following section shows the wiring procedure from top view.



- Insert a screwdriver at an angel into the square opening as shown.
- Press and hold the screwdriver in the opposite direction to open the contact spring.



- Insert the stripped end of the wire into the round opening. You can use wires with a diameter of 0.08mm^2 to 2.5mm^2 (1.5mm^2 for 18pole connectors).



- By removing the screwdriver the wire is connected safely with the plug connector via a spring.

Note!

Wire the power supply connections first followed by the signal cables (inputs and outputs).

Installation guidelines

General

The installation guidelines contain information about the interference free deployment of System 200V systems. There is the description of the ways, interference may occur in your control, how you can make sure the electromagnetic digestibility (EMC), and how you manage the isolation.

What means EMC?

Electromagnetic digestibility (EMC) means the ability of an electrical device, to function error free in an electromagnetic environment without being interferenced res. without interferencing the environment.

All System 200V components are developed for the deployment in hard industrial environments and fulfill high demands on the EMC. Nevertheless you should project an EMC planning before installing the components and take conceivable interference causes into account.

Possible interference causes

Electromagnetic interferences may interfere your control via different ways:

- Fields
- I/O signal conductors
- Bus system
- Current supply
- Protected earth conductor

Depending on the spreading medium (lead bound or lead free) and the distance to the interference cause, interferences to your control occur by means of different coupling mechanisms.

One differs:

- galvanic coupling
- capacitive coupling
- inductive coupling
- radiant coupling

Basic rules for EMC

In the most times it is enough to take care of some elementary rules to guarantee the EMC. Please regard the following basic rules when installing your PLC.

- Take care of a correct area-wide grounding of the inactive metal parts when installing your components.
  - Install a central connection between the ground and the protected earth conductor system.
  - Connect all inactive metal extensive and impedance-low.
  - Please try not to use aluminum parts. Aluminum is easily oxidizing and is therefore less suitable for grounding.
- When cabling, take care of the correct line routing.
  - Organize your cabling in line groups (high voltage, current supply, signal and data lines).
  - Always lay your high voltage lines and signal res. data lines in separate channels or bundles.
  - Route the signal and data lines as near as possible beside ground areas (e.g. suspension bars, metal rails, tin cabinet).
- Proof the correct fixing of the lead isolation.
  - Data lines must be laid isolated.
  - Analog lines must be laid isolated. When transmitting signals with small amplitudes the one sided laying of the isolation may be favorable.
  - Lay the line isolation extensively on an isolation/protected earth conductor rail directly after the cabinet entry and fix the isolation with cable clamps.
  - Make sure that the isolation/protected earth conductor rail is connected impedance-low with the cabinet.
  - Use metallic or metalized plug cases for isolated data lines.
- In special use cases you should appoint special EMC actions.
  - Wire all inductivities with erase links.
  - Please consider luminescent lamps can influence signal lines.
- Create a homogeneous reference potential and ground all electrical operating supplies when possible.
  - Please take care for the targeted employment of the grounding actions. The grounding of the PLC is a protection and functionality activity.
  - Connect installation parts and cabinets with the System 200V in star topology with the isolation/protected earth conductor system. So you avoid ground loops.
  - If potential differences between installation parts and cabinets occur, lay sufficiently dimensioned potential compensation lines.

Isolation of conductors

Electrical, magnetically and electromagnetic interference fields are weakened by means of an isolation, one talks of absorption.

Via the isolation rail, that is connected conductive with the rack, interference currents are shunt via cable isolation to the ground. Hereby you have to make sure, that the connection to the protected earth conductor is impedance-low, because otherwise the interference currents may appear as interference cause.

When isolating cables you have to regard the following:

- If possible, use only cables with isolation tangle.
- The hiding power of the isolation should be higher than 80%.
- Normally you should always lay the isolation of cables on both sides. Only by means of the both-sided connection of the isolation you achieve high quality interference suppression in the higher frequency area.

  Only as exception you may also lay the isolation one-sided. Then you only achieve the absorption of the lower frequencies. A one-sided isolation connection may be convenient, if:
  - the conduction of a potential compensating line is not possible
  - analog signals (some mV res. µA) are transferred
  - foil isolations (static isolations) are used.
- With data lines always use metallic or metalized plugs for serial couplings. Fix the isolation of the data line at the plug rack. Do not lay the isolation on the PIN 1 of the plug bar!
- At stationary operation it is convenient to strip the insulated cable interruption free and lay it on the isolation/protected earth conductor line.
- To fix the isolation tangles use cable clamps out of metal. The clamps must clasp the isolation extensively and have well contact.
- Lay the isolation on an isolation rail directly after the entry of the cable in the cabinet. Lead the isolation further on to the System 200V module and **don't** lay it on there again!

Please regard at installation!

At potential differences between the grounding points, there may be a compensation current via the isolation connected at both sides.

Remedy: Potential compensation line.

General data

Structure/ dimensions

- Profile rail 35mm
- Peripheral modules with recessed labelling
- Dimensions of the basic enclosure:
  1tier width: (HxWxD) in mm: 76x25.4x74 in inches: 3x1x3
  2tier width: (HxWxD) in mm: 76x50.8x74 in inches: 3x2x3

Reliability

- Wiring by means of spring pressure connections (CageClamps) at the front-facing connector, core cross-section 0.08 ... 2.5mm^2 or 1.5 mm^2 (18pole plug)
- Complete isolation of the wiring when modules are exchanged
- Every module is isolated from the backplane bus

General data

Conformity and approval		
Conformity		
CE	2006/95/EC	Low-voltage directive
	2004/108/EC	EMC directive
Approval		
UL	UL 508	Approval for USA and Canada
others		
RoHS	2011/65/EU	Product is lead-free; Restriction of the use of certain hazardous substances in electrical and electronic equipment

Protection of persons and device protection		
Type of protection	-	IP20
Electrical isolation		
to the field bus	-	electrically isolated
to the process level	-	electrically isolated
Insulation resistance	EN 61131-2	-
Insulation voltage to reference earth		
Inputs / outputs	-	AC / DC 50V, test voltage AC 500V
Protective measures	-	against short circuit

Environmental conditions to EN 61131-2		
Climatic		
Storage / transport	EN 60068-2-14	-25…+70°C
Operation		
Horizontal installation	EN 61131-2	0…+60°C
Vertical installation	EN 61131-2	0…+60°C
Air humidity	EN 60068-2-30	RH1 (without condensation, rel. humidity 10…95%)
Pollution	EN 61131-2	Degree of pollution 2
Mechanical		
Oscillation	EN 60068-2-6	1g, 9Hz ... 150Hz
Shock	EN 60068-2-27	15g, 11ms

Mounting conditions		
Mounting place	-	In the control cabinet
Mounting position	-	Horizontal and vertical

EMC	**Standard**		**Comment**
Emitted interference	EN 61000-6-4		Class A (Industrial area)
Noise immunity zone B	EN 61000-6-2		Industrial area
		EN 61000-4-2	ESD 8kV at air discharge (degree of severity 3), 4kV at contact discharge (degree of severity 2)
		EN 61000-4-3	HF irradiation (casing) 80MHz … 1000MHz, 10V/m, 80% AM (1kHz) 1.4GHz ... 2.0GHz, 3V/m, 80% AM (1kHz) 2GHz ... 2.7GHz, 1V/m, 80% AM (1kHz)
		EN 61000-4-6	HF conducted 150kHz … 80MHz, 10V, 80% AM (1kHz)
		EN 61000-4-4	Burst, degree of severity 3
		EN 61000-4-5	Surge, installation class 3 *)

*) Due to the high-energetic single pulses with Surge an appropriate external protective circuit with lightning protection elements like conductors for lightning and overvoltage is necessary.

Chapter 2 Hardware description

Overview

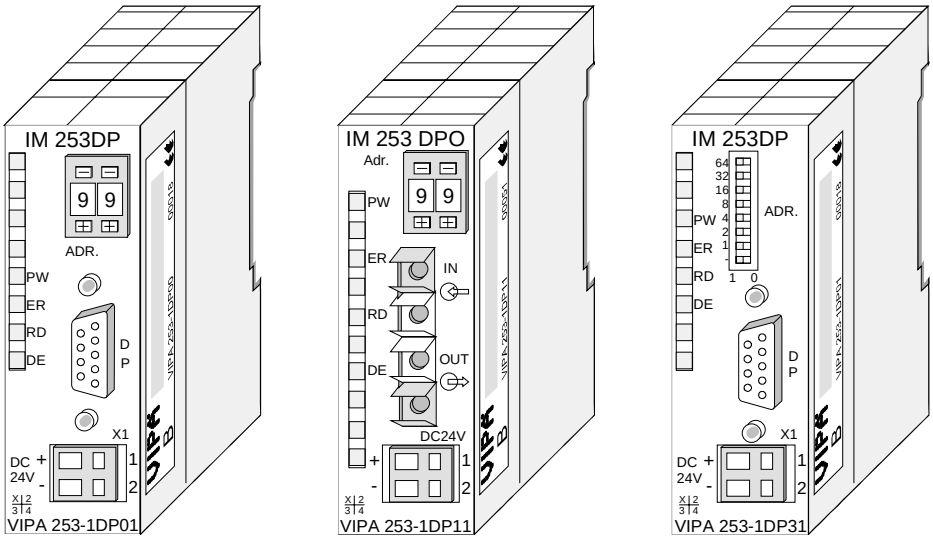
Here the hardware components of the IM 253-xDPxx are described.
The technical data are at the end of the chapter.

Contents

Properties

PROFIBUS DP slaves

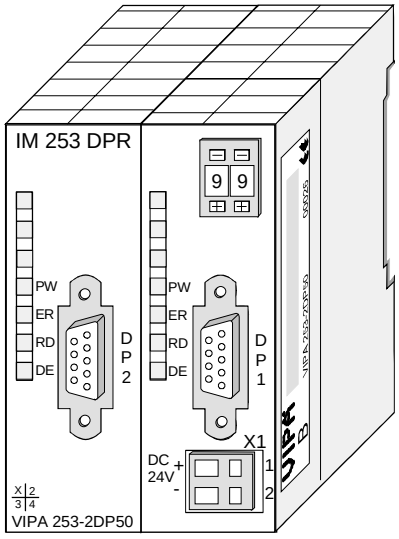
- Version with RS485 interface or fiber optic connectors
- Version with DP-V1 interface
- Online diagnostic protocol



Order data

Type	Order number	Description
IM 253DP	VIPA 253-1DP01	PROFIBUS DP-V0/V1 slave
IM 253DPO	VIPA 253-1DP11	PROFIBUS DP-V0/V1 slave with FO connector
IM 253DP	VIPA 253-1DP31	PROFIBUS DP-V0/V1 slave - ECO

PROFIBUS DPR slave (redundant)



Order data

Type	Order number	Description
IM 253DPR	VIPA 253-2DP50	PROFIBUS DP-V0 slave 2 channel redundant

IM 253-1DP01 - DP-V1 slave - Structure

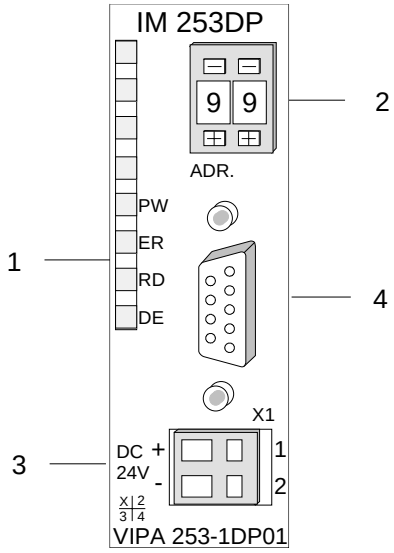
Properties IM 253DP

- PROFIBUS (DP-V0, DP-V1)
- PROFIBUS DP slave for max. 32 peripheral modules (max. 16 analog modules)
- Max. 244Byte input data and 244Byte output data
- Internal diagnostic protocol
- Integrated DC 24V power supply for the peripheral modules (3.5A max.)
- Supports all PROFIBUS data transfer rates

Use as DP-V1 slave

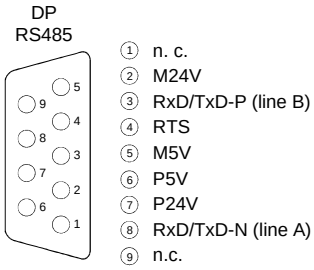
- 1 MSAC_C1 connection (Read, Write) with 244Byte data (4 Byte DP-V1-Header + 240Byte user data)
- 3 MSAC_C2 connections (Initiale, Read, Write, DataTransport, Initiate Abort) with each 244Byte data (4 Byte DP-V1-Header + 240 Byte user data)

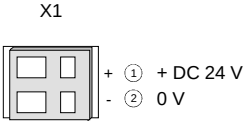
Front view 253-1DP01



[1] LED status indicators
[2] Address selector (Coding switch)
[3] Connector for DC 24V power supply
[4] RS 485 interface

Interfaces





RS485 interface

A 9pin socket is provided for the RS485 interface between your PROFIBUS slave and the PROFIBUS.

Power supply

Every PROFIBUS slave has an internal power supply. This power supply requires DC 24V. In addition to the electronics on the bus coupler, the supply voltage is also used to power any modules connected to the backplane bus. The "max. current drain at backplane bus" can be found in the Technical Data.

The power supply is protected against reverse polarity.

PROFIBUS and backplane bus are isolated from each other.

Attention!

Please ensure that the polarity is correct when connecting the power supply!

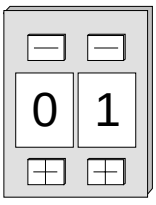
LEDs

The PROFIBUS slave modules carry a number of LEDs that are available for diagnostic purposes on the bus and for displaying the local status. The following table explains the different colors of the diagnostic LEDs.

Label	Color	Description
PW	green	Indicates that the supply voltage is available on the backplane bus (Power).
ER	red	Turned on and off again when a restart occurs and is permanently on when an internal error has occurred.
		Blinks when an initialization error has occurred.
		Alternates with RD when the master configuration is bad (configuration error).
		Blinks in time with RD when the configuration is bad.
RD	green	Is turned on when the status is "Data exchange" and the V-bus cycle is faster than the PROFIBUS cycle.
		Is turned off when the status is "Data exchange" and the V-bus cycle is slower than the PROFIBUS cycle.
		Blinks when self-test is positive (READY) and the initialization has been completed successfully.
		Alternates with ER when the configuration received from the master is bad (configuration error).
		Blinks in time with ER when the configuration is bad
DE	green	DE (Data exchange) indicates PROFIBUS communication activity.

Address selector

This address selector is used to configure the PROFIBUS address for the DP slave. Addresses may range from 1 to 99. Addresses must be unique on the bus.



The slave address must have been selected before the bus coupler is turned on.

When the address is set to 00 during operation, a once-off image of the diagnostic data is saved to Flash-ROM. Please take care to reset the correct PROFIBUS address, so at the next PowerOn the right PROFIBUS address is used!

IM 253-1DP11 - DP-V1 slave - Structure

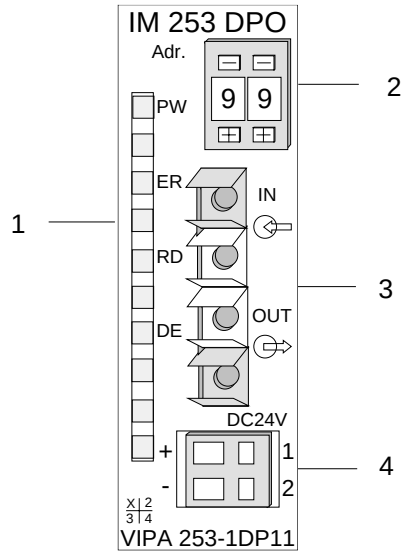
Properties IM 253DPO

- PROFIBUS (DP-V0, DP-V1)
- PROFIBUS DP slave for max. 32 peripheral modules (max. 16 analog modules)
- Max. 244Byte input data and 244Byte output data
- Internal diagnostic protocol
- Integrated DC 24V power supply for the peripheral modules (3.5A max.)
- Supports all PROFIBUS data transfer rates

Use as DP-V1 slave

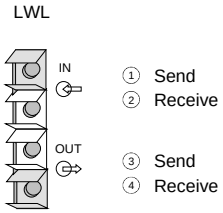
- 1 MSAC_C1 connection (Read, Write) with 244Byte data (4 Byte DP-V1-Header + 240Byte user data)
- 3 MSAC_C2 connections (Initiale, Read, Write, DataTransport, Initiate Abort) with each 244Byte data (4 Byte DP-V1-Header + 240 Byte user data)

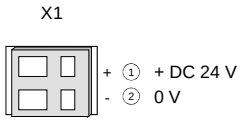
Front view 253-1DP11



[1] LED status indicators
[2] Address selector (Coding switch)
[3] FO interface
[4] Connector for DC 24V power supply

Interfaces





FO interface

These connectors are provided for the fiber optic connectors between your PROFIBUS coupler and PROFIBUS.

The diagram on the left shows the layout of the interface.

Power supply

Every PROFIBUS slave has an internal power supply. This power supply requires DC 24V. In addition to the electronics on the bus coupler, the supply voltage is also used to power any modules connected to the backplane bus. The "max. current drain at backplane bus" can be found in the Technical Data.

The power supply is protected against reverse polarity.

PROFIBUS and backplane bus are isolated from each other.

Attention!

Please ensure that the polarity is correct when connecting the power supply!

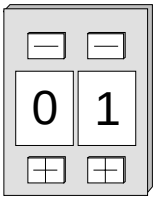
LEDs

The PROFIBUS slave modules carry a number of LEDs that are available for diagnostic purposes on the bus and for displaying the local status. The following table explains the different colors of the diagnostic LEDs.

Label	Color	Description
PW	green	Indicates that the supply voltage is available on the backplane bus (Power).
ER	red	Turned on and off again when a restart occurs and is permanently on when an internal error has occurred.
		Blinks when an initialization error has occurred.
		Alternates with RD when the master configuration is bad (configuration error).
		Blinks in time with RD when the configuration is bad.
RD	green	Is turned on when the status is "Data exchange" and the V-bus cycle is faster than the PROFIBUS cycle.
		Is turned off when the status is "Data exchange" and the V-bus cycle is slower than the PROFIBUS cycle.
		Blinks when self-test is positive (READY) and the initialization has been completed successfully.
		Alternates with ER when the configuration received from the master is bad (configuration error).
		Blinks in time with ER when the configuration is bad
DE	green	DE (Data exchange) indicates PROFIBUS communication activity.

Address selector

This address selector is used to configure the PROFIBUS address for the DP slave. Addresses may range from 1 to 99. Addresses must be unique on the bus.



The slave address must have been selected before the bus coupler is turned on.

When the address is set to 00 during operation, a once-off image of the diagnostic data is saved to Flash-ROM. Please take care to reset the correct PROFIBUS address, so at the next PowerOn the right PROFIBUS address is used!

IM 253-1DP31 - DP-V1 slave - Structure

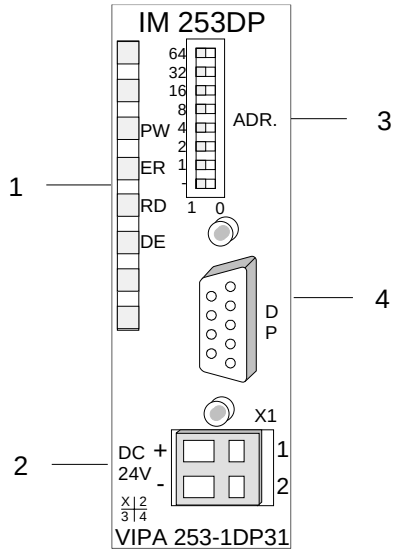
Properties IM 253DP

- PROFIBUS (DP-V0, DP-V1)
- PROFIBUS DP slave for max. 8 peripheral modules (max. analog modules)
- The PROFIBUS address can be adjusted by DIP switch
- Max. 244Byte input data and 244Byte output data
- Internal diagnostic protocol
- Integrated DC 24V power supply for the peripheral modules max. 0.8A
- Supports all PROFIBUS data transfer rates

Use as DP-V1 slave

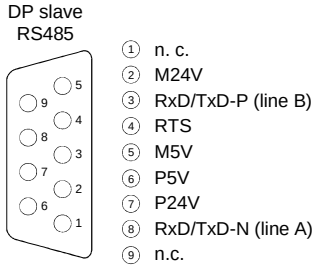
- 1 MSAC_C1 connection (Read, Write) with 244Byte data (4 Byte DP-V1-Header + 240Byte user data)
- 3 MSAC_C2 connections (Initiale, Read, Write, DataTransport, Initiate Abort) with each 244Byte data (4 Byte DP-V1-Header + 240 Byte user data)

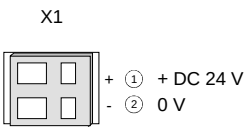
Front view 253-1DP31 - ECO



[1] LED status indicators
[2] Connector for DC 24V power supply
[3] Address selector (DIP switch)
[4] RS485 interface

Interface





RS485 interface

A 9pin socket is provided for the RS485 interface between your PROFIBUS slave and the PROFIBUS.

Power supply

Every PROFIBUS slave has an internal power supply. This power supply requires DC 24V. In addition to the electronics on the bus coupler, the supply voltage is also used to power any modules connected to the backplane bus. The "max. current drain at backplane bus" can be found in the Technical Data.

The power supply is protected against reverse polarity.

PROFIBUS and backplane bus are isolated from each other.

Attention!

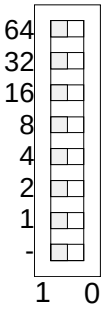
Please ensure that the polarity is correct when connecting the power supply!

LEDs

The PROFIBUS slave modules carry a number of LEDs that are available for diagnostic purposes on the bus and for displaying the local status. The following table explains the different colors of the diagnostic LEDs.

Label	Color	Description
PW	green	Indicates that the supply voltage is available on the backplane bus (Power).
ER	red	Turned on and off again when a restart occurs and is permanently on when an internal error has occurred.
		Blinks when an initialization error has occurred.
		Alternates with RD when the master configuration is bad (configuration error).
		Blinks in time with RD when the configuration is bad.
RD	green	Is turned on when the status is "Data exchange" and the V-bus cycle is faster than the PROFIBUS cycle.
		Is turned off when the status is "Data exchange" and the V-bus cycle is slower than the PROFIBUS cycle.
		Blinks when self-test is positive (READY) and the initialization has been completed successfully.
		Alternates with ER when the configuration received from the master is bad (configuration error).
		Blinks in time with ER when the configuration is bad
DE	green	DE (Data exchange) indicates PROFIBUS communication activity.

Address selector



Contrary to the coding switched described above at the IM 253-1DP31 - ECO the PROFIBUS address is configured by means of a DIL switch.

Addresses may range from 1 to 125. Addresses must be unique on the bus.

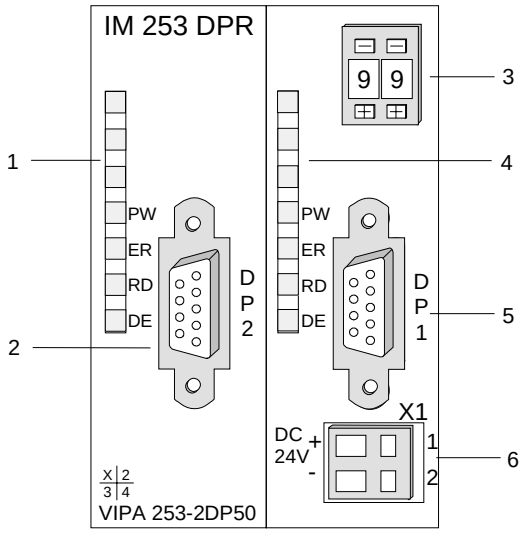
The slave address must have been configured before the bus coupler is turned on. When the address is set to 00 during operation, a once-off image of the diagnostic data is saved to Flash-ROM.
Please take care to reset the correct PROFIBUS address, so at the next PowerON the right PROFIBUS address is used!

IM 253-2DP50 - DP-V0 slave (redundant) - Structure

Properties IM 253DPR

- 2 redundant channels
- DPR slave for max. 32 peripheral modules (max. 16 analog modules)
- Max. 152Byte input data and 152Byte output data
- Internal diagnostic protocol with a time stamp
- Integrated DC 24V power supply for the peripheral modules (max. 3.5A)
- Supports all PROFIBUS data transfer rates

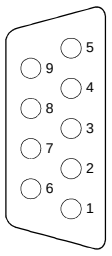
Front view 253-2DP50



[1] LED Status DP2
[2] RS485 interface DP2
[3] Address selector
[4] LED Status DP1
[5] RS485 interface DP1
[6] Connector for DC 24V power supply

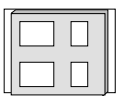
Interface

DP1 / DP2
RS485



① shield
② n. c.
③ RxD/TxD-P (line B)
④ RTS
⑤ M5V
⑥ P5V
⑦ n. c.
⑧ RxD/TxD-N (line A)
⑨ n.c.

X1



\+ ① + DC 24 V
\- ② 0 V

RS485 interface Via two 9pin RS485 sockets you include the 2 redundant channels into PROFIBUS.

Power supply

Every PROFIBUS slave has an internal power supply. This power supply requires DC 24V. In addition to the electronics on the bus coupler, the supply voltage is also used to power any modules connected to the backplane bus. The "max. current drain at backplane bus" can be found in the Technical Data.

The power supply is protected against reverse polarity.

PROFIBUS and backplane bus are isolated from each other.

Attention!

Please ensure that the polarity is correct when connecting the power supply!

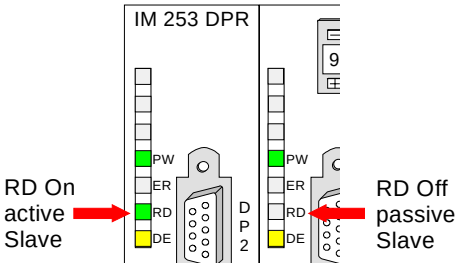
LEDs

The redundant slave includes one LED row for every slave unit that are available for diagnostic purposes The following table explains the different colors of the diagnostic LEDs.

Label	Color	Description
PW	green	Indicates that the supply voltage is available on the backplane bus. (Power).
ER	red	Turned on and off again when a restart occurs.
		Is turned on when an internal error has occurred.
		Blinks when an initialization error has occurred.
		Alternates with RD when the master configuration is bad (configuration error).
		Blinks in time with RD when the configuration is bad.
RD	green	Blinks at positive self test(READY) and successful initialization.
DE	green	DE (Data exchange) indicates PROFIBUS communication activity.

LEDs at redundant operation

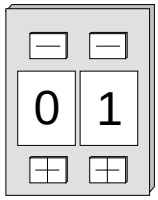
During redundant operation the active slave shows its activity via the green RD-LED, at the passive slave the RD-LED is off. At both slaves the PW- and the DE-LED are on.



RD	DE	Description
on	on	active slave (write and read)
off	on	passive backup slave (read)

Address selector

This address selector is used to configure the PROFIBUS address for the DP slave. Addresses may range from 1 to 99. Addresses must be unique on the bus.



The slave address must have been selected before the bus coupler is turned on.

When the address is set to 00 during operation, a once-off image of the diagnostic data is saved to Flash-ROM. Please take care to reset the correct PROFIBUS address, so at the next PowerOn the right PROFIBUS address is used!

Technical data

253-1DP01

Order no.	**253-1DP01**
Type	IM 253DP, PROFIBUS-DP slave
Technical data power supply	
Power supply (rated value)	DC 24 V
Power supply (permitted range)	DC 20.4...28.8 V
Reverse polarity protection	✓
Current consumption (no-load operation)	70 mA
Current consumption (rated value)	1 A
Inrush current	65 A
I^2t	0.85 A^2s
Max. current drain at backplane bus	3.5 A
Max. current drain load supply	-
Power loss	2.5 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	yes, parameterizable
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes, parameterizable
Diagnostics information read-out	possible
Supply voltage display	green LED
Service Indicator	-
Group error display	yes
Channel error display	none
Hardware configuration	
Racks, max.	1
Modules per rack, max.	32
Number of digital modules, max.	32
Number of analog modules, max.	16
Communication	
Fieldbus	PROFIBUS-DP to EN 50170
Type of interface	RS485
Connector	Sub-D, 9-pin, female
Topology	Linear bus with bus termination at both ends
Electrically isolated	✓
Number of participants, max.	125
Node addresses	1 - 99
Transmission speed, min.	9.6 kbit/s
Transmission speed, max.	12 Mbit/s
Address range inputs, max.	244 Byte
Address range outputs, max.	244 Byte
Number of TxPDOs, max.	-
Number of RxPDOs, max.	-
Housing	
Material	PPE / PA 6.6
Mounting	Profile rail 35 mm
Mechanical data	
Dimensions (WxHxD)	25.4 x 76 x 78 mm
Weight	100 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C

Order no.	253-1DP01
Certifications	
UL508 certification	yes

253-1DP11

Order no.	**253-1DP11**
Type	IM 253DPO, PROFIBUS-DP slave
Technical data power supply	
Power supply (rated value)	DC 24 V
Power supply (permitted range)	DC 20.4...28.8 V
Reverse polarity protection	✓
Current consumption (no-load operation)	70 mA
Current consumption (rated value)	1 A
Inrush current	65 A
I^2t	0.85 A^2s
Max. current drain at backplane bus	3.5 A
Max. current drain load supply	-
Power loss	2.5 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	yes, parameterizable
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes, parameterizable
Diagnostics information read-out	possible
Supply voltage display	green LED
Service Indicator	-
Group error display	red SF LED
Channel error display	none
Hardware configuration	
Racks, max.	1
Modules per rack, max.	32
Number of digital modules, max.	32
Number of analog modules, max.	16
Communication	
Fieldbus	PROFIBUS-DP to EN 50170
Type of interface	FOC
Connector	2-pin FOC POF/HCS
Topology	Line structure with two-wire FOC
Electrically isolated	✓
Number of participants, max.	125
Node addresses	1 - 99
Transmission speed, min.	9.6 kbit/s
Transmission speed, max.	12 Mbit/s
Address range inputs, max.	244 Byte
Address range outputs, max.	244 Byte
Number of TxPDOs, max.	-
Number of RxPDOs, max.	-
Housing	
Material	PPE / PA 6.6
Mounting	Profile rail 35 mm
Mechanical data	
Dimensions (WxHxD)	25.4 x 76 x 78 mm
Weight	110 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL508 certification	yes

253-1DP31

Order no.	**253-1DP31**
Type	IM 253DP, PROFIBUS-DP slave
Technical data power supply	
Power supply (rated value)	DC 24 V
Power supply (permitted range)	DC 20.4...28.8 V
Reverse polarity protection	✓
Current consumption (no-load operation)	50 mA
Current consumption (rated value)	300 mA
Inrush current	60 A
I^2t	0.4 A^2s
Max. current drain at backplane bus	0.8 A
Max. current drain load supply	-
Power loss	1.5 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	yes, parameterizable
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes, parameterizable
Diagnostics information read-out	possible
Supply voltage display	green LED
Service Indicator	-
Group error display	red SF LED
Channel error display	none
Hardware configuration	
Racks, max.	1
Modules per rack, max.	8
Number of digital modules, max.	8
Number of analog modules, max.	8
Communication	
Fieldbus	PROFIBUS-DP to EN 50170
Type of interface	RS485
Connector	Sub-D, 9-pin, female
Topology	Linear bus with bus termination at both ends
Electrically isolated	✓
Number of participants, max.	125
Node addresses	1 - 125
Transmission speed, min.	9.6 kbit/s
Transmission speed, max.	12 Mbit/s
Address range inputs, max.	244 Byte
Address range outputs, max.	244 Byte
Number of TxPDOs, max.	-
Number of RxPDOs, max.	-
Housing	
Material	PPE / PA 6.6
Mounting	Profile rail 35 mm
Mechanical data	
Dimensions (WxHxD)	25.4 x 76 x 78 mm
Weight	90 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL508 certification	yes

253-2DP50

Order number	**253-2DP50**
Type	IM 253DPR, PROFIBUS-DP slave
Technical data power supply	
Power supply (rated value)	DC 24 V
Power supply (permitted range)	DC 20.4...28.8 V
Reverse polarity protection	✓
Current consumption (no-load operation)	80 mA
Current consumption (rated value)	1 A
Inrush current	65 A
I^2t	0.85 A^2s
Max. current drain at backplane bus	3.5 A
Max. current drain load supply	-
Power loss	2.5 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	yes, parameterizable
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes, parameterizable
Diagnostics information read-out	none
Supply voltage display	green LED
Service Indicator	-
Group error display	yes
Channel error display	none
Hardware configuration	
Racks, max.	1
Modules per rack, max.	32
Number of digital modules, max.	32
Number of analog modules, max.	16
Communication	
Fieldbus	PROFIBUS-DP to EN 50170
Type of interface	RS485
Connector	Sub-D, 9-pin, female
Topology	Linear bus with bus termination at both ends
Electrically isolated	✓
Number of participants, max.	125
Node addresses	1 - 125
Transmission speed, min.	9.6 kbit/s
Transmission speed, max.	12 Mbit/s
Address range inputs, max.	152 Byte
Address range outputs, max.	152 Byte
Number of TxPDOs, max.	-
Number of RxPDOs, max.	-
Housing	
Material	PPE / PA 6.6
Mounting	Profile rail 35 mm
Mechanical data	
Dimensions (WxHxD)	50.8 x 76 x 78 mm
Weight	90 g
Environmental conditions	
Operating temperature	0 °C to 60 °C
Storage temperature	-25 °C to 70 °C
Certifications	
UL508 certification	yes

Chapter 3 Deployment IM 253DP

Overview

This chapter contains a description of the PROFIBUS DP slave modules IM 253-xDPxx under PROFIBUS. A short introduction and presentation of the system is followed by the project design and configuration of the PROFIBUS slave modules that are available from VIPA.
The chapter concludes with a number of communication examples and the technical data.

Contents

Basics PROFIBUS

General

PROFIBUS is an international standard applicable to an open fieldbus for building, manufacturing and process automation. PROFIBUS defines the technical and functional characteristics of a serial fieldbus system that can be used to create a low (sensor-/actuator level) or medium (process level) performance network of programmable logic controllers.

Together with other fieldbus systems, PROFIBUS has been standardized in **IEC 61158** since 1999. *IEC 61158* bears the title "Digital data communication for measurement and control - Fieldbus for use in industrial control systems".

PROFIBUS comprises an assortment of compatible versions. The following details refer to PROFIBUS DP.

PROFIBUS DP-V0

PROFIBUS DP-V0 *(Decentralized Peripherals)* provides the basic functionality of DP, including cycle data exchange as well as station diagnostic, module diagnostic and channel-specific diagnostic.

PROFIBUS DP is a special protocol intended mainly for automation tasks in a manufacturing environment. DP is very fast, offers Plug'n'Play facilities and provides a cost-effective alternative to parallel cabling between PLC and remote I/O. PROFIBUS DP was designed for high-speed cyclical data communication between bus master and slave systems.

PROFIBUS DP-V1

The original version, designed DP-V0, has been expanded to include version DP-V1, offering acyclic data exchange between master and slave.

DP-V1 contains enhancements geared towards process automation, in particular acyclic data communication for parameter assignment, operation, visualization and alarm handling of intelligent field devices, parallel to cycle user data communication. This permits online access to station using engineering tools. In addition, DP-V1 defines alarms. Examples for different types of alarms are status alarm, update alarm and a manufacturer-specific alarm.

Please note in operating the DP V1 functionality that your DP master supports DP-V1 as well. For this you find details in the documentation to your DP master.

Master and slaves

PROFIBUS distinguishes between active stations (master) and passive stations (slave).

Master devices

Master devices control the data traffic at the bus. It is also possible to operate with multiple masters on a PROFIBUS. This is referred to as multi-master operation. The protocol on the bus establishes a logical token ring between intelligent devices connected to the bus. Only the master that has the token, can communicate with its slaves.

A master (IM 208DP or IM 208DPO) is able to issue unsolicited messages if it is in possession of the access key (token). The PROFIBUS protocol also refers to masters as active participants.

Slave devices

A PROFIBUS slave acquires data from peripheral equipment, sensors, actuators and transducers. The VIPA PROFIBUS couplers (IM 253DP, IM 253DPO and the CPU 24xDP, CPU 21xDP) are modular slave devices that transfer data between the System 200V periphery and the high-level master.

In accordance with the PROFIBUS standards these devices have no bus-access rights. They are only allowed to acknowledge messages or return messages to a master when this has issued a request. Slaves are also referred to as passive participants.

Master class 1 MSAC_C1

The master of the class 1 is a central control that exchanges cyclically information with the decentral stations (slaves) in a defined message cycle. Typical MSAC_C1 devices are controls (PLC) or PCs. MSAC_C1 devices gain active bus access which allows them to read the measuring values (inputs) of the field devices and to write the set points (outputs) of the actuators at a fixed time.

Master class 2 MSAC_C2

MSAC_C2 are employed for service and diagnostic. Here connected devices may be configured, measuring values and parameters are evaluated and device states can be requested. MSAC_C2 devices don't need to be connected to the bus system permanently. These also have active bus access.

Typical MSAC_C2 devices are engineering, project engineering or operator devices.

Communication

The bus transfer protocol provides two alternatives for the access to the bus:

Master with master

Master communication is also referred to as token-passing procedure. The token-passing procedure guarantees the accessibility of the bus. The permission to access the bus is transferred between individual devices in the form of a "token". The token is a special message that is transferred via the bus.

When a master is in possession of the token it has the permission to access the bus and it can communicate with any active or passive device. The token retention time is defined when the system is configured. Once the token retention time has expired, the token is passed to the following master which now has permission to access the bus and may therefore communicate with any other device.

Master-slave procedure

Data communication between a master and the slaves assigned to it, is conducted automatically in a predefined and repetitive cycle by the master. You assign a slave to a specific master when you define the project. You can also define which DP slaves are included and which are excluded from the cyclic exchange of data.

Data communication between master and slave can be divided into a parameterization, a configuration and a data transfer phase. Before a DP slave is included in the data transfer phase the master checks whether the defined configuration corresponds with the actual configuration. This check is performed during the definition and configuration phase. The verification includes the device type, format and length information as well as the number of inputs and outputs. In this way a reliable protection from configuration errors is achieved.

The master handles the transfer of application related data independently and automatically. You can, however, also send new configuration settings to a bus coupler.

When the status of the master is DE "Data Exchange" it transmits a new series of output data to the slave and the reply from the slave contains the latest input data.

Data consistency

Consistent data is the term used for data that belongs together by virtue of its contents. This is the high and the low byte of an analog value (word consistency) as well as the control and status byte along with the respective parameter word for access to the registers.

The data consistency as applicable to the interaction between the periphery and the controller is only guaranteed for 1Byte. This means that input and output of the bits of a byte occurs together. This byte consistency suffices when digital signals are being processed.

Where the data length exceeds a byte, for example in analog values, the data consistency must be extended. VIPA PROFIBUS DP master guarantees (from Firmware version V3.00) that the consistency will cater for the required length.

Restrictions

- Max. 125 DP slaves at one DP master - max. 32 slaves/segment
- Max. 16 DPO slaves at one DPO master at 1.5MBaud
- You can only install or remove peripheral modules when you have turned the power off!
- The max. distance for RS485 cables between two stations is 1200m (depending on the baud rate).
- The max. distance for FO cables between two stations is 300m (at HCS-FO) and 50m (at POF-FO).
- The maximum baud rate is 12MBaud.
- The PROFIBUS address of operational modules must never be changed.

Diagnostic

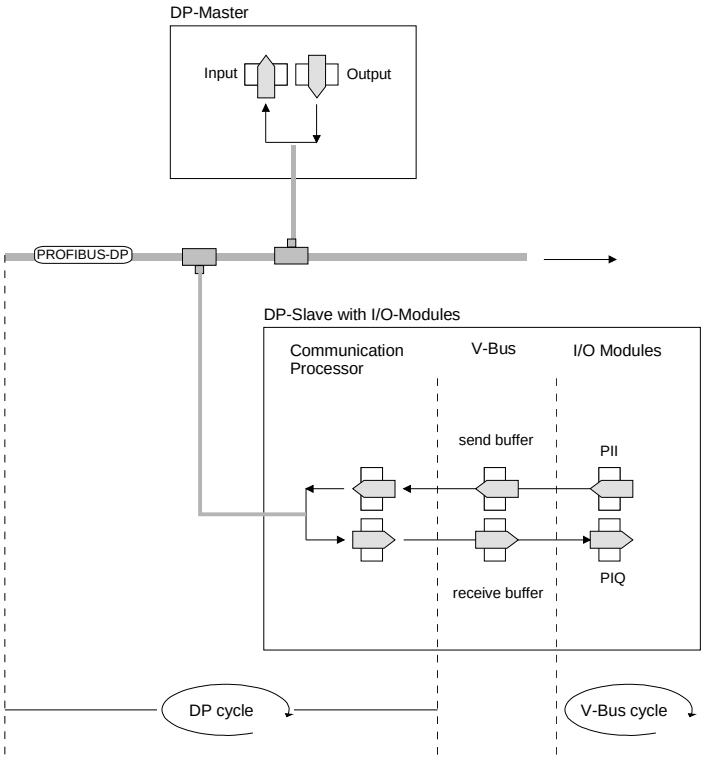
PROFIBUS DP provides an extensive set of diagnostic functions for fast error localization. Diagnostic messages are transferred via the bus and collected by the master.

As a further function, the device-specific diagnostic of the DP-V1 have been enhanced and divided into the categories alarms and status messages.

Function cyclic data communication (DP-V0)

DP-V0 provides the basic functionality of DP, including cycle data exchange as well as station diagnostic, module diagnostic and channel-specific diagnostic.

Data is transferred cyclically between the DP master and the DP slave by means of transmit and receive buffers.



PII: process image of the inputs

PIQ: process image of the outputs

V-bus cycle

A V-bus cycle (V-Bus = VIPA backplane bus) saves all the input data from the modules in the PII and all the output data from the PIQ in the output modules. When the data has been saved the PII is transferred into the ”buffer send” and the contents of the ”buffer receive” is transferred into PIQ.

DP cycle

During a PROFIBUS cycle the master addresses all its slaves according to the sequence defined in the data exchange. The data exchange reads and writes data from/into the memory areas assigned to the PROFIBUS.

The contents of the PROFIBUS input area is entered into the ”buffer receive” and the data in the ”buffer send” is transferred into the PROFIBUS output area.

The exchange of data between DP master and DP slave is completed cyclically and it is independent from the V-bus cycle.

V-bus cycle ≤ DP cycle

To ensure that the data transfer is synchronized the V-bus cycle time should always be less than or equal to the DP cycle time.

The parameter **min_slave_interval = 3ms** is located in the GSD-file (VIPA_0550.gsd).

In an average system it is guaranteed that the PROFIBUS data on the V-bus is updated after a max. time of 3ms. You can therefore exchange data with the slave at intervals of 3ms.

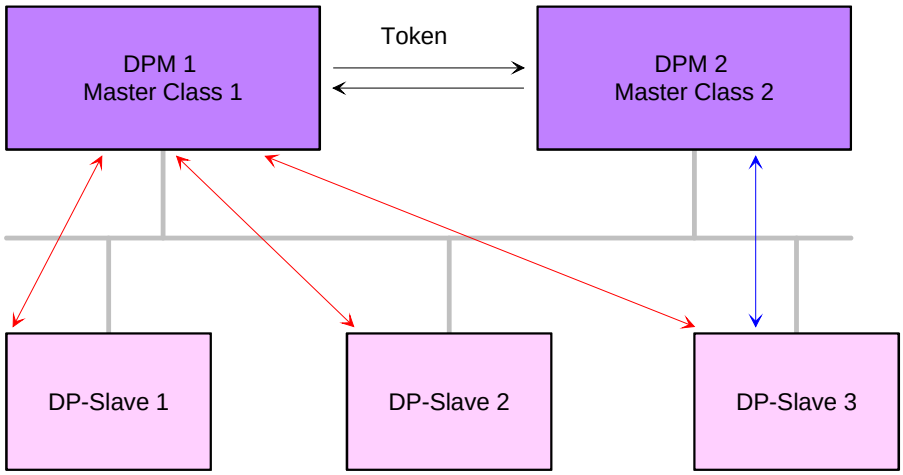
Note!

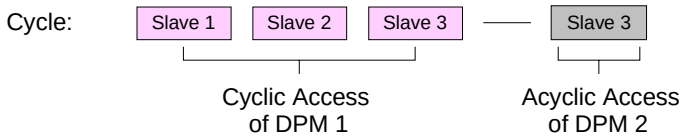
Starting with release version 6, the RUN-LED of a DP-V0 slave extinguishes as soon as the V-Bus cycle lasts longer than the DP cycle. This function is de-activated at the employment of a DP-V1 slave as DP-V0.

Function Acyclic data communication (DP-V1)

The key feature of version DP-V1 is the extended function for acyclic data communication. This forms the requirement for parameterization and calibration of the field devices over the bus during runtime and for the introduction of confirmed alarm messages.

Transmission of acyclic data is executed parallel to cycle data communication, but with lower priority.





The DPM 1 (Master Class 1) has the token and is able to send messages to or retrieve them from slave 1, then slave 2, etc. in a fixed sequence until it reaches the last slave of the current list (MS0 channel); it then passes on the token to the DPM 2 (Master Class 2). This master can then use the remaining available time ("gap") of the programmed cycle to set up an acyclic connection to *any* slave (e.g. slave 3) to exchange records (MS2 channel); at the end of the current cycle time it returns the token to the DPM1.

The acyclic exchange of records can last for several scan cycles on their "gaps"; at the end, the DPM 2 uses the gap to clear the connection. Similarly as well as the DPM 2, the DPM 1 can also execute acyclic data exchange with slaves (MS1 channel).

Services Acyclic data communication

Additional available services are shown in following table.

More detailed information to the services and the DP-V0/1 communication - principles is to find in the PROFIBUS norm IEC 61158.

DPM 1 (MSAC-C1)

Services for Acyclic data communication between the DPM 1 and Slaves	
Read	The master reads a data block from the slave.
Write	The master writes a data block to the slave.
Alarm	An alarm is transmitted from the slave to the master, which explicitly acknowledges receipt. The slave can only send a new alarm message after it has received this acknowledgment; this prevents any alarms being overwritten.
Alarm_Acknowledge	The master acknowledges receipt of an alarm to the slave.
Status	A status message is transmitted from the slave to the master. There is no acknowledgment.
Data transmission is connection-oriented over a MS1 connection. This is set up by the DPM 1 and is closely linked to the connection for cyclic data communication. It can be used by the master that has parameterized and configured the respective slave.	

DPM 2 (MSAC-C2)

Services for Acyclic data communication between the DPM 2 and Slaves	
Initiate Abort	Setup and termination of a connection for acyclic data communication between the DPM 2 and the Slave
Read	The master reads a data block from the slave.
Write	The master writes a data block to the slave.
Data_Transport	The master can write application-specific data (specified in profiles) acyclically to the slave and if required, read data from the slave in the same cycle.
Data transmission is connection-oriented over a MS2 connection. This is set up before the start of the acyclic data communication by the DPM 2 using the Initiate service. The connection is then available for Read, Write and Data_Transport services. The connection is terminated correspondingly. A slave can maintain several active MS2 connections simultaneously. A limitation is given by the resources available in the Slave.	

Data transfer medium

PROFIBUS employs screened twisted pair cable on the basis of the RS485 interfaces or a duplex fiber optic link (FO). The data transfer rate of both systems is limited to a max. of 12MBaud.

For details please refer to the "Assembly and installation guidelines".

Electrical system based on RS485

The RS485 interface uses differential voltages. For this reason this kind of interface is less susceptible to interference than a plain voltage or current based interface. The network may be configured as linear or as tree structure. Your VIPA PROFIBUS coupler carries a 9pin socket. This socket is used to connect the PROFIBUS coupler to the PROFIBUS network as a slave.

Due to the bus structure of RS485, any station may be connected or disconnected without interruptions and a system can be commissioned in different stages. Extensions to the system do not affect stations that have already been commissioned. Any failures of stations or new devices are detected automatically.

Optical system using fiber optic data links

The fiber optic system employs pulses of monochromatic light. The optical waveguide is not susceptible to external electrical interference. Fiber optic systems have a linear structure. Each device requires two lines, a transmit and a receive line. It is not necessary to provide a terminator at the last device.

Due to the linear structure of the FO data link, it is not possible to install or remove stations without interruption to data communication.

Addressing

Every device on the PROFIBUS is identified by an address. This address must be an unique number in the bus system between 1 and 126. The address of the VIPA PROFIBUS coupler is set by the addressing switch located on the front of the module.

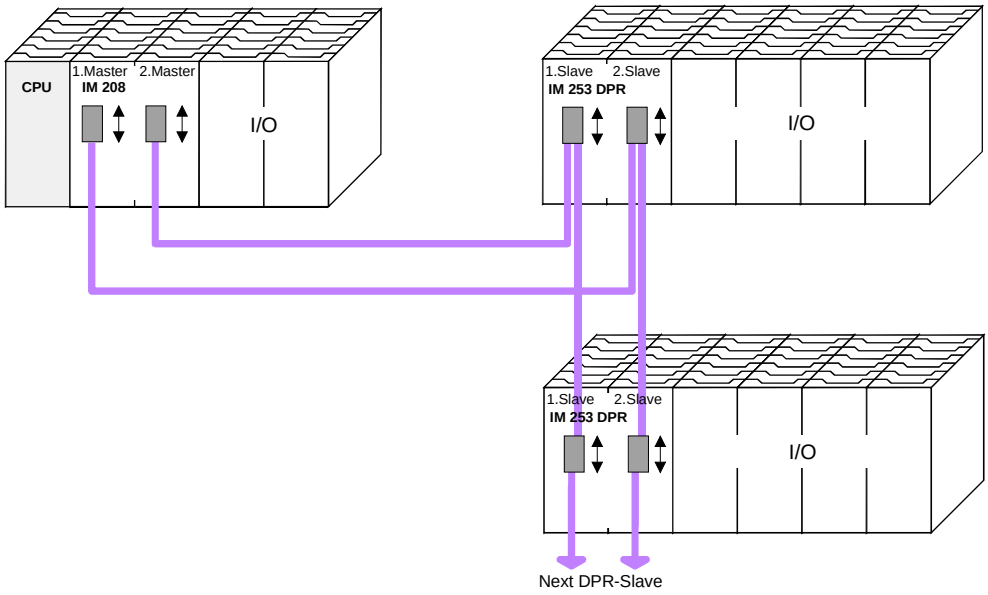
You assign the address to the VIPA PROFIBUS master during the configuration phase.

IM 253-2DP50 - DP-V0 slave (Redundant system)

Redundant system

In principal, the IM 253DPR consists of 2 PROFIBUS DP slave connections. The two PROFIBUS slaves are controlling the operating modes of each other. Both slaves have the same address at the PROFIBUS and are communicating with a redundant DP master.

Both slaves are reading the peripheral inputs. Only one slave at a time has access to the peripheral outputs. The other slave is passive and in stand-by. As soon as the active slave is failing, the passive slave accesses the peripheral outputs.



Requirements for the deployment

Please regard to use a redundant DP master for the redundant deployment of the slave module. Every master unit needs the same parameterization and bus configuration.

IM 253-xDPxx - DP-V0 slave - Project engineering

General

The module is configured by means of your PROFIBUS master configuration tool. During the configuration you will assign the PROFIBUS slave modules to your master module.

The direct allocation is defined by means of the PROFIBUS address that you have to set at the slave module.

The Slaves are projected via GSD-File at the hardware configuration.

GSD-File

The VIPA WinNCS configuration tool already contains all GSD-files for the VIPA components!

The GSD files may be found at www.vipa.com at the "Service" part.

The integration of the GSD takes place with the following proceeding:

- Browse to www.vipa.com.
- Click to *Service* > *Download* > *GSD-Files* > *PROFIBUS*.
- Download the file *Cx000023_Vxxx*.
- Extract the file to your work directory. The SPEEDBUS.GSD is stored in the directory *VIPA_System_200V*.
- Start the hardware configurator from Siemens.
- Close every project.
- Select **Options** > *Install new GSD-File.*

After the installation of the GSD-File you will find this entry e.g. in the hardware catalog from Siemens at:

PROFIBUS DP>Additional field devices>I/O>VIPA_System_200V>
VIPA 253-2DP50

Deployment at a IM 208DP master from VIPA

The project engineering of the IM 253DP slave at the IM 208 DP master from VIPA is to be find in the description to the DP master.

Parameterization in a redundant system

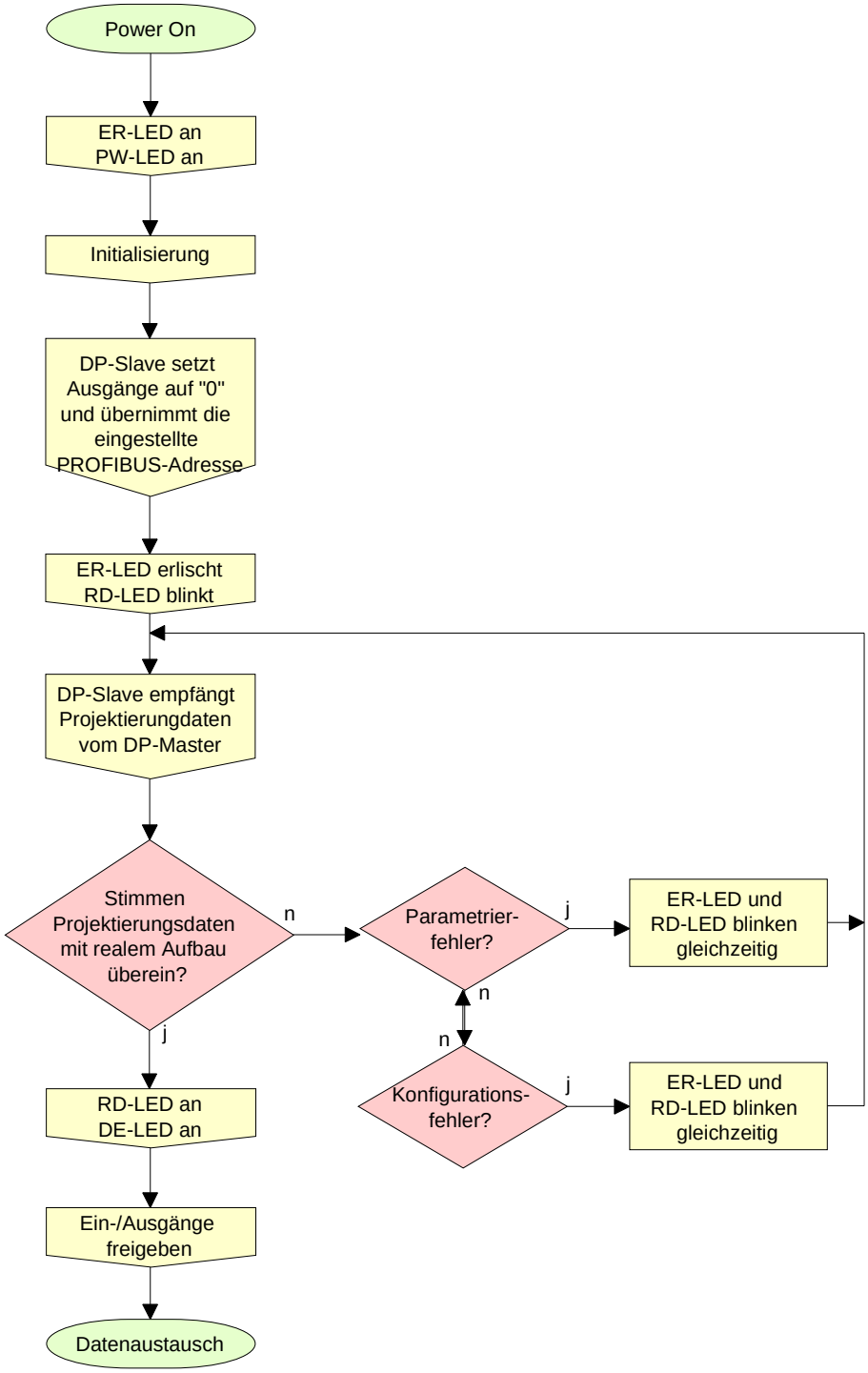
The slave section that achieves firstly the DataExchange state (due to the system, this is always the most left one), is automatically the active slave and has the parameterization access at the peripheral modules.

For assigning new parameters to your remote I/O you should notice that you need an active master-slave-system. Before the transfer of new parameters is possible, both slaves must be in WAITPARAM state.

Start-up behavior IM 253DP slave

After Power ON, the DP slave executes a self test. It controls its internal functions and the communication via the backplane bus. After the error free start-up, the bus coupler switches into the state "ready". In this state, the DP slave gets its parameters from the DP master and, at valid parameters, switches into the state "DataExchange" DE (DE is permanently on).

At communication errors at the backplane bus, the PROFIBUS slave switches into STOP and boots again after app. 2 seconds. As soon as the test has been completed positive, the RD-LED blinks.



IM 253-xDPxx - DP-V0 slave - Parameters

Overview At deployment of DP slaves presented in this manual there are 4 parameters for configuration that are individually used for every slave.

Parameters The following parameters are available:

Slot number
For reasons of compatibility to VIPA slaves with revision level 4 or lower, you may here select the start number of the slot numeration. With DP slaves rev. level 5 and higher, this parameter is ignored. The following values are possible: 0: slot number 0 (default) 1: slot number 1
Sync Mode
The SYNC-Mode synchronizes the V-Bus cycle (VIPA backplane bus communication) and the DP cycle (PROFIBUS DP communication). This guarantees that there is one PROFIBUS transmission per V-Bus cycle. The following values are possible: Sync Mode off: DP and V-Bus cycle are asynchronous (default) Sync Mode on: DP and V-Bus cycle are synchronous
Diagnostic
Via this parameter you influence the diagnostic function of the slaves. The following values are possible: activated: activates the diagnostic function of the slaves (default) deactivated: deactivates the diagnostic function of the slaves
Redundancy diagnostic
Via this parameter you may influence the redundant diagnostic function of the slaves and it is only accepted with redundant slaves. The following values are possible: activated: activates the red. diagnostic function of the slaves (default) deactivated: deactivates the redundant diagnostic function of the slaves

IM 253-xDPxx - DP-V0 slave - Diagnostic functions

Overview

PROFIBUS DP provides an extensive set of diagnostic functions for quick error localization. Diagnostic messages are transferred via the bus and collected by the master.

The most recent 100 diagnostic messages along with a time stamp are stored in RAM res. saved to the Flash of every VIPA PROFIBUS slave. These can be analyzed by means of software.

Please call the VIPA hotline for this purpose.

Internal diagnostic system messages

The system also stores diagnostic messages like the status "Ready" or "DataExchange". These are not send to the master.

The contents of the diagnostic RAM is saved by the PROFIBUS slave in a Flash-ROM, every time the status changes between "Ready" and "DataExchange". At restart it deposits the data back to the RAM.

Saving diagnostic data manually

You can manually save the diagnostic data in Flash-ROM by changing the address switch to 00 during "DataExchange" for a short while.

Diagnostic message in case of a power failure

If a power failure or a voltage drop is detected, a time stamp is saved in the EEPROM. If there is still enough voltage left, the diagnostic data is transferred to the master.

At the next startup the time stamp in the EEPROM is used to generate an undervoltage/power-off diagnostic message and saved to the diagnostic RAM.

Diagnostic addition at IM 253DPR

At deployment of a redundant slave, the diagnostic telegram is extended with an 8Byte sized redundant state. This diagnostic addition is not internally stored. By additionally configuring the state module "State byte IM253-2DP50" as last "module" (most slot number), you are able to include 2Byte of the redundant state into the peripheral area.

This virtual state "module" is available from GSD version 1.30 on.

Structure of the DP-V0 diagnostic data via PROFIBUS

The length of the diagnostic messages that are generated by the PROFIBUS slave is 23Byte. This is also referred to as the *device related diagnostic data*.

When the PROFIBUS slave sends a diagnostic message to the master, a 6Byte standard diagnostic block and 1Byte header is prepended to the 23Byte diagnostic data:

Byte 0 ... Byte 5	Standard diagnostic data	precedes message to master
Byte 6	Header device related diagnostic	only for PROFIBUS transfers
Byte 7 ... 29	**Device related diagnostic data**	**Diagnostic data that is saved internally**
Byte x... Byte x+8	Redundancy state of a redundant DP slave	is only added at transfer via PROFIBUS and usage of the redundant DP slave

Standard diagnostic data

Diagnostic data that is being transferred to the master consist of the standard diagnostic data for slaves and a header byte that are prepended to the device related diagnostic bytes. The PROFIBUS standards contain more detailed information on the structure of standard diagnostic data. These standards are available from the PROFIBUS User Organization. The structure of the standard diagnostic data for slaves is as follows:

Byte	Bit 7 ... Bit 0
0	Bit 0: permanently 0 Bit 1: slave not ready for data exchange Bit 2: configuration data mismatch Bit 3: slave has external diagnostic data Bit 4: slave does not support the requested function Bit 5: permanently 0 Bit 6: bad configuration Bit 7: permanently 0
1	Bit 0: slave requires re-configuration Bit 1: statistical diagnostic Bit 2: permanently 1 Bit 3: Watchdog active Bit 4: Freeze-command was received Bit 5: Sync-command was received Bit 6: reserved Bit 7: permanently 0
2	Bit 0 ... Bit 6: reserved Bit 7: diagnostic data overflow
3	Master address after configuration FFh: slave was not configured
4	Ident number high byte
5	Ident number low byte

Header for device related diagnostic

This byte is only prepended to the device related diagnostic data when this is being transferred via PROFIBUS.

Byte	Bit 7 ... Bit 0
6	Bit 0 ... Bit 5: Length device related diagnostic data incl. Byte 6 Bit 6 ... Bit 7: permanently 0

Device related diagnostic

Byte	Bit 7 ... Bit 0
7 ... 29	Device related diagnostic data that can be stored internally by the slave for analysis

Structure of the device related diagnostic data in the DP slave

As of revision level 6, all diagnostic data that is generated by the PROFIBUS slave is stored in a ring-buffer along with the time stamp. The ring-buffer always contains the most recent 100 diagnostic messages.

You can analyze these messages by means of the "Slave Info Tool".

Since the standard diagnostic data (Byte 0 ... Byte 5) and the header (Byte 6) are not stored, the data in Byte 0 ... Byte 23 corresponds to Byte 7 ... Byte 30 that is transferred via PROFIBUS.

The structure of the device related diagnostic data is as follows:

Byte	Bit 7 ... Bit 0
0	Message 0Ah: DP parameter error 14h: DP configuration error length 15h: DP configuration error entry 1Eh: undervoltage/power failure 28h: V-bus parameterization error 29h: V-bus initialization error 2Ah: V-bus bus error 2Bh: V-bus delayed acknowledgment 32h: diagnostic alarm System 200 33h: process alarm System 200 3Ch: new DP address was defined 3Dh: slave status is ready (only internally) 3Eh: slave status is DataExchange (only internally)
1	Module no. or slot no. 1 ... 32: module no. slot no. 0: module no. slot no. not available
2 ... 23	Additional information for message in Byte 0

Overview of diagnostic messages

The following section contains all the messages that the diagnostic data can consist of. The structure of Byte 2 ... Byte 23 depends on the message (Byte 0). When the diagnostic data is transferred to the master via PROFIBUS, Byte 7 of the master corresponds to Byte 0 of the slave. The specified length represents the "length of the diagnostic data" during the PROFIBUS data transfer.

0Ah *DP parameter error* Length: 8

The parameter telegram is too short or too long

Byte	Bit 7 ... Bit 0
0	0Ah: DP parameter error
1	Module no. or slot no. 1 ... 32: module no. or slot no. 0: module no. or slot no. not available
2	Length user parameter data
3	Mode 0: standard mode 1: 400-mode
4	Number of digital modules (slave)
5	Number of analog modules (slave)
6	Number of analog modules (master)

14h *DP configuration error - length* Length: 6

Depending on the mode, the length of the configuration message is compared to the length of the default configuration (modules detected on the V-Bus).

Byte	Bit 7 ... Bit 0
0	14h: DP configuration error - length
1	Module no. or slot no. 1 ... 32: module no. or slot no. 0: module no. or slot no. not available
2	Configuration data quantity (master)
4	Configuration data quantity (slave)
3	Mode 0: Standard mode 1: 400-mode

15h *DP configurations error - entry* Length: 6

Depending on the mode and when the length of the configuration message matches the length of the default configuration the different entries in the configuration message are compared to the default configuration.

Byte	Bit 7 ... Bit 0
0	15h: DP configuration error - entry
1	Module no. or slot no. 1 ... 32: module no. or slot no. 0: module no. or slot no. not available
2	Configuration byte master (module identifier)
4	Configuration byte slave (module identifier)
3	Mode 0: Standard mode 1: 400-mode

1Eh *Undervoltage/power failure* Length: 2

A time stamp is saved immediately to the EEPROM when a power failure or a voltage drop is detected. If there is still enough voltage, the diagnostic data is transferred to the master.

At the next restart, the time stamp in the EEPROM is used to generate an undervoltage/power-off diagnostic message that is saved in the diagnostic RAM.

Byte	Bit 7 ... Bit 0
0	1Eh: Undervoltage/power failure

28h *V-bus configuration error* Length: 3

The configuration for the specified slot failed.

Byte	Bit 7 ... Bit 0
0	28h: V-bus configuration error
1	Module no. or slot no. 1 ... 32: module no. or slot no. 0: module no. or slot no. not available

29h *V-bus initialization error* Length: 2

General backplane bus error

Byte	Bit 7 ... Bit 0
0	29h: V-bus initialization error

2Ah *V-bus bus error* Length: 2

Hardware error or module failure

Byte	Bit 7 ... Bit 0
0	2Ah: V-bus error

2Bh *V-bus delayed acknowledgment* Length: 2

Reading or writing from/to digital modules failed

Byte	Bit 7 ... Bit 0
0	2Bh: V-bus delayed acknowledgment

32h *System 200V diagnostic alarm* Length: 16

Byte	Bit 7 ... Bit 0
0	32h: System 200V diagnostic alarm
1	Module no. or slot no. 1 ... 32: module no. or slot no. 0: module no. or slot no. not available
2 ... 14	Data diagnostic alarm

33h *System 200V process alarm* Length: 16

Byte	Bit 7 ... Bit 0
0	33h: System 200V process alarm
1	Module no. or slot no. 1 ... 32: module no. or slot no. 0: module no. or slot no. not available
2 ... 14	Process alarm data

3Ch *New DP address assigned* Length: 2

When the slave has received the service with "Set Slave Address" it sends the respective diagnostic message and re-boots. The slave will then become available on the bus under the new address.

Byte	Bit 7 ... Bit 0
0	3Ch: new DP address has been assigned

3Dh *Slave status is READY* Length: none (internal only)

The READY status of the slave is only used internally and is not transmitted via the PROFIBUS.

Byte	Bit 7 ... Bit 0
0	3Dh: slave status is READY

3Eh *Slave status is DataExchange* Length: none (only internal)

The DataExchange status of the slave is only used internally and is not transmitted via the PROFIBUS.

Byte	Bit 7 ... Bit 0
0	3Eh: slave status is DataExchange

Redundancy state at deployment of IM 253DPR

At deployment of a redundant slave, the diagnostic message is expanded for 8Byte data with the redundancy state. This diagnostic addition is not stored in the internal diagnostic buffer. The redundancy state has the following structure:

Redundancy state

Byte	Description
X	08h: length of redundancy state permanent at 8
X+1	80h: type of redundancy state
X+2	00h: reserved, permanent 00h
X+3	00h: reserved, permanent 00h
X+4	00h: reserved, permanent 00h
X+5	Red_State slave that communicates with the respective master)
	Bit 0 = slave is backup slave
	Bit 1 = slave is primary slave
	Bit 2 = reserved
	Bit 3 = reserved
	Bit 4 = slave is in DataExchange
	Bit 5 = reserved
	Bit 6 = reserved
	Bit 7 = reserved
X+6	Red_State of second slave
X+7	00h: reserved, permanent 00h

Include the redundancy state into the peripheral area

As from GSD version 1.30 from VIPA, the virtual module "State byte IM253-2DP50" is available in the hardware catalog. When using this module during the project engineering. You may define an address range of 2Byte where the Red_State byte of both slaves shall be stored.

Please regard that you have to configure this module always at the last slot, otherwise the slave will throw a parameterization error.

(De)activate diagnostic

Via the parameterization window of the slaves, you may influence the diagnostic functions by activating res. deactivating diagnostic or the redundancy state.

IM 253-xDPx1 - DP-V1 slave - Project engineering

General

The module is configured by means of your PROFIBUS master configuration tool. During the configuration you will assign the PROFIBUS slave modules to your master module.

The direct allocation is defined by means of the PROFIBUS address that you have to set at the slave module.

The Slaves are projected via *GSD-File* at the hardware configuration.

GSD-File > DP slave

The GSD files may be found at www.vipa.com at the "Service" part.

The integration of the GSD takes place with the following proceeding:

- Browse to www.vipa.com.
- Click to *Service* > *Download* > *GSD-Files* > *PROFIBUS*.
- Download the file *Cx000023_Vxxx*.
- Extract the file to your work directory. The SPEEDBUS.GSD is stored in the directory *VIPA_System_200V*.
- Start the hardware configurator from Siemens.
- Close every project.
- Select **Options** > *Install new GSD-File.*

After the installation of the GSD-File you will find e.g. the DP-V1 slave in the hardware catalog from Siemens at:

PROFIBUS DP>Additional field devices>I/O>VIPA_System_200V>
VIPA 253-1DP01

Note!

Please use the appropriate GSD for DP-V0 for PROFIBUS DP master which do not support DP-V1.

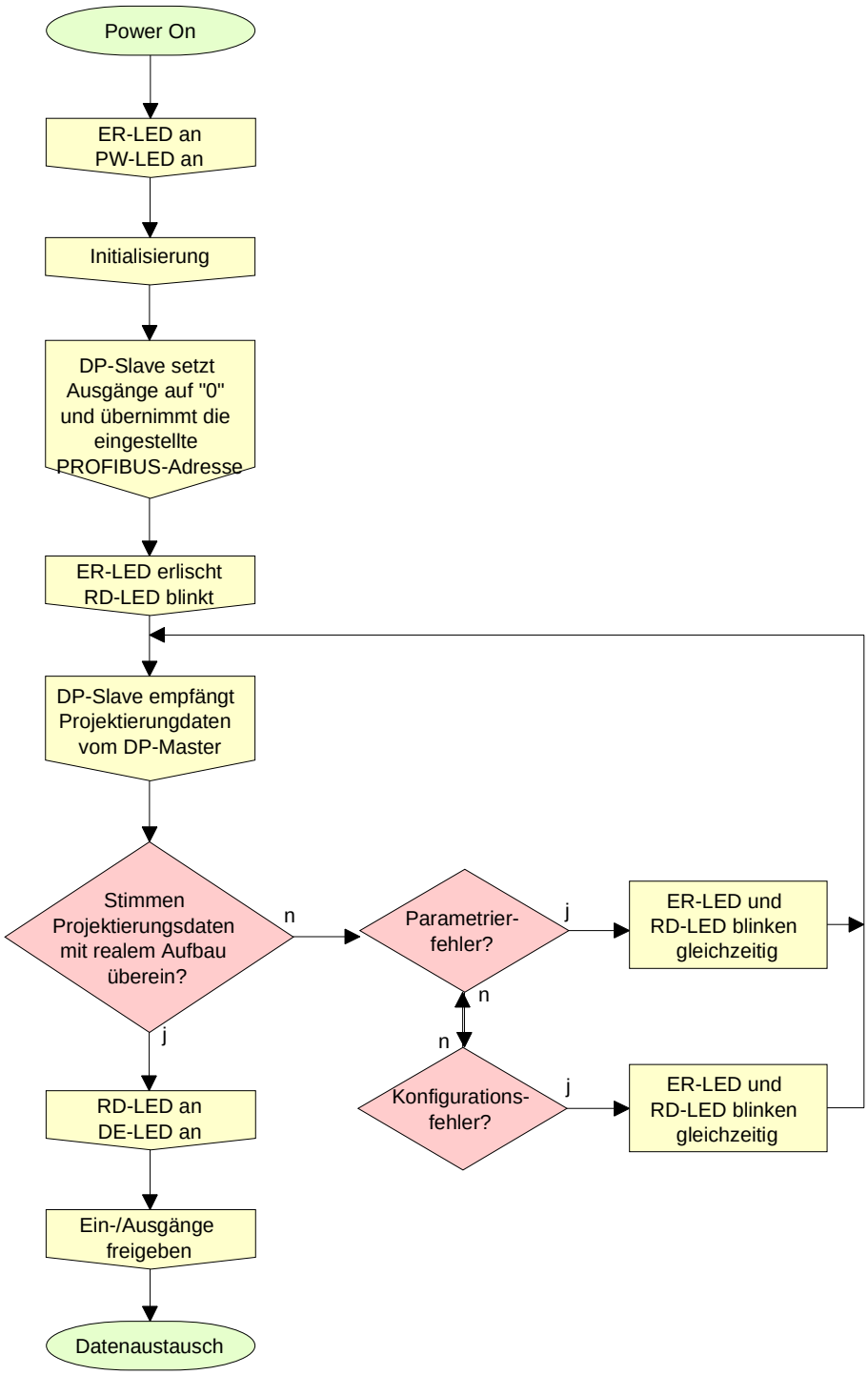
Deployment at a IM 208DP master from VIPA

The project engineering of the IM 253DP slave at the IM 208 DP master from VIPA is to be find in the description to the DP master.

Start-up behavior IM 253DP slave

After Power ON, the DP slave executes a self test. It controls its internal functions and the communication via the backplane bus. After the error free start-up, the bus coupler switches into the state "ready". In this state, the DP slave gets its parameters from the DP master and, at valid parameters, switches into the state "DataExchange" DE (DE is permanently on).

At communication errors at the backplane bus, the PROFIBUS slave switches into STOP and boots again after app. 2 seconds. As soon as the test has been completed positive, the RD-LED blinks.



IM 253-xDPx1 - DP-V1 slave - Parameters

Outline

At deployment of DP slaves presented in this manual there are parameters for configuration that are individually used for every slave.

Parameters DP-V0

At usage of the corresponding GSD for DP-V0 operation you have the following parameter data:

Byte	Bit 7 ... Bit 0	Default
0	Bit 1 ... 0: 0 (fix) Bit 2: 0 = WD-Timebase 10ms 1 = WD-Timebase 1ms Bit 4 ... 3: 0 (fix) Bit 5: 0 = Publisher-Mode not available 1 = Publisher-Mode available Bit 7 ... 6: 0 (fix)	00h
1	00h (fix)	00h
2	08h (fix)	08h
3	0Ah (fix)	0Ah
4	81h (fix)	81h
5	00h (fix)	00h
6	00h (fix)	00h
7	Bit 0: 0 = Enhanced diagnostic enable 1 = Enhanced diagnostic disable Bit 1: 0 = Module status enable 1 = Module status disable Bit 2: 0 = Channel-specific diagnostic enable 1 = Channel-specific diagnostic disable Bit 3: 0 (fix) Bit 4: 0 = V0: Manufacturer alarm not available 1 = V0: Manufacturer alarm available Bit 5: 0 = V0: Diagnostic alarm not available 1 = V0: Diagnostic alarm available Bit 6: 0 = V0: Process alarm not available 1 = V0: Process alarm available Bit 7: 0 (fix)	70h
8	Bit 6 ... 0: 0 (fix) Bit 7: 0 = Data format Motorola 1 = Data format Intel (only at analog modules)	00h
9 ... 12	00h (fix)	00h

DP-V1 UserPrmData

At usage of a GSD for DP-V1 operation you have the following parameter data:

Byte	Bit 7 ... Bit 0	Default
0	Bit 1 ... 0: 0 (fix) Bit 2: 0 = WD-Timebase 10ms 1 = WD-Timebase 1ms Bit 4 ... 3: 0 (fix) Bit 5: 0 = Publisher-Mode not available 1 = Publisher-Mode available Bit 6: 0 = Fail-Safe-Mode not available 1 = Fail-Safe-Mode available Bit 7: 0 = DP-V1 mode disable 1 = DP-V1 mode enable	80h
1	Bit 3 ... 0: 0 (fix) Bit 4: 0 = V1: Manufacturer alarm not available 1 = V1: Manufacturer alarm available Bit 5: 0 = V1: Diagnostic alarm not available 1 = V1: Diagnostic alarm available Bit 6: 0 = V1: Process alarm not available 1 = V1: Process alarm available Bit 7: 0 (fix)	00h
2	08h (fix)	08h
3	0Ah (fix)	0Ah
4	81h (fix)	81h
5	00h (fix)	00h
6	00h (fix)	00h
7	Bit 0: 0 = Identifier related diagnostic enable 1 = Identifier related diagnostic disable Bit 1: 0 = Module status enable 1 = Module status disable Bit 2: 0 = Channel-specific diagnostic enable 1 = Channel-specific diagnostic disable Bit 7 ... 3: 0 (fix)	00h
8	Bit 6 ... 0: 0 (fix) Bit 7: 0 = Data format Motorola 1 = Data format Intel (only at analog modules)	00h
9 ... 12	00h (fix)	00h

*) The IM 253-1DP31 does not support manufacturer alarm.

Data format Motorola/Intel

This parameter is exclusively evaluated with deployment of analog modules and refers to how a value is stored in the CPU address range.

In the *Motorola format* (default) the bytes were stored in descending significance i.e. the 1st byte contains the high byte and 2nd byte the low byte.

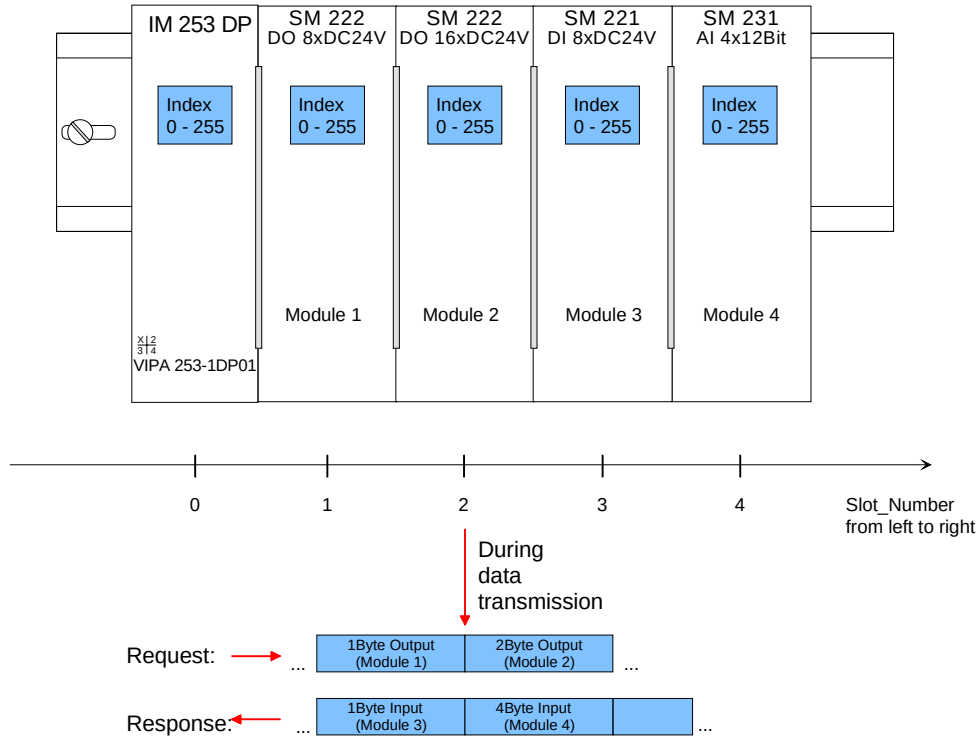
In the *Intel format* the value is switched and it is worked with ascending significance i.e. the 1st byte contains the low byte and 2nd byte the high byte.

Addressing with Slot and Index

When addressing data, PROFIBUS assumes that the physical structure of the slaves is *modular* or it can be structured internally in logical functional units, so-called *modules*. This model is also used in the basic DP functions for cyclic data communication where each module has a constant number of input-/output bytes that are transmitted in a fixed position in the user data telegram. The addressing procedure is based on identifiers, which characterize a module type as input, output or a combination of both. All identifiers combined produce the configuration of the slave, which is also checked by the DPM1 when the system starts up.

The acyclic data communication is also based on this model. All data blocks enabled for read/write access are also regarded as assigned to the modules and can be addressed using slot number and index.

The *Slot-Number* addresses the module and the *index* addresses the data blocks assigned to a module. The Slot_Number = 0 addresses the data of the PROFIBUS coupler, the Slot_Number > 0 addresses the data of the Function modules.



Each data block can be up to 244bytes. In the case of modular devices, the slot number is assigned to the modules. Compact devices are regarded as a unit of virtual modules. These can also be addressed whit Slot_Number and index.

Through the length specification in the read/write request, it is also possible to read/write parts of a data block.

Read res. write access via SFB 52 res. 53

Starting with the firmware version 1.3.0 your CPU has the SFB 52 res. 53 integrated for DP-V1 read res. write accesses. Here you may access the according component of your system by declaring the ID (Slot number as address) and index.

More detailed information is given in the description of SFB 52/53.

Data transmission

Per default, one class-1 master and one class-2 master connection with 244Byte data (4Byte DP-V1 header plus 240Byte user data) are supported. The class-1 master connection is established together with the cyclic connection and is activated via the parameterization. The class-2 master connection can be used by a C2 master that then communicates with the slave only acyclical and provides an own connection establishment.

Data from DP-V1 slave

At access to the DP-V1 coupler via Slot_Number = 0 you have access to the following elements via *Index*:

Index	Access	Description
A0h	R	Device name (VIPA 253-1DP01)
A1h	R	Hardware Version (V1.00)
A2h	R	Software Version (V1.00)
A3h	R	Serial number from the device (e.c. 000347 = 30h, 30h, 30h, 33h, 34h, 37h)
A4h	R	Device configuration (see module configuration and module type)
D0h	R	Number of stored diagnostic
	W	Deletes diagnostic entries
D1h	R	Diagnostic entries
	W	Stores diagnostic entries permanently in the FLASH memory
FFh	R	I&M functions
	W	

R = Read; W = Write

Structure stored diagnostic entry

With every D1h call a stored diagnostic entry with max. 26Byte is displayed starting with the newest one.

Basically every stored diagnostic entry has the following structure:

Label	Type	Description
Length	Word	Length of the diagnostic data
Time stamp	Double word	Internal time stamp
Diagnostic (max. 20Byte)	Byte	Diagnostic entry (alarm) that is stored internal

Data of the function modules

Index	Access	Description
00h	R	Diagnostic – record set 0
	W	Module parameter
01h	R	Via "Index" you may access the according diagnostic of a module by presetting a record set number. Example: Index=01h → Access to diagnostic record set 01
F1h	R	Module parameter
F2h	R	Read module process image

R = Read; W = Write

Module configuration

Via the index A3h, the module configuration of the modules at the backplane bus can be monitored.

Module type	Identification (hex)	No. of Digital Input-Byte	No. of Digital Input-Byte
DI 8	9FC1h	1	-
DI 8 - Alarm	1FC1h	1	-
DI 16	9FC2h	2	-
DI 16 / 1C	08C0h	6	6
DI 32	9FC3h	4	-
DO 8	AFC8h	-	1
DO 16	AFD0h	-	2
DO 32	AFD8h	-	4
DIO 8	BFC9h	1	1
DIO 16	BFD2h	2	2
AI2	15C3h	4	-
AI4	15C4h	8	-
AI4 - fast	11C4h	8	-
AI8	15C5h	16	-
AO2	25D8h	-	4
AO4	25E0h	-	8
AO8	25E8h	-	16
AI2 / AO2	45DBh	4	4
AI4 / AO2	45DCh	8	4
SM 238	45DCh 38C4h	8 16	4 16
CP 240	1CC1h	16	16
FM 250	B5F4h	10	10
FM 250-SSI	B5DBh	4	4
FM 253, FM 254	18CBh	16	16

IM 253-xDPx1 - DP-V1 slave - Diagnostic functions

Overview

PROFIBUS DP provides an extensive set of diagnostic functions for quick error localization. Diagnostic messages are transferred via the bus and collected by the master.

At the DP-V1 the device related diagnostic has been improved as further function and is subdivided into the categories alarms and status messages.

Additionally in the DP-V1 slave from VIPA the last 100 alarm messages are stored in a RAM res. in the flash with a time stamp and may be evaluated with a software.

For this, please call the VIPA hotline!

Internal diagnostic system messages

The system also stores diagnostic messages like the states "Ready" res. "DataExchange" that are not passed on to the master.

With every status change between "Ready" and "DataExchange" the PROFIBUS slave stores the diagnostic-RAM content in a Flash-ROM and writes it back to the RAM at every reboot.

Manual storage of diagnostic data

With the short setting of 00 at the address lever you may save the diagnostic data in the Flash-ROM during "DataExchange".

Diagnostic messages at voltage failure

At voltage failure res. decreasing voltage a time stamp is stored in the EEPROM. If enough voltage is still left, a diagnostic output to the master occurs.

At the next reboot an undervoltage/shut-down diagnostic message is generated from the time stamp of the EEPROMs and is stored in the Diagnostic-RAM.

Structure of the DP-V1 diagnostic data via PROFIBUS

The diagnostic messages that are created by the PROFIBUS slave have, depending on the parameterization, a length of 58Byte.

As soon as the PROFIBUS slave sends a diagnostic to the master, the max. of 58Byte diagnostic data are preceding by 6Byte norm diagnostic data:

Byte 0 ... Byte 5	Norm diagnostic data	
Byte 6 ... 10	Identifier related diagnostic *	
x ... x+11	Module state*	
7...13 ·(x ... x+2)	Channel related diagnostic*	
x ... x+19	Alarm*	Internal stored diagnostic

*) Can be enabled or disabled via parameterization

Diagnostic data IM 253-1DP31 - ECO

Due to the restrictions there are the following diagnostic data for the IM 253-1DP31 - ECO:

Byte 0 ... Byte 5	Normdiagnose-Daten	
Byte 6 ... 7	Kennungsbezogene Diagnose*	
x ... x+5	Modulstatus*	
10...13 ·(x ... x+2)	Kanalbezogene Diagnose*	
x ... x+19	Alarm*	Internal stored diagnostic

*) Can be enabled or disabled via parameterization

Norm diagnostic data

At the transfer of a diagnostic to the master the slave *norm diagnostic data* are prepended to the diagnostic bytes. More detailed information to the structure of the slave *norm diagnostic data* is to find in the norm papers of the PROFIBUS User Organization.

The slave *norm diagnostic data* have the following structure:

Byte	Bit 7 ... Bit 0
0	Bit 0: Bit is always at 0 Bit 1: DP slave is not yet ready to exchange data Bit 2: Configuration data does not correspond actual configuration Bit 3: External diagnostic available Bit 4: Request function is not supported by the DP slave Bit 5: Bit is always at 0 Bit 6: Wrong parameterization Bit 7: Bit is always at 0
1	Bit 0: New parameters have to be assigned to the DP slave Bit 1: Statistic Diagnostic Bit 2: Bit is always at 1 Bit 3: Response monitoring has been enabled Bit 4: DP slave has received "FREEZE" control command Bit 5: DP slave has received "SYNC" control command Bit 6: reserved Bit 7: Bit is always at 0
2	Bit 0 ... Bit 6: reserved Bit 7: Diagnostic data overflow
3	Master address after Parameterizing FFh: Slave has not been parameterized by DP master
4	Ident number High Byte
5	Ident number Low Byte

Enhanced diagnostic

Via the *Enhanced diagnostic,* which can be activated by parameterization, you gain information at which slot number (module) an error has occurred. More detailed information about the error is available via the *Module state* and the *channel specific diagnostic*.

Note!

Note that the length of the *enhanced diagnostic* of the IM 253-1DP31 - ECO is limited to 2.

Enhanced diagnostic

Byte	Bit 7 ... Bit 0
X	Bit 5 ... 0: 000101 (fix) Length of the Enhanced diagnostic* Bit 7 ... 6: 01 (fix) Code for Enhanced diagnostic
X+1	The bit is set if one of the following occurs: - a module is removed - an unconfigured module is inserted - an inserted module cannot be accessed - a module reports a diagnostic interrupt Bit 0: Entry for module on slot 1 Bit 1: Entry for module on slot 2 Bit 2: Entry for module on slot 3 Bit 3: Entry for module on slot 4 Bit 4: Entry for module on slot 5 Bit 5: Entry for module on slot 6 Bit 6: Entry for module on slot 7 Bit 7: Entry for module on slot 8
X+2	Bit 0: Entry for module on slot 9 Bit 1: Entry for module on slot 10 Bit 2: Entry for module on slot 11 Bit 3: Entry for module on slot 12 Bit 4: Entry for module on slot 13 Bit 5: Entry for module on slot 14 Bit 6: Entry for module on slot 15 Bit 7: Entry for module on slot 16
X+3	Bit 0: Entry for module on slot 17 Bit 1: Entry for module on slot 18 Bit 2: Entry for module on slot 19 Bit 3: Entry for module on slot 20 Bit 4: Entry for module on slot 21 Bit 5: Entry for module on slot 22 Bit 6: Entry for module on slot 23 Bit 7: Entry for module on slot 24
X+4	Bit 0: Entry for module on slot 25 Bit 1: Entry for module on slot 26 Bit 2: Entry for module on slot 27 Bit 3: Entry for module on slot 28 Bit 4: Entry for module on slot 29 Bit 5: Entry for module on slot 30 Bit 6: Entry for module on slot 31 Bit 7: Entry for module on slot 32

*) Bit 5 ... 0: 000010 at 253-1DP31 - ECO

Module state

Via the *Module state,* which can be activated by parameterization, you gain information about the error that occurred at a module.

Note!

Note that the length of the *Module state* of the IM 253-1DP31 - ECO is limited to 6.

Module state

Byte	Bit 7 ... Bit 0
X	Bit 5 ... 0: 001100 (fix) Length of the Module status* Bit 7 ... 6: 00 (fix) Code for Module status
X+1	82h (fix) Status type Module status
X+2	00h (fix)
X+3	00h (fix)
X+4	Follow bits indicates the status of the modules from slot 1 ... 32 00: Module ok - valid Data 01: Module error - invalid Data (Module defective) 10: Incorrect module - invalid Data 11: No Module - invalid Data Bit 1, 0: Module status module slot 1 Bit 3, 2: Module status module slot 2 Bit 5, 4: Module status module slot 3 Bit 7, 6: Module status module slot 4
X+5	Bit 1, 0: Module status module slot 5 Bit 3, 2: Module status module slot 6 Bit 5, 4: Module status module slot 7 Bit 7, 6: Module status module slot 8
X+6	Bit 1, 0: Module status module slot 9 Bit 3, 2: Module status module slot 10 Bit 5, 4: Module status module slot 11 Bit 7, 6: Module status module slot 12
X+7	Bit 1, 0: Module status module slot 13 Bit 3, 2: Module status module slot 14 Bit 5, 4: Module status module slot 15 Bit 7, 6: Module status module slot 16
X+8	Bit 1, 0: Module status module slot 17 Bit 3, 2: Module status module slot 18 Bit 5, 4: Module status module slot 19 Bit 7, 6: Module status module slot 20
X+9	Bit 1, 0: Module status module slot 21 Bit 3, 2: Module status module slot 22 Bit 5, 4: Module status module slot 23 Bit 7, 6: Module status module slot 24
X+10	Bit 1, 0: Module status module slot 25 Bit 3, 2: Module status module slot 26 Bit 5, 4: Module status module slot 27 Bit 7, 6: Module status module slot 28
X+11	Bit 1, 0: Module status module slot 29 Bit 3, 2: Module status module slot 30 Bit 5, 4: Module status module slot 31 Bit 7, 6: Module status module slot 32

*) Bit 5 ... 0: 000110 at 253-1DP31 - ECO

Channel specific Diagnostic

With the *channel specific diagnostic* you gain detailed information about the channel error within a module. For the usage of the *channel specific diagnostic* you have to release the diagnostic alarm for every module via the parameterization. The *channel specific diagnostic* can be activated via the parameterization and has the following structure:

Channel-specific diagnostic

Byte	Bit 7 ... Bit 0
X	Bit 5 ... 0: ID number of the module that delivers the channel-specific diagnostic (000001 ... 011111)* z.B.: Slot 1 has ID no. 0 Slot 32 has ID no. 31 Bit 7, 6: 10 (fix) Code for channel-specific diagnostic
X+1	Bit 5 ... 0: Number of the channel or the channel group that delivers the diagnostic (00000 .... 11111) Bit 7 ... 6: 01=Input Module 10=Output Module 11=In-/Output Module
X+2	Bit 4 ... 0: *Error messages to PROFIBUS standard* 00001: Short circuit 00010: Undervoltage (Supply voltage) 00011: Overvoltage (Supply voltage) 00100: Output Module is overloaded 00101: Temperature rise output Module 00110: Open circuit sensors or actors 00111: Upper limit violation 01000: Lower limit violation 01001: Error - Load voltage at the output - Sensor supply - Hardware error in the Module *Error messages - manufacturer-specific* 10000: Parameter assignment error 10001: Sensor or load voltage missing 10010: Fuse defect 10100: Ground fault 10101: Reference channel error 10110: Process interrupt lost 11001: Safety-related shutdown 11010: External fault 11010: Indefinable error - not specified Bit 7 ... 5: Channel type 001: Bit 010: 2 Bit 011: 4 Bit 100: Byte 101: Word 110: 2 Words

*) Bit 5 ... 0: 000001...001000 (slot 1...8) at 253-1DP31 - ECO

The maximum number of *channel specific diagnostic* is limited by the total length of 58Byte for diagnostic. By de-activating of other diagnostic ranges you may release these areas for further *channel specific diagnostic*. For each channel always 3 Byte are used.

Interrupts

The interrupts section of the slave diagnostic provides information on the type of interrupt and the cause that triggered the input. The interrupt section has a maximum of 20bytes. A maximum of one interrupt can be used per slave diagnostic. The interrupt component is always the last part of the diagnostic frame.

Contents

The contents of the interrupt information depend on the type of interrupt:

- In the case of *diagnostic interrupts*, the diagnostic data record 1 is send as interrupt information (as of Byte x+4)
- In the case of *process interrupts*, the additional information is 4bytes long. These data is module specific and is described at the concerning module.

Alarm status

If there is a diagnostic event for channel (/channel group) 0 of a module, there may be a module error as well as a channel error. The entry is made in this case even if you have not enabled the diagnostic for channel (/channel group) 0 of a module.

The interrupt section is structured as follows:

Alarm status Byte x ... x+3

Byte	Bit 7 ... Bit 0
x	Bit 5 ... 0: 010100: Length of the interrupt section incl. Byte x Bit 6 ... 7: Code for Module-Related diagnostic
x+1	Bit 0 ... 6: Type of interrupt 0000001: Diagnostic interrupt 0000010: Process interrupt Bit 7: Code for interrupt
x+2	Bit 7 ... 0: Slot of the module that is producing interrupt 1 ... 32
x+3	Bit 1, 0: 00: Process interrupt 01: Diagnostic interrupt $_{incoming}$ 10: Diagnostic interrupt $_{outgoing}$ 11: reserved Bit 2: 0 (fix) Bit 7 ... 3: Interrupt sequence number 1…32

Alarm status at diagnostic alarm Bytes x+4 to x+7
(corresponds CPU diagnostic record set 0)

Byte	Bit 7 ... Bit 0
x+4	Bit 0: Module malfunction, i.e. a problem has been detected Bit 1: Internal error in the module Bit 2: External error - module no longer addressable Bit 3: Channel error in the module Bit 4: Load power supply is missing Bit 5: Front connector is missing Bit 6: Module is not parameterized Bit 7: Parameter assignment error
x+5	Bit 0 ... 3: Module class 1111: Digital module 0101: Analog module 1000: FM 1100: CP Bit 4: Channel information available Bit 5: User information available Bit 6: always "0" Bit 7: always "0"
x+6	Bit 0: Memory or coding key analog module is missing Bit 1: Communication error Bit 2: Operating mode 0: RUN 1: STOP Bit 3: Cycle time monitoring addressed Bit 4: Module power supply failure Bit 5: Empty battery Bit 6: Complete backup failure Bit 7: always "0"
x+7	Bit 0: reserved Bit 1: reserved Bit 2: reserved Bit 3: reserved Bit 4: reserved Bit 5: reserved Bit 6: Process interrupt lost Bit 7: reserved

Continued …

… Continue

Alarm status at diagnostic alarm Bytes x+8 to x+19 (corresponds CPU diagnostic record set 1)

Byte	Bit 7 ... Bit 0
x+8	70h: Module with digital inputs 71h: Module with analog inputs 72h: Module with digital outputs 73h: Module with analog outputs 74h: Module with analog in-/-outputs 76h: Counter
x+9	Lenght of the channel-specific diagnostic
x+10	Number of channels per module
x+12	Diagnostic event on the channel/channel group 0 Assignment see module description
x+13	Diagnostic event on the channel/channel group 1 Assignment see module description
. . .	. . .
x+19	Diagnostic event on the channel/channel group 7 Assignment see module description

Alarm status at process alarm Bytes x+4 to x+7

More detailed information to the diagnostic data is to find in the concerning module descriptions.

IM 253-xDPx1 - DP-V1 slave - Firmware update

Overview

The firmware update for the DP-V1 slave VIPA 253-1DP01 is at this time only available with Siemens CPUs. For this your firmware is online transferred from the hardware configurator to the CPU, which passes the firmware on to the according DP slave via the connected DP master using PROFIBUS.

Note!

The DP slaves IM 253-1DP31 - ECO and IM 253-1DP11 don't support a firmware update!

Approach

- Make firmware file available
- Load project into the hardware configurator
- Transfer firmware

Supply firmware file *header.upd*

The most recent firmware for the DP-V1 PROFIBUS slaves is to find at www.vipa.com/support/firmware/System%20200V/DP_Slave/IM253-1DP01 as package Px000019_Vxxx.zip with xxx=version.

Extract and copy the file *header.upd* into your work directory.

Load project into hardware configurator

- Open the hardware configurator with the configured DP slave.
- Click on the DP slave and choose **PLC** > *Update Firmware*. This menu option is only available when the highlighted DP slave supports the function "Update firmware ".
  → the dialog window "Update firmware " appears.
- Choose your work directory via the button "Search" where the file *header.upd* is stored. Choose *header.upd*.
  → You will see information for which modules and from which firmware version on the chosen file is convenient.
- Activate the control field "Activate firmware after loading" because only then the new firmware is copied to the Flash and click then on [Execute].
  → it is proofed if the chosen file is valid and at positive result the file is transferred to the DP slave.

Note!

During runtime the firmware update at the DP slave is executed after app. 3s. Please regard that the DP slave executes a reboot, which may cause the DP master to remain in STOP res. may influence your user application.

IM 253-xDPx1 - DP-V1 slave - I&M data

Overview

Identification and maintenance data (I&M) are stored information in a module which support you at:

- check of the system configuration
- discover of hardware changes
- remove errors in a system

Identification data (I data) are information of the module e.g. order number, serial number, which can be found printed at the module.

I data are manufacturer information and can only be read.

Maintenance data (M data) are information like location and date of installation. M data were produced and stored during project engineering

By means of I&M data the modules can online be identified. Starting with PROFIBUS firmware V1.1.0 the data are available at the PROFIBUS slaves.

Note!

Only one DP master may access at one time the I&M data.

Structure

The data structure of the I&M data corresponds to the specifications of PROFIBUS guideline - order no. 3.502, version 1.1 from May 2003.

I&M data	Access	Preset	Explanation
Identification data 0: IM_INDEX: 65000			
MANUFACTURER_ID	read (2Byte)	22B hex (555 dez)	Name of the manufacturer (555 dez = VIPA GmbH)
ORDER_ID	read (20Byte)	depends on the module	Order number of the module VIPA 253-1DP01/31
SERIAL_NUMBER	read (16Byte)	depends on the module	Serial number of the module for clear identification.
HARDWARE_REVISION	read (2Byte)	depends on the module	Hardware revision of the module which is incremented on changes at the firmware.

continued ...

... continue

I&M data	Access	Preset	Explanation
SOFTWARE_REVISION	read (4Byte)	Firmware version Vxyz	Firmware version of the module. An increase of the firmware version also increases the hardware revision
REVISION_COUNTER	read (2Byte)	0000 hex	reserved
PROFILE_ID	read (2Byte)	F600 hex	Generic Device
PROFILE_SPECIFIC_TYPE	read (2Byte)	0003 hex	at I/O modules
IM_VERSION	read (2Byte)	0101 hex	Information about the version of the I&M data. (0101 hex = Version 1.1)
IM_SUPPORTED	read (2Byte)	001F hex	Information about available I&M-Data (IM_INDEX: 650000 ...65004)
Maintenance data 1: IM_INDEX: 65001			
TAG_FUNCTION	read / write (32Byte)	_	Clear module ID inside the system
TAG_LOCATION	read / write (22Byte)	_	Location of installation of the module
Maintenance data 2: IM_INDEX: 65002			
INSTALLATION_DATE	read / write (16Byte)	_	Date and if applicable time of installation of the module
RESERVED	read / write (38Byte)	_	reserved
Maintenance data 3: IM_INDEX: 65003			
DESCRIPTOR	read / write (54Byte)	_	Commentary to the module
Maintenance data 4: IM_INDEX: 65004			
SIGNATURE	read / write (54Byte)	_	Commentary to the module

PROFIBUS installation guidelines

PROFIBUS in general

- A PROFIBUS DP network may only be built up in linear structure.
- PROFIBUS DP consists of minimum one segment with at least one master and one slave.
- A master has always been deployed together with a CPU.
- PROFIBUS supports max. 126 participants.
- Per segment a max. of 32 participants is permitted.
- The max. segment length depends on the baud rate:

9.6 ... 187.5kbaud	→	1000m
500kbaud	→	400m
1.5Mbaud	→	200m
3 ... 12Mbaud	→	100m

- Max. 10 segments may be built up. The segments are connected via repeaters. Every repeater counts for one participant.
- The bus respectively a segment is to be terminated at both ends.
- All participants are communicating with the same baud rate. The slaves adjust themselves automatically on the baud rate.

Fiber optic system

- Only one fiber optic master may be used on one line.
- Multiple masters may be deployed with a single CPU as long as they are located on the same backplane bus (please take care not to exceed the max. current consumption).
- The maximum length of a FO link between two slaves may not exceed 300m with HCS-FO and 50m with POF-FO, independent from the baud rate.
- The number of bus participants depends on the baud rate:

≤ 1.5MBaud	→	17 participants incl. master
3MBaud	→	15 participants incl. master
6MBaud	→	7 participants incl. master
12MBaud	→	4 participants incl. master

- The bus does not require termination.

Note!

You should place covers on the unused sockets on any fiber optic device (e.g. the jack for the following participant at the bus end) to prevent being blinded by the light or to stop interference from external light sources. You can use the supplied rubber stoppers for this purpose. Insert the rubber stoppers into the unused openings on the FO interface.

Electrical system

- The bus must be terminated at both ends.
- Masters and slaves may be installed in any combination.

Combined system

- Any FO master may only be installed on an electrical system by means of an **O**ptical **L**ink **P**lug, i.e. slaves must not be located between a master and the OLP.
- Only one converter (OLP) is permitted between any two masters.

Installation and integration with PROFIBUS

- Assemble your PROFIBUS system using the required modules.
- Adjust the address of the bus coupler to an address that is not yet in use on your system.
- Transfer the supplied GSD-file into your system and configure the system as required.
- Transfer the configuration into your master.
- Connect the PROFIBUS cable to the coupler and turn the power supply on.

Transfer medium

As transfer medium PROFIBUS uses an isolated twisted-pair cable based upon the RS485 interface.

The RS485 interface is working with voltage differences. Though it is less irritable from influences than a voltage or a current interface. You are able to configure the network as well linear as in a tree structure.

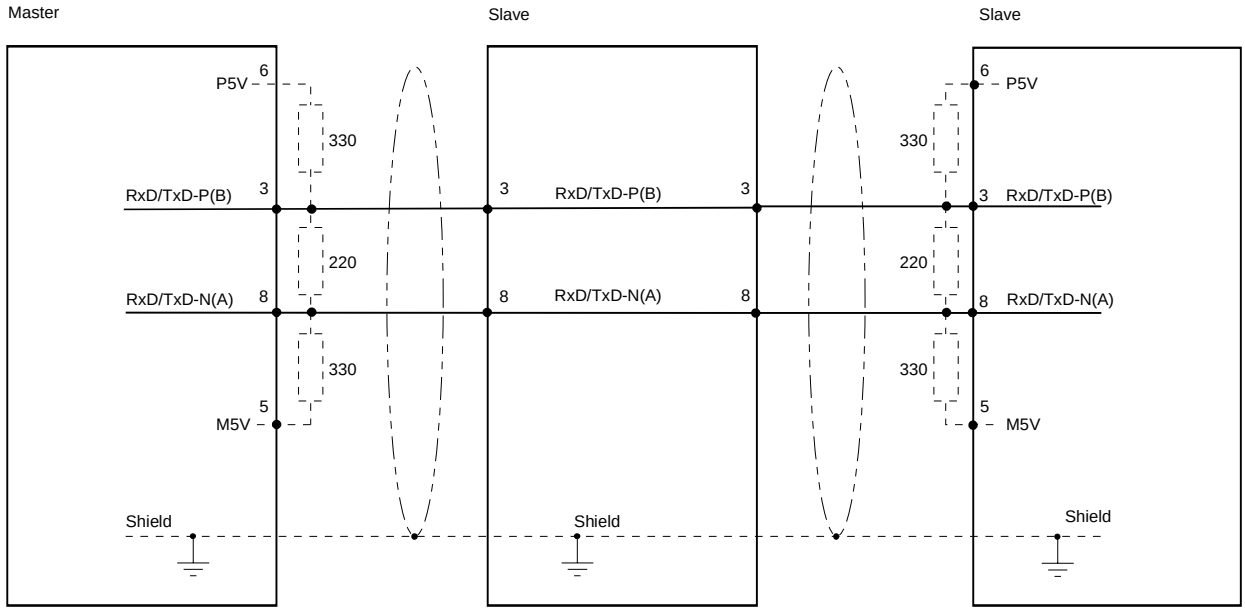
Max. 32 participants per segment are permitted. Within a segment the members are linear connected. The segments are connected via repeaters. The maximum segment length depends on the transfer rate.

PROFIBUS DP uses a transfer rate between 9.6kbaud and 12Mbaud, the slaves are following automatically. All participants are communicating with the same transfer rate.

The bus structure under RS485 allows an easy connection res. disconnection of stations as well as starting the system step by step. Later expansions don't have any influence on stations that are already integrated. The system realizes automatically if one partner had a fail down or is new in the network.

Bus connection

The following picture illustrates the terminating resistors of the respective start and end station.



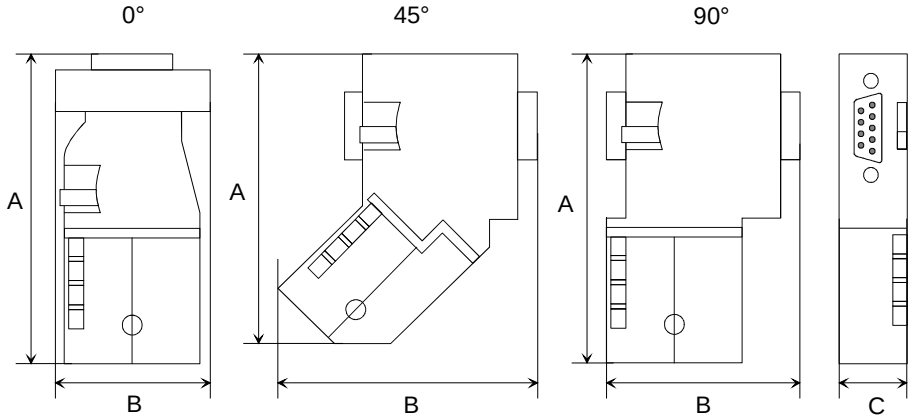
Note!

The PROFIBUS line has to be terminated with its ripple resistor. Please make sure to terminate the last participants on the bus at both ends by activating the terminating resistor.

EasyConn bus connector

In PROFIBUS all participants are wired parallel. For that purpose, the bus cable must be feed-through.

Via the order number VIPA 972-0DP10 you may order the bus connector "EasyConn". This is a bus connector with switchable terminating resistor and integrated bus diagnostic.

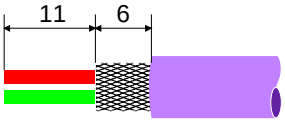


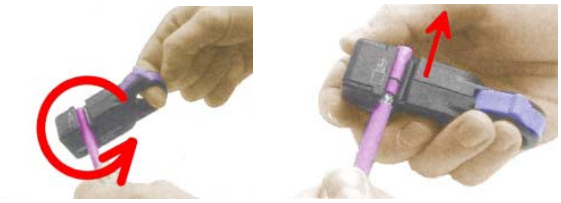
	0°	45°	90°
A	64	61	66
B	34	53	40
C	15.8	15.8	15.8

in mm

Note!

To connect this EasyConn plug, please use the standard PROFIBUS cable type A (EN50170). Starting with release 5 you also can use highly flexible bus cable: Lapp Kabel order no.: 2170222, 2170822, 2170322.
With the order no. 905-6AA00 VIPA offers the "EasyStrip" de-isolating tool that makes the connection of the EasyConn much easier.





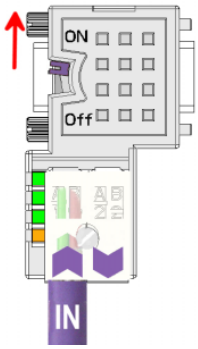
Dimensions in mm

Termination with "EasyConn"

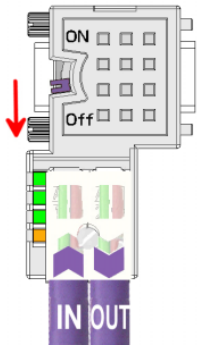
The "EasyConn" bus connector is provided with a switch that is used to activate a terminating resistor.

Wiring

1./last bus participant



further participants



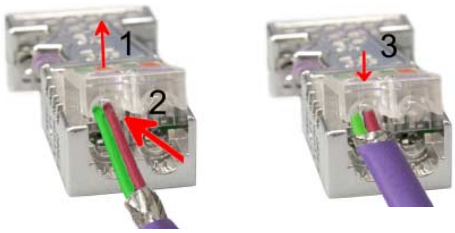
Attention!

The terminating resistor is only effective, if the connector is installed at a bus participant and the bus participant is connected to a power supply.

Note!

A complete description of installation and deployment of the terminating resistors is delivered with the connector.

Assembly



- Loosen the screw.
- Lift contact-cover.
- Insert both wires into the ducts provided (watch for the correct line color as below!)
- Please take care not to cause a short circuit between screen and data lines!
- Close the contact cover.
- Tighten screw (max. tightening torque 4Nm).

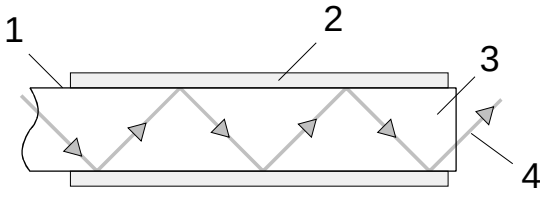
Please note: The green line must be connected to A, the red line to B!

PROFIBUS with FO link

The fiber optic cable/optical waveguide (FO) transfers signals by means of electromagnetic waves at optical frequencies. Total reflection will occur at the point where the coating of the fiber optic cable meets the core since the refractive index of this material is lower than that of the core. This total reflection prevents the ray of light escaping from the fiber optic conductor and it will therefore travel to the end of the fiber optic cable.

The FO cable is provided with a protective coating.

The following diagram shows the Structure of a fiber optic cable:



[1] Fiber coating
[2] Protective cover
[3] Fiber core
[4] Ray of light

The fiber optic system employs pulses of monochromatic light at a wavelength of 650nm. If the fiber optic cable is installed in accordance with the manufacturers guidelines, it is not susceptible to external electrical interference. Fiber optic systems have a linear structure. Each device requires two lines, a transmit and a receive line (dual core). It is not necessary to provide a terminator at the last device.

The PROFIBUS FO network supports a maximum of 126 devices (including the master). The maximum distance between two devices is limited to 50m.

Advantages of FO over copper cables

- wide bandwidth
- low attenuation
- no cross talk between cores
- immunity to external electrical interference
- no potential difference
- lightning protection
- may be installed in explosive environments
- low weight and higher flexibility
- corrosion resistant
- safety from eavesdropping attempts

FO cable
FO connector

VIPA recommends to use FO connector and cable supplied by Hewlett Packard (HP):

HP order no.: FO cable

HFBR-RUS500, HFBR-RUD500, HFBR-EUS500, HFBR-EUD500

HP order no.: FO connector

With crimp-type assembly: HFBR-4506 (grey), HFBR-4506B (black)

Without crimp-type assembly: HFBR-4531

For more see following page.

Fiber optic cabling under PROFIBUS

The VIPA fiber optic PROFIBUS coupler employs dual core plastic fiber optic cable as the communication medium. Please keep the following points in mind when you connect your PROFIBUS FO coupler: predecessor and successor must always be connected by means of a dual core FO cable.

The VIPA bus coupler carries 4 FO connectors. The communication direction is defined by the color of the connector (dark: receive line, light: send line).

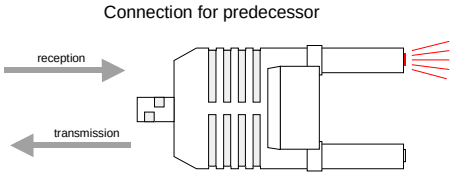
When the bus has been turned on, you recognize the receive line by the light, while the darker line is the send line.

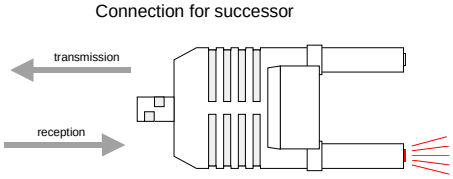
The connectors Hewlett Packard (HP) are available in two different versions:

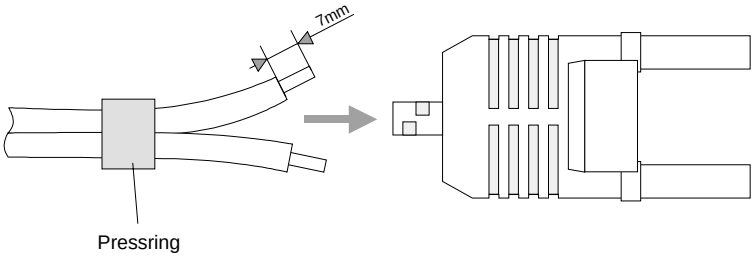
FO connector with crimp-type assembly

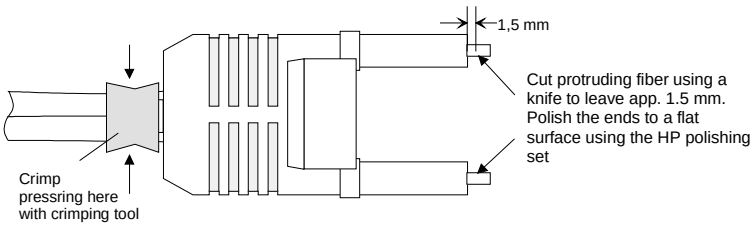
FO connector without crimp-type assembly

FO connector with crimp-type assembly









HP order no.: HFBR-4506 (gray)

HFBR-4506B (black)

Advantages: polarity protection.

You can only install the connector so that the side of the connector shown here faces to the right.

Disadvantages: special tool required

You require a special crimping tool from Hewlett Packard (HP order no.: HFBR-4597) for the installation of the press ring required for strain relief.

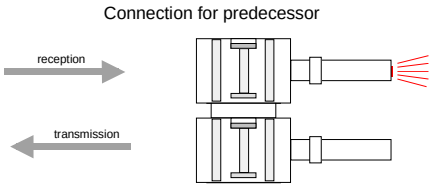
Connector installation

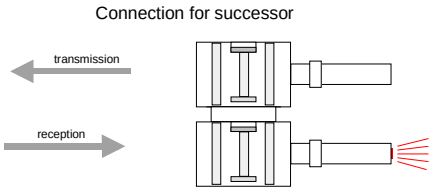
You install the connector by first pushing the press-ring onto the dual core FO cable. Separate the two cores for a distance of app. 5cm. Use a stripper to remove the protection cover for app. 7mm.

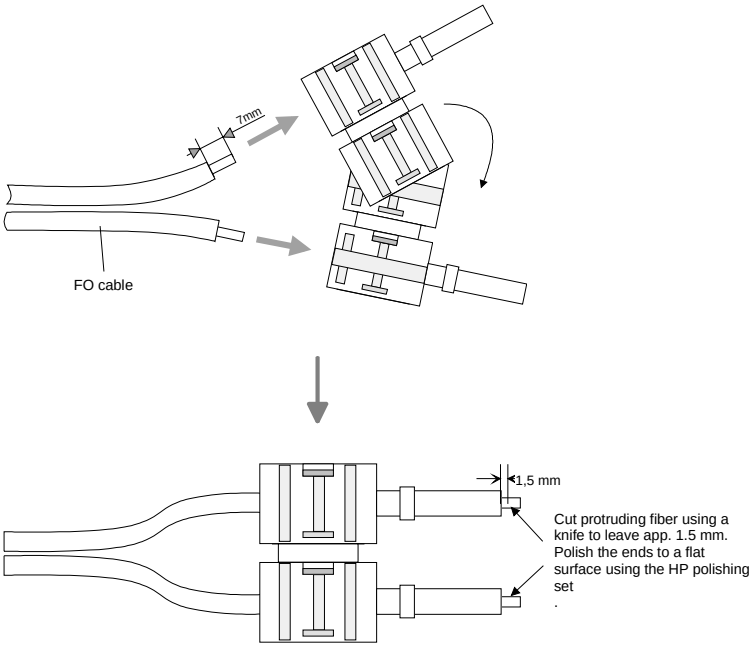
Insert the two cores into the plug so that the ends of the fiber optic cable protrude at the front. Keep an eye on the polarity of the cores (s.a.).

Push the press-ring onto the plug and crimp the ring by means of the crimp tool. The description of how to trim and polish of the ends of the FO cores is identical to the 2nd connector type shown below.

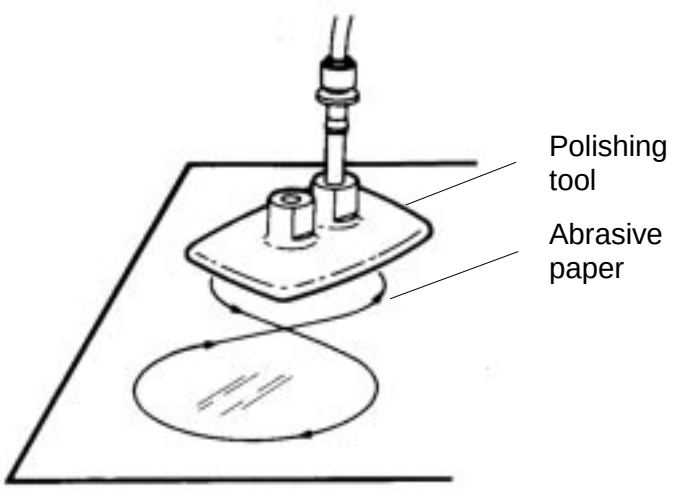
FO connector without crimp-type assembly







Cutting and polishing the ends of the FO cable



HP order no.: HFBR-4531

Advantages: no special tool required.

This shell of this type of plug is provided with an integrated strain relief.

The fiber optic cable is clamped securely when you clip the two sections of the shell together.

This system can be used to prepare simplex and duplex plugs. You can assemble a simplex plug by clipping the two sections of a shell together and a duplex plug by clipping two plugs together.

Disadvantages: no protection against polarity reversal.

These plugs can be inserted in two positions. Please check the polarity when you have turned on the power. The light emitting fiber is the fiber for reception.

Assembling a plug:

2 complete plugs are required to assemble a duplex plug. Separate the two cores for a distance of app. 5cm. Use a stripper to remove the protection cover so that app. 7mm of the fiber is visible.

Insert the two cores into the plug so that the ends of the fiber optic cable protrude at the front. Keep an eye on the polarity of the cores (s.a.).

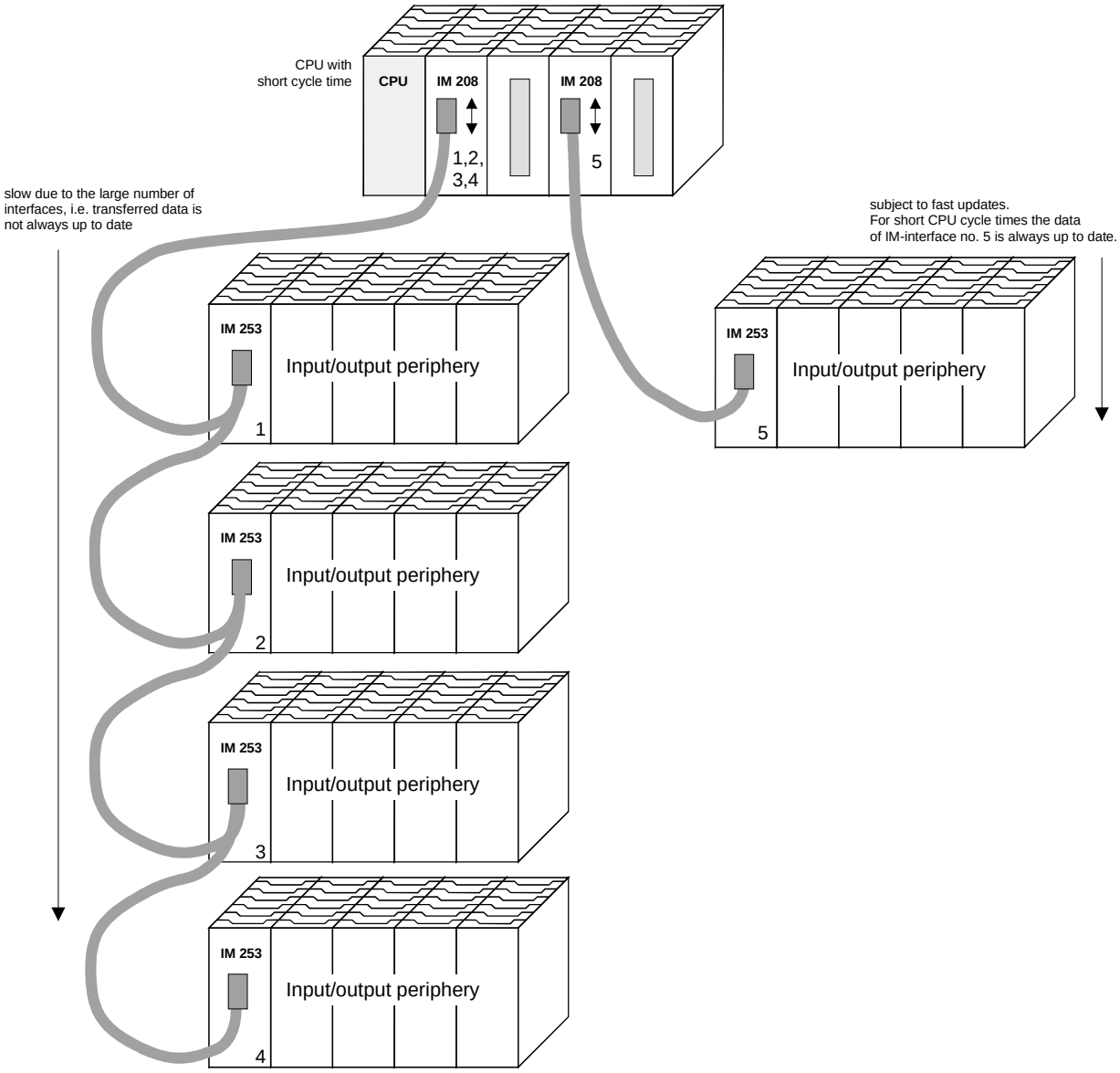
Cut protruding fiber using a knife so that app. 1.5mm are still visible. Polish the ends to a flat surface using the HP polishing set (HP order no.:HFBR-4593).

Insert the plug into the polishing tool and polish the fiber to achieve a plane surface as shown in the figure. The instructions that are included with the set contain a detailed description of the required procedure.

Example for a PROFIBUS network

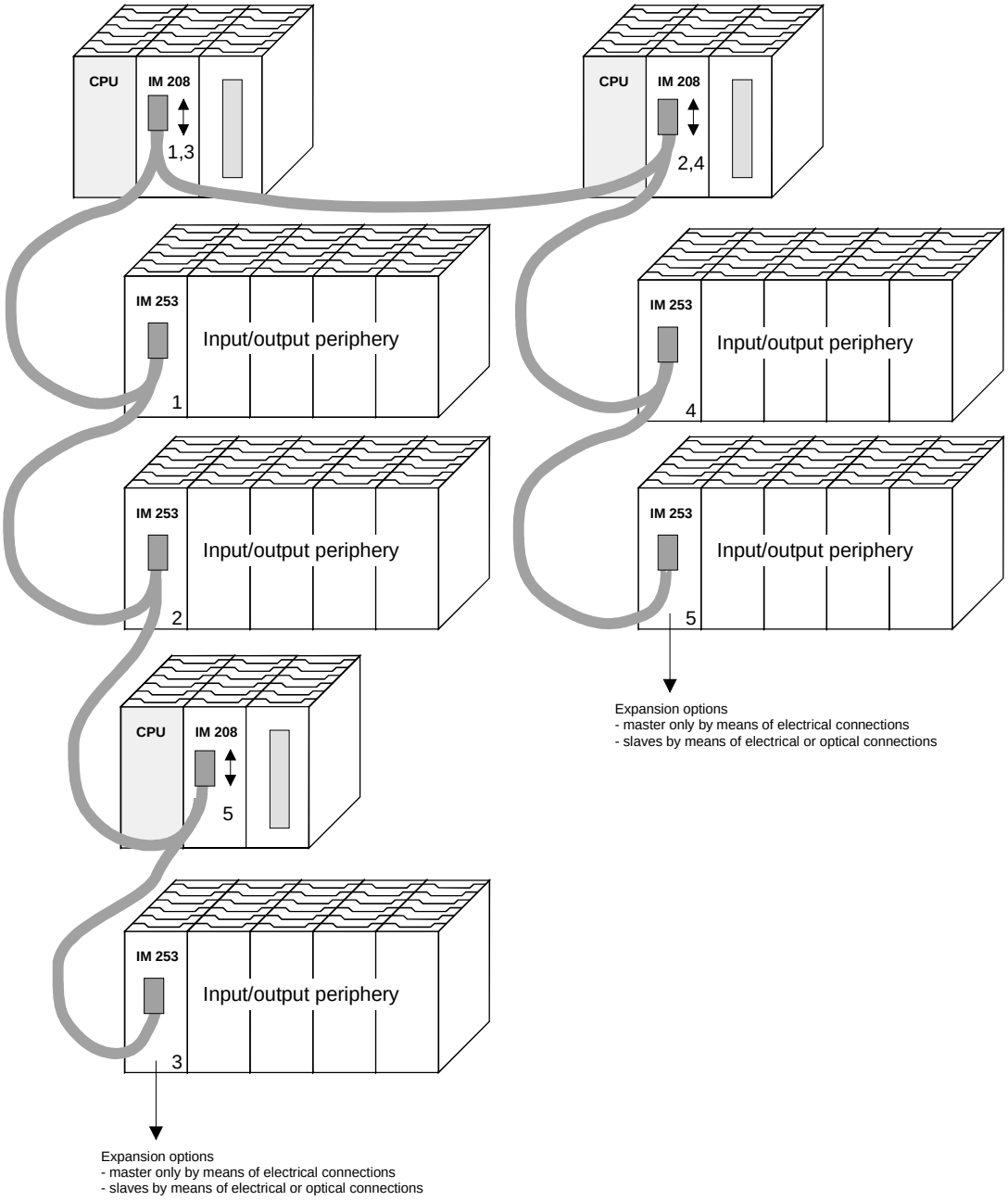
One CPU and multiple master connections

The CPU should have a short cycle time to ensure that the data from slave no. 5 (on the right) is always up to date. This type of structure is only suitable when the data from slaves on the slow trunk (on the left) is not critical. You should therefore not connect modules that are able to issue alarms.

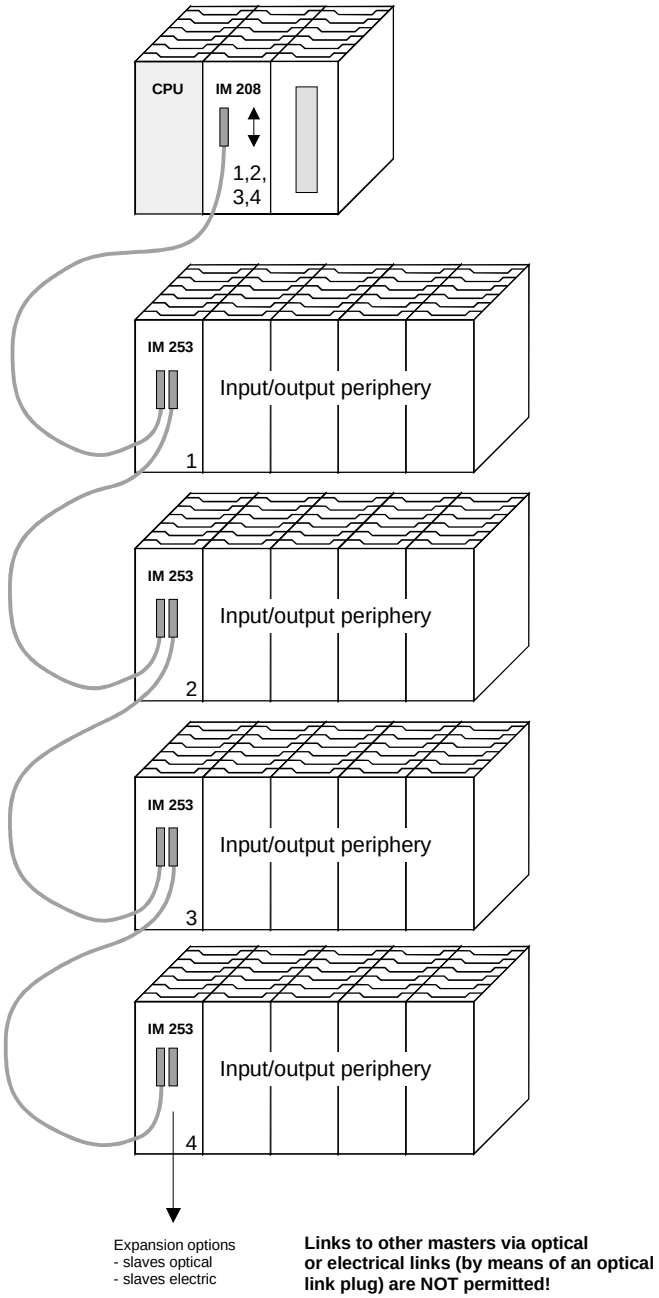


Multi master system

Multiple master connections on a single bus in conjunction with a number of slaves:

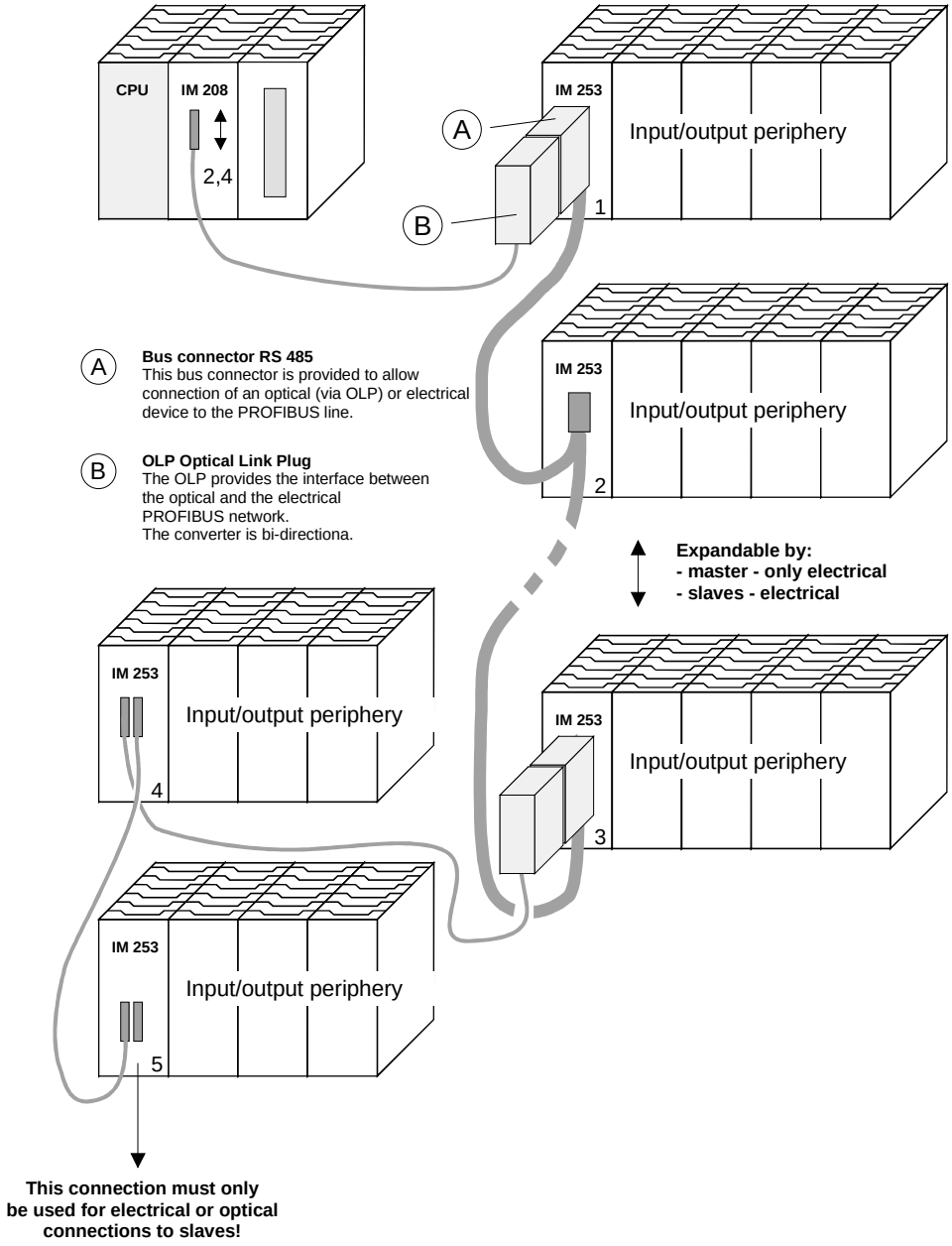


Optical PROFIBUS



Combination of optical and electrical PROFIBUS

In a combined fiber optical PROFIBUS system only one converter (OLP) may be installed between any two masters!



Commissioning

Overview

- Assemble your PROFIBUS system.
- Configure your master system.
- Transfer the configuration into your master.
- Connect the master and slave modules with the PROFIBUS.
- Turn the power supply on.

Installation

Assemble your PROFIBUS system using the wanted modules.

Every PROFIBUS slave coupler has an internal power supply. This power supply requires an external DC 24V power supply. In addition to the circuitry of the bus coupler, the voltage supply is also used to power any modules connected to the backplane bus.

PROFIBUS and backplane bus are galvanically isolated from each other.

Addressing

Adjust the address of every PROFIBUS slave module as required.

Configuration in the master system

Configure your PROFIBUS master in your master system. You can use the WinNCS of VIPA for this purpose.

Transferring your project

A number of different transfer methods are employed due to the fact that a number of different hardware versions of the VIPA PROFIBUS master modules are existing. These transfer methods are described in the master configuration guide for the respective hardware version.

Connecting a system by means of PROFIBUS

In a system with more than one station all stations are wired in parallel. For this reason the bus cable must be feed-through uninterrupted.

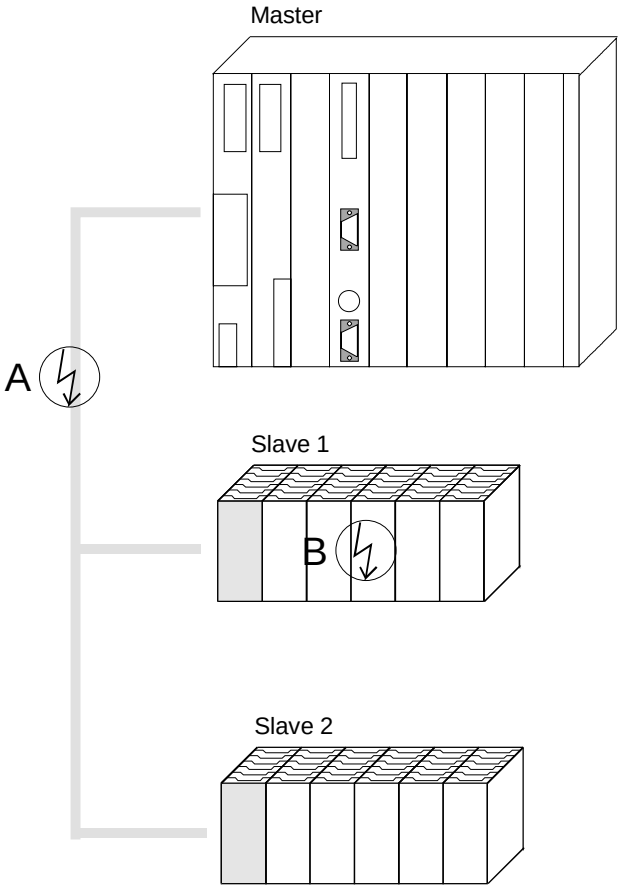
You should always keep an eye on the correct polarity!

Note!

To prevent reflections and associated communication problems the bus cable has always to be terminated with its ripple resistor!

Using the diagnostic LEDs

The following example shows the reaction of the LEDs for different types of network interruption.



Interruption at position A
The PROFIBUS has been interrupted.

Interruption at position B
Communication via the backplane bus has been interrupted.

LED Slave 1	Position of interruption	
LED	A	B
RD	blinks	off
ER	off	on
DE	off	off

LED Slave 2	Position of interruption	
LED	A	B
RD	blinks	on
ER	off	off
DE	off	on

Sample projects for PROFIBUS communication

Example 1

Problem

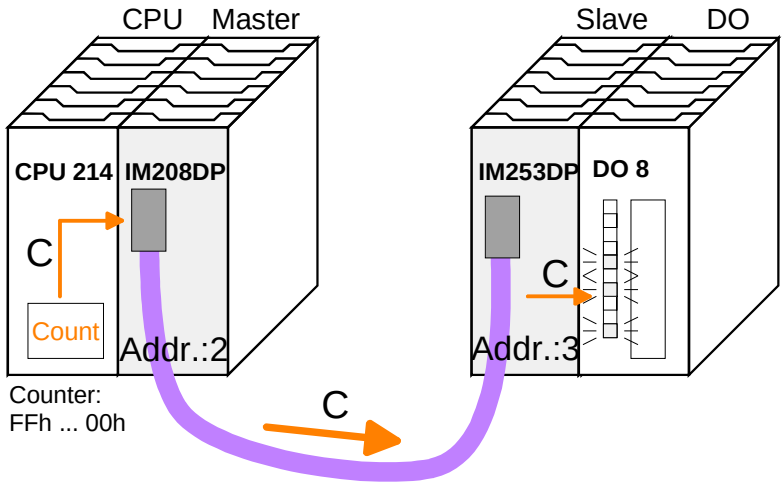
The following example describes a communication between a master and a slave system.

The master system consists of a CPU 21x (here CPU 214-1BA03) and a DP master IM 208DP. This system communicates via PROFIBUS with a IM 253DP and an output module.

Via this system, counter values should be exchanged via PROFIBUS and monitored at the output module. The counter values have to be created in the CPU.

Problem in detail

The CPU has to count from FFh to 00h and transfer the counter value cyclically into the output area of the PROFIBUS master. The master sends this value to the DP slave. The received value shall be monitored at the output module (at address 0).



Project data

CPU 214 and IM 208DP (Master)

Counter value:	MB 0 (FFh ... 00h)
PROFIBUS address:	2

IM 253DP and DO (Slave)

PROFIBUS address:	3
Output area:	Address 0, length: 1Byte

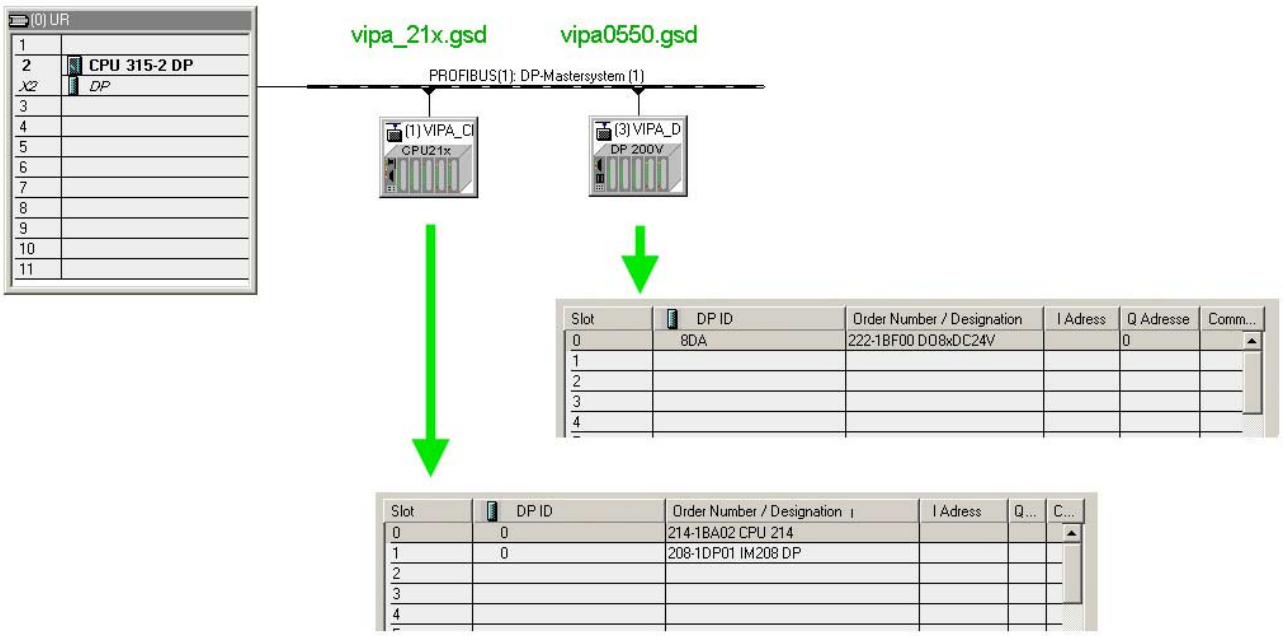
Engineering IM 208DP

To be compatible with the Siemens SIMATIC Manager, you have to execute the following steps for the System 200V:

- Start the Hardware configurator from Siemens
- Install the GSD-file vipa_21x.gsd
- Project a CPU 315-2DP with DP master (master address 2)
- Add a PROFIBUS slave **"VIPA_CPU21x"** with address 1.
- Include the CPU **214-1BA03** at slot 0.
- Include the DP master 208-1DP01 at slot 1.

To connect your IM 253DP, you have to execute the following steps after including the GSD-file vipa0550.gsd:

- Add the PROFIBUS slave **"VIPA_DP200V_2"** with address 3.
  You will find the DP slave in the hardware catalog from Siemens at:
  PROFIBUS DP>Additional field devices>I/O>VIPA_System_200V
- Include the digital output module 222-1BF00 at slot 0.
- Assign the output address 0.



User application in the CPU

For the user application in the CPU, we use the OB35. The OB35 is a time OB, where the call cycle is defined in the CPU properties.

OB 35 (Time-OB)

```
L     MB   0     counter from FFh to 00h
L     1
-I
T     MB   0     remember new counter value
T     AB   0     transfer new counter value to output byte 0
                 via PROFIBUS
BE
```

The call cycle of the OB35 may be defined in the "properties" of your CPU 315-2DP at *prompter alarm*. Type for example 100ms.

Transfer and execute project

Now the programming is complete. Transfer your project into the CPU and execute the program.

- Connect your PU res. PC with your CPU via MPI.

  If your PU doesn't support MPI, you may use the VIPA "Green Cable" to establish a point-to-point connection.

  The "Green Cable" has the order number VIPA 950-0KB00 and may only be used with VIPA CPUs of the Systems 100V, 200V, 300V and 500V. For the employment, the following settings are required:

  - Choose the interface parameterization „PC Adapter (MPI) in your project engineering tool at **Options** > *Configure PU/PC interface.* If needed, you have to add this first.
  - Click on [Properties] and set the wanted COM port and the baud rate 38400 at "Local interface".
- Configure the MPI-interface of your PC.
- Via **PLC** > *Load to module* you transfer your project into the CPU.
- If you want to save your project on MMC additionally, plug-in a MMC and transfer your user application via **PLC** > *Copy RAM to ROM*.

  During the write process the "MC"-LED at the CPU is blinking. Due to the system, the completion of the write operation arrives too soon. It is only completed when the LED has been extinguished.

As soon as CPU and DP master are in RUN, the counter values are transferred via PROFIBUS and monitored at the output module of the DP slave.

Example 2

Problem

This example shows a communication between a CPU 21x (here CPU 214-1BA03) with IM 208 DP master and a CPU 21xDP (here CPU 214-2BP03).

Via this system, counter values should be exchanged via PROFIBUS and monitored at the output module of the respective partner.

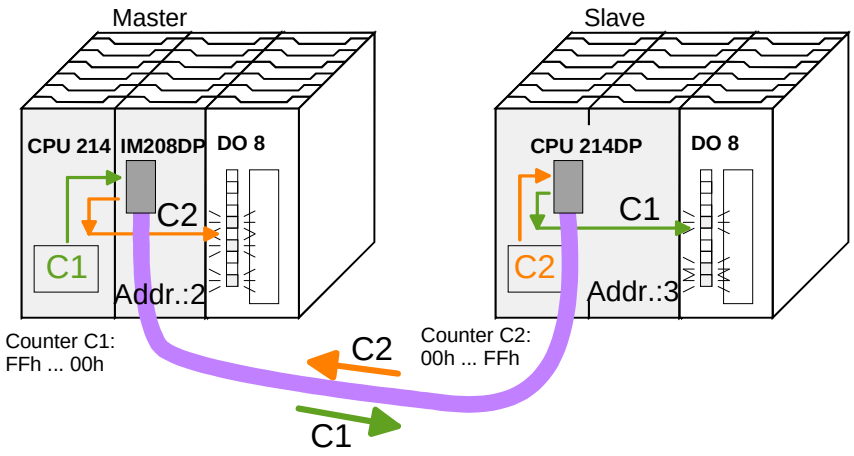
Problem in detail

The CPU 214 has to count from FFh to 00h and transfer the counter value cyclically into the output area of the PROFIBUS master. The master sends this value to the DP slave of the CPU 214DP.

The received value shall be stored in the input periphery area of the CPU and monitored via the backplane bus at the output module (at address 0).

Vice versa, the CPU 214DP has to count from 00h to FFh, store the value in the output area of the CPU slave and transfer it to the master via PROFIBUS.

This value is monitored at the output module of the CPU 214 (address 0).



Project data

CPU 214 and DP master

Counter value:	MB 0 (FFh ... 00h)	
PROFIBUS address:		2
Input area:	Address 10	Length: 2 Byte
Output area:	Address 20	Length: 2 Byte

CPU 214DP

Counter value:	MB 0 (00h...FFh)	
Input area:	Address 30	Length: 2 Byte
Output area:	Address 40	Length: 2 Byte
Parameter data:	Address 800	Length: 24 Byte (fix)
Diagnostic data:	Address 900	Length: 6 Byte (fix)
Status data:	Address 1020	Length: 2 Byte (fix)
PROFIBUS address:		3

Engineering CPU 214 of the DP master

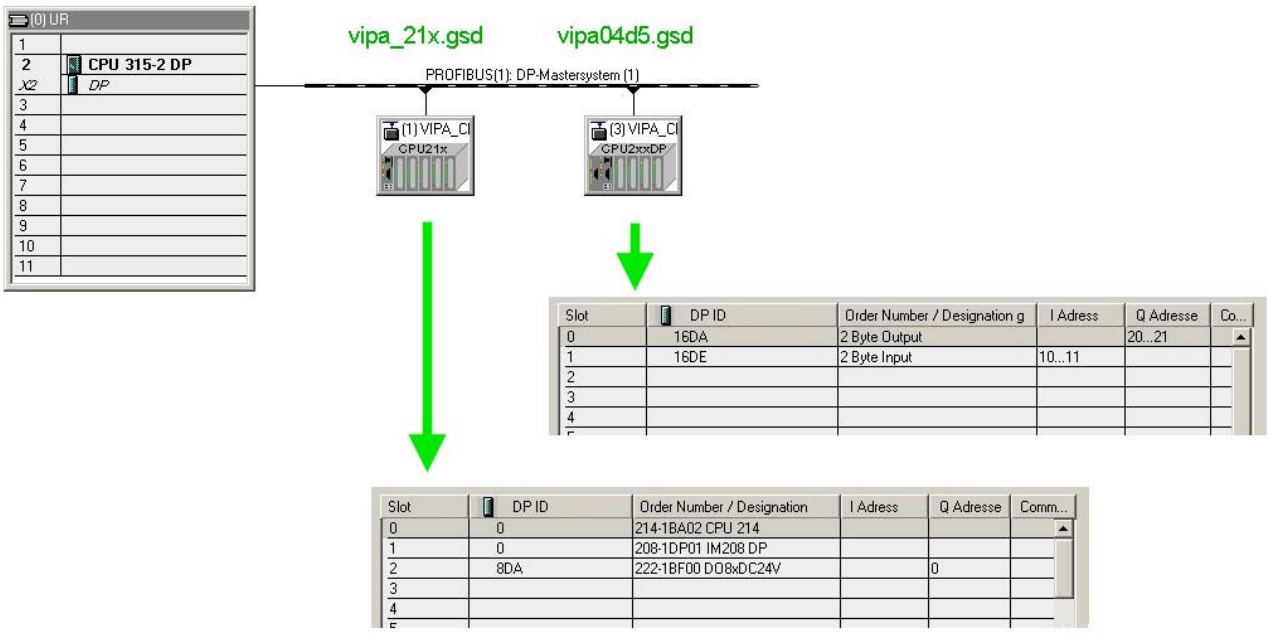
To be compatible with the STEP®7 projecting tool from Siemens, you have to execute the following steps for CPU 214 and DP master:

- Start the Hardware configurator from Siemens
- Install the GSD-file vipa_21x.gsd
- Project a CPU 315-2DP with DP master (master address 2)
- Add a PROFIBUS slave **"VIPA_CPU21x"** with address 1.
- Include a CPU **214-1BA03** at slot 0 of the slave system
- Include the DP master 208-1DP01 (place holder) at slot 1 and include the output module 222-1BF00 at slot 2.
- Give the output module 222-1BF00 at slot 0.

PROFIBUS link-up of the CPU 214DP

To connect your real CPU 214DP, you have to execute the following steps after including the GSD-file vipa04d5.gsd:

- Add the PROFIBUS slave **"VIPA_CPU2xxDP"** (address 3)
- Include the "2 Byte Output" element at slot 0 and choose the output address 20.
- Include the "2 Byte Input" element at slot 1 and choose the input address 10.
- Save your project.



User application in the CPU 214

The user application in the CPU 21x has 2 tasks to execute, shared between two OBs:

- Test the communication via control byte.
  Load the input byte from PROFIBUS and monitor the value at the output module.

  OB 1 (cyclic call)

```
L    B#16#FF
T    QB  20            control byte for slave CPU
L    B#16#FE           load control value 0xFE
L    IB  10            control byte from slave
<>I                    CPU correct?
BEC                    no -> End
                       ------------------------------
                       Data transfer via PROFIBUS
L    IB  11            load input byte 11 (output data
                       of the CPU214DP) and
T    QB   0            transfer to output byte 0
BE
```

- Read counter value from MB 0, decrement it, store in MB 0 and transfer it to the CPU 21xDP via PROFIBUS.

  OB 35 (Time-OB)

```
L    MB   0            counter from 0xFF to 0x00
L    1
-I
T    MB   0
T    QB  21            Transfer to output byte 21
                       (input data of the CPU214DP)
BE
```

Transfer project and execute

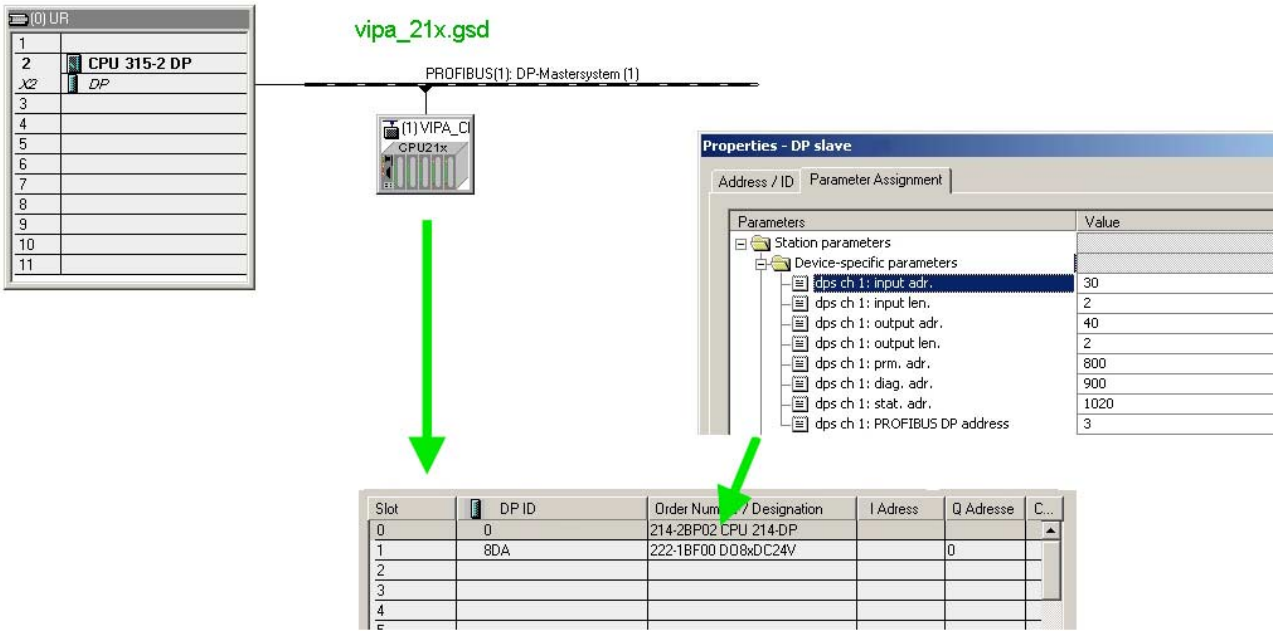
Transfer your project with the hardware configuration into the CPU and execute the program. The hardware configuration of CPU 214 and DP master is now finished.

The following pages describe the project engineering of the CPU 214DP.

Engineering CPU 214DP

To be compatible with the Siemens SIMATIC Manager, you have to execute the following steps for the CPU 214DP:

- Start the Hardware configurator from Siemens
- Install the GSD-file vipa_21x.gsd
- Project a CPU 315-2DP with DP master (master address 2)
- Add a PROFIBUS slave **"VIPA_CPU21x"** with address 1.
- Include the CPU **214-2BP03** at slot 0
- Select the following parameters for the CPU 214DP:
  - Input Add.: 30
  - Input Length: 2
  - Output Add.: 40
  - Output Length: 2
  - Prm. Add.: 800
  - Diag. Add.: 900
  - Stat. Add.: 1020
  - PROFIBUS DP Add.: 3
- Include the output module 222-1BF00 at slot 1 and give them the output address 0.
- Safe your project.



User application in the CPU 214DP

Like shown above, the user application has 2 tasks, shared between two OBs:

- Load the input byte from the PROFIBUS slave and monitor the value at the output module.

OB 1 (cyclic call)

```
L    PIW 1020          load status data and store it
T    MW 100            in the bit memory word

AN   M  100.5          commissioning by DP master
BEC                    successful? no -> End

A    M  101.4          receive data valid?
BEC                    no -> End
L    B#16#FF           load control value and compare with
L    PIB  30           control byte (1st input byte)
<>I
BEC                    receive data not valid


L    B#16#FE           control byte for Master-CPU
T    PQB  40
                       -------------------------------
                       Data transfer via PROFIBUS

L    PIB  31           load periphery byte 31 (input
                       data from PROFIBUS slave) and
T    IB   0            transfer into output byte 0

BE
```

- Read counter value from MB 0, increment it, store it in MB 0 and transfer it via PROFIBUS to CPU 214.

OB 35 (Time-OB)

```
L    MB   0            counter from 0x00 to 0xFF
L    1
+I
T    MB   0

T    PQB  41           Transfer counter value to
                       periphery byte 41 (Output data
                       of the PROFIBUS slave)
BE
```

Transfer project and execute

Transfer your project with the hardware configuration into the CPU (see Example 1) and execute the program.

As soon as the CPUs and DP master are in RUN, the counter values are transferred via PROFIBUS and monitored at the according output module.