User Manual

FC200 Profibus-DP Gateway

Order No.: ELCO HB97E_GW
Rev. 06/29

FC2-GW-DPx1 DP-V1 slave - Structure

Properties GW-DP01 GW-DP11

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

Use as DP-V1 slave

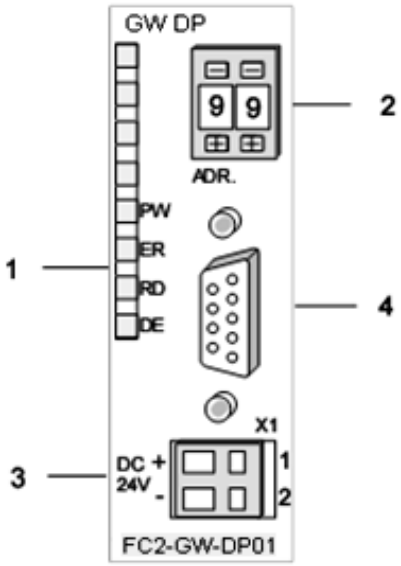
- 1 MSAC_C1 connection (Read, Write) with 244Byte data (4 Byte DP-V1-Header + 240Byte user data)
- 3 MSAC_C2 connections (Initiale, Read, Write, DataTransport, Initiate Abort) with each 244Byte data (4 Byte DP-V1-Header + 240 Byte user data)

Restrictions GW-DP31- ECO

The FC2-GW-DP31 is functionally identical to the FC2-GW-DP01 and has the following restrictions:

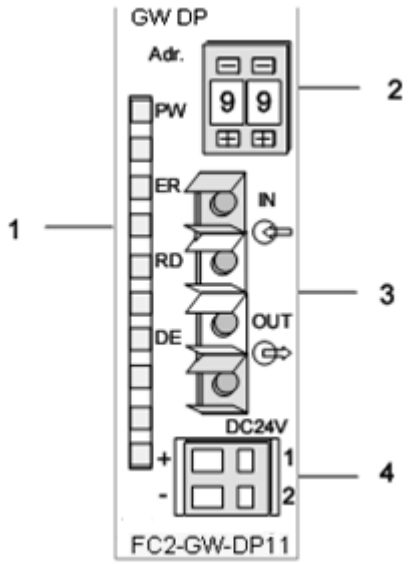
- Profibus DP slave for max. 8 periphery modules
- Integrated DC 24V power supply for the peripheral modules (0.8A max.)
- The Profibus address can be adjusted by DIP switch
- Integrated DC 24V power supply for the peripheral modules (0.8A max.)
- The Profibus address can be adjusted by DIP switch

Front view GW-DP01



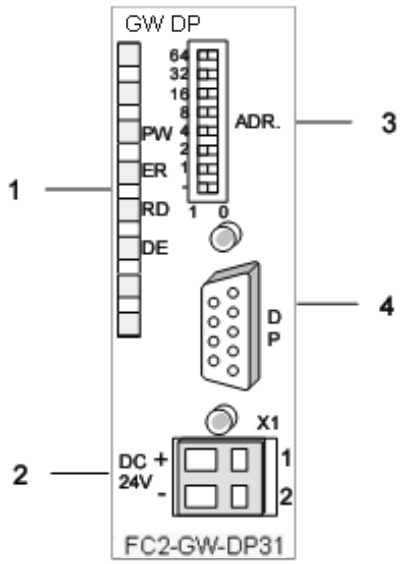
[1] LED status indicators
[2] Address selector (Coding switch)
[3] Connector for DC 24V power supply
[4] RS 485 interface

Front view
GW-DP11



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

Front view
GW-DP31- ECO



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

Components

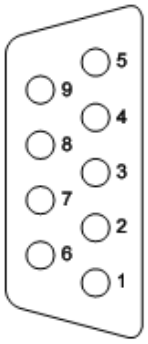
LEDs

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

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

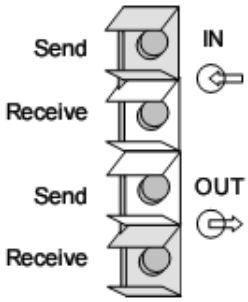
RS485 interface

A 9pin socket is provided for the RS485 interface between your Profibus slave and the Profibus.
The following diagram shows the pin assignment for this interface:



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

FO interface

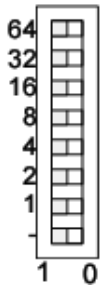


These connectors are provided for the optical waveguide between your Profibus gateway and the Profibus.
The diagram on the left shows the layout of the interface.

Address selector

This address selector is used to configure the Profibus address for the DP slave. Addresses may range from 1 to 99. Addresses must be unique on the bus.
The slave address must have been selected before the bus coupler is turned on.
When the address is set to 00 during operation, a once-off image of the diagnostic data is saved to Flash-ROM. Please take care to reset the correct Profibus address, so at the next PowerOn the right Profibus address is used!

Address selector GW-DP31 - ECO



Contrary to the coding switched described above at the GW-DP31 - ECO the Profibus address is configured by means of a DIL switch. Addresses may range from 1 to 125. Addresses must be unique on the bus.
The slave address must have been configured before the bus coupler is turned on.
When the address is set to 00 during operation, a once-off image of the diagnostic data is saved to Flash-ROM. Please take care to reset the correct Profibus address, so at the next PowerON the right Profibus address is used!

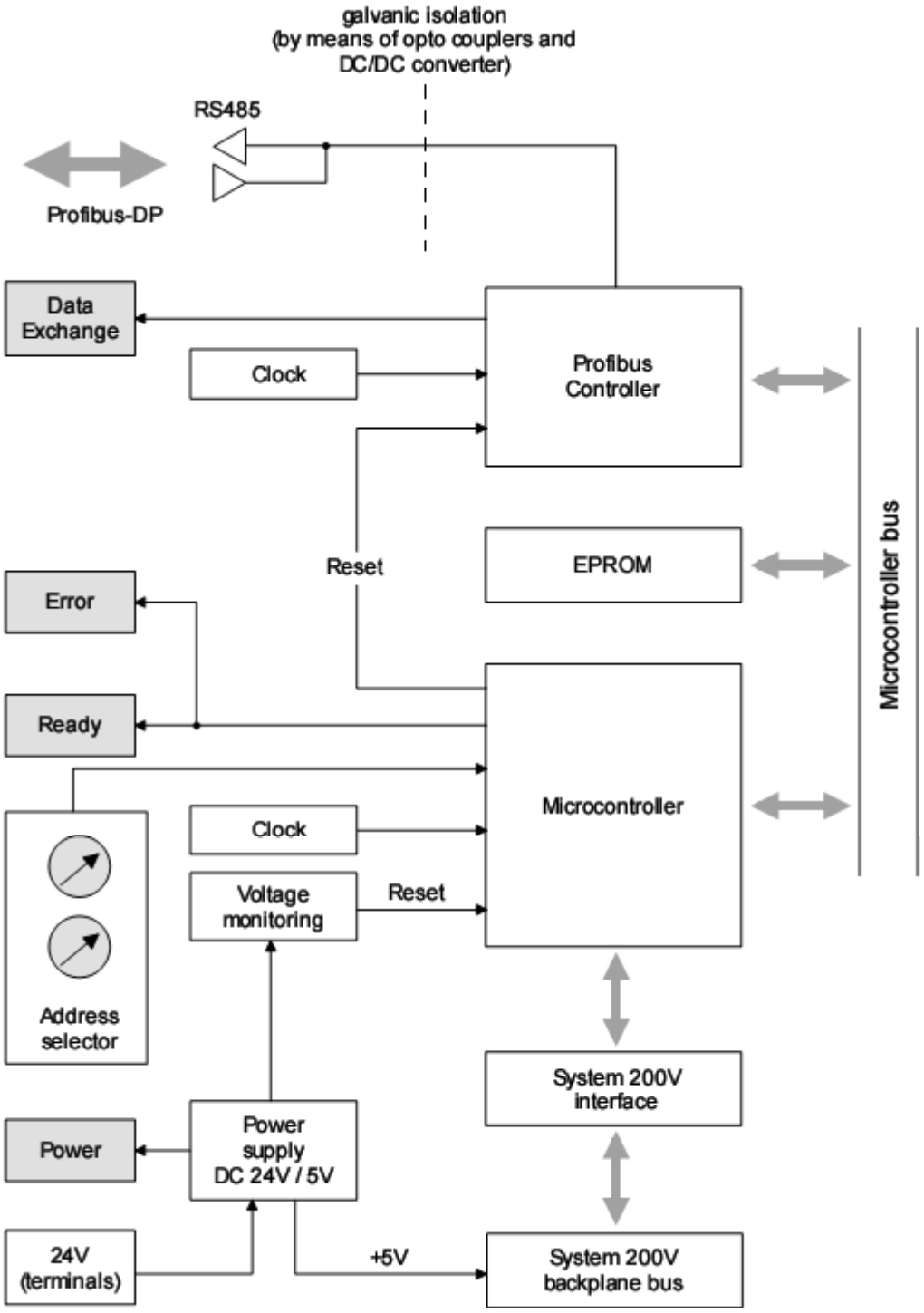
Power supply

Every Profibus slave has an internal power supply. This power supply requires DC 24V. In addition to the electronics on the bus gateway, the supply voltage is also used to power any modules connected to the backplane bus. Please note that the maximum current that the integrated power supply can deliver to the backplane bus is 3.5A. The back plane current of the GW-DP31 - ECO is limited to 0.8A.
The power supply is protected against reverse polarity.
Profibus and backplane bus are isolated from each other.

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

GW-DPx1 - DP-V1 slave - Block diagram

The following block diagram shows the hardware construction of the bus gateways in principal and the internal communication:



GW-DPx1 - DP-V1 slave - Parameters

Outline

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

Parameters DP-V0

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

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

DP-V1 UserPrmData

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

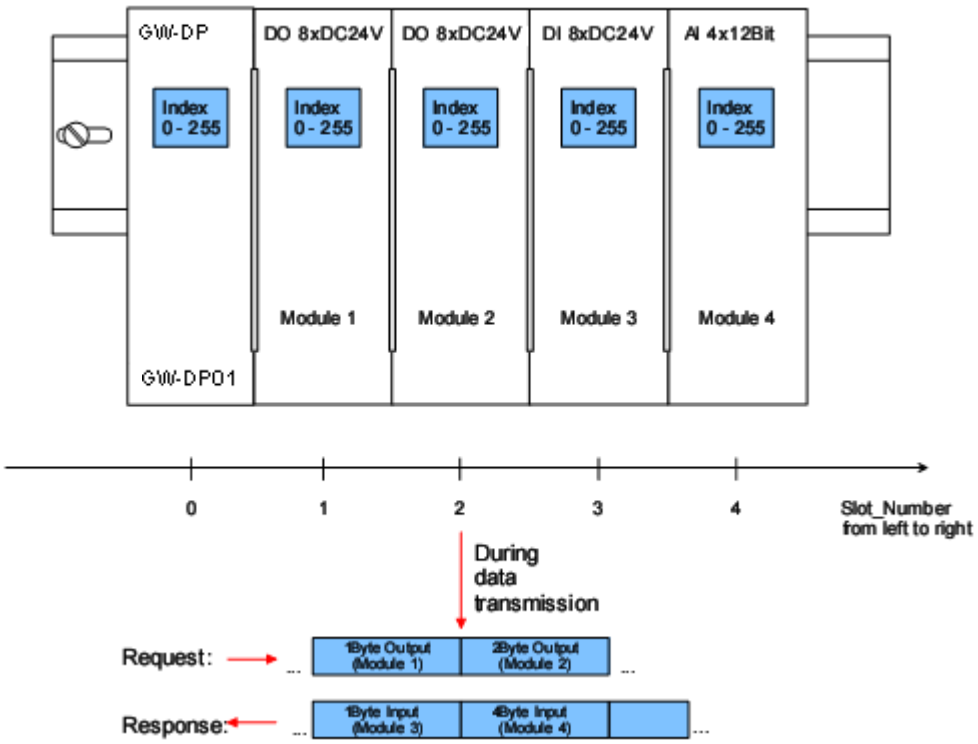
Byte	Bit 7 ... Bit 0	Default
0	Bit 2 ... 0: 0 (fix) Bit 3: 0 = WD-Timebase 10ms 1 = WD-Timebase 1ms Bit 4: 0 (fix) Bit 5: 0 = Publisher-Mode not available 1 = Publisher-Mode available Bit 6: 0 = Fail-Safe-Mode not available 1 = Fail-Safe-Mode available Bit 7: 0 = DP-V1 mode disable 1 = DP-V1 mode enable	C4h
1	Bit 3 ... 0: 0 (fix) Bit 4: 0 = V1: Manufacturer alarm not available 1 = V1: Manufacturer alarm available Bit 5: 0 = V1: Diagnostic alarm not available 1 = V1: Diagnostic alarm available Bit 6: 0 = V1: Process alarm not available 1 = V1: Process alarm available Bit 7: 0 (fix)	70h
2	08h (fix)	08h
3	0Ah (fix)	0Ah
4	81h (fix)	81h
5	00h (fix)	00h
6	00h (fix)	00h
7	Bit 0: 0 = Identifier related diagnostic enable 1 = Identifier related diagnostic disable Bit 1: 0 = Module status enable 1 = Module status disable Bit 2: 0 = Channel-specific diagnostic enable 1 = Channel-specific diagnostic disable Bit 7 ... 3: 0 (fix)	00h
8	Bit 6 ... 0: 0 (fix) Bit 7: 0 = Data format Motorola 1 = Data format Intel (only at analog modules)	00h
9…12	00h (fix)	00h

Data format Motorola/Intel

This parameter is exclusively evaluated with deployment of analog modules and refers to how a value is stored in the CPU address range.
In the *Motorola format* (default) the bytes were stored in descending significance i.e. the 1st byte contains the high byte and 2nd byte the low byte.
In the Intel format the value is switched and it is worked with ascending significance i.e. the 1st byte contains the low byte and 2nd byte the high byte.

Addressing with Slot and Index

When addressing data, Profibus assumes that the physical structure of the slaves is modular or it can be structured internally in logical functional units, so-called modules. This model is also used in the basic DP functions for cyclic data communication where each module has a constant number of input-/output bytes that are transmitted in a fixed position in the user data telegram. The addressing procedure is based on identifiers, which characterize a module type as input, output or a combination of both. All identifiers combined produce the configuration of the slave, which is also checked by the DPM1 when the system starts up.
The acyclic data communication is also based on this model. All data blocks enabled for read/write access are also regarded as assigned to the modules and can be addressed using slot number and index.
The Slot-Number addresses the module and the index addresses the data blocks assigned to a module. The Slot_Number = 0 addresses the data of the Profibus gateway, the Slot_Number > 0 addresses the data of the Function modules.



Read res. write access via SFB 52 res. 53

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

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

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

Data transmission

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

Data from DP-V1 slave

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

Index	Access	Description
A0h	R	Device name (VIPA 253-1DP01)
A1	R	Hardware Version (V1.00)
A2h	R	Software Version (V1.00)
A3h	R	Serial number from the device (e.c. 000347 = 30h, 30h, 30h, 33h, 34h, 37h)
A4h	R	Device configuration (see module configuration and module type)
D0h	R	Number of stored diagnostic
	W	Deletes diagnostic entries
D1h	R	Diagnostic entries
	W	Stores diagnostic entries permanently in the FLASH memory
FFh	R	I&M functions
	W	

R = Read; W = Write

With every D1h call a stored diagnostic entry with max. 26Byte is displayed starting with the newest one.
Basically every stored diagnostic entry has the following structure:

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

Data of the function modules

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

R = Read; W = Write

Module configuration

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

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

GW-DPx1 - DP-V1 slave - Diagnostic functions

Overview

Profibus DP provides an extensive set of diagnostic functions for quick error localization. Diagnostic messages are transferred via the bus and collected by the master.
At the DP-V1 the device related diagnostic has been improved as further function and is subdivided into the categories alarms and status messages.
Additionally in the DP-V1 slave from ELCO the last 100 alarm messages are stored in a RAM res. in the flash with a time stamp and may be evaluated with a software.
For this, please call the ELCO hotline!

Internal diagnostic system messages

The system also stores diagnostic messages like the states "Ready" res. "DataExchange" that are not passed on to the master.
With every status change between "Ready" and "DataExchange" the Profibus slave stores the diagnostic-RAM content in a Flash-ROM and writes it back to the RAM at every reboot.

Manual storage of diagnostic data

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

Diagnostic messages at voltage failure

At voltage failure res. decreasing voltage a time stamp is stored in the EEPROM. If enough voltage is still left, a diagnostic output to the master occurs.
At the next reboot an undervoltage/shut-down diagnostic message is generated from the time stamp of the EEPROMs and is stored in the Diagnostic-RAM.

Structure of the DP-V1 diagnostic data via Profibus

The diagnostic messages that are created by the Profibus slave have, depending on the parameterization, a length of 58Byte.
As soon as the Profibus slave sends a diagnostic to the master, the max. of 58Byte diagnostic data are prepended by 6Byte norm diagnostic data:

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

*) Can be enabled or disabled via parameterization

Diagnostic data
Due to the restrictions there are the following diagnostic data for the GW-DP31 - ECO

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

*) Can be enabled or disabled via parameterization

Norm diagnostic data

At the transfer of a diagnostic to the master the slave norm diagnostic data are prepended to the diagnostic bytes. More detailed information to the structure of the slave norm diagnostic data is to find in the norm papers of the Profibus User Organization.
The slave norm diagnostic data have the following structure:

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

Enhanced diagnostic

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

Note!
Note that the length of the enhanced diagnostic of the GW-DP31 - ECO is limited to 2.

Enhanced diagnostic

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

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

Channel specific Diagnostic

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

Channel-specific diagnostic

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

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

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

Interrupts

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

Contents

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

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

Alarm status

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

Alarm status Byte x ... x+3

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

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

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

Continued ⋯

⋯Continue

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

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

Alarm status at process alarm Bytes x+4 to x+7
More detailed information to the diagnostic data is to find in the concerning module descriptions.

Installation guidelines

Profibus in general

- The ELCO Profibus DP network must have a linear structure.
- Profibus DP consists of minimum one segment with at least one master and one slave.
- A master is always used in conjunction with a CPU.
- Profibus supports a max. of 126 participants.
- A max. of 32 devices are permitted per segment.
- The maximum length of a segment depends on the transfer rate :
  9.6 ... 187.5kBaud → 1000m
  500kBaud → 400m
  1.5MBaud → 200m
  3 ... 12MBaud → 100m
- The network may have a maximum of 10 segments. Segments are connected by means of repeaters. Every repeater is also seen as participant on the network.
- All devices communicate at the same baud rate, slaves adapt automatically to 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 Installation and integration with Profibus

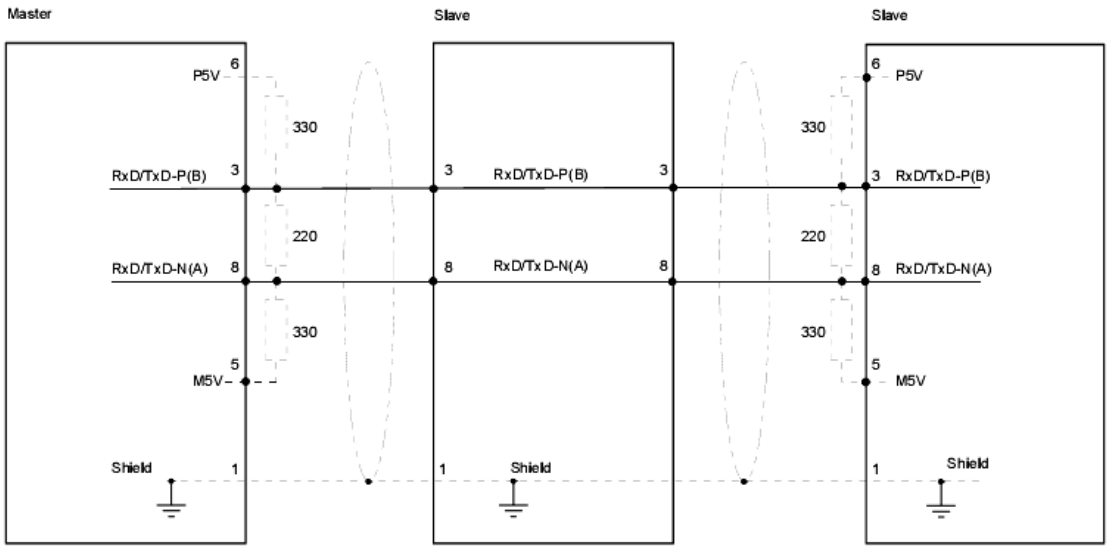
- Any FO master may only be installed on an electrical system by means of an Optical Link Plug, i.e. slaves must not be located between a master and the OLP.
- Only one converter (OLP) is permitted between any two masters.
- Assemble your Profibus system using the required modules.
- Adjust the address 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.

Profibus using RS485

Profibus employs a screened twisted pair cable based on RS485 interface specifications as the data communication medium. The Profibus line must be terminated with ripple resistor.

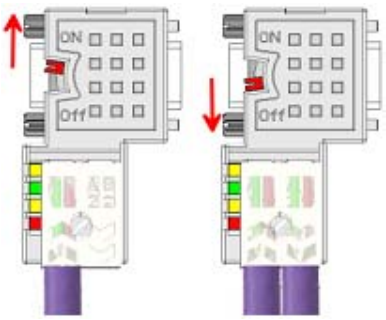
Bus connection

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



Termination with "EasyConn"

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

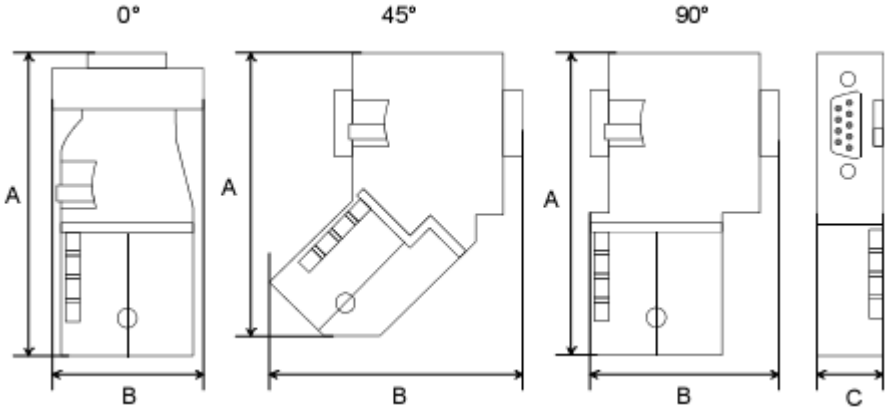


Attention!
The terminating resistor is only effective, if the connector is installed at a slave and the slave is connected to a power supply.

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

"EasyConn" Bus connector

In systems with more than two stations all partners are wired in parallel. For that purpose, the bus cable must be feed-through uninterrupted. 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.

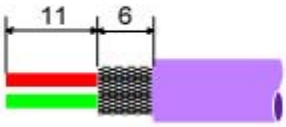


	0°	45°	90°
A	64	61	66
B	34	53	40
C	15,8	15,8	15,8

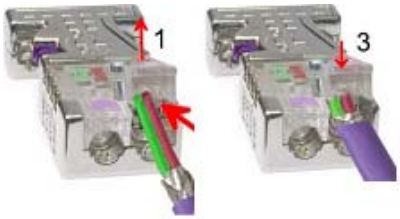
all in mm

Note!
To connect this plug, please use the standard Profibus cable type A with solid wire core according to EN50170.
Under the order no. 905-6AA00 VIPA offers the "EasyStrip" de-isolating tool, that makes the connection of the EasyConn much easier.

Assembly



Dimensions in mm



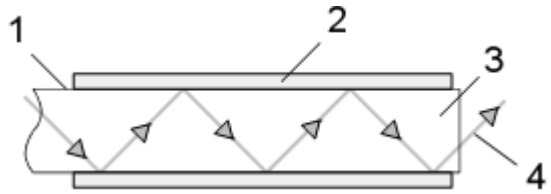
- Loosen the screw.
- Lift contact-cover.
- Insert both wires into the ducts provided (watch for the correct line color as below!)
- Please take care not to cause a short circuit between screen and data lines!
- Close the contact cover.
- Tighten screw

(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

ELCO 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 ELCO 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).

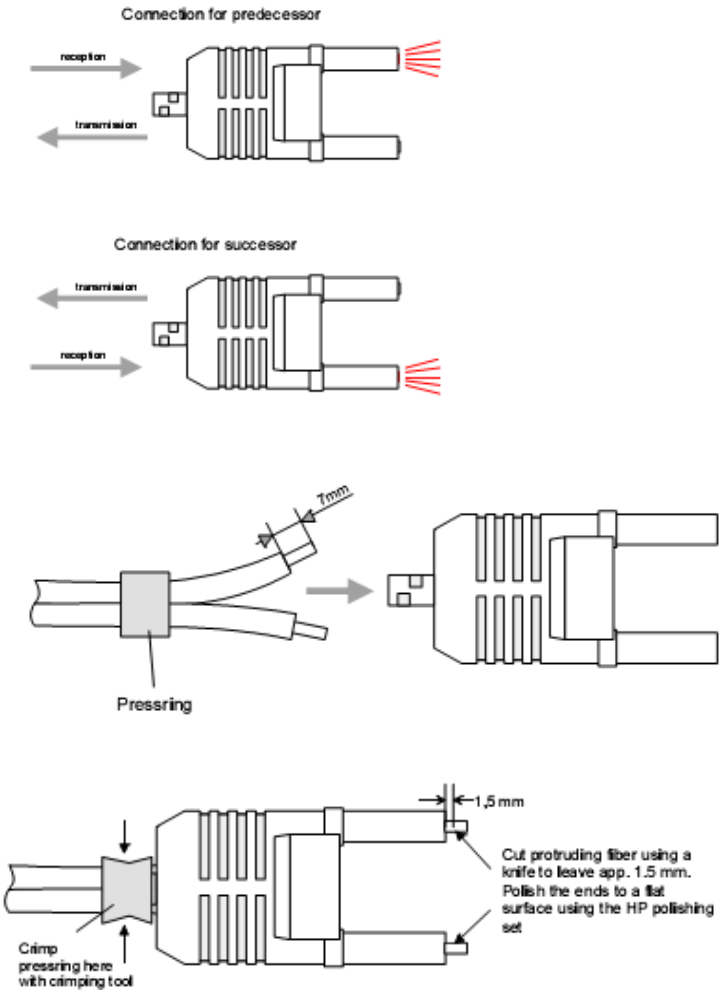
When the bus has been turned on, you recognize the receive line by the light, while the darker line is the send line.

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.

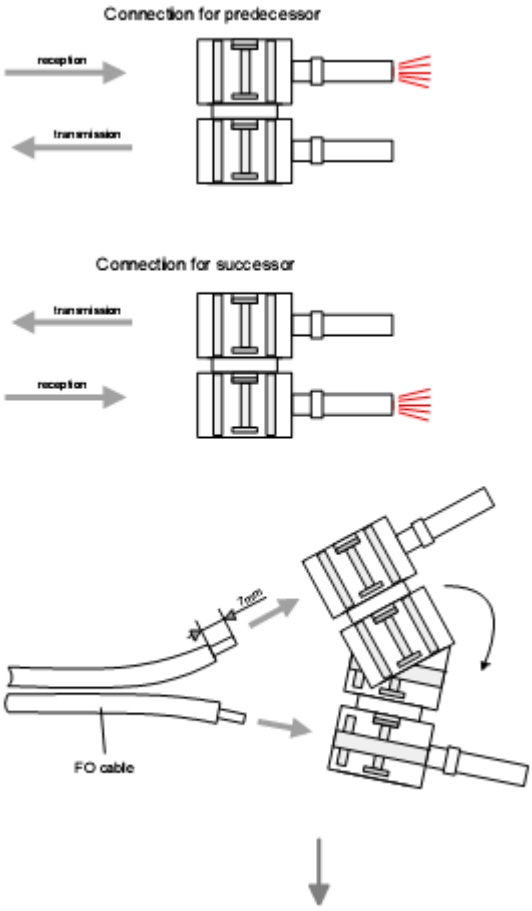
Connector installation

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 ndidentical to the 2 connector type shown below.

FO connector without crimp-type assembly



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.

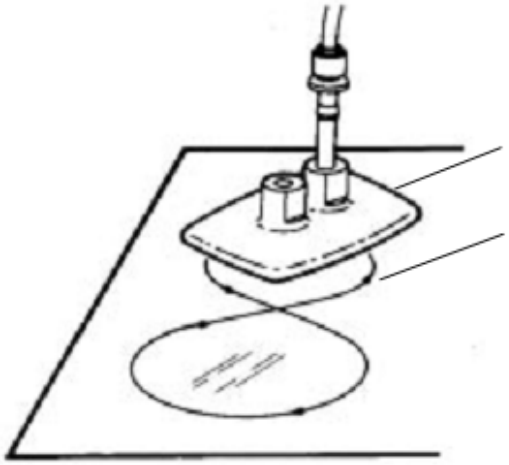
Disadvantages: no protection against polarity reversal.

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.).

Cutting and polishing the ends of the FO cable



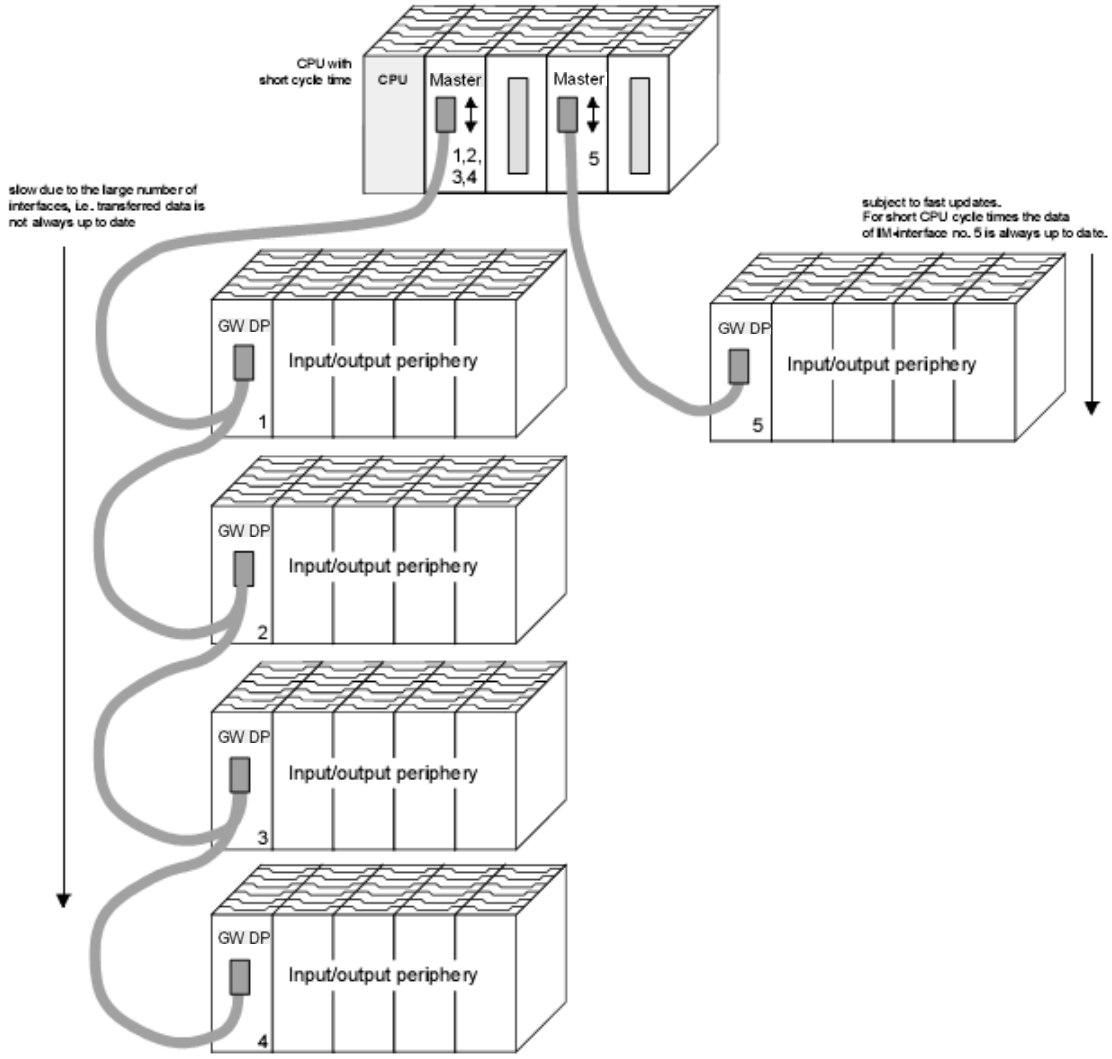
Cut protruding fiber using a knife so that app. 1.5mm are still visible. Polish the ends to a flat surface using the HP polishing set (HP order no.:HFBR-4593).

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

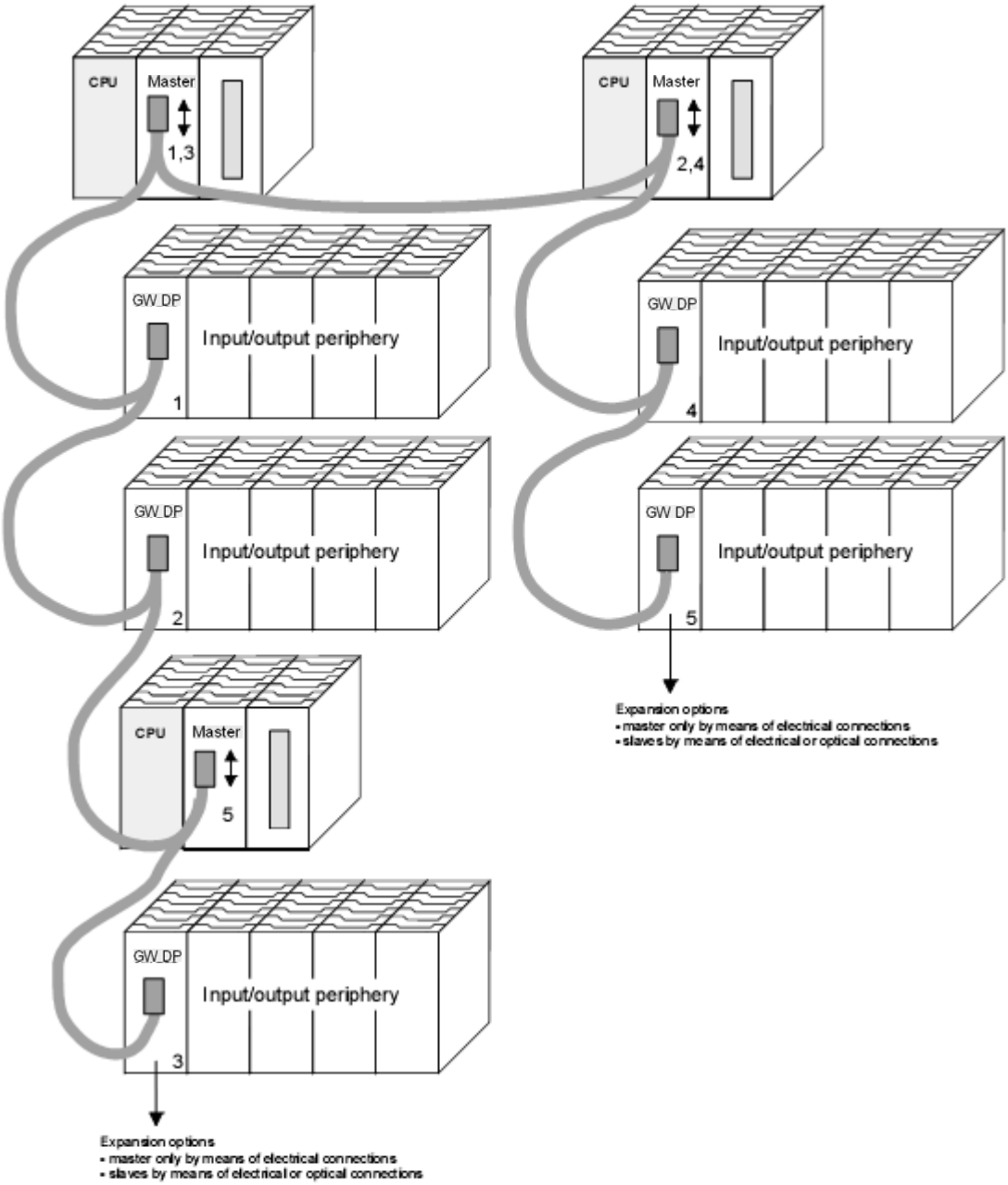
One CPU and multiple master connections

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.

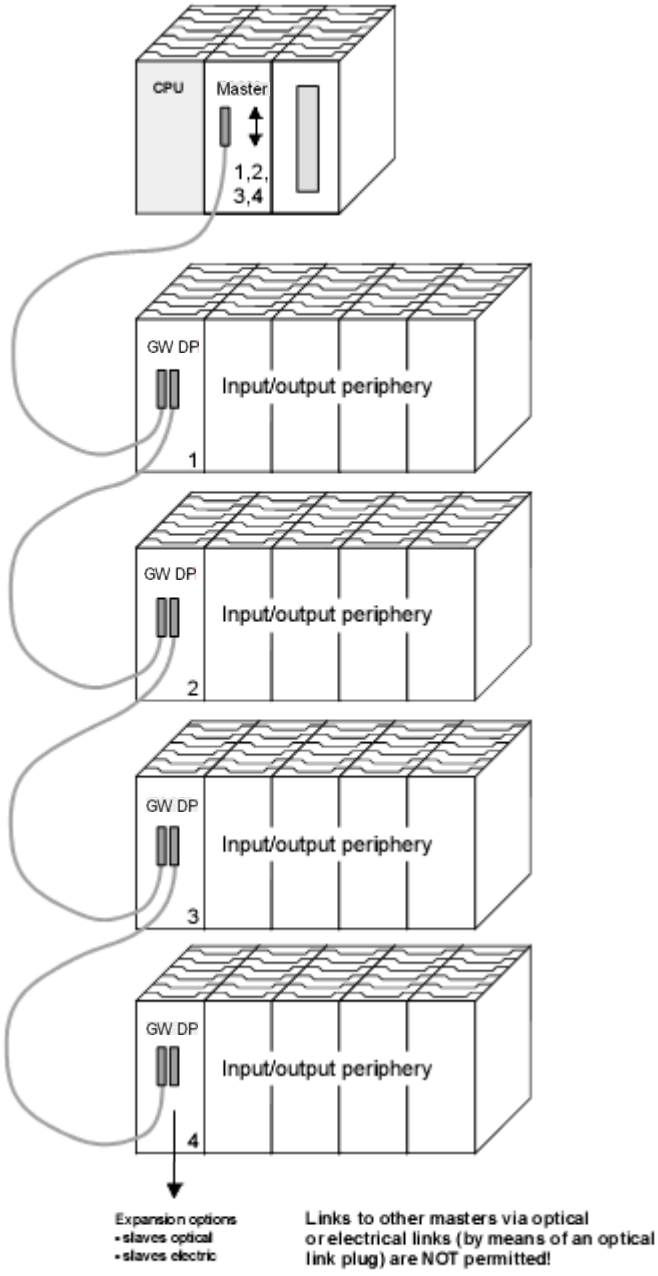


Multi master system

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

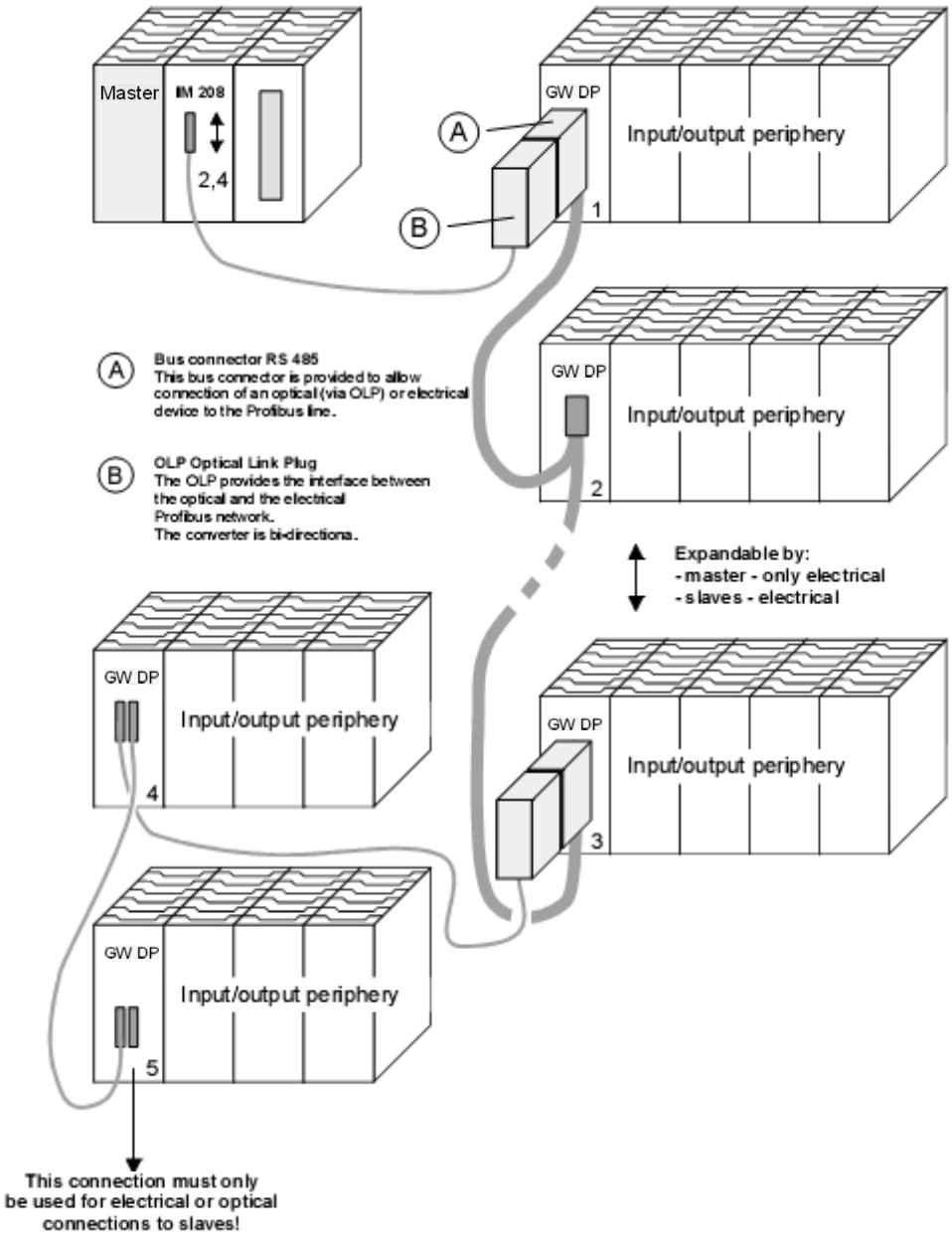


Optical Profibus



Combination of optical and electrical Profibus

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



Technical data

Profibus DP Slave

FC2-GW-DP01/31

Electrical data	**FC2-GW-DP01 (DP-V0/V1)**	**FC2-GW-DP31 - ECO (DP-V0/V1)**
Current consumption	max. 1A	max. 0.3A
Output current backplane bus	max. 3.5A	max. 0.8A
Power supply	DC 24V (20.4 ... 28.8V) ext. power supply at front	
Isolation	⩾ AC 500V	
Status indicator	via LEDs on the front	
Connections/interfaces	Profibus connector	
Profibus interface		
Connection	9pin D-type socket	
Network topology	Linear bus, active bus terminator at both ends, tap lines arepermitted.	
Medium	Screened twisted pair cable, under certain conditions unscreened lines are permitted.	
Data transfer rate	9.6kBaud to 12MBaud	
Total length	100m without repeater for 12MBaud; 1000m with repeater	
Max. no. of stations	32 stations in any segment without repeater. Extendible to 126 stations when using repeaters.	
Diagnostic functions		
Standard diagnostic	The last 100 results are stored in Flash-ROM.	
Extended diagnostic	possible	
Data		
Input data	max. 152Byte	max. 244Byte
Output data	max. 152Byte	max. 244Byte
Combination with peripheral modules		
max. no of modules*	32	8
max. digital I/Os	16	8
max. analog I/Os	16	8
Dimensions and weight		
Dimensions (WxHxD) in mm	25,4x76x78	
Weight	80g	

FC2-GW-DP11

Electrical data	**FC2-GW-DP11 (DP-V0/V1)**
Power supply	DC 24V (20.4 ... 28.8V), ext. power supply at front
Current consumption	1A max.
Output current backplane bus	max. 3.5A
Isolation	⩾ AC 500V
Status indicator	via LEDs on the front
Connections/interfaces	4pole FO socket Profibus connection
Profibus interface	
Connection	4pole socket for fiber optic cable
Network topology	Linear structure with dual FO cable, no bus termination 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 (see below)
Diagnostic functions	
Standard diagnostic	The last 100 results are stored in Flash-ROM.
Extended diagnostic	possible
Data	
Input data	max. 244Byte
Output data	max. 244Byte
Combination with peripheral modules	
max. no of modules*	32 (depending on current consumption)
max. digital I/Os	32
max. analog I/Os	16
Dimensions and weight	
Dimensions (WxHxD) in mm	25,4x76x78
Weight	80g