YASKAWA

VIPA System 200V

IM | Manual

HB97E_IM | 208-1DPx1 | Rev. 14/05

VIPA CONTROLS

VIPA, Gesellschaft für Visualisierung und Prozessautomatisierung mbH
Ohmstraße 4, D-91074 Herzogenaurach, Germany
Tel.: +49 (91 32) 744 -0
Fax.: +49 9132 744 1864
EMail: info@vipa.de
http://www.vipa.com

Note

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Conformity is indicated by the CE marking affixed to the product.

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VIPA GmbH, Ohmstraße 4, 91074 Herzogenaurach, Germany

Telefax:+49 9132 744 1204
EMail: documentation@vipa.de

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VIPA GmbH, Ohmstraße 4, 91074 Herzogenaurach, Germany

Telephone: +49 9132 744 1150 (Hotline)
EMail: support@vipa.de

Contents

About this manual

This manual describes the System 200V PROFIBUS DP master modules IM 208-1DPx1 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 208-1DPx1 are described. The technical data are at the end of the chapter.

Chapter 3: Deployment

This chapter contains a description of the PROFIBUS DP master modules IM 208-1DPx1 under PROFIBUS. A short introduction and presentation of the system is followed by the project design and configuration of the PROFIBUS master 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 master modules IM 208-1DPx1 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 208DP	VIPA 208-1DPx1	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 208DP 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.

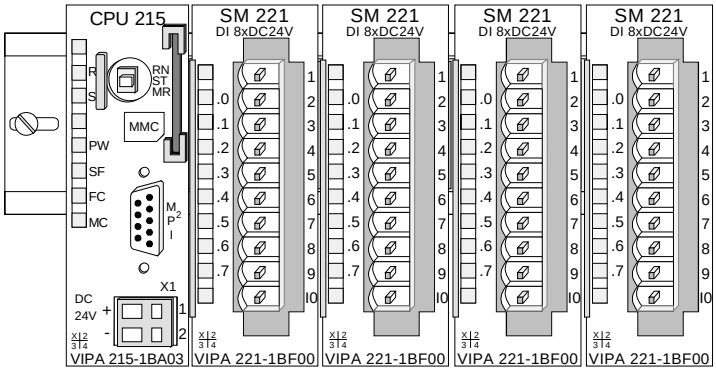
Attention!

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.

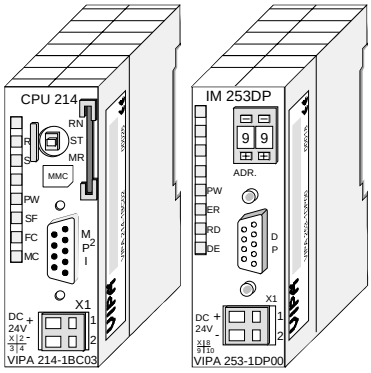


Components

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*

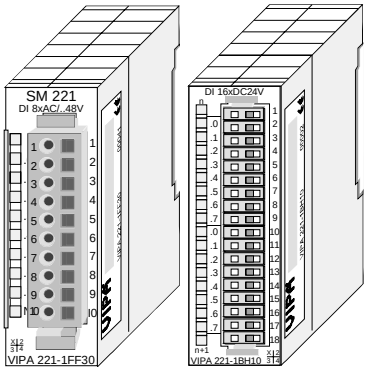
Head modules



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.

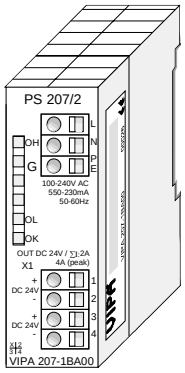
Periphery modules



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.

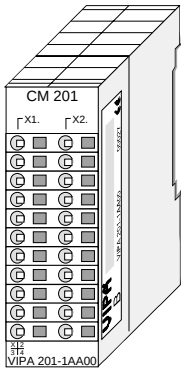
Power supplies



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.

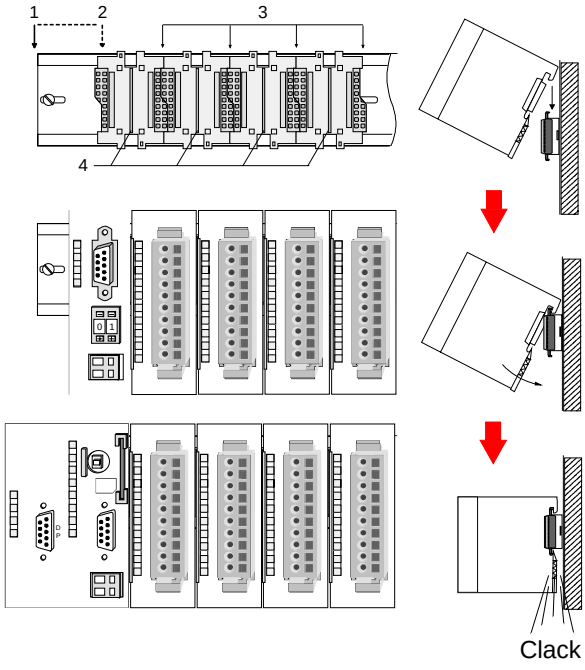
The modules are not connected to the backplane bus.

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.

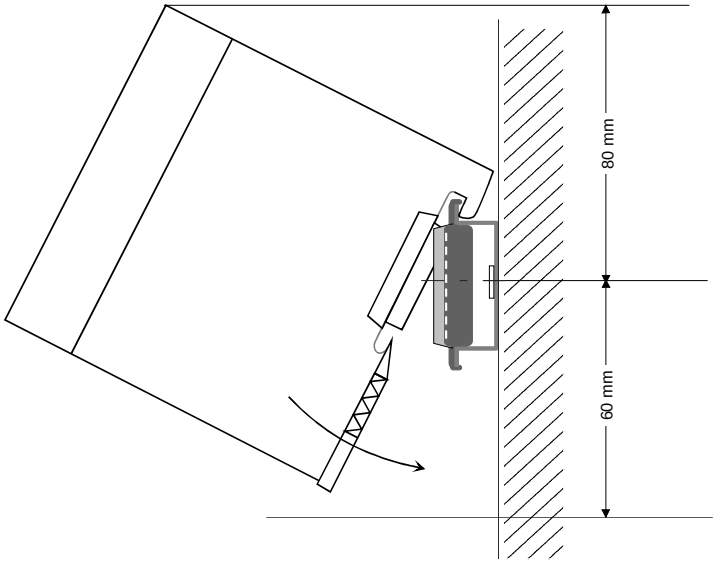
Please install modules with a high current consumption directly beside the head module.

Dimensions

Dimensions Basic enclosure

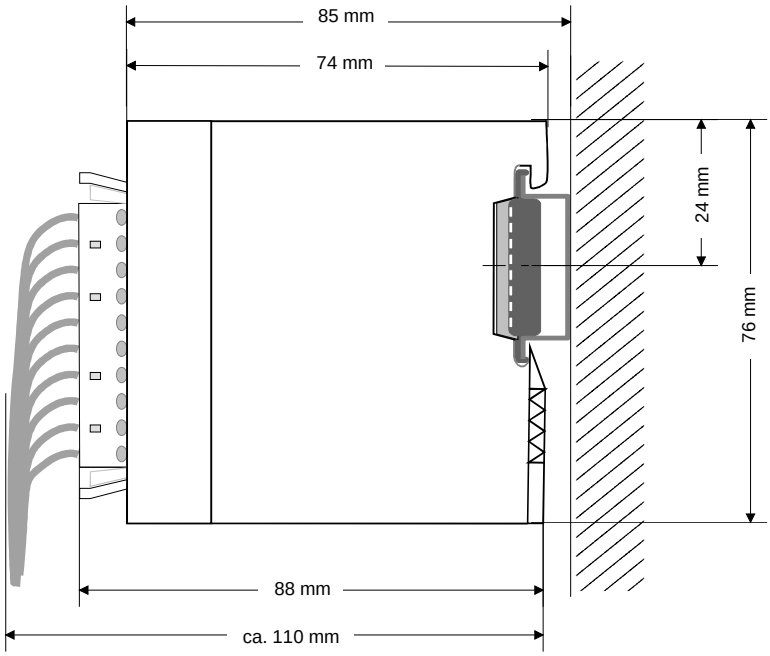
1tier width (HxWxD) in mm: 76 x 25.4 x 74
2tier width (HxWxD) in mm: 76 x 50.8 x 74

Installation dimensions

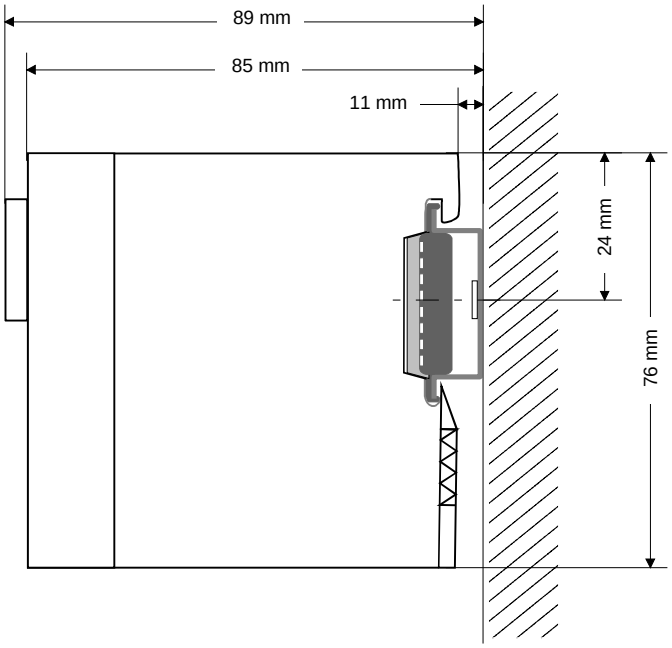


Installed and wired dimensions

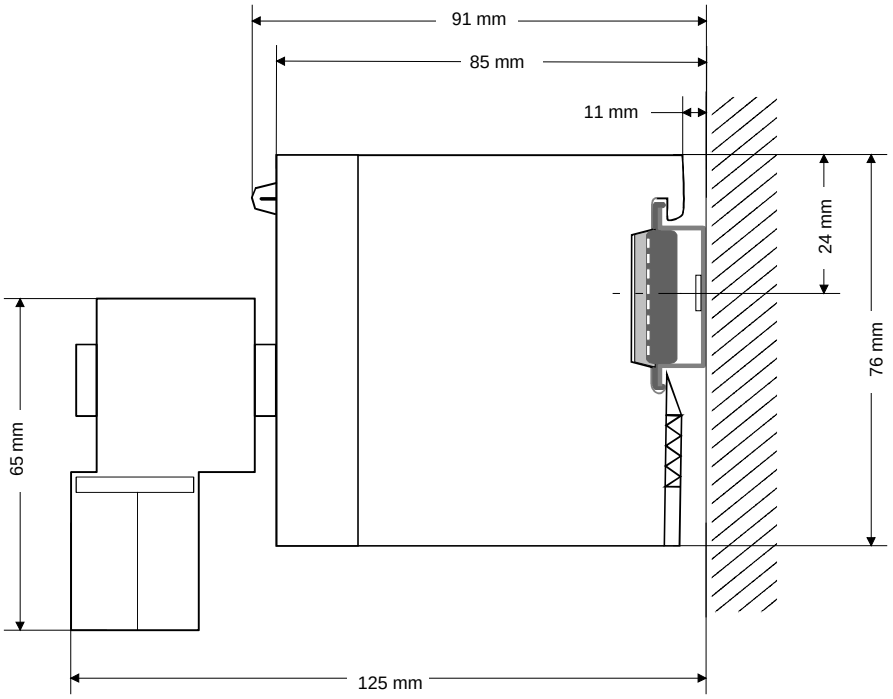
In- / Output modules



Function modules/
Extension modules



CPUs (here with
EasyConn from
VIPA)



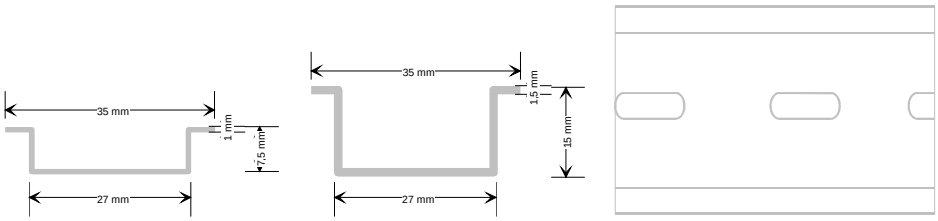
Installation

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:

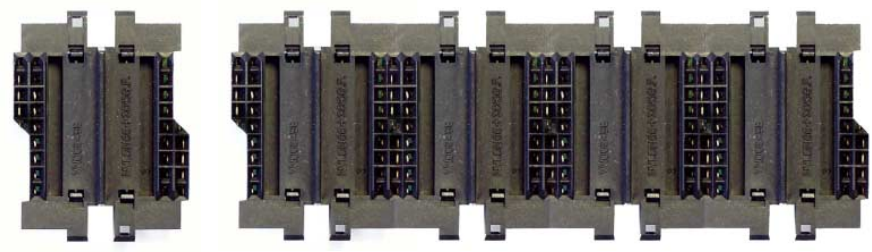


Order number	Label	Description
290-1AF00	35mm profile rail	Length 2000mm, height 15mm
290-1AF30	35mm profile rail	Length 530mm, height 15mm

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:



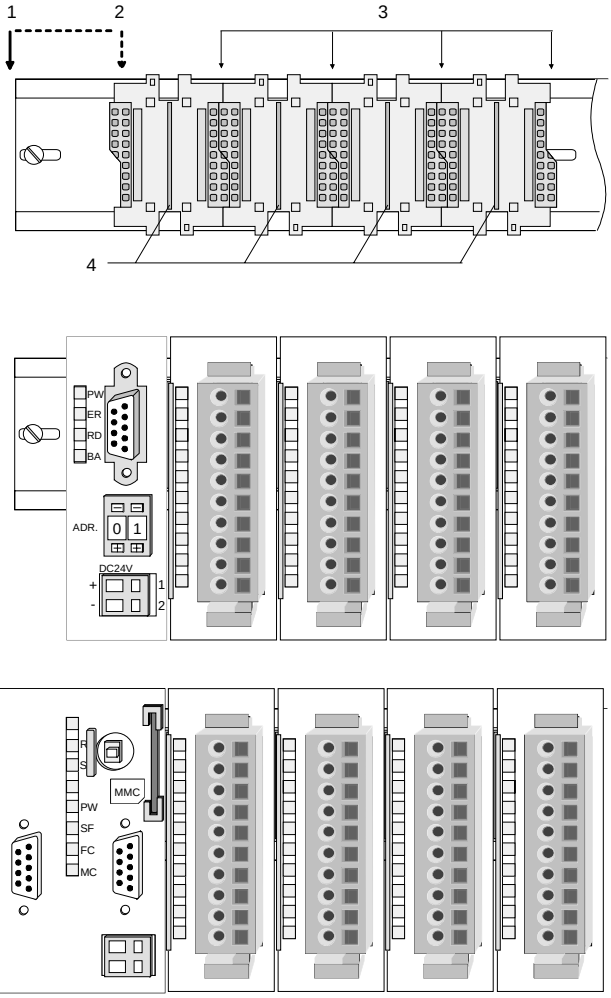
The bus connector is to be placed on the profile rail until it clips in its place and the bus connections look out from the profile rail.

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.



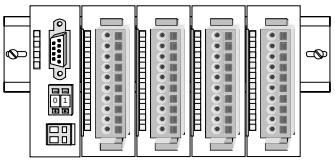
[1] Head module (double width)
[2] Head module (single width)
[3] Peripheral module
[4] Guide rails

Assembly regarding the current consumption

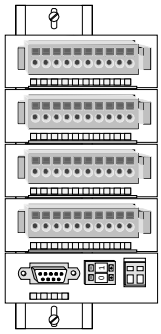
- Use bus connectors as long as possible.
- Sort the modules with a high current consumption right beside the head module. In the service area of www.vipa.com a list of current consumption of every System 200V module can be found.

Assembly possibilities

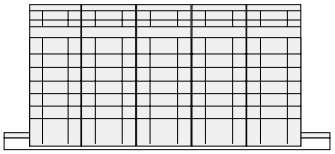
hoizontal assembly



vertical assembly



lying assembly

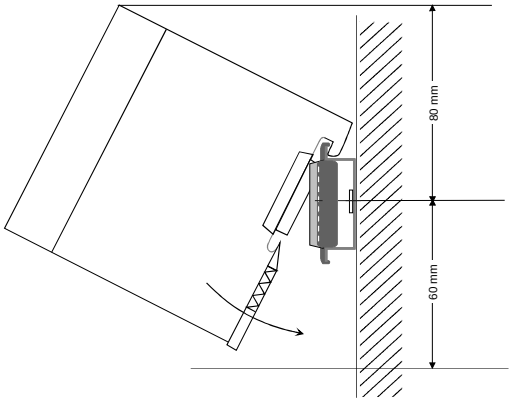


Please regard the allowed environmental temperatures:

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

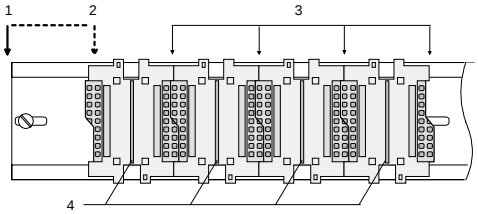
The horizontal assembly always starts at the left side with a head module, then you install the peripheral modules beside to the right.

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

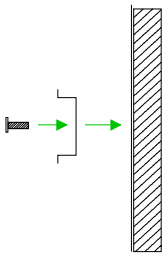
- Modules are to be installed side by side. Gaps are not permitted between the modules since this would interrupt the backplane bus.
- A module is only installed properly and connected electrically when it has clicked into place with an audible click.
- Slots after the last module may remain unoccupied.

Note!

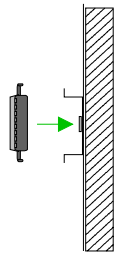
Information about the max. number of pluggable modules and the max. current at the backplane bus can be found in the "Technical Data" of the according head module.

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

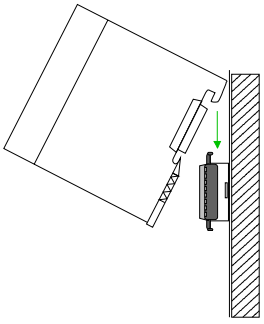
Assembly procedure



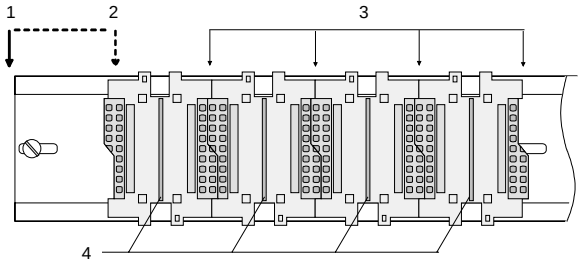
- Install the profile rail. Make sure that a clearance of at least 60mm exists above and 80mm below the middle of the profile rail.



- 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.

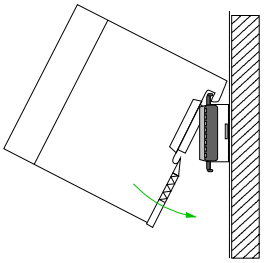


[1] Head module (double width)

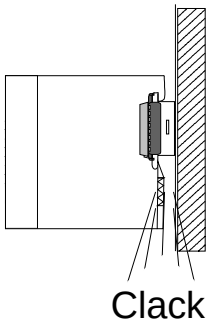
[2] Head module (single width)

[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.

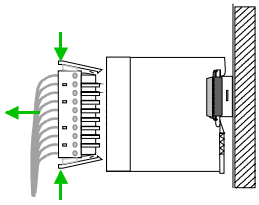


Attention!

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

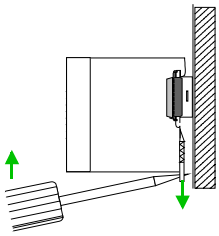
Demounting and module exchange

1



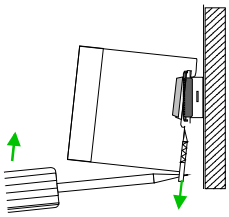
- Remove if exists the wiring to the module, by pressing both locking lever on the connector and pulling the connector.

2



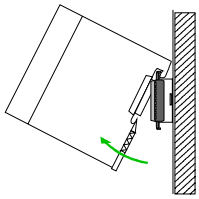
- The casing of the module has a spring loaded clip at the bottom by which the module can be removed.

3



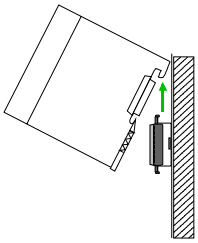
- The clip is unlocked by pressing the screwdriver in an upward direction.

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.

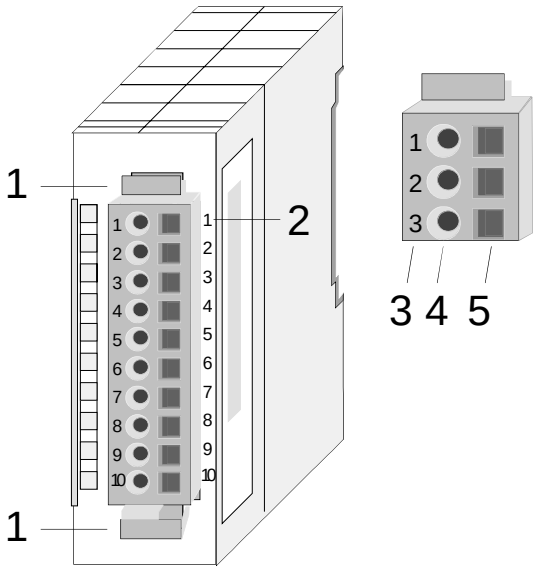
The modules carry spring-clip connectors for interconnections and wiring.

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.



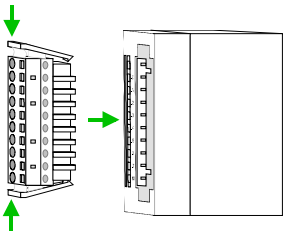
[1] Locking lever
[2] Pin no. at the module
[3] Pin no. at the connector
[4] Wiring port
[5] Opening for screwdriver

Note!

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

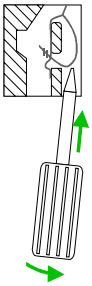
Make sure that you only insert the screwdriver into the square hole of the connector!

Wiring procedure

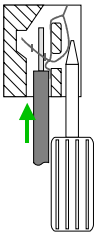


- Install the connector on the module until it locks with an audible click. For this purpose you press the two clips together as shown.
  The connector is now in a permanent position and can easily be wired.

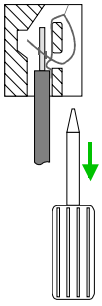
The following section shows the wiring procedure from top view.



- 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
- ESD/Burst acc. IEC 61000-4-2 / IEC 61000-4-4 (to level 3)
- Shock resistance acc. IEC 60068-2-6 / IEC 60068-2-27 (1G/12G)
- Class of protection IP20

Environmental conditions

- Operating temperature: 0 ... +60°C
- Storage temperature: -25 ... +70°C
- Relative humidity: 5 ... 95% without condensation
- Ventilation by means of a fan is not required

Chapter 2 Hardware description

Overview

Here the hardware components of the IM 208-1DPx1 are described.
The technical data are at the end of the chapter.

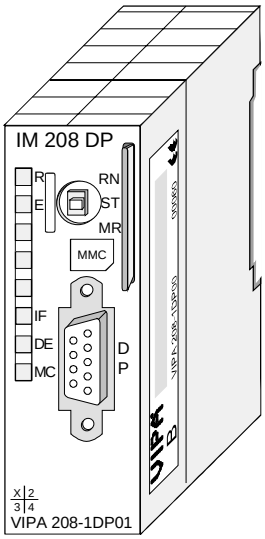
Contents

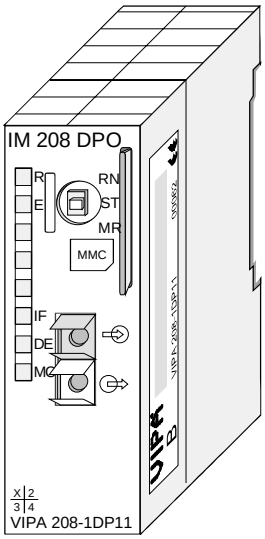
Properties

IM 208DP
208-1DPx1

The System 200V PROFIBUS DP master modules from VIPA are available with RS485 as well as with FO connector.

- Class 1 PROFIBUS DP master
- 125 DP slaves (16 at DPO) connectable to one DP master
- Inserts the data areas of the slaves located on the V-bus into the addressing area of the CPU
- Project engineering by means of VIPAs WinNCS or Siemens SIMATIC Manager or ComPROFIBUS
- Diagnostic facilities



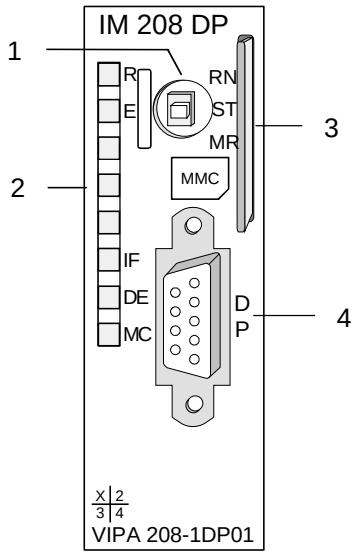


Order data

Type	Order number	Description
IM 208DP	VIPA 208-1DP01	PROFIBUS DP master with RS485
IM 208DPO	VIPA 208-1DP11	PROFIBUS DP master with FO connector

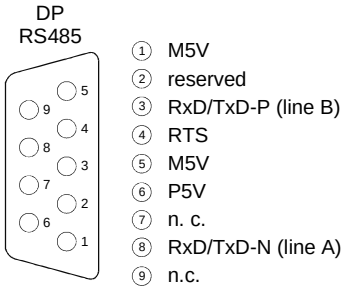
Structure

Front view IM 208DP



[1] Operating mode switch RUN/STOP
[2] LED status indicators
[3] Slot for memory card
[4] RS485 interface

Interface



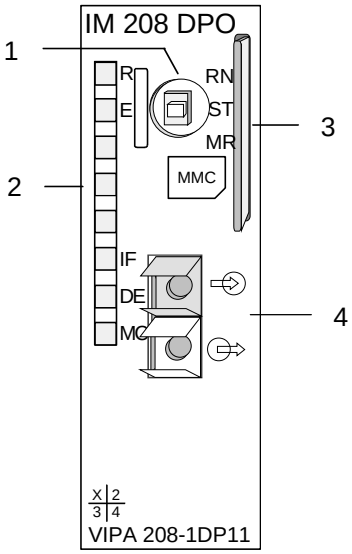
① M5V
② reserved
③ RxD/TxD-P (line B)
④ RTS
⑤ M5V
⑥ P5V
⑦ n. c.
⑧ RxD/TxD-N (line A)
⑨ n.c.

RS485 interface

The VIPA PROFIBUS master is connected to your PROFIBUS network via the 9pin socket.

Please note, that due to the system pin 2 of the PROFIBUS interface must not be connected!

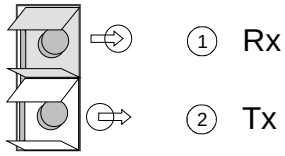
Front view IM 208DPO



[1] Operating mode switch RUN/STOP
[2] LED status indicators
[3] Slot for memory card
[4] FO interface

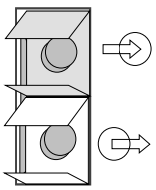
Interface

LWL



FOL interface

The IM 208DPO is connected to PROFIBUS by a FOL (**f**iber **o**ptic **l**ink) interface. The layout of this interface is shown below:



Connect to receive line (from slave)

Connect to send line (to slave)

LEDs

The module carries 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
R	green	If R is the only LED that is on, then the master status is RUN. The slaves are being accessed and the outputs are 0 ("Clear" state). If both R+DE are on the status of the Master is "operate". It is communicating with the slaves. Blinks 3 times: Transfer from MMC to Flash-ROM without error.
E	red	On at slave failure (ERROR). Blinks 3 times: Transfer from MMC to Flash-ROM without error.
IF	red	Initialization error for bad parameterization
DE	green	DE (Data exchange) indicates PROFIBUS communication activity. At the DP master with the order no. 208-1DP01 this LED is yellow.
MC	yellow	Blinks at reading the parameters from MMC. Is on at wrong parameterization.

Power supply

The PROFIBUS master receives power via the backplane bus.

Operating mode selector

The operating mode selector is used to select the operating modes STOP (ST), RUN (RN) and MEMORY (MR).

The master will change to RUN mode if the operating mode selector is set to RN and parameters are acceptable.

When the operating mode switch is set to ST, the master will change to STOP mode. In this mode all communication is terminated, the outputs of the allocated slaves will be set to 0 and the master issues an alarm to the controlling system.

This chapter contains under ”Operating modes” a detailed explanation of the change between RUN and STOP mode.

In position MR you may activate:

- the data transfer from MMC into Flash-ROM
- a serial mode for deploying the VIPA Green Cable
- Overall reset of the DP master

MMC as external storage medium

The VIPA MMC (**m**e**m**ory **c**ard) is employed as an external storage medium. The MMC is available from VIPA with the order no.: VIPA 953-0KX00. You can get a external MMC reading device from VIPA (Order no: VIPA 950-0AD00) for your PC. Hereby you can read and write MMC by using your PC.

You initiate the transfer of project data from the MMC into the master by setting the operating mode selector into position MR.
For details, please refer to the section on "Transferring a project".

Technical data

208-1DP01

Order no.	208-1DP01
Type	IM 208DP, PROFIBUS-DP master
Current consumption/power loss	
Current consumption from backplane bus	450 mA
Power loss	2 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	yes, parameterizable
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes
Diagnostics information read-out	possible
Supply voltage display	none
Group error display	red LED
Channel error display	none
Functionality Sub-D interfaces	
Type	-
Type of interface	RS485
Connector	Sub-D, 9-pin, female
Electrically isolated	✓
MPI	-
MP²I (MPI/RS232)	-
DP master	yes
DP slave	yes
Point-to-point interface	-
5V DC Power supply	max. 90mA, non-isolated
24V DC Power supply	-
Housing	
Material	PPE
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	
UL certification	yes

208-1DP11

Order no.	**208-1DP11**
Type	IM 208DPO, PROFIBUS-DP master FO interface
Current consumption/power loss	
Current consumption from backplane bus	450 mA
Power loss	2 W
Status information, alarms, diagnostics	
Status display	yes
Interrupts	yes, parameterizable
Process alarm	yes, parameterizable
Diagnostic interrupt	yes, parameterizable
Diagnostic functions	yes
Diagnostics information read-out	possible
Supply voltage display	none
Group error display	red LED
Channel error display	none
Functionality Sub-D interfaces	
Type	-
Type of interface	FOC
Connector	2-pin FOC POF/HCS
Electrically isolated	✓
MPI	-
MP²I (MPI/RS232)	-
DP master	yes
DP slave	yes
Point-to-point interface	-
Housing	
Material	PPE
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
Certifications	
UL certification	yes

Additional Technical Data

IM 208DP

PROFIBUS interface	VIPA 208-1DP01
Connection	9pin D-type socket
Network topology	Linear bus, active bus terminator at both ends, tap lines are permitted.
Medium	Screened twisted pair cable, under certain conditions unscreened lines are permitted.
Data transfer rate	9.6kBaud to 12MBaud
Total length	100m without repeaters for 12MBaud, 1000m with repeaters
Max. no. of stations	32 stations in any segment without repeaters. Extendible to 126 stations when using repeaters.
Combination with peripheral modules	
max. no of slaves	125
max. no. of input bytes	256 (1024 since V3.0.0)
max. no. of output bytes	256 (1024 since V3.0.0)

IM 208DPO

PROFIBUS interface	
Connection	2pin socket for fiber optic cable
Network topology	Linear structure with dual FO cable, no bus terminator required
Medium	dual-core fiber optic cable
Data transfer rate	12MBaud
Total length	at POF-FO: max. 50m between stations at HCS-FO: max. 300m between stations
Max. no. of stations	17 stations incl. Master
Combination with peripheral modules	
max. no of slaves	16
max. no. of input bytes	256 (1024 since v3.0.0)
max. no. of output bytes	256 (1024 since v3.0.0)

Max. number of stations

The maximum number of DPO participants depends on the baud rate. The table shows the max. number incl. master:

Baud rate	max. no. of participants
≤ 1.5MBaud	17
3MBaud	15
6MBaud	7
12MBaud	4

Chapter 3 Deployment

Overview

This chapter contains a description of the PROFIBUS DP master modules IM 208-1DPx1 under PROFIBUS. A short introduction and presentation of the system is followed by the project design and configuration of the PROFIBUS master 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

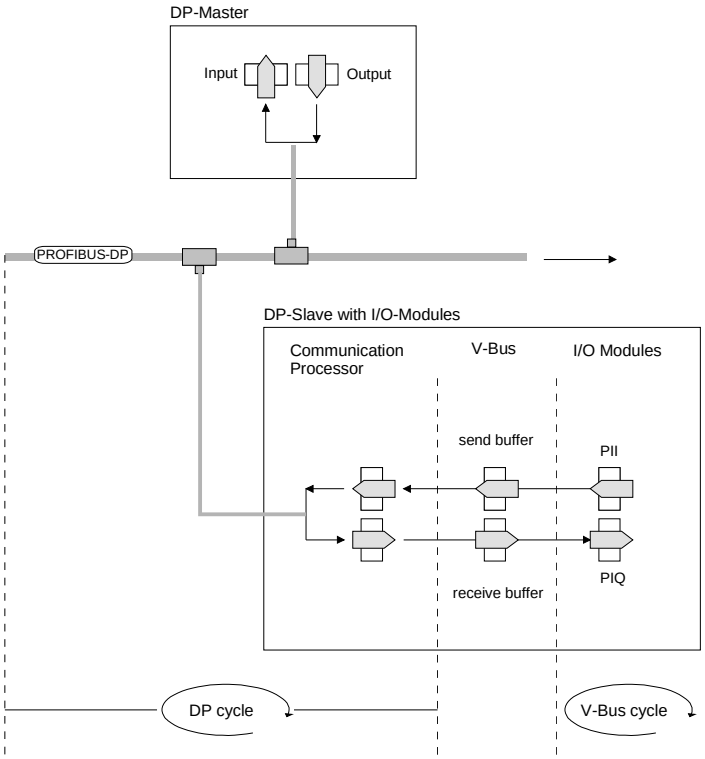
PROFIBUS DP provides an extensive set of diagnostic functions for fast error localization. Diagnostic messages are transferred via the bus and collected by the master.

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.

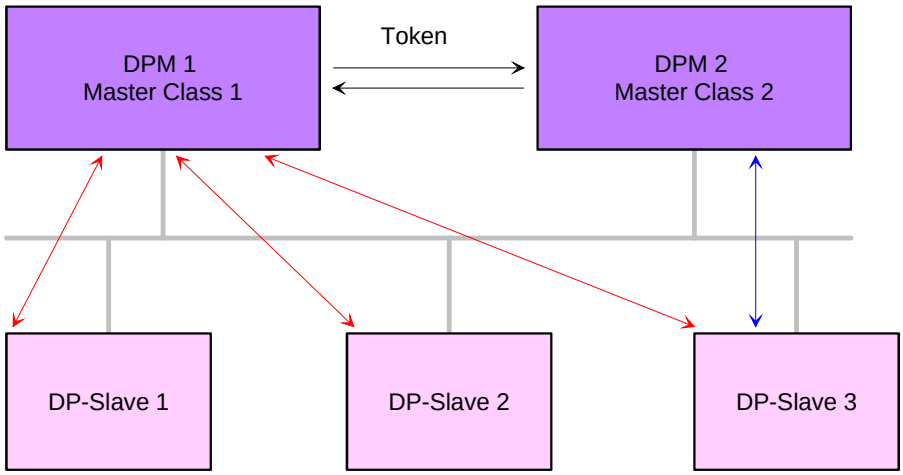
Note!

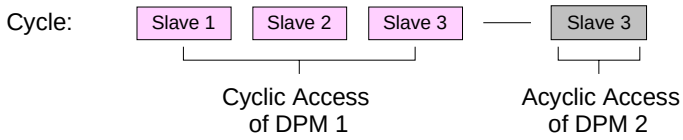
Starting with release version 6, the RUN-LED of a DP-V0 slave extinguishes as soon as the V-Bus cycle lasts longer than the DP cycle. This function is de-activated at the employment of a DP-V1 slave as DP-V0.

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.

Operating modes and Start-up behavior

Power ON

The DP master is powered on. The master will change automatically to RUN mode when the operating mode lever is in position RUN and the parameters are valid.

STOP

In STOP mode the outputs of the allocated slaves will be set to 0 if the parameters are valid. Although no communication will take place, the master will remain active on the bus using current bus parameters and occupying the allocated bus address. To release the address the PROFIBUS plug must be removed from the DP master.

STOP → RUN

In the RN position the master will re-boot. Here an existing hardware configuration is not deleted.

At a STOP → RUN transition the communication link to the slaves is established. At this time only the R-LED is on. Once communication has been established DP master changes to RUN mode. The DP master interface shows this status by means of the LEDs R and DE.

With incorrect parameters the DP master remains in STOP state and shows an error in parameterization by means of the IF-LED. The DP master will then be active on the bus with the following default bus parameters:

Default bus parameters: Address: 2, Communication rate: 1.5MBaud.

Note!

With DP master firmware versions older than V 5.0.0 with a STOP-RUN transition of the DP master a just existing hardware configuration is deleted and a probably in the flash ROM stored project is used.

To retransmit the hardware configuration a power cycle of the CPU is necessary.

RUN

In RUN mode the R- and DE-LEDs are on. In this condition data transfer can take place. If an error occurs, e.g. slave failure, the DP master will indicate the event by means of the E-LED and it will issue an alarm to the system on the next higher level.

RUN → STOP

The master is placed in STOP mode. It terminates communication and all outputs are set to 0. An alarm is issued to the system on the next higher level.

Deployment Master with a CPU 21x

Communication

Via the IM 208 master modules you may connect up to 125 PROFIBUS DP slaves (up to 16 at DPO) to one System 200V CPU.

The master communicates with the slaves and transfers the data areas via the backplane bus into the address area of the CPU. There may occur a maximum of 1024Byte input and 1024Byte output data.

With firmware versions < V3.0.0 there are only 256Byte available for input and output data.

With every boot procedure of the CPU, this fetches the I/O mapping data from all masters.

Alarm processing

The alarm processing is activated, i.e. a IM 208 error message may initialize the following alarms, causing the CPU to call the according OBs:

- Process alarm: OB40
- Diagnostic alarm: OB82
- Slave failure: OB86

As soon as the BASP signal (i.e. "**B**efehls**a**usgabe**sp**erre" = command output lock) comes from the CPU, the IM 208 sets the outputs of the connected periphery to zero.

Note!

After a slave failure, the process image of the inputs is in the same state than before the failure.

Preconditions

At deployment of the IM 208 PROFIBUS DP master, please make sure that this has a firmware version V3.0.0 or higher; otherwise it is not deployable with a CPU 21x with firmware version V3.0.0 or higher.

The according firmware version is to find on the label at the backside of the module.

Having questions to the firmware update, please call the VIPA support (support@vipa.de).

More detailed descriptions to the inclusion into your CPU are to find in the documentation of your CPU.

Project engineering

Overview

There are the following possibilities for project engineering:

- Project engineering of the 1. DP master in the System (CPU 21xDPM, IM 208)

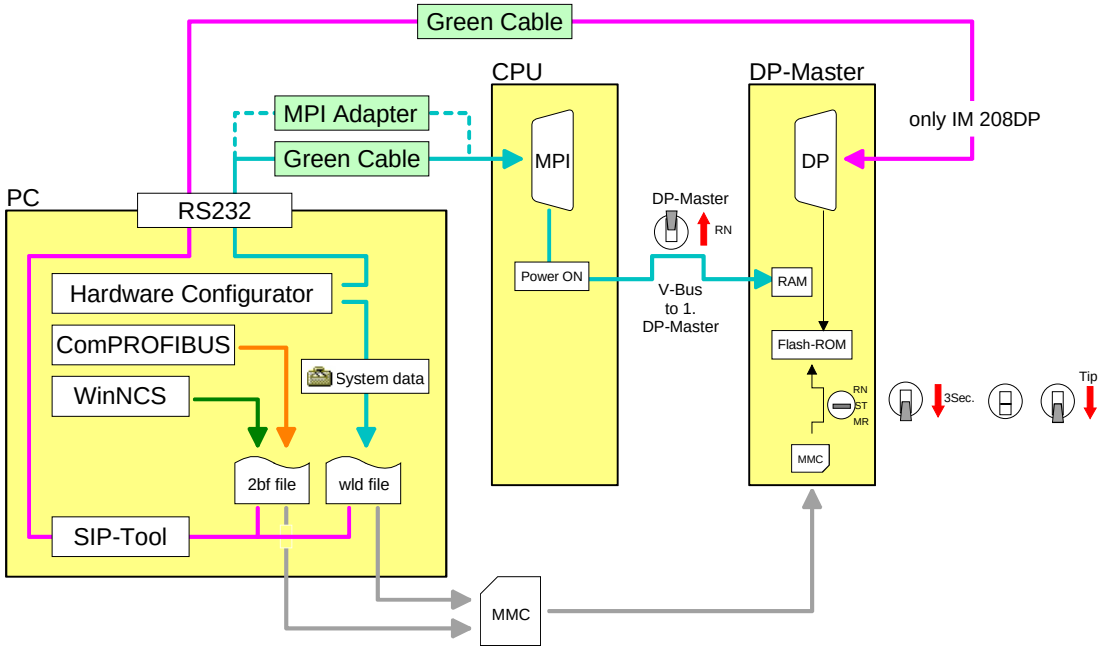
  Project engineering in the hardware configurator from Siemens and transfer via the system data into the CPU. At CPU start-up the DP master is configured by the CPU.

- Project engineering of further DP master in the system (only IM 208)

  Project engineering in the hardware configurator from Siemens and export as wld-file. The file is transferred by MMC respectively SIP-Tool and Green Cable to the DP master. With a overall reset sequence the project is transferred to the Flash ROM of the DP master.

- Project engineering with WinNCS respectively ComPROFIBUS

  Project engineering with VIPA WinNCS respectively ComPROFIBUS from Siemens and export as 2bf-file. The file is transferred by MMC respectively SIP-Tool and Green Cable to the DP master. With a overall reset sequence the project is transferred to the Flash ROM of the DP master.



Required firmware versions

DP master and CPU should have a firmware version V3.0.0 or higher, otherwise the DP master may not be deployed at the CPU 21x.

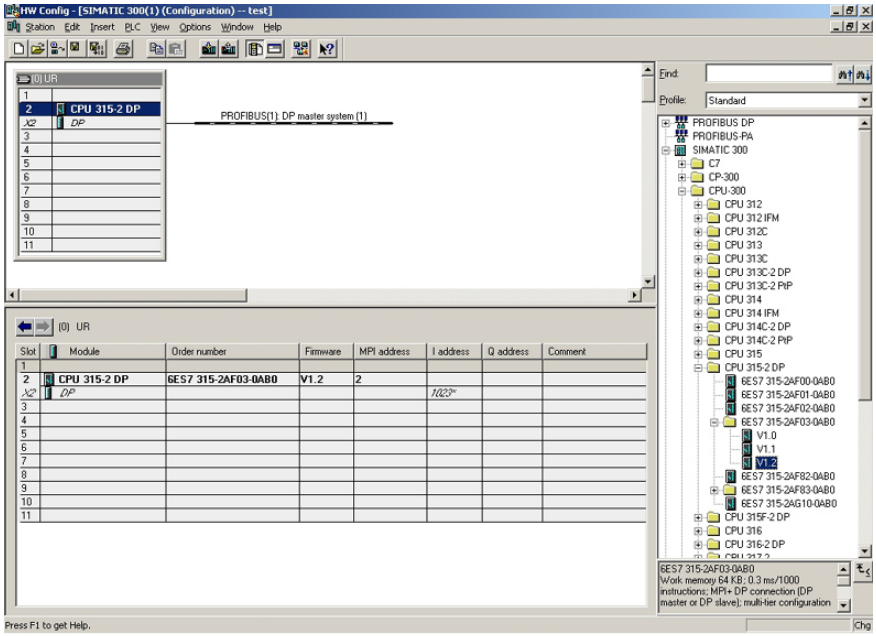
The according firmware version is to find on the label at the backside of each module.

Firmware version

DP master	CPU	Properties
V3.0.0	V3.0.0	1024Byte in- and output data
V3.0.4	V3.0.0	Project engineering via wld-file
V3.0.6	V3.3.0	Project engineering as HW configuration via MPI
V3.0.6	---------	Overall reset of the DP master

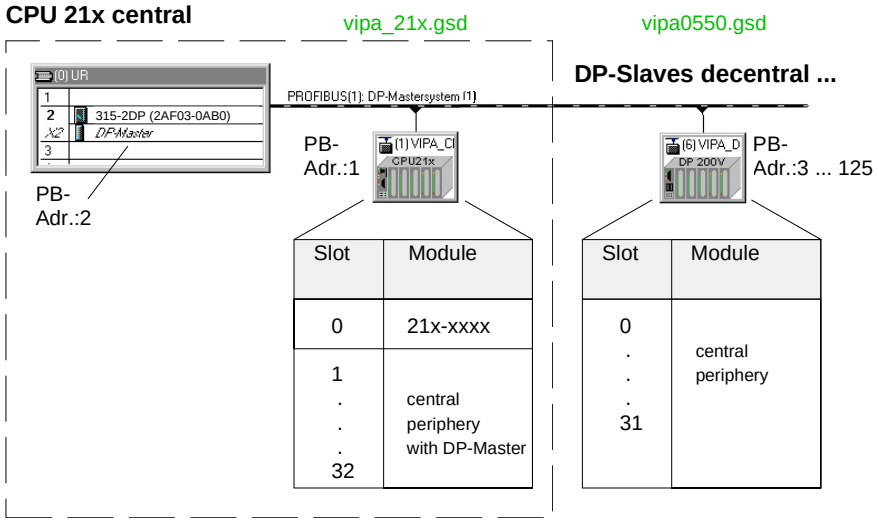
Project engineering of the 1. DP master in the system

In the hardware configurator from Siemens your PLC system is projected together with the DP master. This "hardware configuration" is to be transferred via MPI into the CPU. At PowerON, the configuration data is transferred to the DP master.

1.	Create a new project System 300 and add a profile rail from the hardware catalog.
2.	Insert the CPU 315-2DP. This may be found with PROFIBUS master in the hardware catalog at: *Simatic300>CPU-300>CPU315-2DP* **(6ES7 315-2AF03-0AB0 V1.2)**
3.	Assign a PROFIBUS address 2 or higher to your master.
4.	Click at DP, select the operating mode "DP master" at *Object properties* and confirm your entry with OK.
5.	With a right-click on "DP", a context menu opens. Choose "Insert master system". Create a new PROFIBUS subnet via NEW. The following picture shows the new master system: 

Note!

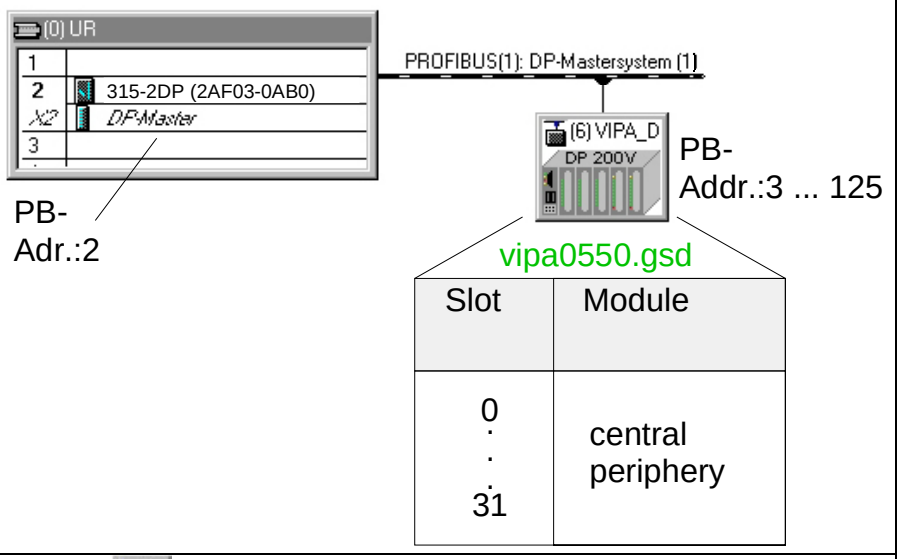
At DP master firmware older than V 5.0.0 the operating mode switch of the DP master should be in RN position. Otherwise, a STOP-RUN switch causes the master to reboot and the project is deleted.

6.	To be compatible to the Siemens SIMATIC Manager, the System 200V CPU has to be included explicitly. For this, you add a System "VIPA_CPU21x" to the subnet. This system is to find in the hardware catalog at: *PROFIBUS DP > Additional field devices > IO > VIPA_System_200V > VIPA_CPU21x*. Assign the PROFIBUS address 1 to this slave. Set the according CPU 21x from VIPA at slot 0 by choosing it in the hardware catalog at *VIPA_CPU21x*. **Slot 0 is mandatory!**
7.	For including the modules connected to the VIPA-Bus, you drag and drop the according System 200V modules from the hardware catalog at *VIPA_CPU21x* to the slots following the CPU. Start with slot 1. The same is to do for the DP master (place holder).
8.	For projecting DP slaves connected to the DP master select the VIPA_DP200V_2 system. Select the according PROFIBUS system in the hardware catalog and drag it to the DP master subnet. Assign an address > 2 to the slave. Set the according modules at slot 0 by choosing it in the hardware catalog at VIPA_DP200V_2. 
9.	Click on  (save and translate).

How the project is transferred via MPI to the CPU is shown at the following pages at "Transfer variants"

Project engineering of further DP master in the system

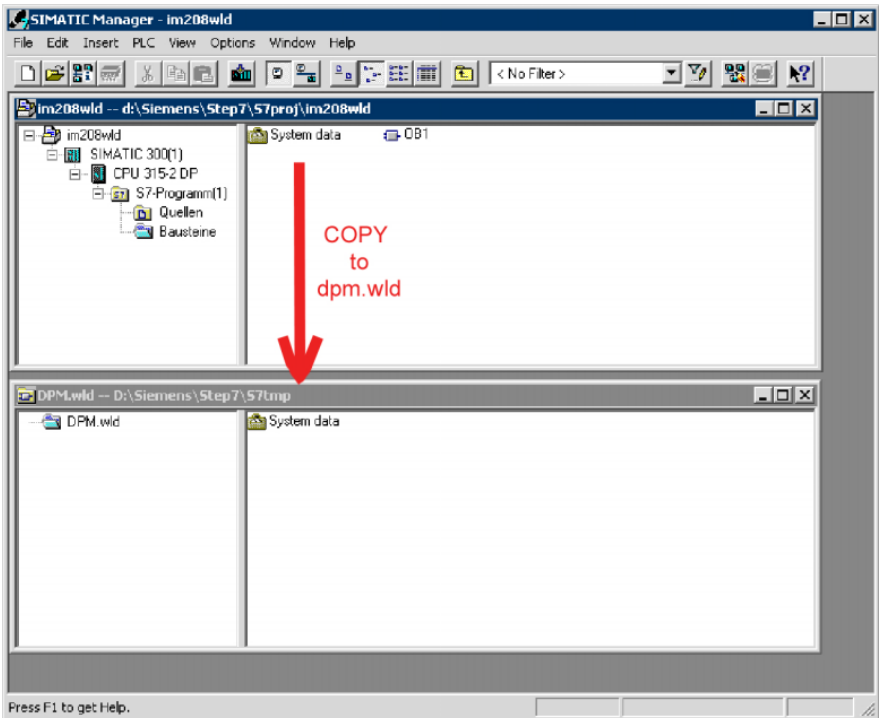
If there are further more IM 208 DP master in one system, for each a project is to be projected. This project may be transferred to the corresponding DP master either by MMC or by Green Cable. The Project is permanently stored in the Flash ROM of the DP master by means of an overall reset sequence.

1.	Create a new project System 300 for the corresponding DP master and add a profile rail from the hardware catalog.
2.	Insert the CPU 315-2DP. This may be found with PROFIBUS master in the hardware catalog at: : *Simatic300>CPU-300>CPU315-2DP* **(6ES7 315-2AF03-0AB0 V1.2)**
3.	Assign a PROFIBUS address 2 or higher to your master.
4.	Click at DP, select the operating mode "DP master" at *Object properties* and confirm your entry with OK.
5.	With a right-click on "DP", a context menu opens. Choose "Insert master system". Create a new PROFIBUS subnet via NEW.
6.	To configure DP salves, which are connected to the DP master, select the VIPA_DP200V_2 system. Select the according PROFIBUS system in the hardware catalog and drag it to the DP master subnet. Assign an address > 2 to the slave. Set the according modules at slot 0 by choosing it in the hardware catalog at VIPA_DP200V_2. **CPU 21x central** **DP slaves decentral ...** 
7.	Click on  (save and translate).

Export dpm.wld

Export your project to a MMC by creating a wld-file. The MMC is then plugged in the according DP master. The Project is permanently stored in the Flash ROM of the DP master by means of an overall reset sequence.

After the transfer, you may release the MMC again. This allows you to configure several masters at the same backplane bus with one MMC.

8.	Create with **File** > *Memory Card File* > *New ...* a new wld-file. This need to have the file name **dpm.wld** to be recognized from the PROFIBUS master. → This file is additionally shown to the configuration window.
9.	Go into your project into the directory *modules* and copy the directory "System data" into the created dpm.wld-file.  If an already existing "System data" directory shall be overwritten, you first have to delete that.

How the dpm.wld-file is transferred to the corresponding DP master is shown at the following pages at "Transfer variants".

Configuration with WinNCS respectively ComPROFIBUS

The PROFIBUS master may be easily configured by means of the VIPA WinNCS configuration tool. You may export your project as 2bf-file on a MMC res. transfer it via SIP-Tool into the DP master (only at IM 208DP possible).

The WinNCS configuration procedure is outlined below. For more detailed information see the manual HB91 for WinNCS.

1.	Start WinNCS and create a new project file for the ”PROFIBUS” function by clicking on **File** > *create/open*.
2.	If you have not yet done so, use  to insert a **PROFIBUS function group** into the network window and click [Accept] in the parameter box.
3.	Use  to insert a **PROFIBUS host/master** into the network window and specify the PROFIBUS address of your master in the parameter window.
4.	Insert a **PROFIBUS slave** into the network window by means of  . Enter the PROFIBUS address, the family "I/O" and the station type "*VIPA_DP200V_2*" into the parameter window and click [Accept].
5.	Use  to define the configuration of every peripheral module that is connected to the corresponding slave via the backplane bus. You can select automatic addressing for the periphery by clicking [Auto] and display allocated addresses by means of [MAP]. **Please take care that the automatic address allocation does not cause conflicts with the local periphery!** For intelligent modules like the CP 240 the configurable parameters will be displayed.
6.	When you have configured all the slaves with the respective periphery, the bus parameters for PROFIBUS must be calculated. Select the PROFIBUS function group in the network window. In the parameter window click on the "Bus parameter" tab. Select the required baud rate and click [calculate]. The bus parameters will be calculated - [Accept] these values. The bus parameters must be re-calculated with every change to the set of modules!
7.	Activate the master level in the network window and export your project into the file dpm.2bf.
8.	Transfer the dpm.2bf-file into your IM208 master (see "transferring a project ") .

Note!

For the IM 208 DP master is configured like the IM 308-C from Siemens, you may configure the VIPA module also as IM 308-C under "ComPROFIBUS" from Siemens and export it as 2bf-file.

Transfer variants

There are the following possibilities to transfer the wld- respectively 2bf-file into the DP master:

- Transfer via MPI into the CPU (only for the 1st DP master at system)
- Transfer via MMC
- Transfer via Green Cable and SIP-Tool

Transfer via MPI into the CPU

Starting with firmware V3.0.6 of the DP master and V3.3.0 of the CPU, your project may be transferred via MPI into the CPU with the following approach.

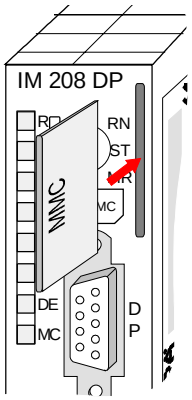
At Power ON the DP master project is transferred to the 1. DP master (IM 208DP or CPU 21xDPM) in the system by the CPU.

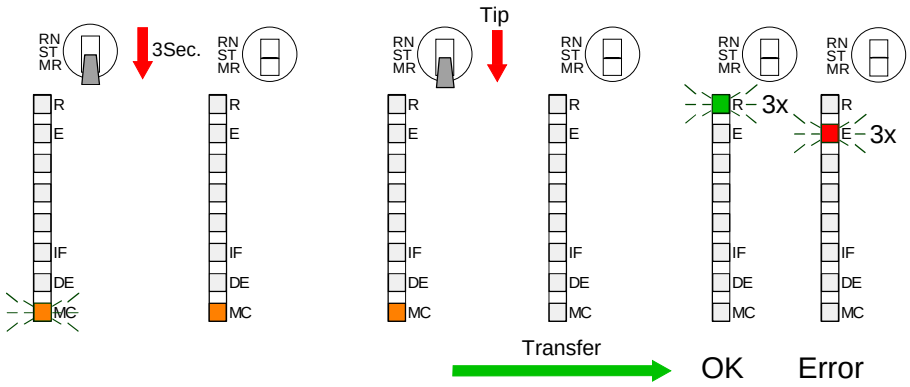
1.	Connect your PG res. your PC via MPI with your CPU. For a serial point-to-point transfer from your PC, you may also use the Green Cable from VIPA. The Green Cable has the order no. VIPA 950-0KB00 and may only be deployed at compatible modules from VIPA. Please regard the instructions to the Green Cable further down!! At deployment of the Green Cable from VIPA, the MPI interface has to be configured (PC Adapter MPI, 38400Baud).
2.	Switch your DP master to RUN.
3.	Switch on the power supply of the CPU.
4.	Transfer your project into the CPU with **PLC** > *Load to module* in the hardware configurator from Siemens. At Power ON the CPU always transfers the PROFIBUS project to the 1. DP master. For additional saving of your project on a MMC, you plug a MMC in the CPU slot and transfer the project via **PLC** > *Copy RAM to ROM.* During write operation, the "MC"-LED at the CPU is blinking. Due to the system, the successful write operation is announced too soon. Please wait until the LED extinguishes.

Note!

At DP master firmware older than V5.0.0 the operating mode lever of the DP master should be in RN position. Otherwise, a STOP-RUN switch causes the master to reboot and the project is deleted.

Transfer via MMC



1.	Transfer the wld- respectively the 2bf-file to the MMC by means of a MMC reading device.
2.	Plug-in the MMC memory module into your IM 208DP master
3.	Turn on the power supply for the System 200V.
4.	Hold the operating mode lever of the PROFIBUS master in position MR until the blinking MC-LED switches to permanent on.
5.	Release the operating mode lever and tip it once more to MR. → The data is transferred from the MMC into the internal Flash-ROM. During data transfer all LEDs extinguish. At successful data transfer, the green R-LED blinks 3 times. At error, the red E-LED blinks 3 times. 
6.	Now you may release the MMC again.
7.	Switch the master from STOP to RUN. → The IM 208DP master now starts with the new project in the internal Flash-ROM. The RUN-LED (R) and DE are on.

Note!

The project inside the PLC for the 1. Master takes priority over the project downloaded to Flash-ROM of the Master.

If the MMC contains a wld- and a 2bf-file, the wld-file has the priority.

Transfer via Green Cable and VIPA SIP-Tool

The method shown below can only be used at the IM 208DP with RS485-interface. The SIP-Tool is a transfer tool. It is supplied together with WinNCS from VIPA. It allows you to deploy the Green Cable from VIPA to transfer your project as wld- respectively 2bf-file into the master serial via the PROFIBUS interface. The transferred project is stored in the internal Flash-ROM of the DP master.

The Green Cable is a programming and download cable for VIPA CPUs MP^{2}I jack and VIPA fieldbus masters. The Green Cable from VIPA is available under the order no. VIPA 950-0KB00.

The Green Cable allows you to:

- *transfer projects serial*
  Avoiding high hardware needs (MPI transducer, etc.) you may realize a serial point-to-point connection via the Green Cable and the MP^{2}I jack. This allows you to connect components to your VIPA-CPU that are able to communicate serial via a MPI adapter like e.g. a visualization system.
- *execute firmware updates of the CPUs and fieldbus masters*
  Via the Green Cable and an upload application you may update the firmware of all recent VIPA CPUs with MP^{2}I jack and certain fieldbus masters (see Note).

Important notes for the deployment of the Green Cable

Nonobservance of the following notes may cause damages on system components.

For damages caused by nonobservance of the following notes and at improper deployment, VIPA does not take liability!

Note to the application area

The Green Cable may exclusively deployed directly at the concerning jacks of the VIPA components (in between plugs are not permitted). E.g. a MPI cable has to be disconnected if you want to connect a Green Cable.

At this time, the following components support Green Cable:

VIPA CPUs with MP^{2}I jack and fieldbus masters from VIPA.

Note to the lengthening

The lengthening of the Green Cable with another Green Cable res. The combination with further MPI cables is not permitted and causes damages of the connected components!

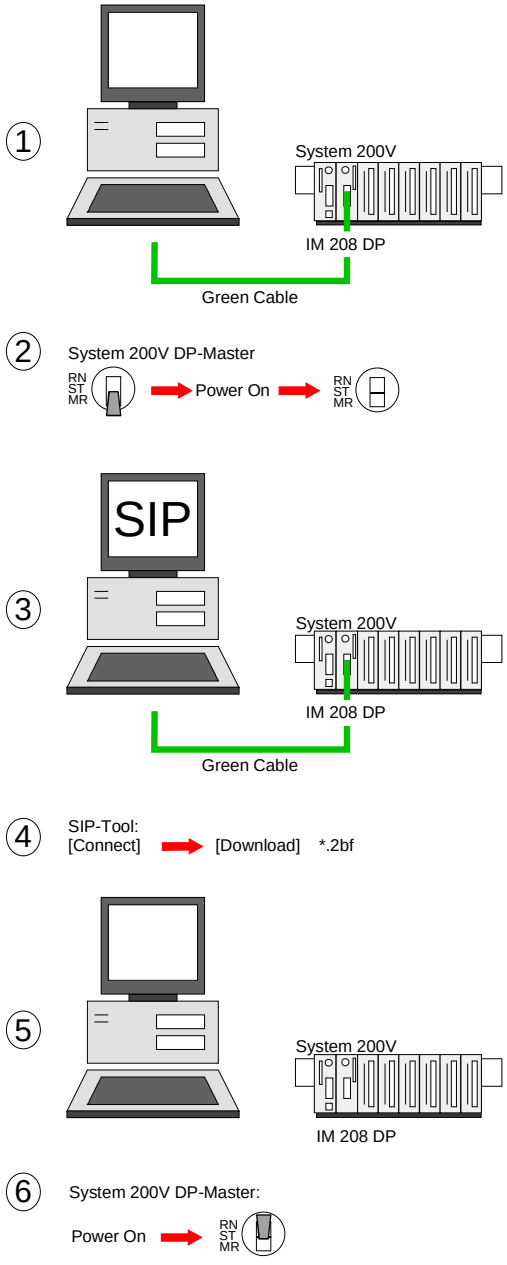
The Green Cable may only be lengthened with a 1:1 cable
(all 9 Pins are connected 1:1).

Continued transfer via Green Cable and VIPA SIP-Tool

If you like to project the IM 208 PROFIBUS DP master with the SIP-Tool, this is only possible with DP master firmware V4.0.0 and higher and with SIP-Tool Version V1.0.6 and higher.

Either a wld- ore a 2bf-file may be transferred to the DP master by the SIP-Tool. As described before the system data exported by the Siemens SIMATIC manager are stored in the wld-file.

The project may be exported as 2bf-file by VIPA WinNCS respectively by ComPROFIBUS from Siemens.



1.	Disconnect the PROFIBUS plug from the DP master. Connect the "Green Cable" to the serial interface of your PC and to the PROFIBUS interface of the IM 208DP master.
2.	Place and hold the operating mode lever of your master module in position MR and turn on the power supply. Release the lever again. → Now your PROFIBUS master may receive data serial via the PROFIBUS interface.
3.	Turn on your PC and start the SIP tool that is supplied with WinNCS. Select the appropriate COM port and establish a connection by means of [Connect]. When the connection has been established, the SIP tool will display OK in the status line located at the top, otherwise an ERR message will be displayed.
4.	Click [Download], select your dpm.2bf- res. dpm.wld-file and transfer this file into the DP master
5.	Terminate the connection and the SIP tool when the data has been transferred. Disconnect the "Green Cable" from the master.
6.	Turn off the power supply of your master. Connect the master to the PROFIBUS network and turn the power supply on again. Change the operating mode of the master to RUN (RN). → Your IM 208DP PROFIBUS master is now connected to the network with the updated configuration. The configuration data is saved in the internal Flash-ROM.

Slave operating mode

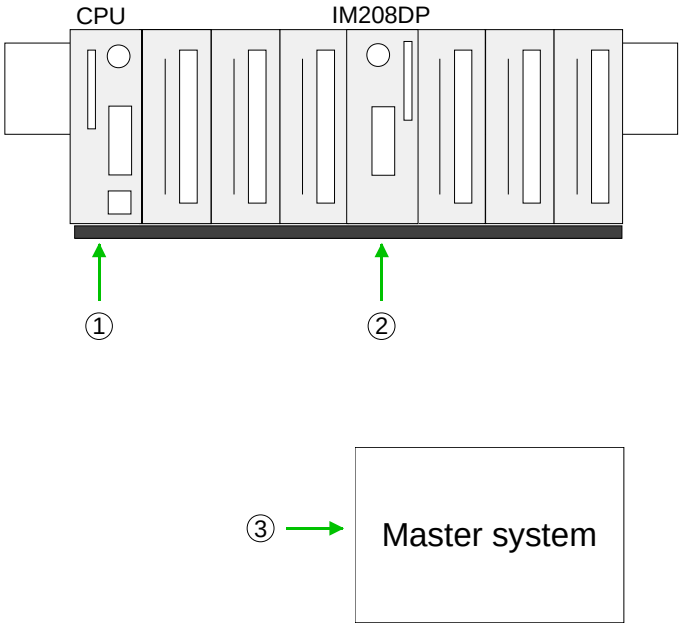
Overview

Starting with CPU firmware V3.7.2 there is the possibility to use the IM 208DP as DP slave. The Siemens GSD file for the CPU S7-315-2DP is needed for connection to a DP master system.

For hardware technical reasons this functionality is not available for the IM 208DPO master with FO.

For deployment of the IM 208DP as DP slave 3 hardware configurations are needed, which were described in the following:

Slave system



1. *Hardware configuration System 200V*

   Project engineering Siemens CPU 315-2DP with virtual PROFIBUS slave (address 1) for System 200V. The DP slave contains CPU 21x, I/O periphery and IM 208DP (set parameter *Transfer project to IM 208* to "No"). Project is to be transferred to the CPU 21x.

2. *Hardware configuration IM 208DP*

   Project engineering IM 208DP as Siemens CPU 315-2DP with Slave-Operation of the DP part. Use *Properties* to set PROFIBUS address and I/O area and transfer the project to IM 208DP.

3. *Hardware configuration superordinate master system*

   Project engineering of the superordinate master system. Connection of the IM 208DP (slave) as Siemens CPU S7-315-2DP. Here the installation of the Siemens GSD is necessary. Use *Properties* to set PROFIBUS address (identical to hardware configuration IM 208DP) and I/O areas as "modules". The project is to be transferred to the CPU of the master system.

Hardware configuration System 200V

- Start the Siemens SIMATIC manager.
- Install for CPU 21x project engineering the GSD *VIPA_21x.GSD.*
- Install for linking the DP master the GSD *VIPA04D5.GSD.*
- Create a new project System 300 and add a profile rail from the hardware catalog.
- Insert the CPU 315-2DP. Hardware catalog:
  Simatic300>CPU-300>CPU315-2DP **(6ES7 315-2AF03-0AB0 V1.2)**
- Create a new PROFIBUS sub net and assign a PROFIBUS address 2 or higher to your master.
- Add a System "VIPA_CPU21x" to the subnet. This can be found in the hardware catalog at *PROFIBUS DP > Additional field devices > IO > VIPA_System_200V > VIPA_CPU21x*.
- Assign the **PROFIBUS address 1** to this slave.
- Set the according CPU 21x from VIPA at slot 0 by choosing it in the hardware catalog at *VIPA_CPU21x*. **Slot 0 is mandatory!**
- For including the modules connected to the VIPA-Bus, you drag and drop the according System 200V modules from the hardware catalog at *VIPA_CPU21x* to the slot following the CPU. Start with slot 1. The same is to do for the DP master (substitute).
- Set at the IM 208DP properties the parameter *Transmit project to IM 208* to "No". So the CPU can not overwrite the recent local stored DP slave project in the IM 208DP.
- Transfer the project to the CPU.

Hardware configuration System 100V

The employment of the IM208 DP as DP slave in a System100V can exclusively be made by the system expansion. Details for the assembly can be found in HB100 at "expansion an terminal modules". Here the hardware configuration takes place in the same way as with the System200V by means of the following GSD files for the System100V:

- *VIPA_11x.GSD* for project engineering of CPU 11x
- Siemens GSD for linking at DP master

Here also set the parameter *Transmit project to IM 208* to "No". Transfer your project to the CPU 11x.

Continue with the hardware configuration of the IM 208DP and the superordinate master system shown as follows.

Hardware-configuration IM 208DP

- Create a new project System 300 and add a profile rail from the hardware catalog.
- Insert the CPU 315-2DP. Hardware catalog:
  Simatic300 > CPU-300 > CPU315-2DP **(6ES7 315-2AF03-0AB0 V1.2)**
- Open the *Properties* of the *DP* part.
- Choose at *Operating mode* "DP slave".
- Set at *general* a PROFIBUS DP slave address.
- The data transfer areas are set at *configuration*. Please note only the "MS" mode is supported.
- Transfer as shown at "Transfer variants" above the system data to your IM 208DP - not to the CPU! - and set the IM 208DP to RUN.

Note!

The parameters "Input" respectively "Output" at *configuration* always take place from CPU sight.

"Input" refers to the input part and "Output" to the output part of the CPU.

Hardware-configuration superordinate master system

The Siemens GSD is necessary for project engineering at a superordinate master system.

- Start your configuration program with a new project and configure the superordinate PROFIBUS master system.
- Add a DP slave of the station type "S7-315-2DP". This is to be found in the hardware catalog at:
  PROFIBUS DP > Additional field devices > PLC > SIMATIC > S7-315-2DP.
- Assign the PROFIBUS address to the DP slave that you've parameterized at the slave.
- For the PROFIBUS communication, create the same I/O range that you've parameterized at the slave in form of "modules". Please regard that a slave output area relates to a master input area and vice versa. Also the IO areas must be constantly configured without gaps.
- Save your project and transfer it into the CPU of your master system.

Note!

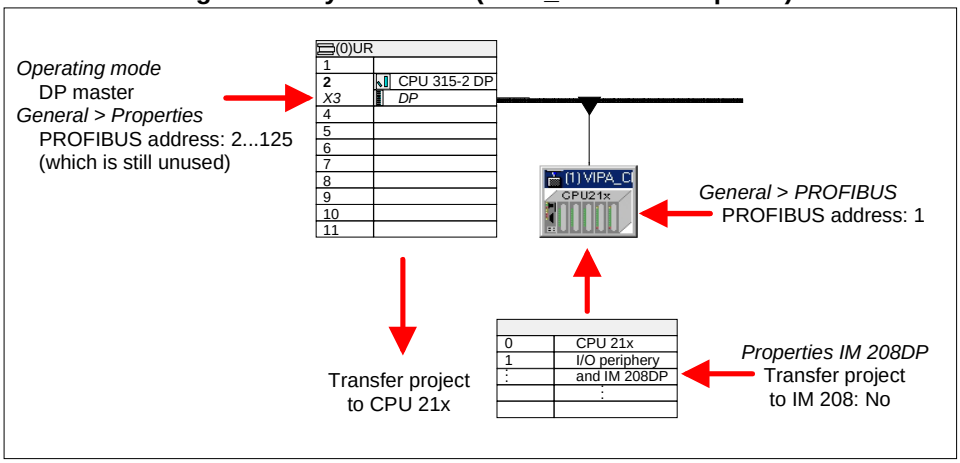
If your DP master system is a System 200V module from VIPA, you may parameterize the directly plugged-in modules by including a "DP200V" slave system.

To enable the VIPA CPU to recognize the project as central system, you have to assign the PROFIBUS address 1 to your slave system!

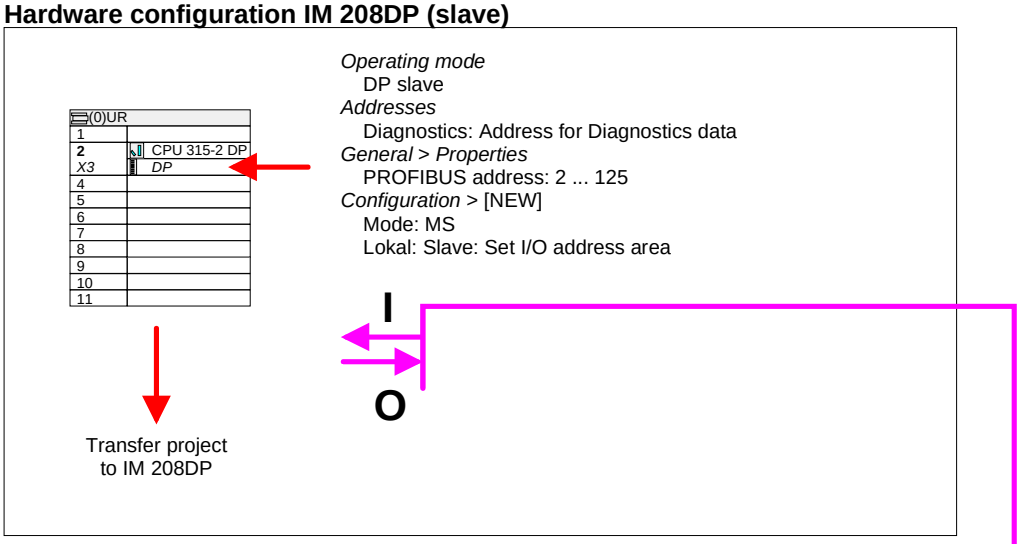
Please take care at deployment of the IM 208 PROFIBUS DP master that this has a firmware version V3.0.0 or higher; otherwise this may not be used at a CPU 21x with a firmware version V3.0.0 or higher. The firmware versions are on a label at the backside of the modules.

Summary

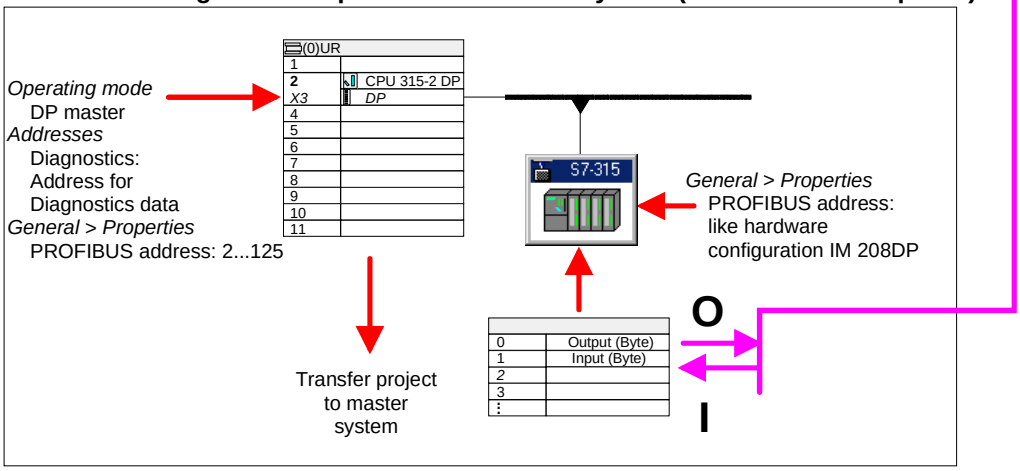
Hardware configuration System 200V (VIPA_21x.GSD required)



Hardware configuration IM 208DP (slave)



Hardware configuration superordinate master system (Siemens GSD required)



Attention!

The length specification of the I/O area of the DP slave must be identical to the bytes configured at the project engineering of the DP master. Otherwise no PROFIBUS communication can take place and a slave loss is replied by the master.

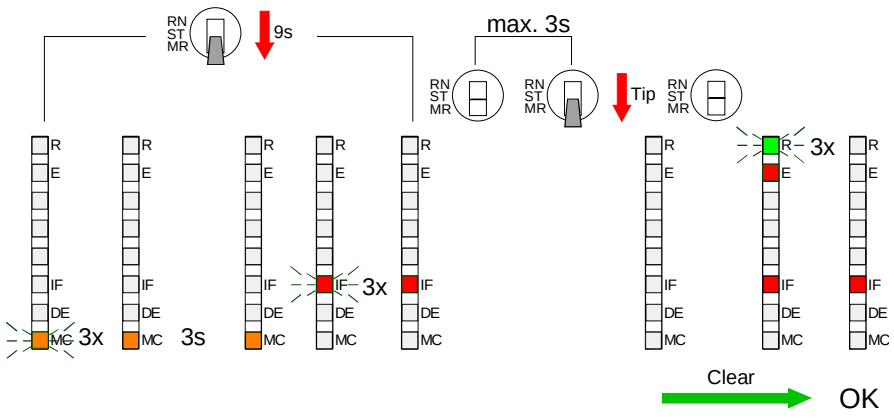
Overall reset

General

Starting with the firmware version V3.0.6 of the DP masters, you have the possibility to request an overall reset at the DP master.

An overall reset clears all data in the Flash-ROM.

Execute an overall reset

1.	Turn on the power supply of the System 200V.
2.	Push the operating mode lever of the master module in position MR. Hold it for app. 9s. → first, the MC-LED blinks 3 times. For 3s the blinking switches into permanent on. Then, the IF-LED blinks 3 times and switches to permanent on.
3.	Release the lever and tip it within 3s once more in pos. MR. → The content of the Flash-ROM is deleted. The operation has been executed properly when the green R-LED blinks 3 times and the IF-LED is permanent on.  As soon as you switch the master to RUN, this boots and starts with its default parameters at the bus. **Default parameter: Address: 2, Transfer rate: 1.5MBaud**

Project engineering via CPU after power-on to first master

If there is a valid profibus project in the CPU, this is automatically transfered via backplane bus into the RAM of the 1st master after Power ON - independet from position of operating mode lever.

Firmware update

Overview

Starting with CPU firmware version 3.3.3 a MMC inside your CPU can be used to update the firmware of CPU an DP master. The latest 2 firmware versions are to find in the service area at www.vipa.de and at the ftp server at ftp.vipa.de.

Latest Firmware at www.vipa.com

The latest firmware versions are to be found in the service area at www.vipa.com

For designation the master firmware has the following name convention:

dpmxx.**bin** xx specifies the slot number the DP master is plugged in (Slot: 00 ... 31)

Attention!

When installing a new firmware you have to be extremely careful. Under certain circumstances you may destroy the DP master, for example if the voltage supply is interrupted during transfer or if the firmware file is defective.

In this case, please call the VIPA-Hotline!

Please regard that the version of the update firmware has to be different from the existing firmware otherwise no update is executed.

Seek firmware version

A label on the rear of the DP master module indicates the firmware version.

Load firmware and transfer it to MMC as *firmware.bin*

- Go to www.vipa.com
- Click on Service > Download > Firmware Updates.
- Click on "Firmware for PROFIBUS Master System 200V".
- Select the according IM 208 order no. and download the firmware to your PC.
- Rename the file to "**dpm**xx.**bin**" (xx specifies the slot number the DP master is plugged in, starting with 00) and transfer this file onto a MMC.

Note!

The server always stores the latest two firmware versions.

Transfer firmware from MMC into DP master

- Get the RUN-STOP lever of your CPU in position STOP.
- Turn off the voltage supply.
- Plug the MMC with the firmware into the CPU. Please take care of the correct plug-in direction of the MMC.
- Turn on the voltage supply.
- After a short boot-up time, the alternate blinking of the LEDs SF and FC shows that the firmware file has been found on the MMC.
- You start the transfer of the firmware as soon as you tip the RUN/STOP lever downwards to MRES within 10s. The CPU shows the transfer via a LED blink line.
- During the update process, the LEDs SF, FC and MMC are alternately blinking. This may last several minutes.
- The update is successful finished when all CPU-LEDs are on. If they are blinking fast, an error occurred.
- After Power OFF - ON the Master starts with new firmware.

Note!

More information to the firmware update can be found at the service area under downloads.

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.

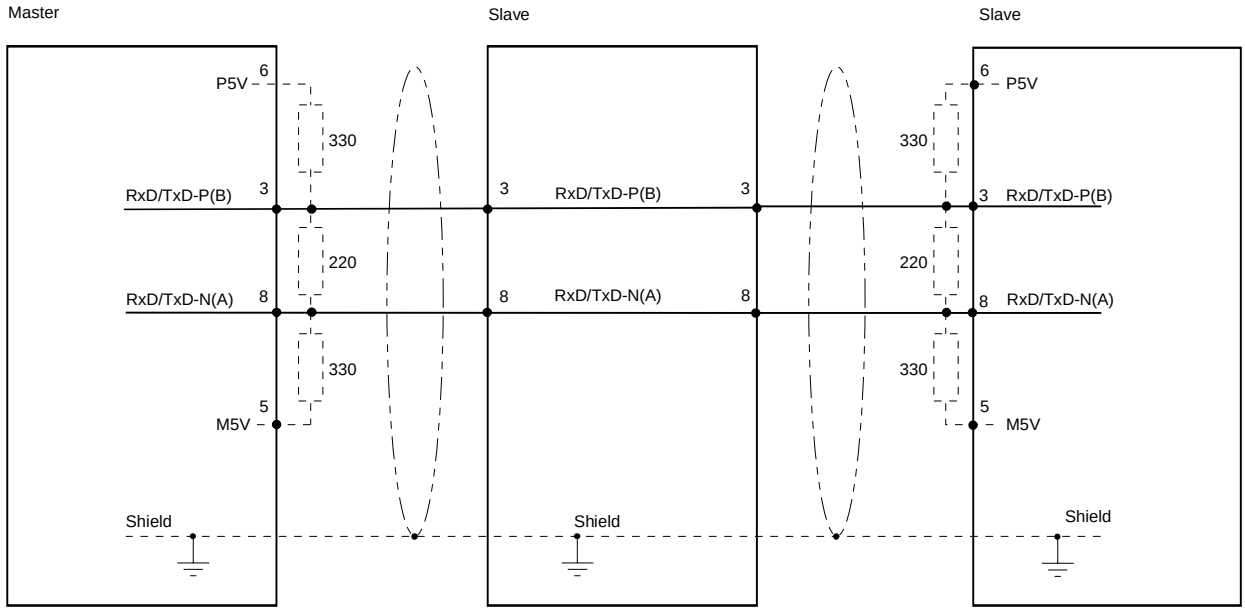
Max. 32 participants per segment are permitted. Within a segment the members are linear connected. The segments are connected via repeaters. The maximum segment length depends on the transfer rate.

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.



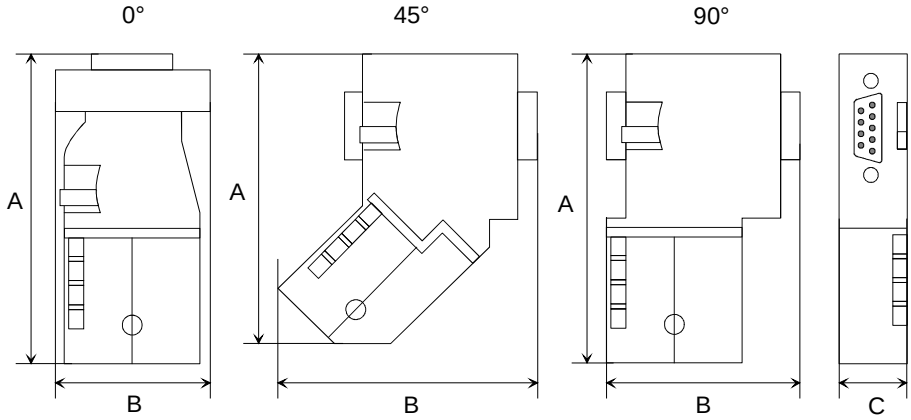
Note!

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.

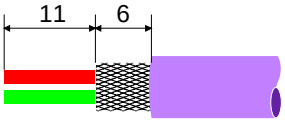


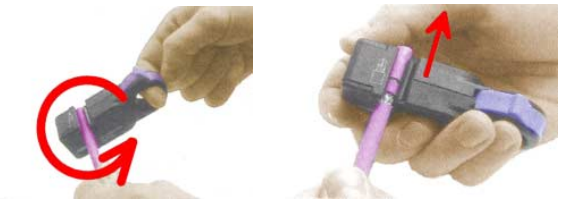
	0°	45°	90°
A	64	61	66
B	34	53	40
C	15.8	15.8	15.8

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.





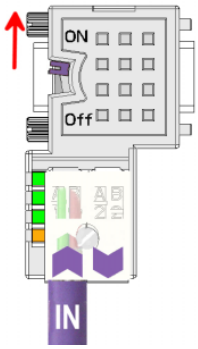
Dimensions in mm

Termination with "EasyConn"

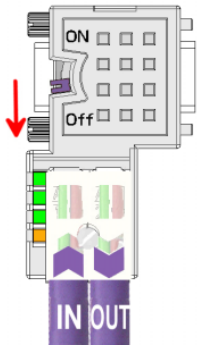
The "EasyConn" bus connector is provided with a switch that is used to activate a terminating resistor.

Wiring

1./last bus participant



further participants



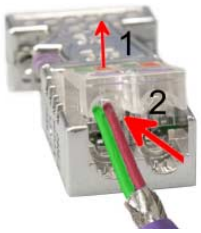
Attention!

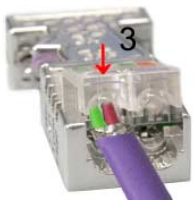
The terminating resistor is only effective, if the connector is installed at a bus participant and the bus participant is connected to a power supply.

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).

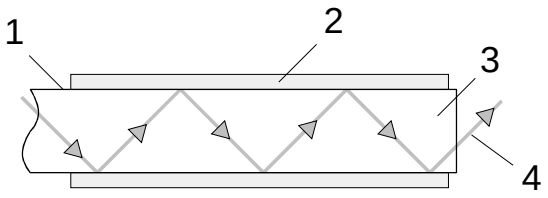
Please note: The green line must be connected to A, the red line to B!

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).

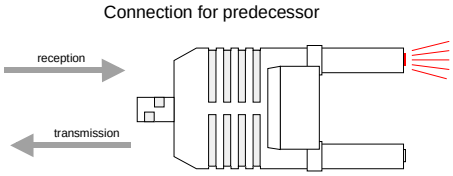
When the bus has been turned on, you recognize the receive line by the light, while the darker line is the send line.

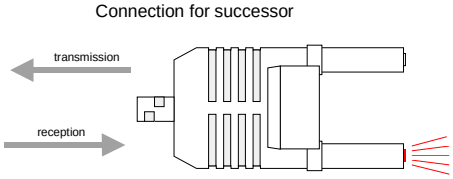
The connectors Hewlett Packard (HP) are available in two different versions:

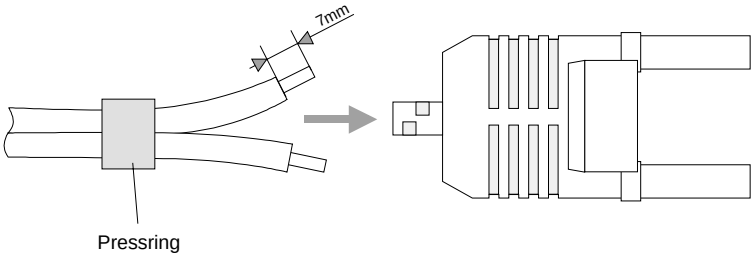
FO connector with crimp-type assembly

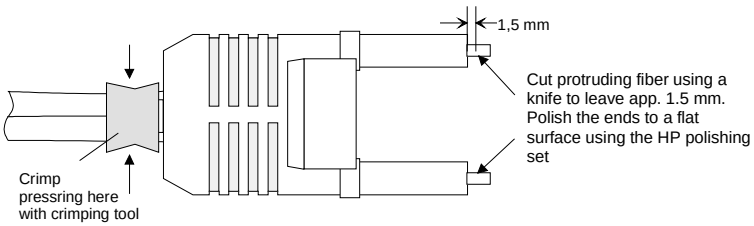
FO connector without crimp-type assembly

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.

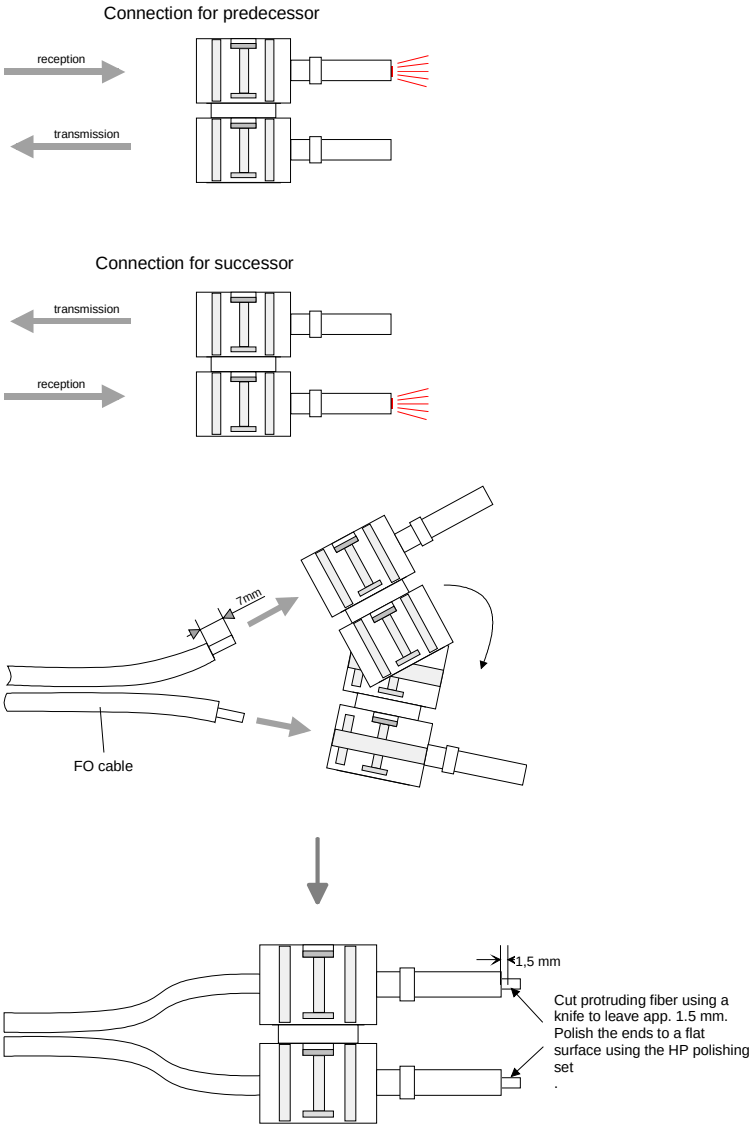
Connector installation

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.

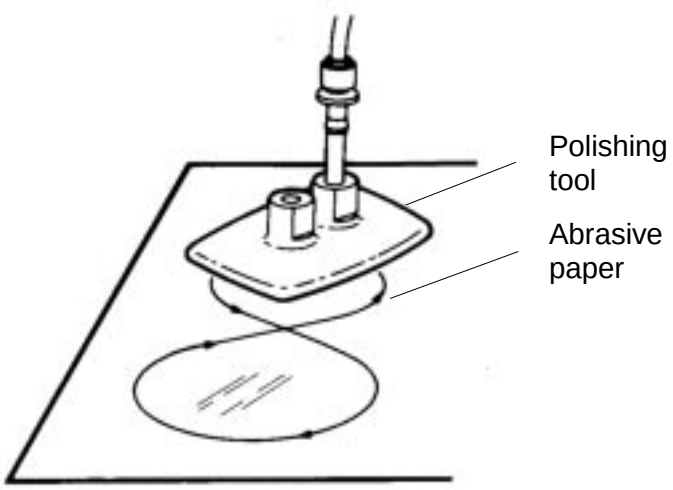
Insert the two cores into the plug so that the ends of the fiber optic cable protrude at the front. Keep an eye on the polarity of the cores (s.a.).

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.).

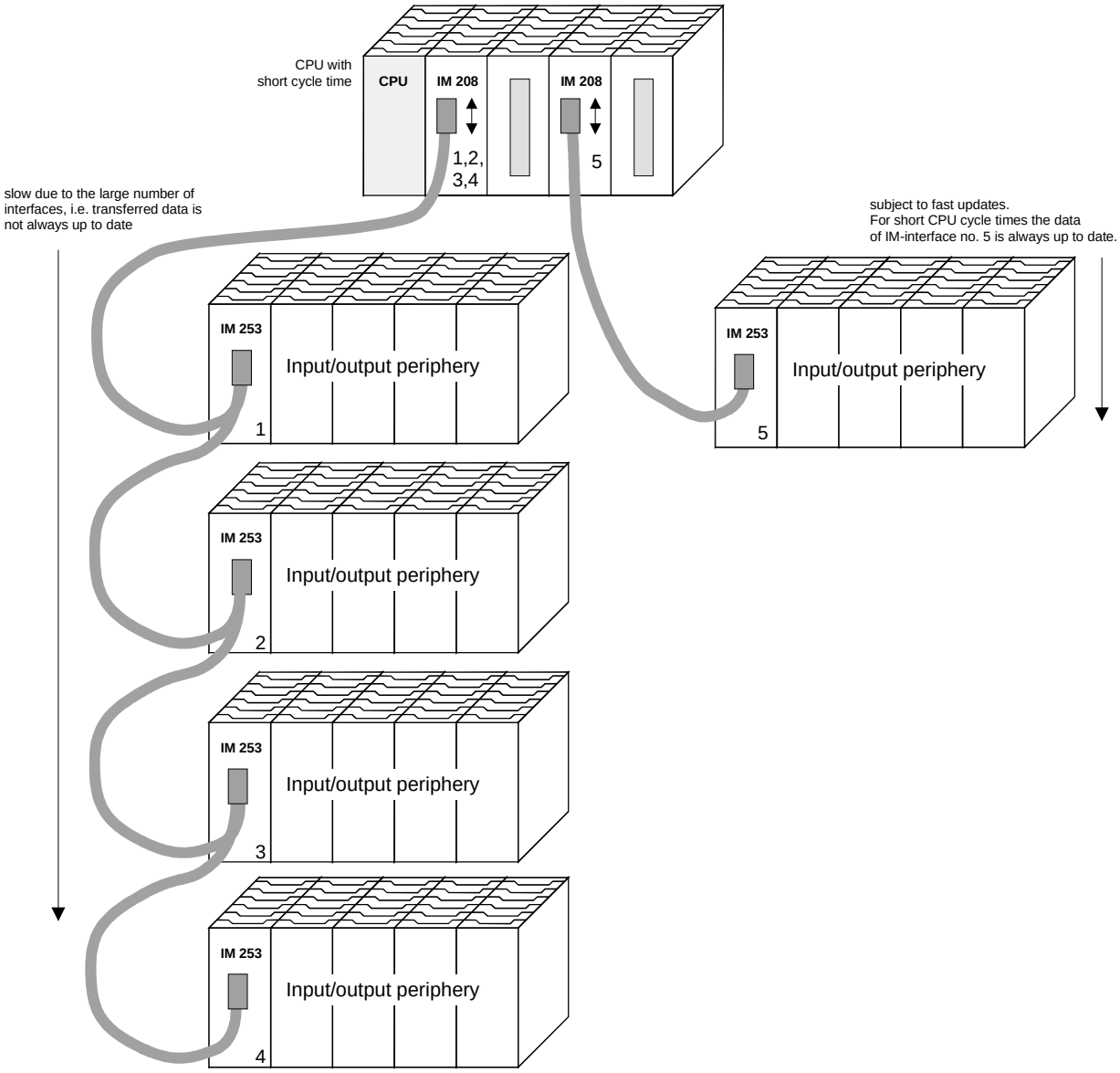
Cut protruding fiber using a knife so that app. 1.5mm are still visible. Polish the ends to a flat surface using the HP polishing set (HP order no.:HFBR-4593).

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

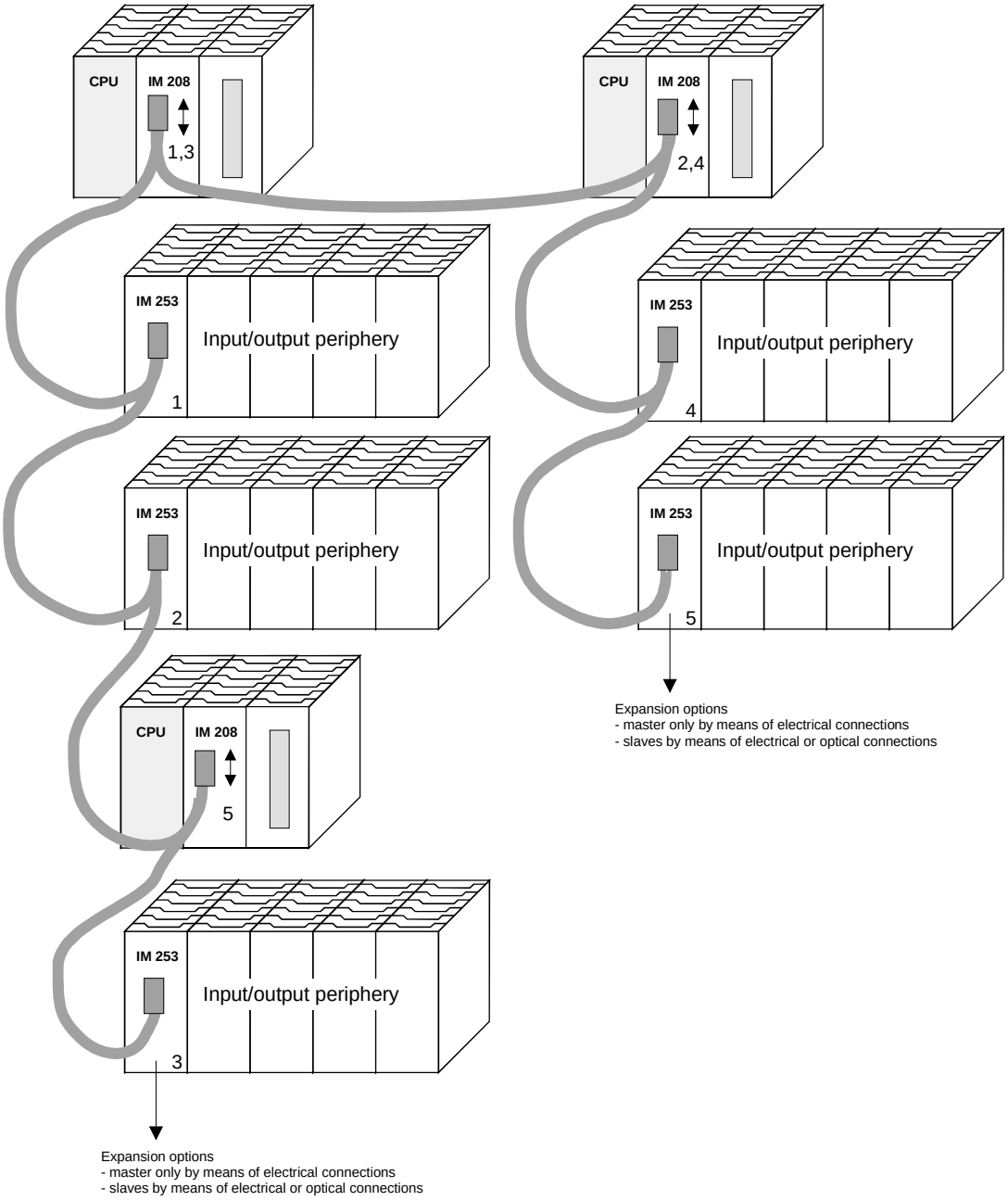
One CPU and multiple master connections

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.

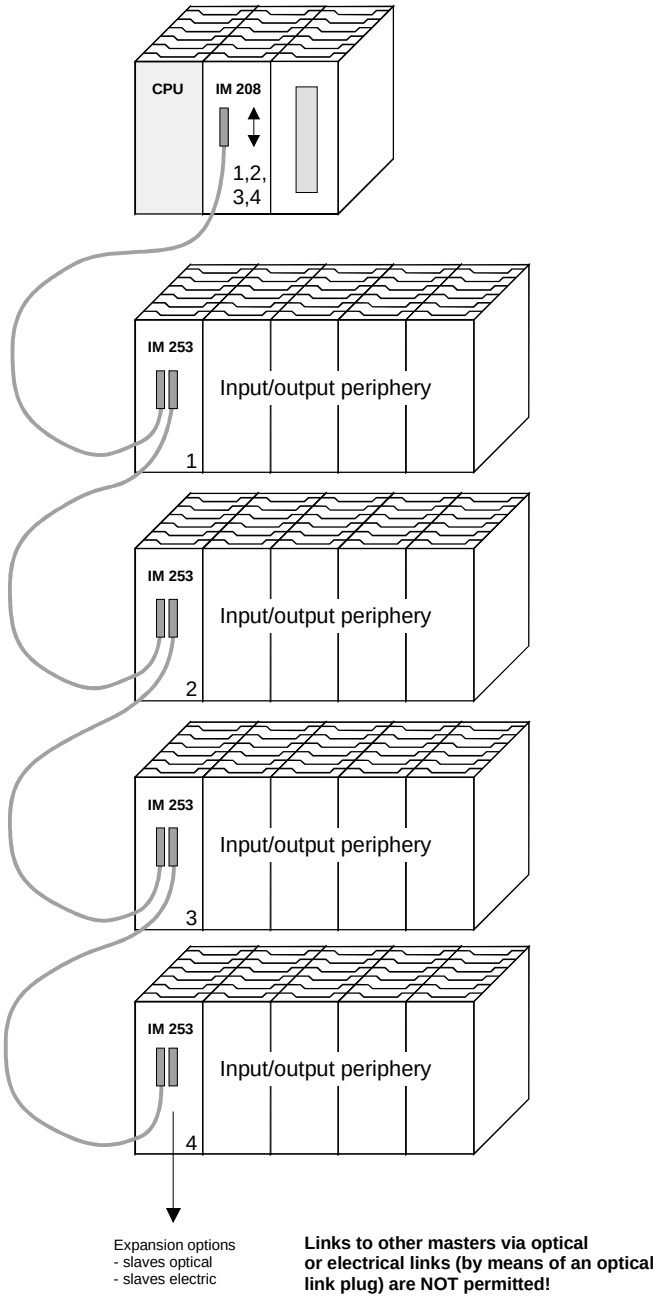


Multi master system

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

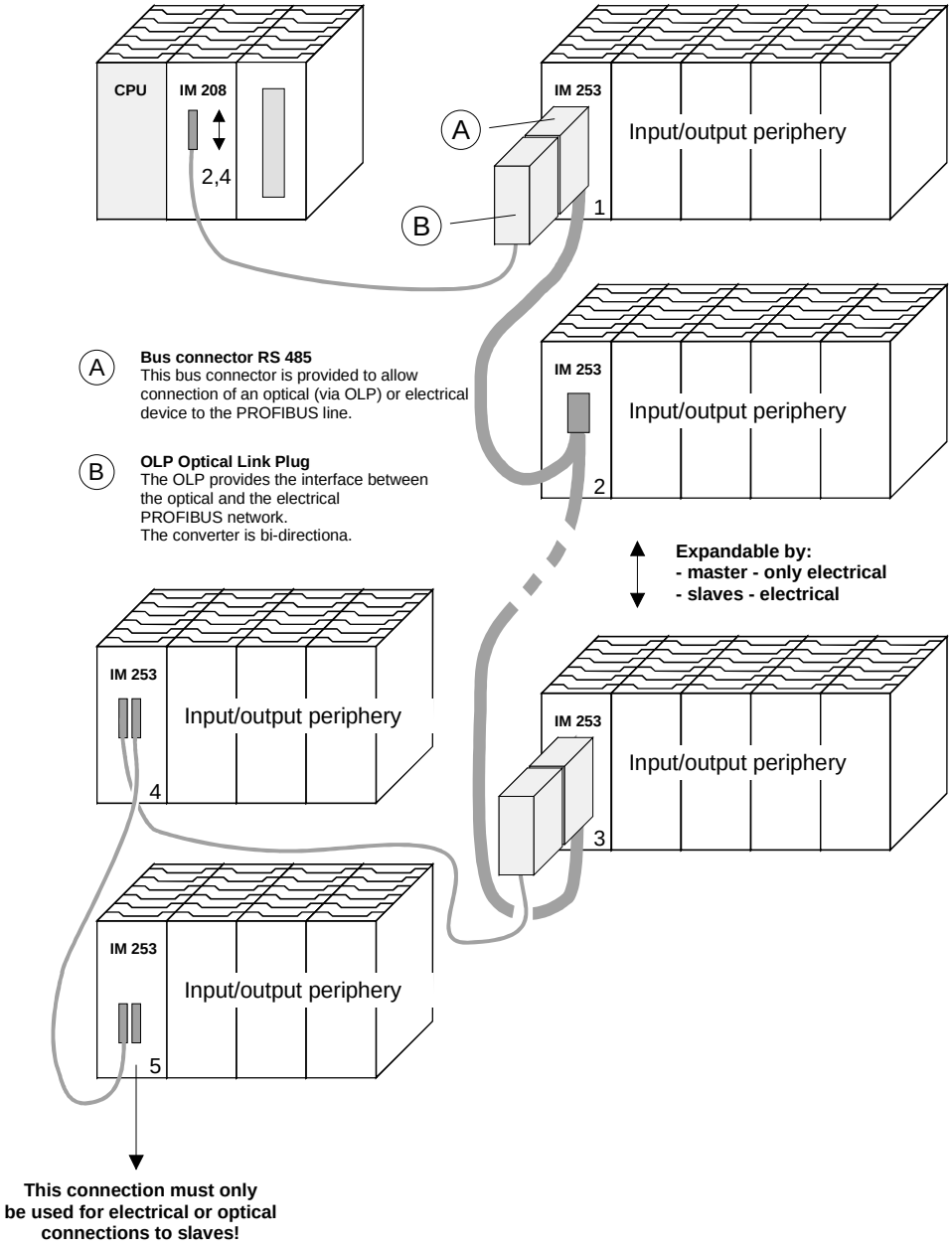


Optical PROFIBUS



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.

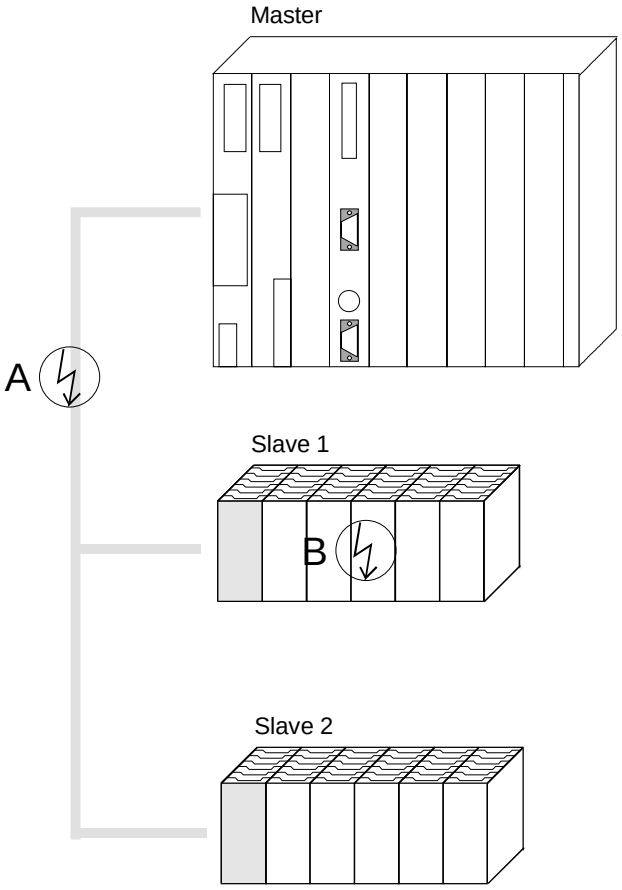
You should always keep an eye on the correct polarity!

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

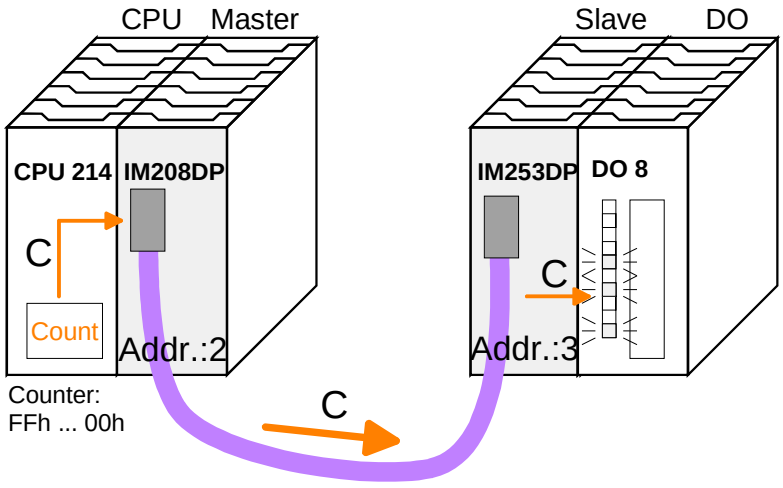
The following example describes a communication between a master and a slave system.

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

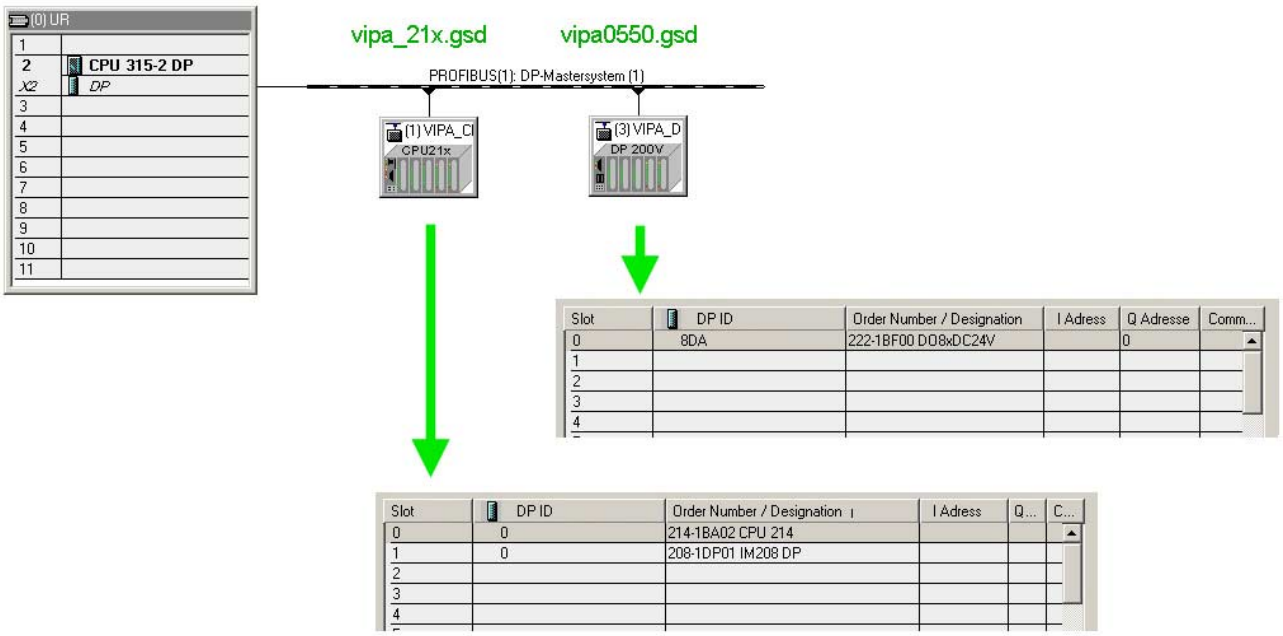
Engineering IM 208DP

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.

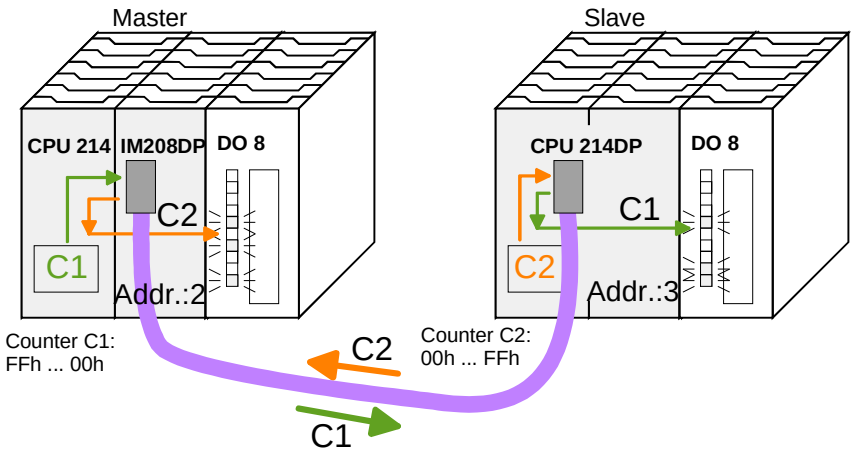
Problem in detail

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

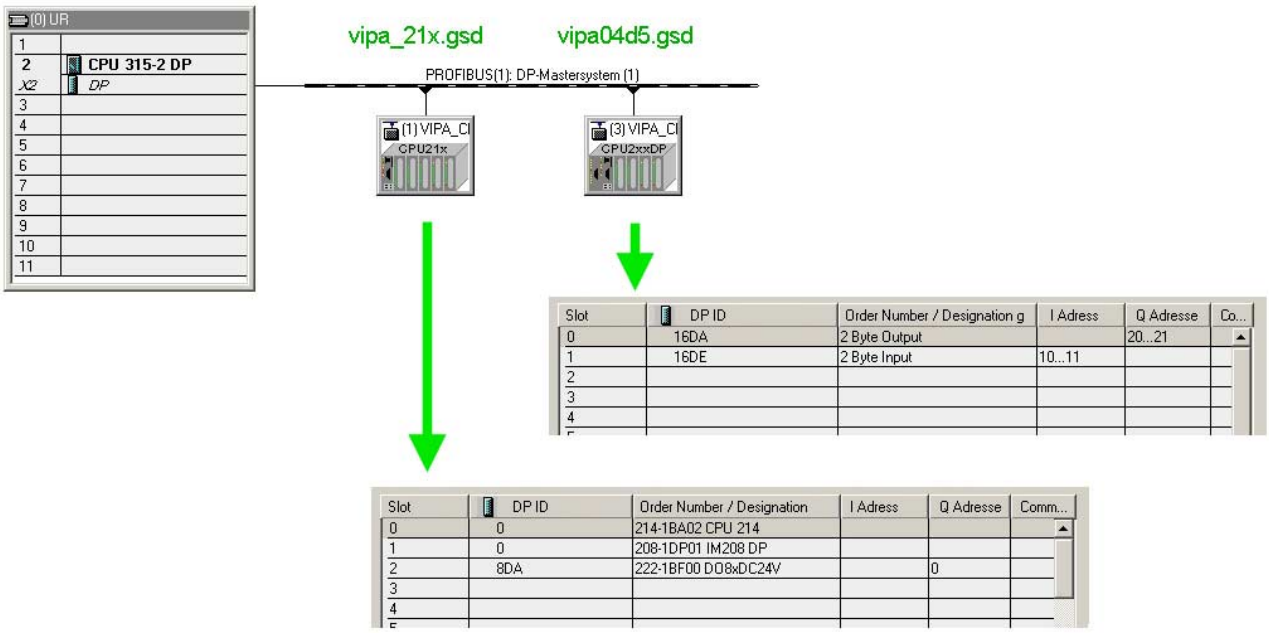
To be compatible with the STEP®7 projecting tool from Siemens, you have to execute the following steps for CPU 214 and DP master:

- 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

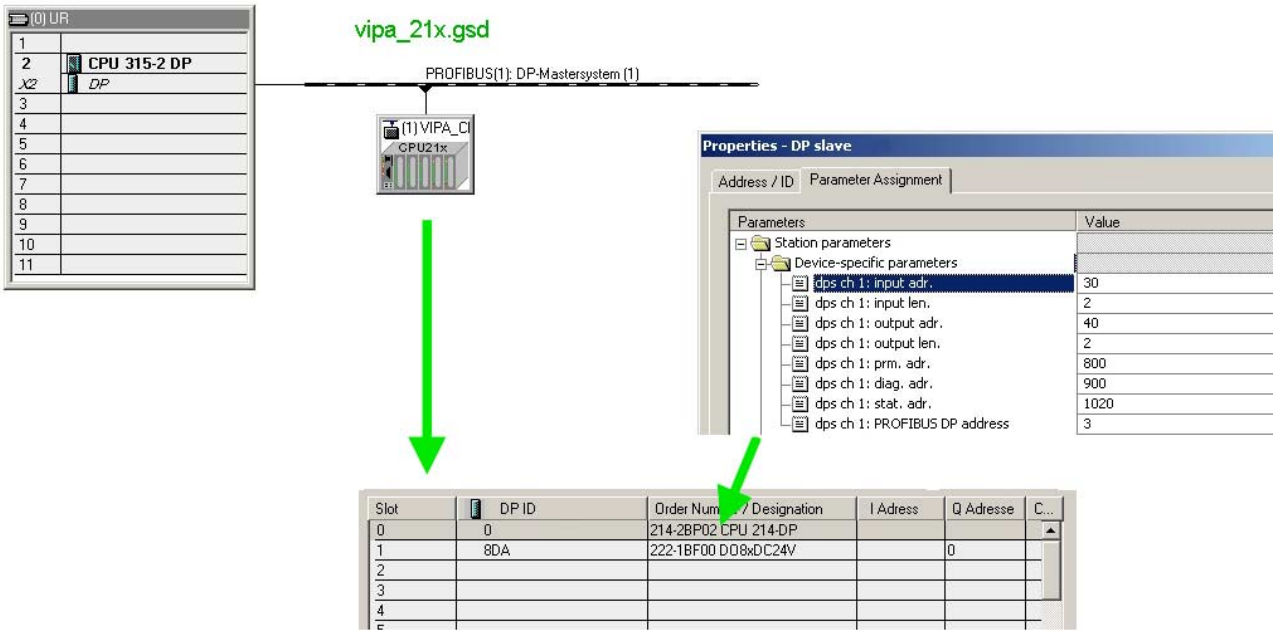
Transfer your project with the hardware configuration into the CPU and execute the program. The hardware configuration of CPU 214 and DP master is now finished.

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.