Operating Manual

DF30DP, DF31DP

digiCLIP

HBM

A1894-3.0 en

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1 Safety instructions

Appropriate use

The digiCLIP with the connected transducers may be used for measurement and directly related control and regulation tasks, only. Any other use is not appropriate.

To ensure safe operation, the transducer may only be used according to the specifications given in this manual. It is also essential to comply with the legal and safety requirements for the application concerned during use. The same applies to the use of accessories.

Each time, before starting up the equipment, you must first run a project planning and risk analysis that takes into account all the safety aspects of automation technology. This particularly concerns personal and machine protection.

Additional safety precautions must be taken in plants where malfunctions could cause major damage, loss of data or even personal injury. In the event of a fault, these precautions establish safe operating conditions.

This can be done, for example, by mechanical interlocking, error signaling, limit value switches, etc.

WARNING

The device must not be connected directly to the mains supply. The supply voltage must be 10 V … 30 V (DC). It is essential to ensure that the device can be quickly disconnected from the mains supply at any time.

Before connecting the device, make sure that the mains voltage and current type specified on the name plate correspond to the mains voltage and current type at the site of installation and that the current circuit used is sufficiently safe.

The device complies with the safety requirements of DIN EN 61010-part1 (VDE 0411-part1).

General dangers in the case of non-observance of the safety instructions

The digiCLIP complies with the state of the art and is operationally reliable. If the device is used and operated inappropriately by untrained personnel, residual dangers might develop.

Any person charged with device installation, operation, maintenance or repair must in any case have read and understood the operating manual and the safety instructions, in particular.

Conditions on site

- Protect the device from direct contact with water.
- Protect the device from moisture and humidity or weather conditions such as rain, snow, etc. The degree of protection per EN 60529 standard is IP 20.
- Do not expose the device to direct sunlight.
- Please observe the permissible maximum ambient temperatures stated in the specifications.
- The permissible relative humidity at 31 °C is 95 % (non condensing); linear reduction to 50 % at 40 °C.
- Install the device so that it can be disconnected from the supply voltage at any time without difficulty.
- It is safe to operate the device up to a height of 2000 m.

Maintenance and cleaning

digiCLIP devices are maintenance-free.

- Withdraw the mains plug from the socket before carrying out any cleaning.
- Clean the housing with a soft, slightly damp (not wet!) cloth. You should **on no account** use solvent, since it may damage the labelling on the front panel and the indicator box.
- When cleaning, ensure that no liquid gets into the device or connections.

Residual dangers

The digiCLIP's scope of performance and supply covers part of the measuring-technology, only. The plant designer/constructor/operator must in addition design, realise and take responsibility for the measuring-system's safety such that potential residual dangers are minimized. The respective regulations must in any case be observed. Residual dangers regarding the measuringsystem must be specified explicitly.

Product liability

In the following cases, the protection provided for the device may be adversely affected. Liability for device functionality then passes to the operator:

- The device is not used in accordance with the operating manual.
- The device is used outside the field of application described in this Chapter.
- The operator makes unauthorized changes to the device.

Warning signs and danger symbols

Important instructions for your safety are specifically identified. It is essential to follow these instructions in order to prevent accidents and damage to property.

Safety instructions are structured as follows:

⚠ **SIGNAL WORD**

Type of danger

Consequences of non-compliance

Averting the danger

- **Warning sign:** draws your attention to the danger
- **Signal word:** indicates the severity of the danger (see table below)
- **Type of danger:** mentions the type or source of the danger
- **Consequences:** describes the consequences of non-compliance
- **Defense:** indicates how the danger can be avoided/bypassed

Danger class according to ANSI

Warning sign, signal word	Significance
WARNING	This marking warns of a *potentially* dangerous situation in which failure to comply with safety requirements *can* **result in death or serious physical injury.**
CAUTION	This marking warns of a *potentially* dangerous situation in which failure to comply with safety requirements *can* **result in slight or moderate physical injury.**
NOTE	This marking draws your attention to a situation in which failure to comply with safety requirements *could* **lead to damage to property**.

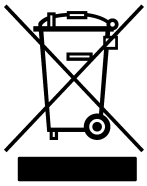
On the module

Meaning: **Take details in the operating manual into account**

On the module

Meaning: **CE mark**

The CE mark is used by the manufacturer to declare that the product complies with the requirements of the relevant EC directives (the Declaration of Conformity can be found at http://www.hbm.com/HBMdoc).



On the module

Meaning : **Statutory waste disposal mark**

The electrical and electronic devices that bear this symbol are subject to the European Waste Electrical and Electronic Equipment Directive 2002/96/EC.

The symbol indicates that the device must not be disposed of as household garbage.

In accordance with national and local environmental protection and material recovery and recycling regulations, old modules that can no longer be used must be disposed of separately and not with normal household garbage.

If you need more information about waste disposal, please contact your local authorities or the dealer from whom you purchased the product.

As waste disposal regulations within the EU may differ from country to country, we ask that you contact your supplier as necessary.

Environmental protection

The product will comply with general hazardous substances limits for at least 20 years, and will be ecologically safe to use during this period, as well as recyclable. This is documented by the following symbol.

On the modul

Meaning: **Statutory mark of compliance with emission limits in electronic equipment supplied to China.**

Working safely

Note

The device must not be connected directly to the mains supply. The supply voltage must be 10 V … 30 V (DC).

The supply connection, as well as the signal and sense leads, must be installed in such a way that electromagnetic interference does not adversely affect device functionality (HBM recommendation: ”Greenline shielding design”, downloadable from the Internet at http://www.hbm.com/Greenline).

Automation equipment and devices must be covered over in such a way that adequate protection or locking against unintentional actuation is provided (such as access checks, password protection, etc.).

When devices are working in a network, these networks must be designed in such a way that malfunctions in individual nodes can be detected and shut down.

Safety precautions must be taken both in terms of hardware and software, so that a line break or other interruptions to signal transmission, such as via the bus interfaces, do not cause undefined states or loss of data in the automation device.

The digiCLIP module must be operated with a safety extra low voltage (18 to 30 V supply voltage (DC)).The supply voltage lead must be no more than 3 m long. **Connecting to a direct voltage network in accordance with EN 61326 is not permitted.** Instead you must use a power pack mounted, for example, in the control cabinet, together with the digiCLIP modules.

Note

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Reconstruction and modifications

HBM’s express consent is required for modifications regarding the digiCLIP’s construction and safety. HBM does not take responsibility for damage resulting from unauthorized modifications.

In particular, repair and soldering works on the boards are prohibited. If complete componentry is replaced use original HBM components, only.

The product is delivered from the factory with a fixed hardware and software configuration. Changes can only be made within the possibilities documented in the manuals.

Qualified personnel

Qualified personnel means persons entrusted with siting, mounting, starting up and operating the product, who possess the appropriate qualifications for their function (qualified electrician, or by someone with electrical training under the supervision of a qualified electrician).

This device is only to be installed and used by qualified personnel strictly in accordance with the specifications and with the safety rules and regulations which follow.

This includes people who meet at least one of the three following requirements:

- Knowledge of the safety concepts of automation technology is a requirement and as project personnel, you must be familiar with these concepts.
- As automation plant operating personnel, you have been instructed how to handle the machinery and are familiar with the operation of the equipment and technologies described in this documentation.
- As commissioning engineers or service engineers, you have successfully completed the training to qualify you to repair the automation systems. You are also authorized to activate, to ground and label circuits and equipment in accordance with safety engineering standards.

It is also essential to comply with the legal and safety requirements for the application concerned during use. The same applies to the use of accessories.

Maintenance and repair work on an open device with the power on must only be carried out by trained personnel who are aware of the dangers involved. During installation and operation, operating personnel must act in accordance with the electrostatic discharge safety measures.

Important

The safety instructions are also included in paper format with the product.

2 Introduction

2.1 Scope of supply and accessories

Scope of supply:

- 1 digiCLIP module — Order no.: 1−DF30DP / Order no.: 1−DF31DP
- Coded plug connector for the sensor connection — Order no.: 3−3312.0404
- Connector terminal for PROFIBUS and supply voltage — Combicon order no.: CR−MSTB
- digiCLIP Operating Manual

CD−ROM including free setup software (digiCLIP Assistant), (a free updated version of the Assistant can be downloaded from http://www.hbm.com/support).

For DF31DP:

- Coded plug connector for digital IN/OUT (2 pieces)

24 V / 0 V	Order No.: 3−3312.0418
IN / OUT	Order No.: 3−3312.0444

Accessories:

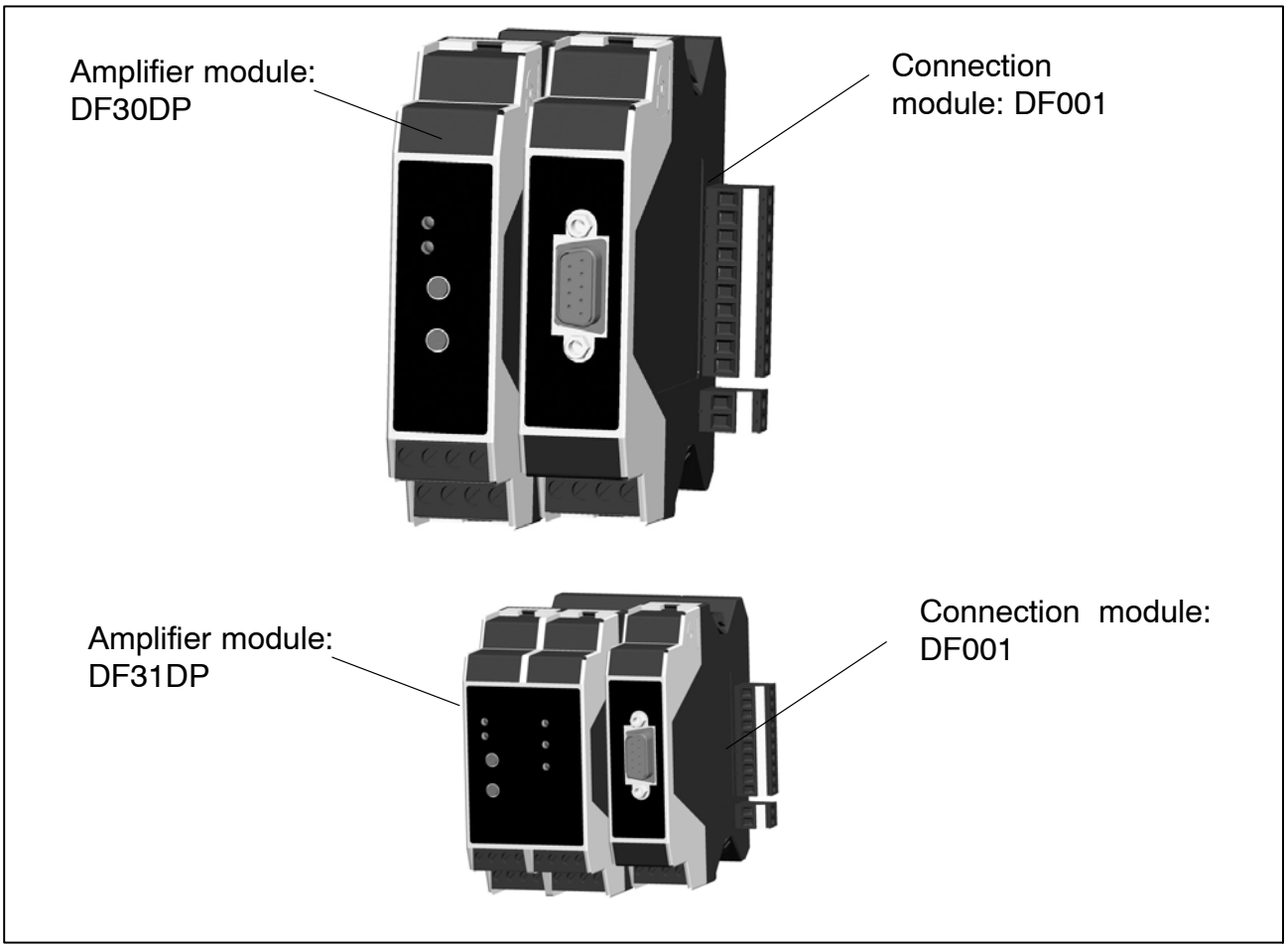
- 1 connector set: Order no.:1−digiCLIP−ST

  containing 1 ”PROFIBUS” connector terminal  and

  1 male and 1 female connector for ”synchronization” 

  (needed for two−tier installation in the control cabinet)

- Connection module for frontal assignment of the rear terminal strip (bus and power supply) Order no.:1−DF001



2.2 General

The DF30DP/DF31DP module from the digiCLIP product line is a carrier−frequency amplifier suitable for connecting force transducers, pressure transducers, torque transducers and load cells.

The DF30DP/DF31DP module is set up and parameterized by means of the digiCLIP Setup Assistant and a simple interface under MS−Windows.

The Setup Assistant also provides extensive Online Help, with descriptions of all the functions and many tips for the DF30DP/DF31DP.

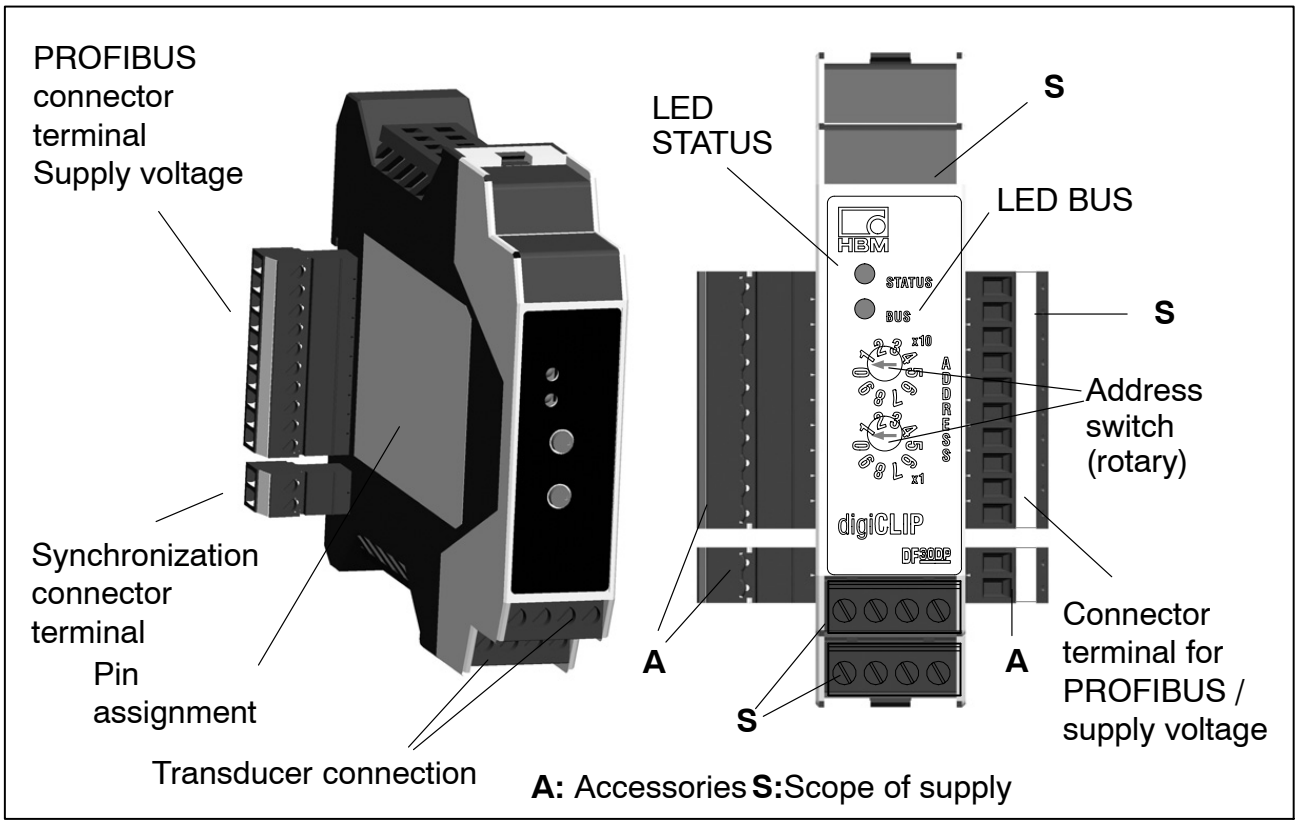


Fig. 2.1: digiCLIP module DF30DP

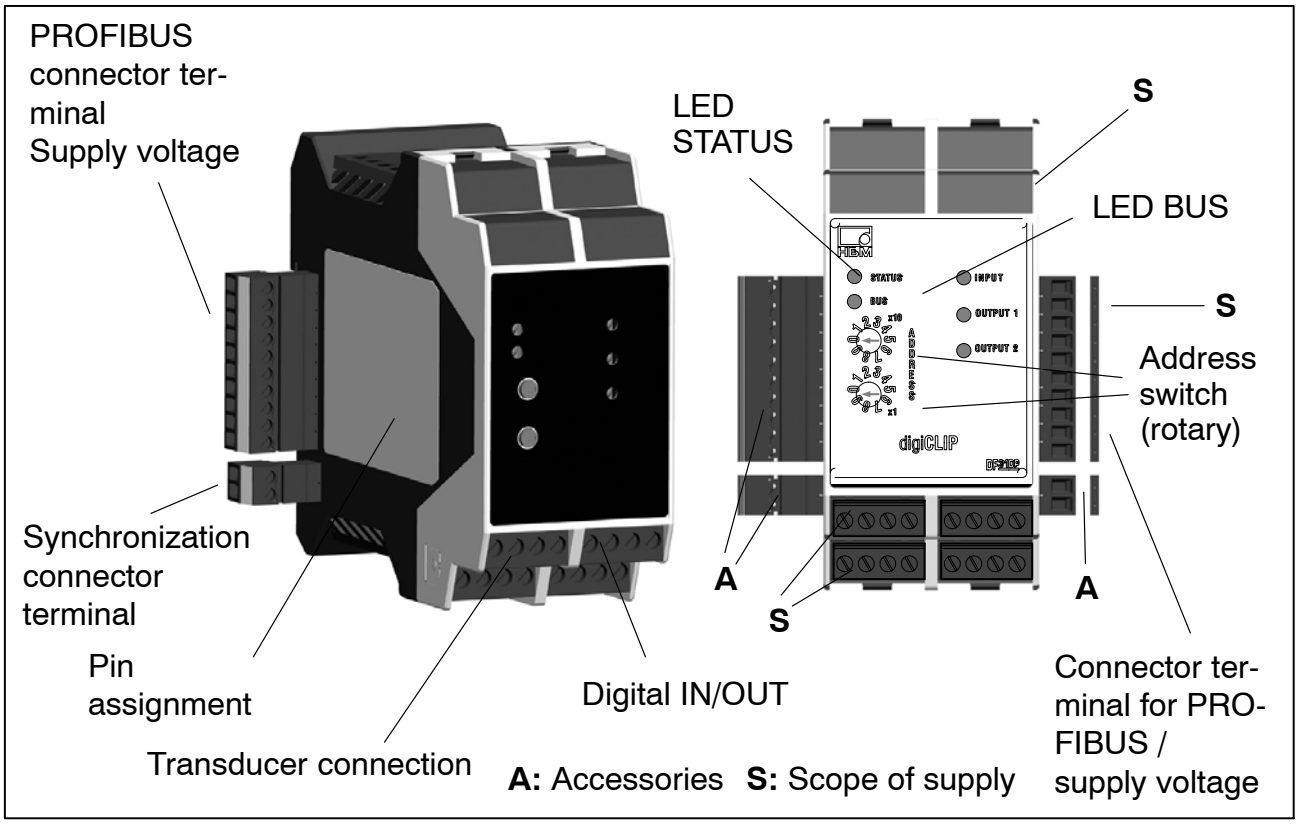


Fig. 2.2: digiCLIP-Modul DF31DP

3 Installation

The modules are mounted on support rails in accordance with DIN EN 60715 by hooking on the top edge and engaging the spring plate at the bottom edge.

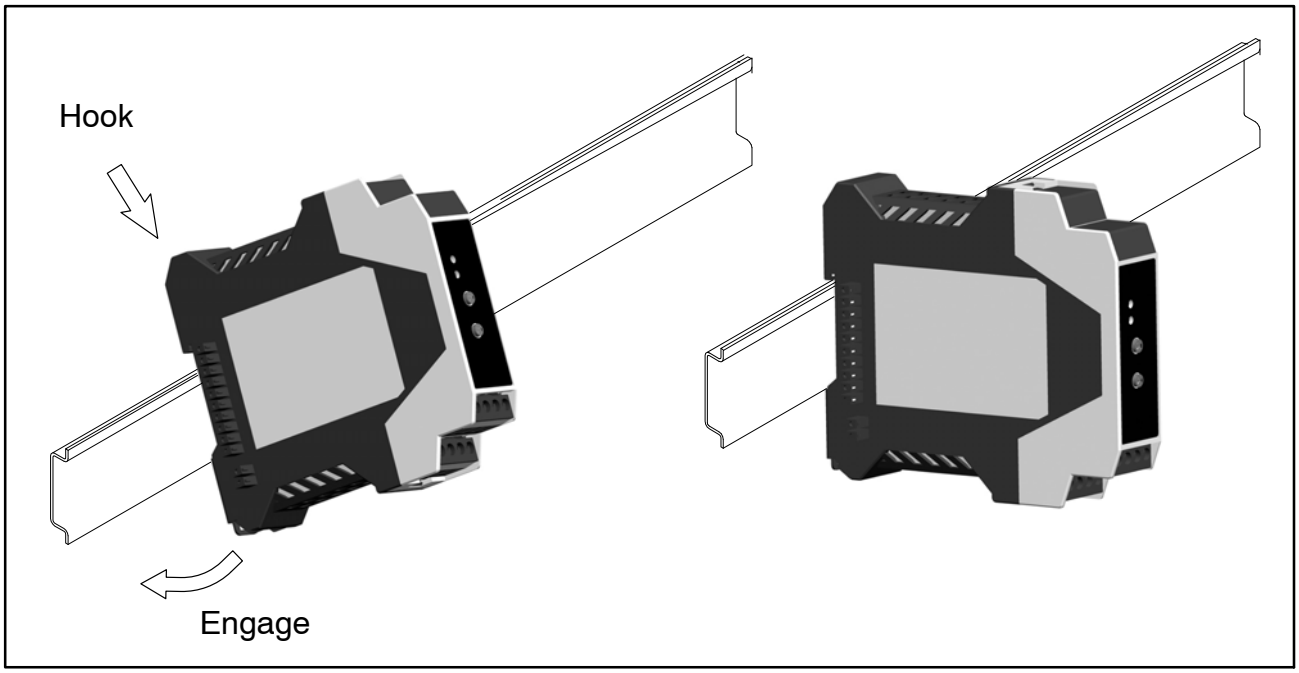


Fig. 3.1 Mounting on a support rail (here : DF30DP)

To remove, press down on the spring plate with a screwdriver and detach the housing.

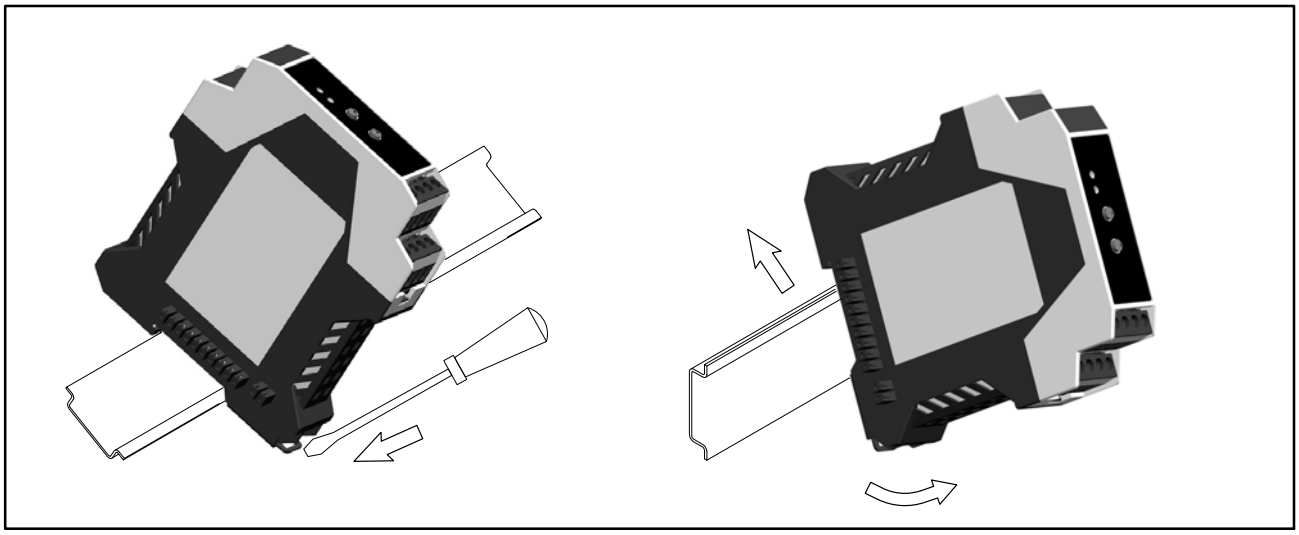


Fig. 3.2: Removal

WARNING

The support rail should be connected to grounded conductor potential ⏚ .

Several type DF30DP and DF31DP can be connected, also in mixed operation. The rear multipoint connector with internal wiring makes the local connection for supply voltage, PROFIBUS and synchronization.

Interconnecting several modules:

- Intermate modules 1, 2 and 3
- When mounting at several levels: mate the SYNC–OUT connector to module 3 (see Fig. 3.4 and Fig. 4.5) and connect to SYNC–IN of the first module of the next level

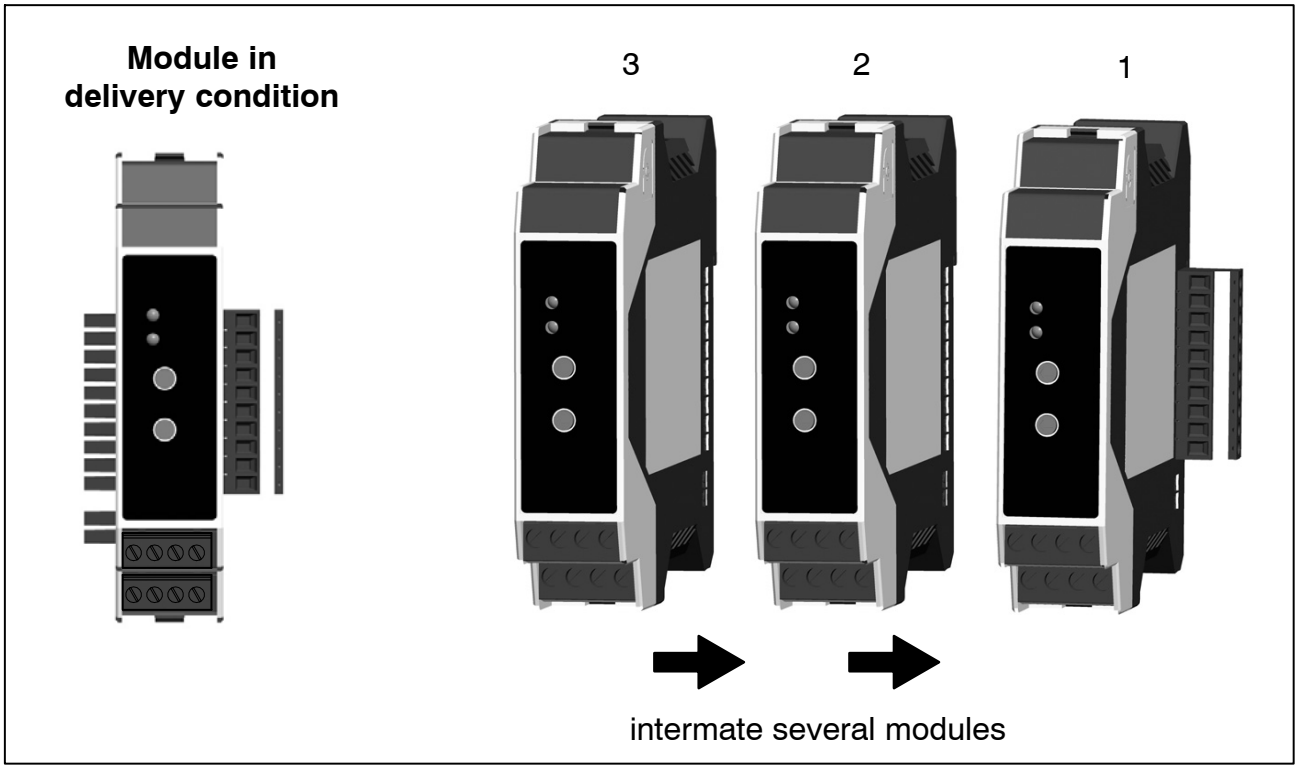


Fig. 3.3 Module installation

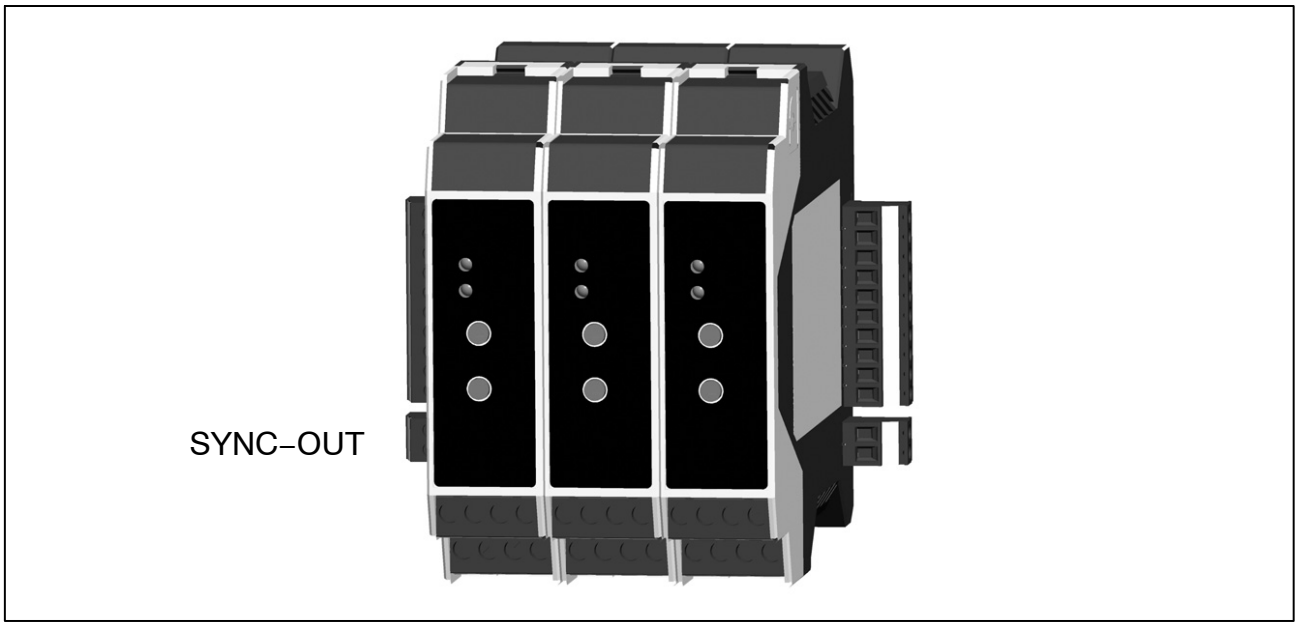


Fig. 3.4: Modules mounted side–by–side

4 Electrical connection

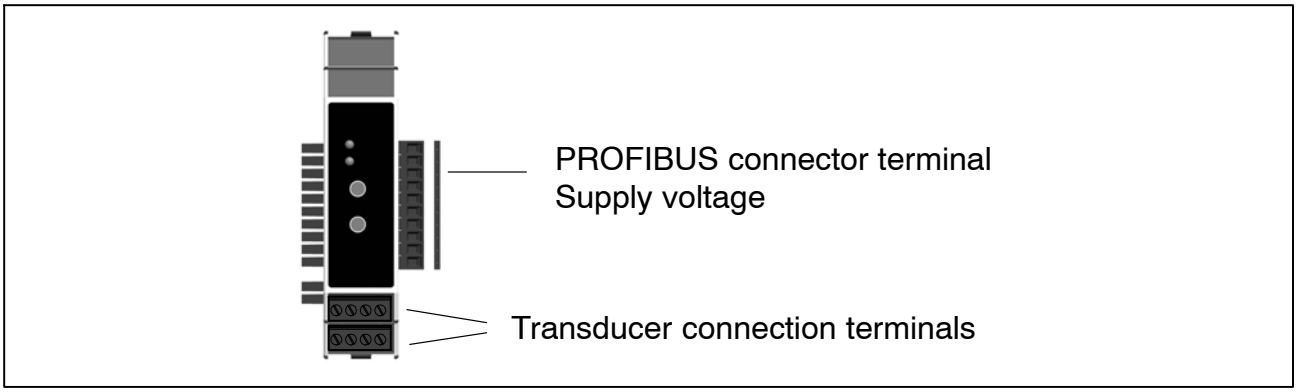
Transducers can be connected to the module in a strain gage full–bridge circuit.

The transducers are connected via 2 screw terminals on the front. Use the strain relief provided. The shield of the transducer cable must make contact over a large area. The clamping area is 0.2 mm^2 to 3.3 mm^2.

If several conductors are to be connected to a terminal, the line cross–section must be adapted accordingly.

The Profibus and the power supply can be connected via the 10–pin terminal strip at the side, or via an adapter module. The clamping area is 0.05 mm^2 to 2 mm^2.

End sleeves (without plastic collars, length 10 mm) should be used on the strands to connect the wires to the terminals.



Note

But because of the design of the DF30/31DP modules and possible reflections on the Profibus, especially at high bus speeds, no more than 4 modules should be interconnected (be sure to comply with section 4.5, Profibus repeater for digiCLIP groups). The DF001 connection module does not include a bus termination resistor. It needs to be connected externally.

Voltage supply via the DF001 adapter module's *front side* is identical to the voltage supply via the *rear terminal strip* (terminal 9 and 10) (24 V / 0V).

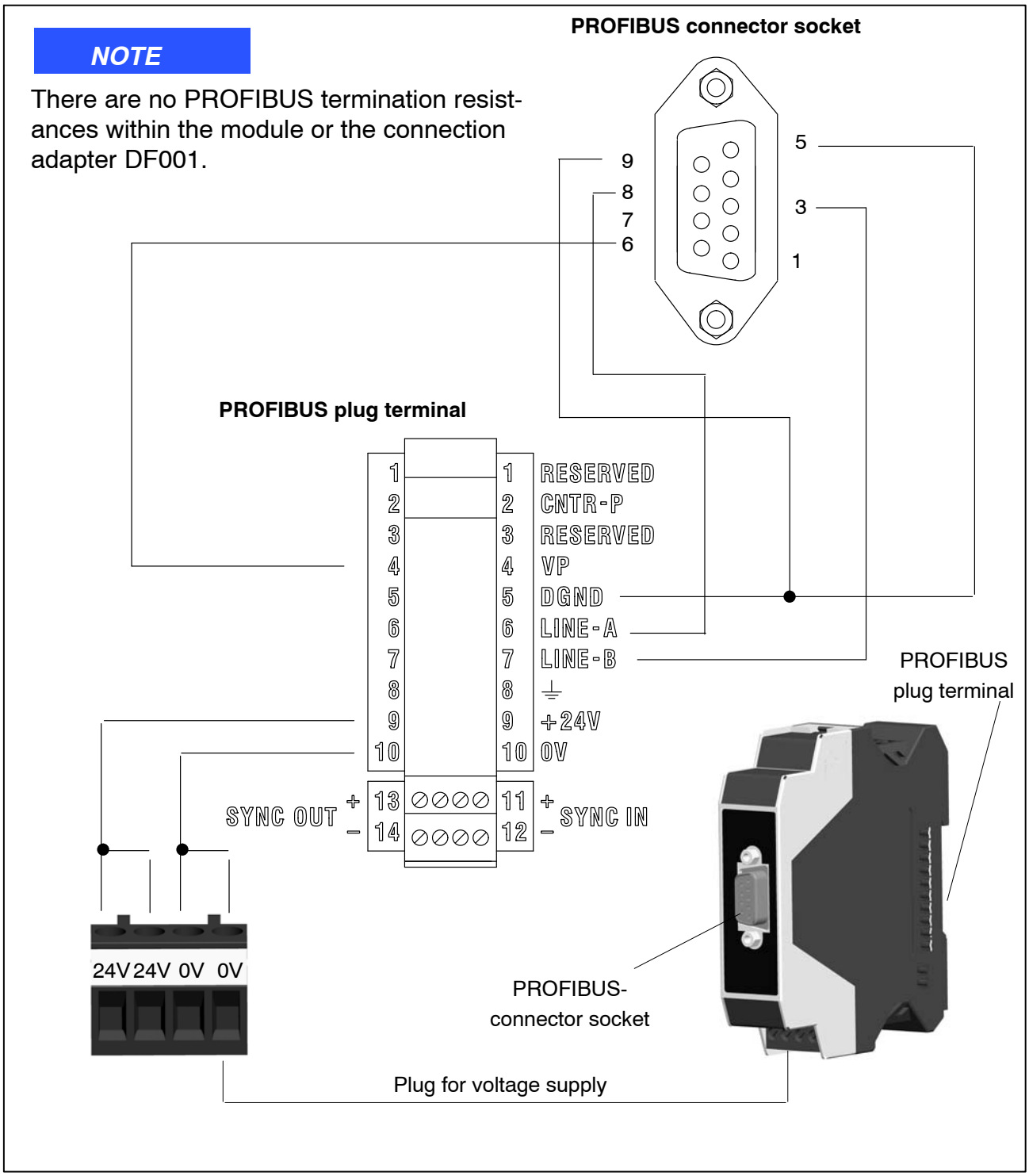
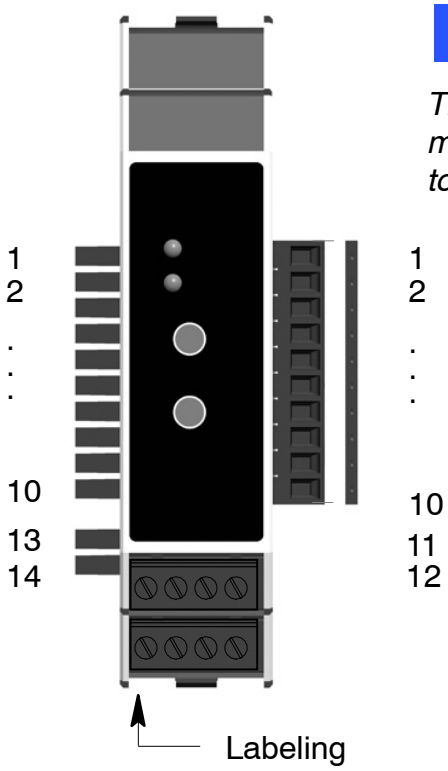


Fig. 4.1: DF30DP: pin assignment of the DF001 adapter module

The plugs for the voltage supply and the PROFIBUS plug terminal are **not** electrically isolated.



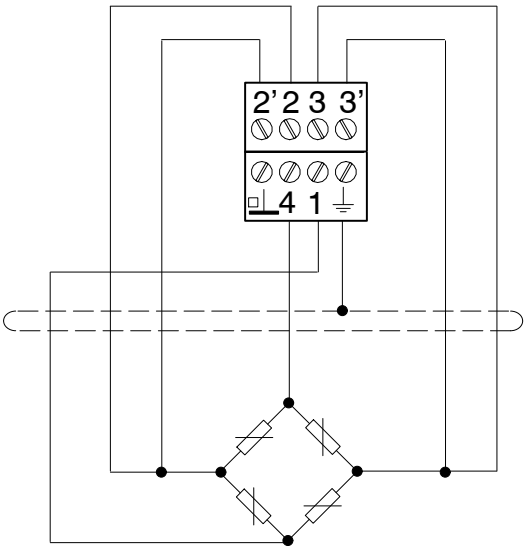
NOTE

The reserve connections must have nothing connected to them.

Assignment

PIN

1	Reserve
2	CNTR–P
3	Reserve
4	VP
5	DGND
6	LINE_A
7	LINE–B
8	⏚
9	+24 V
10	0 V
11	SYNC IN +
12	SYNC IN –
13	SYNC OUT +
14	SYNC OUT–



NOTE

The DGND terminal (Pin 5) does not correspond to the ground potential of the amplifier ⏚, however, it corresponds to the ground potential of the Profibus.

Terminal markings on the transducer connection terminals (view from below)

Fig. 4.2: DF30DP: Plug–in terminal assignment (single–shielded cable)

Terminal	**Function**	**Color** (HBM cable)
1	measurement signal (+)	WH (white)
2	excitation voltage (–)	BK (black)
2'	sense lead (–)	GY (gray)
3	excitation voltage (+)	BU (blue)
3'	sense lead (+)	GN (green)
4	measurement signal (–)	RD (red)
⏚	cable shield / grounding	

Transducer connection in six-wire configuration

The transducer connection terminals are coded with coding tabs, to prevent confusion when attaching them to the female connectors.

Six–wire circuitry is used for connection (with two sense leads).

Note

With double-shielded cables, the inner shield is connected to ground, the outer shield to the housing connection.

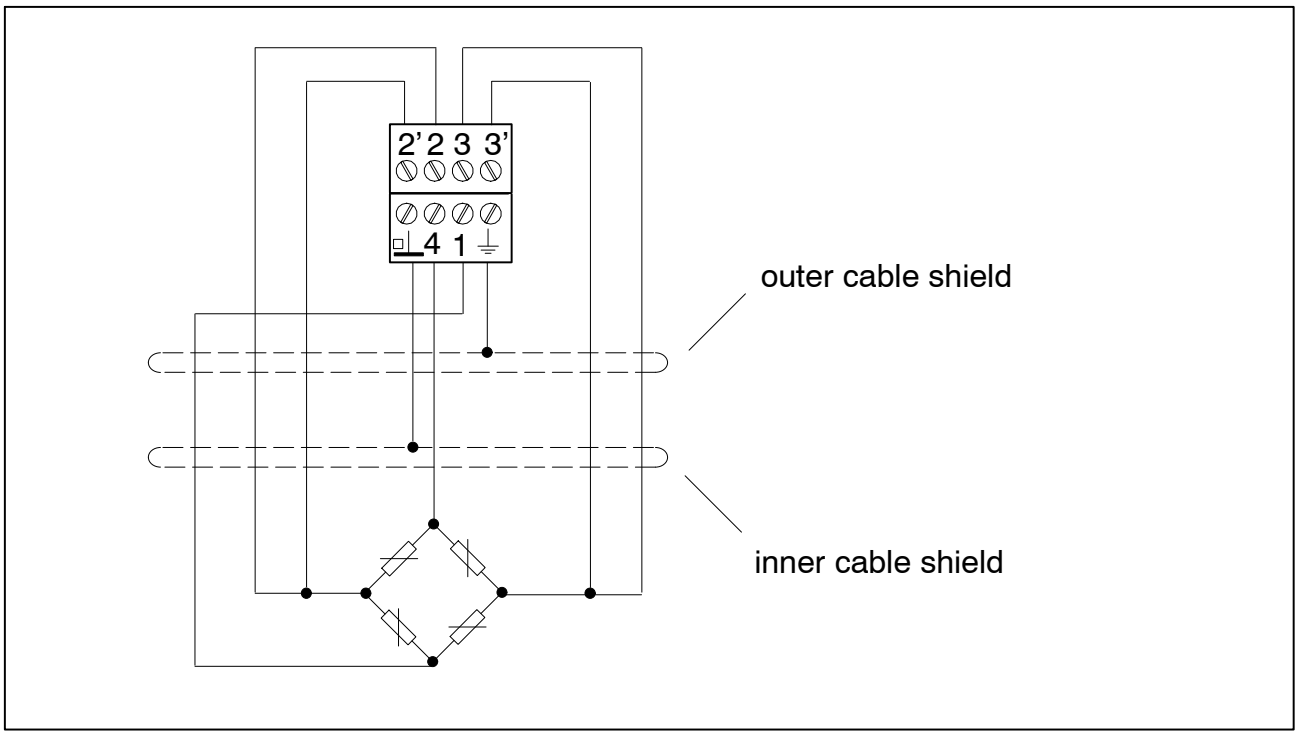


Fig. 4.3: Transducer connection in six–wire configuration

Transducer connection in four-wire configuration

When connecting in four–wire circuitry, the connections for long lead compensation are missing. So line influences have to be calibrated in. This can be done by the digiCLIP Assistant in the ”2–point scaling” range.

When connecting in four-wire circuitry, TEDS functionality is not available.

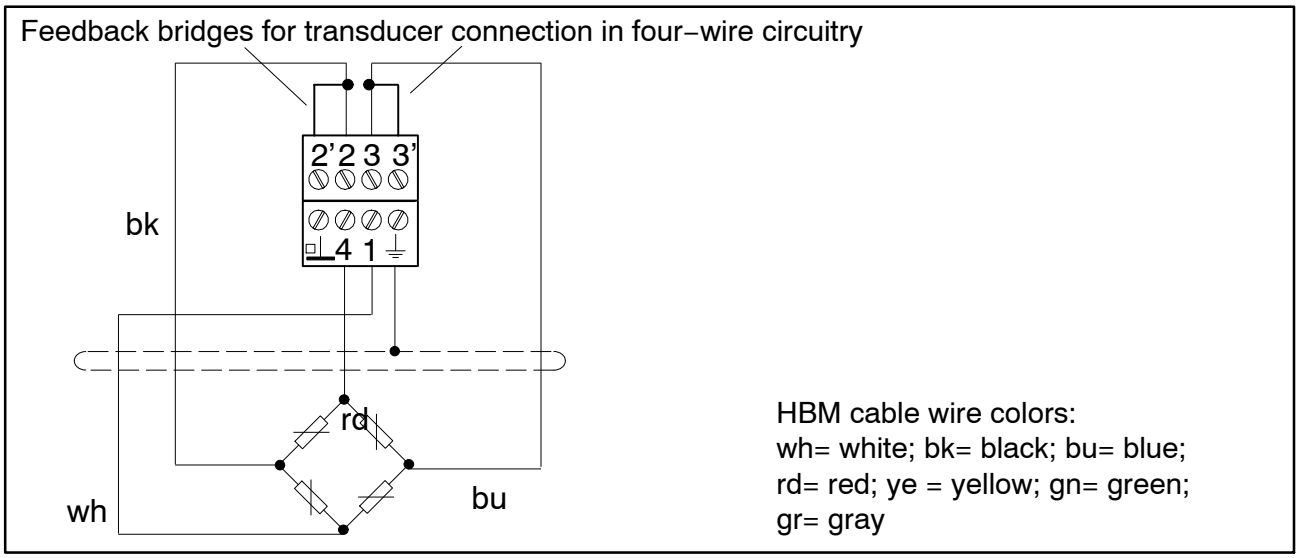


Fig. 4.4: Four−wire connection with feedback bridges

When connecting a transducer in four−wire circuitry, the sense leads must be connected to the relevant bridge excitation line (PIN 2’−2 and Pin 3’−3) by jumpers, as otherwise a sensor error will be detected.

Note

Use standard HBM cables for connecting the transducers. When using other shielded, low-capacitance measurement cables, attach the shield of the transducer cable to the cable shield connection in accordance with HBM Greenline information. The power supply for the digiCLIP modules must not come from a direct voltage network. We recommend a local voltage supply, in the control cabinet.

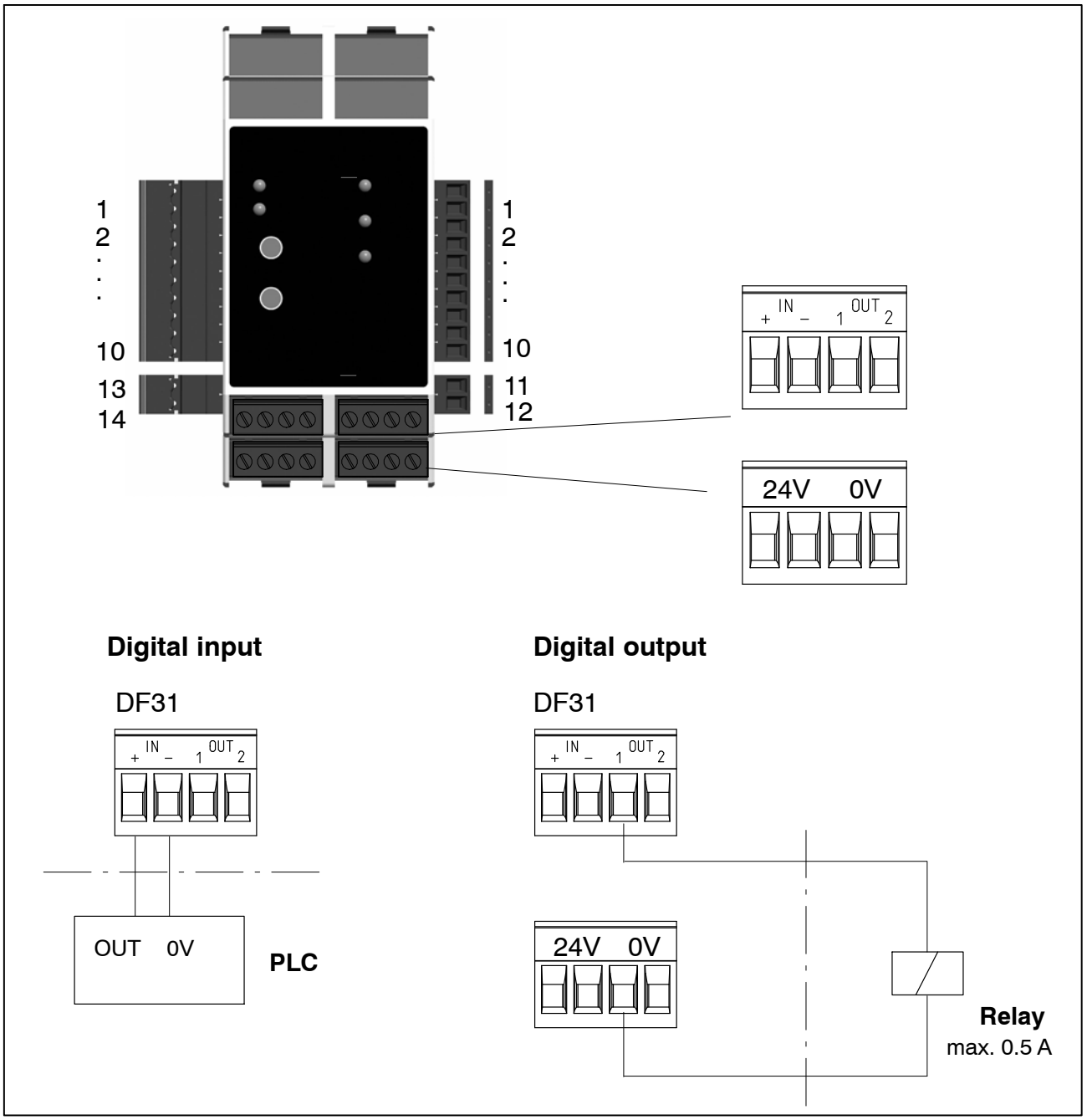
Connect the shield of the particular transducer cable via as short a lead as possible (< 5 cm). Alternatively, you can use the supplied cable holder, that also acts as strain relief. This ensures EMC protection.

Please also note:

- When connecting the leads, measures need to be taken to prevent electrostatic discharge.
- The relevant connection diagram is printed on the side of the housing.
- digiCLIP modules are designed for installation in enclosed, metal housings (such as a control cabinet); however, they can be operated without any additional housing.

4.1 Connecting the digital I/O

This function is only available in DF31DP.



The frontal terminals ”24V” are connected to the side bus terminals ”+24V” (Pin 9). The frontal terminals ”0V” are connected to the side bus terminals ”0V” (Pin 10).

4.2 Use with Zener barriers

When transducers are used in potentially explosive atmospheres, intrinsically safe measurement circuits (Ex II (1) GD, [EEX ia]IIC) have to be set up by connecting SD01A safety barriers (Zener barriers) to the digiCLIP. Similar to the digiCLIP modules, the safety barriers are also mounted on DIN rails. An ATEX test certificate must be available for the transducers that are used.

For use with Zener barriers, the excitation voltage has to be set to 1 V on the digiCLIP. For this purpose, use the ”Transducer – Excitation voltage” menu in the digiCLIP Assistant.

For more information on the design, mounting, and use of the safety barriers, please see the SD01A manual.

Note

TEDS transducer identification is not available for use with Zener barriers. Use with line lengths > 100 m and transducer resistances < 80 ohms is not permitted.

4.3 Synchronization of the carrier frequency

The first device (starting from the right) is used as the master when synchronizing. All the subsequent modules are automatically set as slaves and work at the carrier frequency of the first module. Should the connection between the modules be interrupted, the first module after the interruption is automatically set as the master and synchronizes the subsequent modules.

If the modules are divided among several rails, use the 2−pin synchronization connectors, 1−digiCLIP−ST; (see Fig. 4.5).

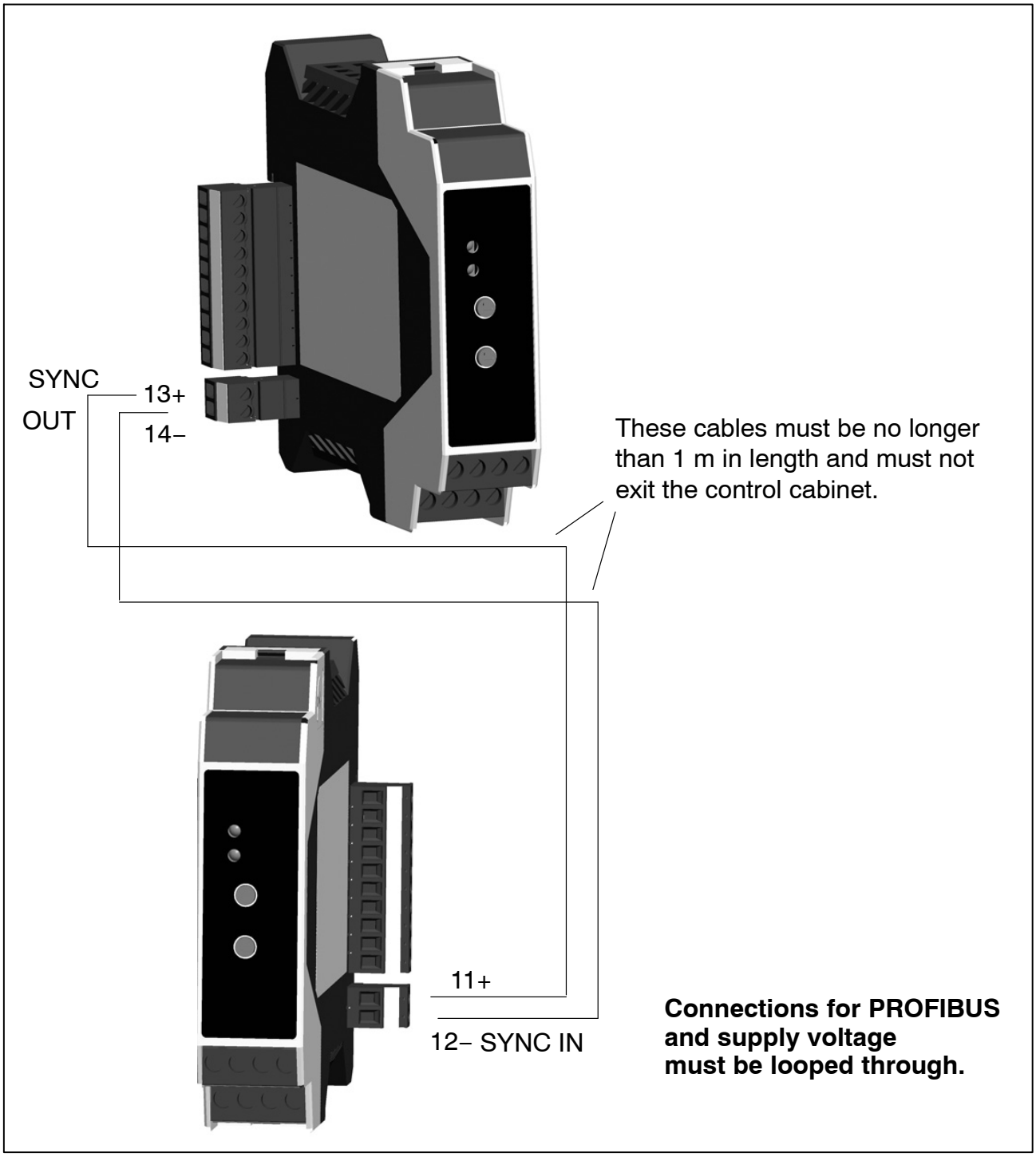


Fig. 4.5: Mounting at several levels (here: DF30DP)

Synchronizing:

Synchronizing is advisable for transducers with carrier frequency excitation when

- the transducer cables of several devices run side by side
- the measuring points are unshielded and are close together

Synchronization prevents differences in the carrier frequency causing disturbing superpositions. A maximum of 97 modules can be interconnected.

4.4 Profibus installation

The Profibus system is cabled in a bus topology (linear or tree structure) with active termination resistors at the start and at the end. Stub lines should be avoided if possible at bit rates faster than 1.5 Mbit/s. The cable should be run as a shielded, twisted-pair cable, and should have an impedance of 150 ohm and a resistance of 110 ohm/km. Data is transmitted by the Line-A and Line-B signals, with a common GND as the data ground. There is also the option to incorporate a 24-volt supply voltage.

Located on the front of the DF001 connection module is a 9-pin D-Sub connection socket for the PROFIBUS connection. As an alternative, the PROFIBUS connection can also be made via the 10-pin plug terminal at the side.

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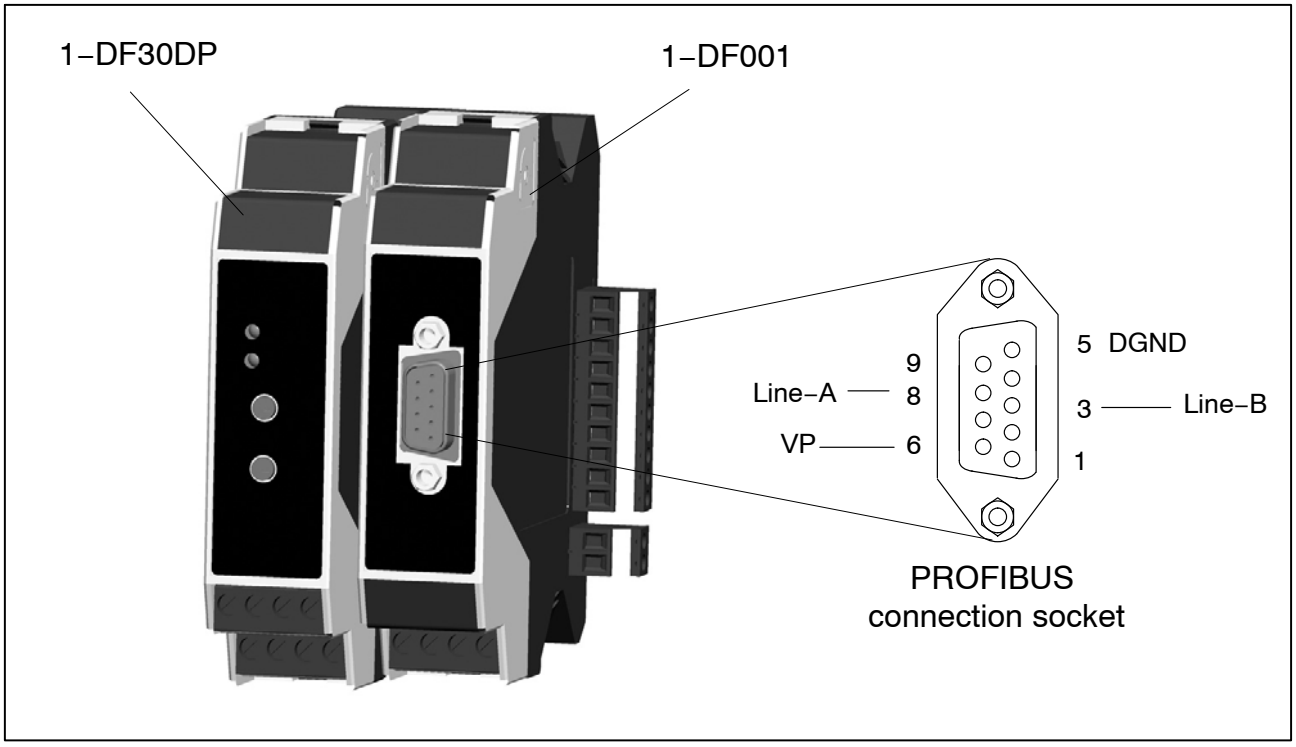


Fig. 4.6: PROFIBUS connector (9–pin D–Sub connection socket)

Note

Please note that there is a termination resistor connected to the first and last PROFIBUS nodes (there is usually a slide switch for this on the housing of the PROFIBUS connector).

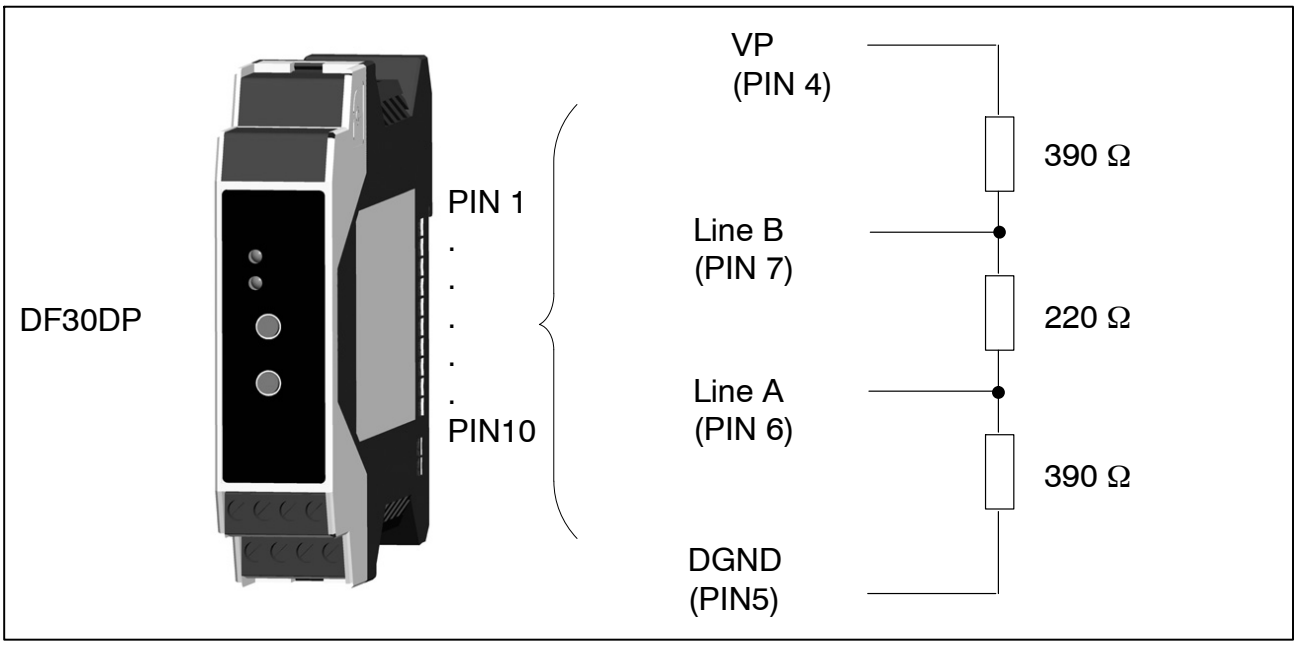


Fig. 4.7: Connecting the termination resistor, 10–pin connector terminal at the side (without the DF001 module)

Example:

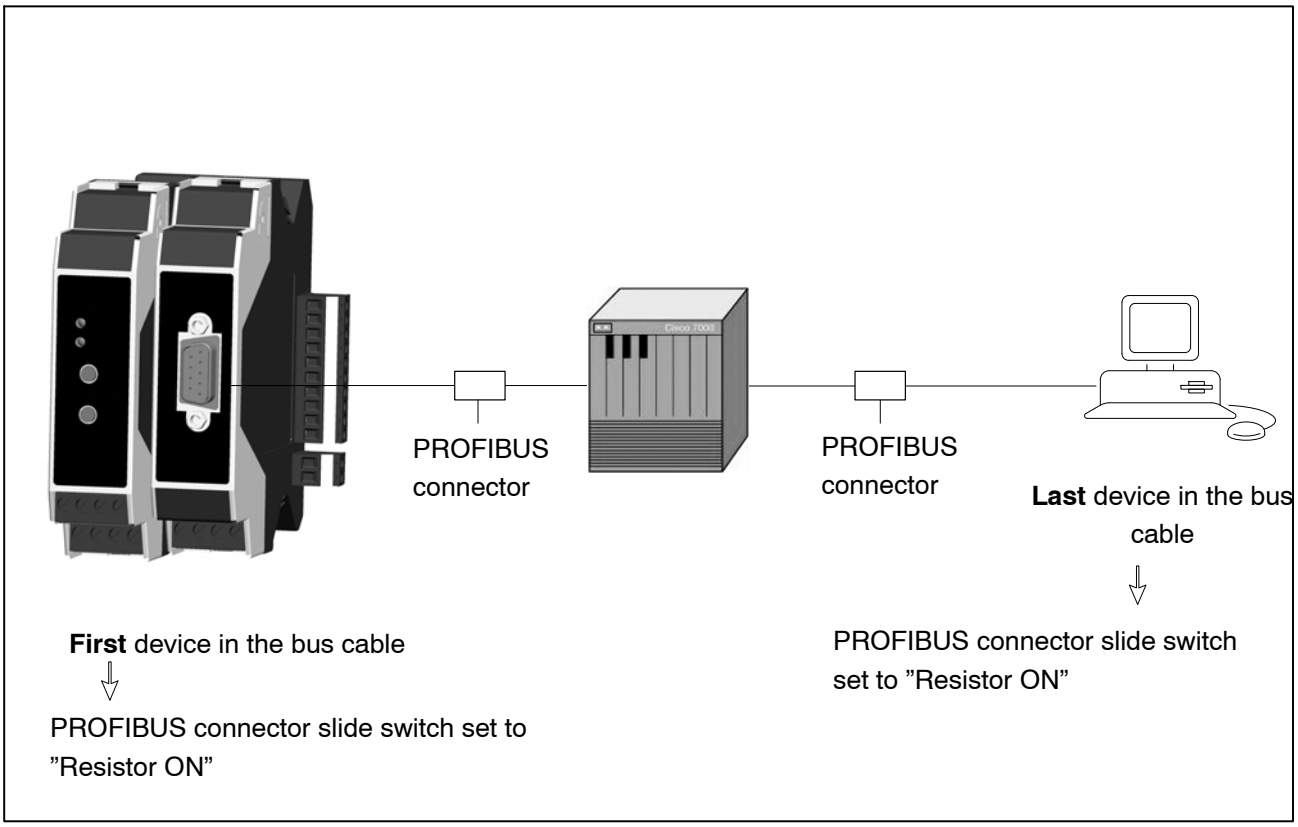


Fig. 4.8: PROFIBUS operation

A maximum of 32 nodes can be connected in a PROFIBUS DP segment.

Note

But because of the design of the DF30/31DP modules and possible reflections on the Profibus, especially at high bus speeds, no more than 4 modules should be interconnected (be sure to comply with section 4.5, Profibus repeater for digiCLIP groups).

Using repeaters, a maximum of 126 can be operated in a DP network. The transmission speed can be adjusted in specified steps in the 9.6 kbit/s to 12 Mbit/s range. The length of a Profinet DP network depends on the transmission speed, and is shown in the table below.

The cable length of each segment depends on the transmission rate:

Cable length (m)	Transmission rate
1200	max. 93.75 kbit/s
1000	187.5 kbit/s
400	500 kbit/s
200	1.5 Mbit/s
100	12 Mbit/s

4.5 Profibus repeater for digiCLIP groups

Each individual DF30DP and DF31DP digiCLIP module contains a full PROFIBUS interface. This is particularly beneficial in distributed arrangements, as there is no need for a coupling station and the amplifier can be positioned close to the sensor.

The housing of the digiCLIP modules allows for several modules to be lined up next to one another. This results in a short stub line, which, if too many digiCLIP modules are lined up next to one another, can become critical electrically, especially at bit rates of 12 Mbit/s. So to prevent malfunctions, we recommend using repeaters to decouple the digiCLIP modules from the rest of the PROFIBUS network when 4 or more digiCLIPs are to be lined up right next to one another.

The use of repeaters optimizes the electrical performance of the PROFIBUS network. It has no effect on communication or the parameter configuration of the connected PROFIBUS modules.

4.5.1 digiCLIP group at the end of a Profibus segment

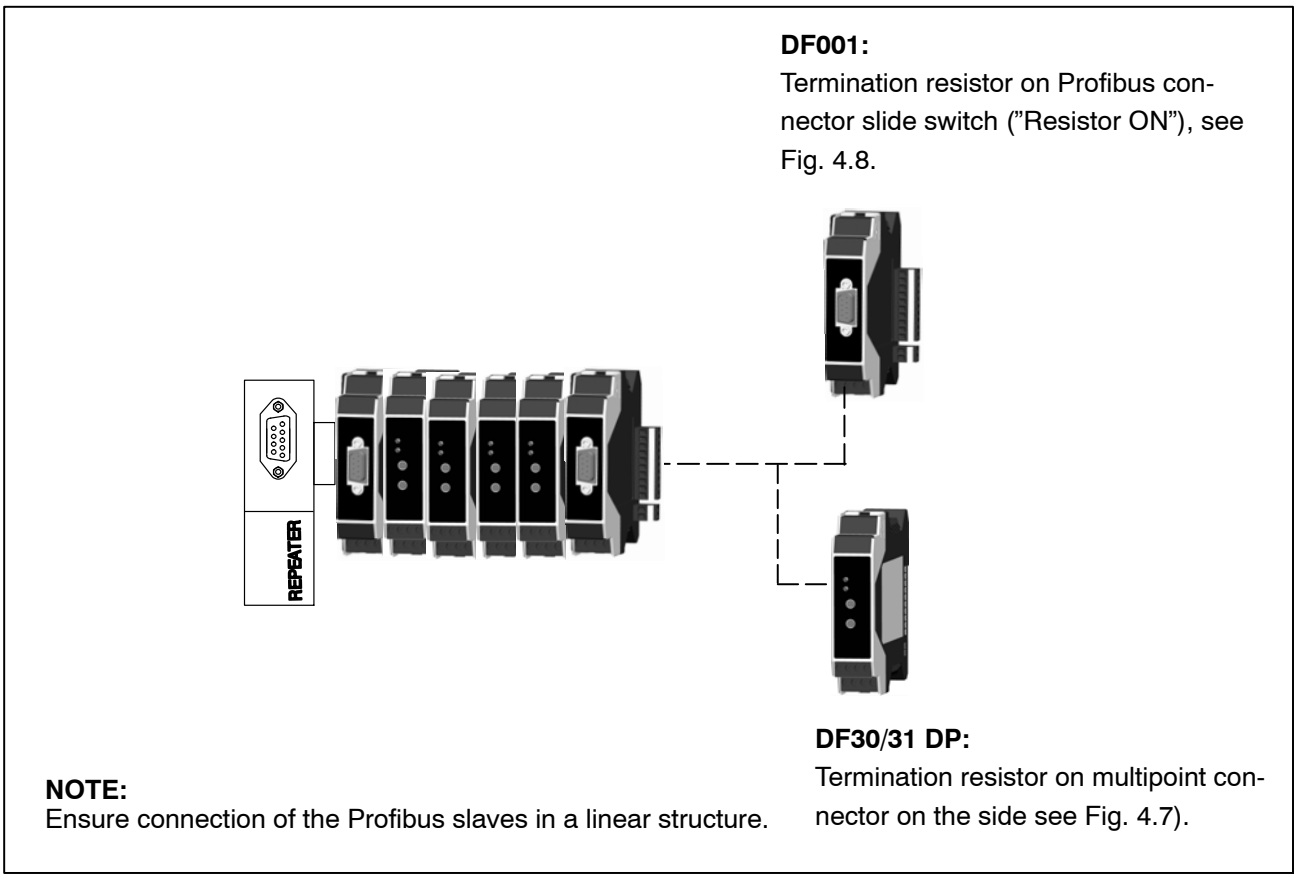


Fig. 4.9: digiCLIP group at the end of a Profibus segment

A plug with an integrated repeater (Helmholz PROFIBUS Compact Repeater, art. no. 700–972–0RB12) is used instead of a typical PROFIBUS plug.

Please note that:

Note

- ***It is imperative to position the digiCLIP group at the end of a PROFIBUS network.***
- ***It is essential for the PROFIBUS network cable to be connected to terminals A2/B2 (see photos below).***
- ***No additional outgoing PROFIBUS plug can be attached to the diagnostic socket of the plug*** *(unless for diagnostic purposes)****!***
- ***The termination resistor in the Compact Repeater must be set to ”ON”!***
- ***Terminals A1/B1 must not be used!***

Neither a DF001 nor a bus termination is necessary at the other end of the digiCLIP group. It does not matter whether the DF001 module is connected to the digiCLIP group on the right or on the left.

The voltage supply for this repeater plug comes from the digiCLIP. It is necessary for at least two digiCLIPs to be intermated in a group to make the power of 0.5 W available.

The LEDs in the Compact Repeater indicate electrical faults in the PROFIBUS segment of the digiCLIP group, so that their electrical operation can also be monitored when starting up.

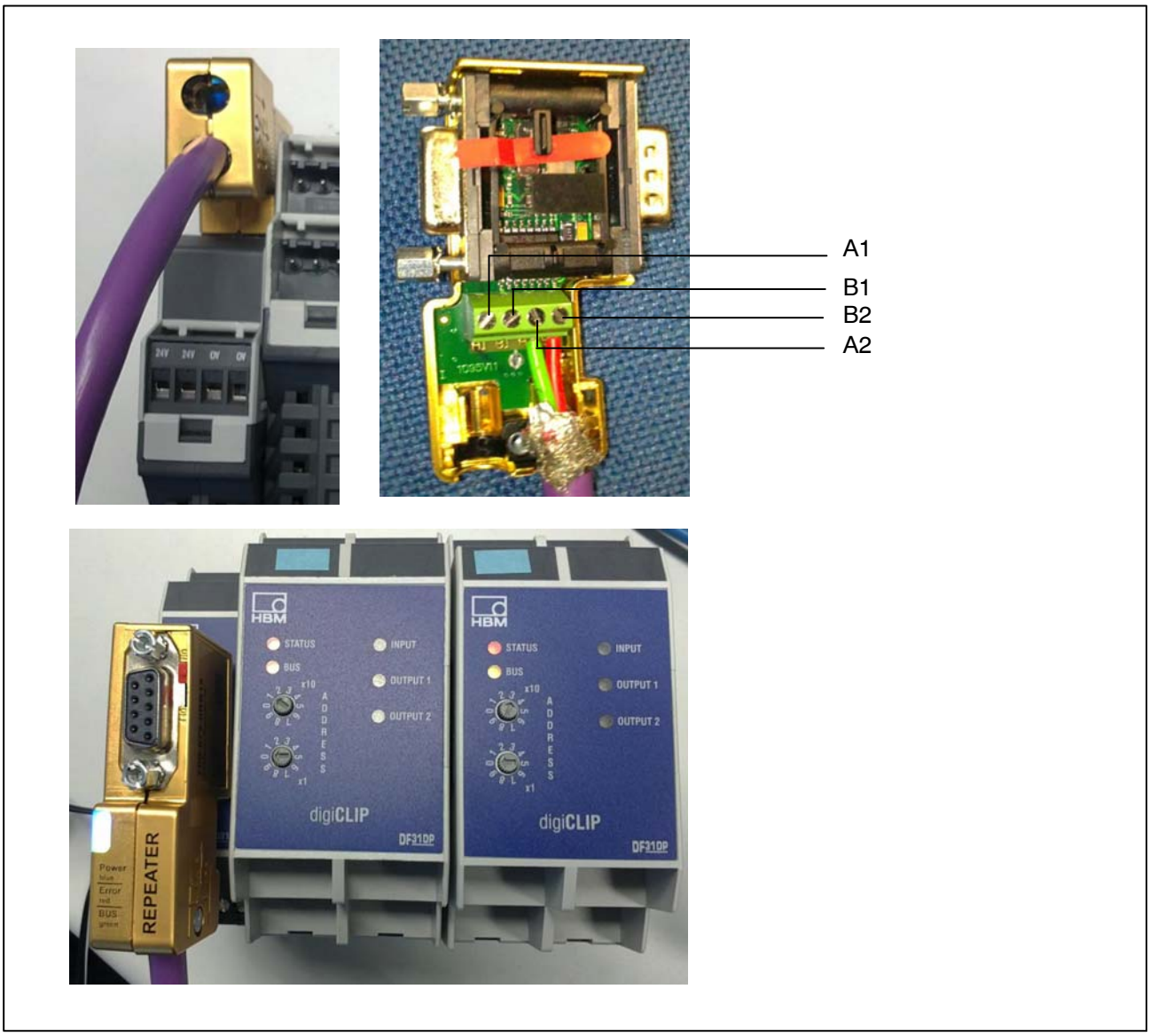


Fig. 4.10: Compact repeater for digiCLIP use at the end of a Profibus network

4.5.2 Universal arrangement of the digiCLIP group in the Profibus network

If the digiCLIP group cannot be positioned at the end of a PROFIBUS segment, the solution with the Compact Repeater shown in 4.5.1 is **not possible**. A different repeater must be used.

If a simple SIEMENS repeater is used, however, the digiCLIP group can be connected both at the end and within a PROFIBUS network.

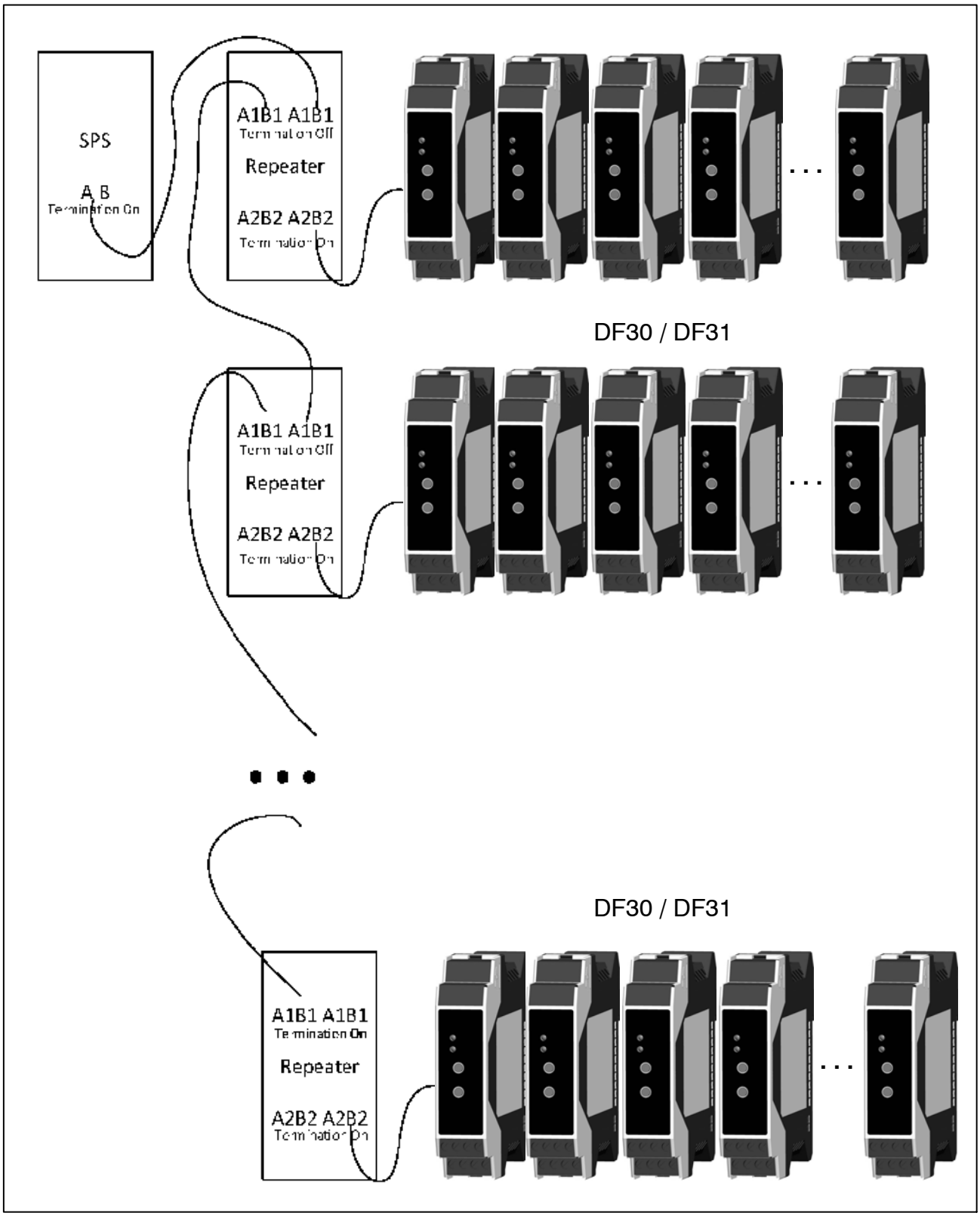


Fig. 4.11: Standard repeater for universal digiCLIP use in a Profibus network

We recommend using this repeater: SIEMENS 6ES7972−0AA01−0XA0. The cables are snugly held in place, and a socket is available for diagnosis. It is not necessary to use a repeater with an active diagnostic function, nor is it advisable, as it makes the configuration of the PROFIBUS network more difficult.

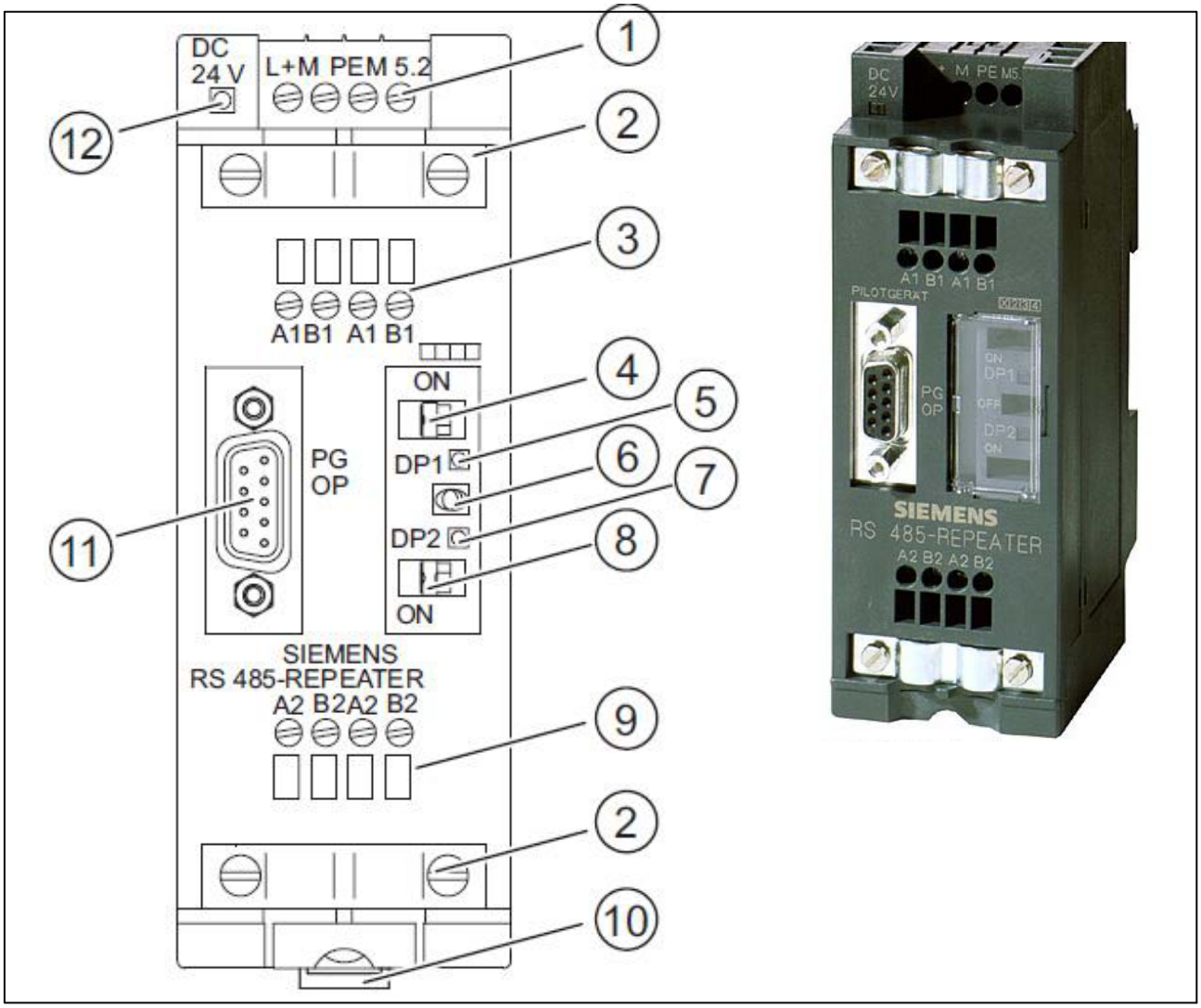
This repeater needs a 24 V supply to be connected. The system PROFIBUS network must be connected to screw terminals A1/B1. Alternatively, this system segment can also be connected to the repeater PG interface by a PROFIBUS plug.

A shielded, short cable (typically around 10 cm long) is directly connected from A2/B2 to the side 10−pin terminal of the digiCLIP group: A2 (repeater) to terminal 6 (digiCLIP), B2 to terminal 7, shield to terminal 8. The digiCLIP module can also be supplied with voltage via this 10−pin terminal. This means that it is totally unnecessary to use a DF001 module here.

A short cable with a PROFIBUS plug (switch set to ”OFF”) can also be made as an alternative. Its stranded wires are connected to the A2/B2 terminals of the repeater, and the other end is attached to a DF001 module on the digiCLIP group via the PROFIBUS plug.

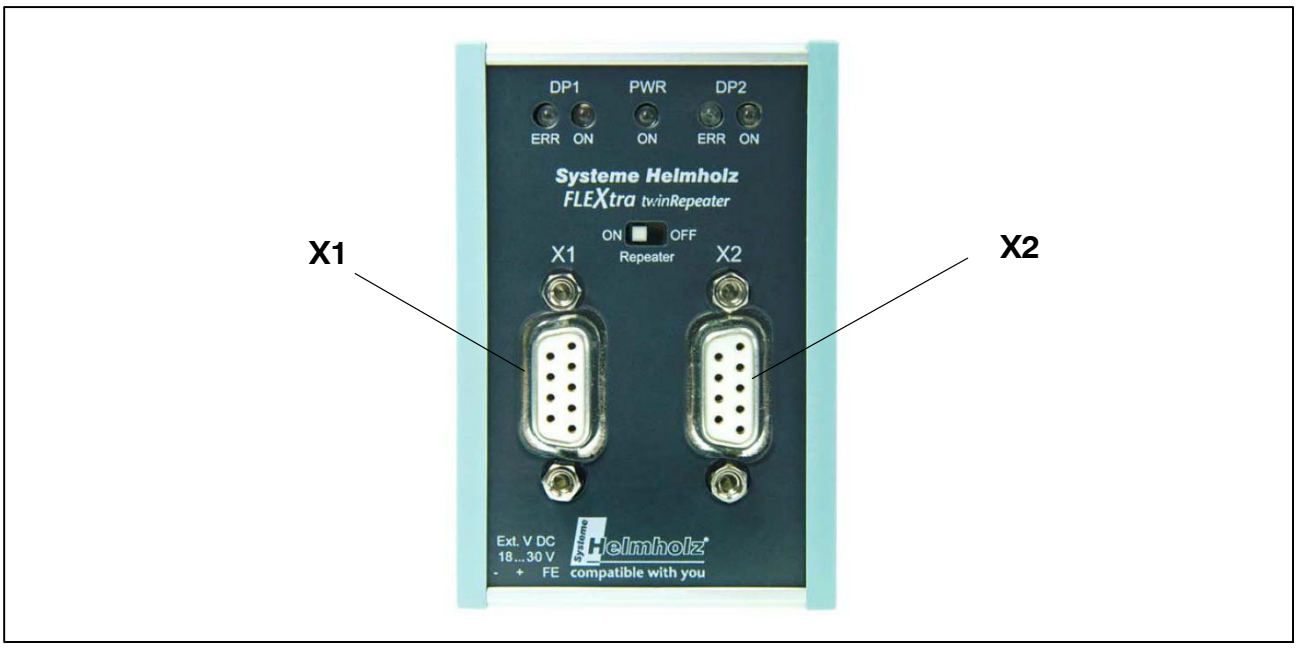
Neither a DF001 nor a bus termination is necessary at the other end of the digiCLIP group. It does not matter whether the repeater is connected to the digiCLIP group from the right or from the left.

Switch ”DP2” on the repeater must always be set to ”ON”. The switch ”DP1” for the PROFIBUS network termination resistors is then moved to ”ON” when the PROFIBUS network ends with the digiCLIP group, instead of being set to ”OFF”. If the PROFIBUS network is connected via the PG socket, the switch on the plug must always be set to ”OFF”.



No.	Description
1	Connection for the RS 485 repeater power supply (pin ”M5.2” is the reference ground, if you want to measure the voltage characteristic between connections ”A2” and ”B2”).
2	Shield clip for strain relief and grounding the bus cable from bus segment 1 or bus segment 2
3	Connection for the bus cable from bus segment 1
4	Termination resistor for bus segment 1
5	LED for bus segment 1
6	Switch for OFF operating mode (= disconnecting the bus segments from one another, e.g. for starting up)
7	LED for bus segment 2
8	Termination resistor for bus segment 2
9	Connection for the bus cable from bus segment 2
10	Slider for mounting and dismounting the RS 485 repeater on a standard mounting rail
11	Interface for PG/OP on bus segment 1
12	24 V voltage supply LED

4.5.2 .1 Alternative Repeater



As well as the terminal solution for the stated SIEMENS repeater, there are also purely plug–based repeaters, such as the ”Helmholz FLEXtra twinRepeater”, see above photo. Here both segments are connected via PROFIBUS plugs.

The digiCLIP group is connected to socket ”X2”. Only digiCLIP modules can be located in this segment, and bus termination must occur in the plug on the repeater. The cable to the digiCLIP group should be no longer than 20 cm.

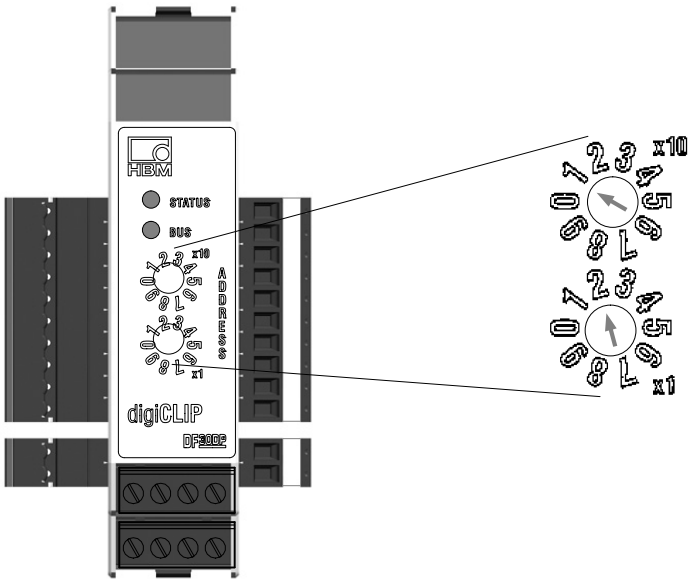
The rest of the Profibus network is connected to socket ”X1”. The bus cable to other PROFIBUS clients can be extended via the PROFIBUS plug attached here. The termination resistor on plug ”X1” is connected, subject to whether or not the repeater with the digiCLIP group marks the end of the segment.

The repeater requires an external voltage supply of 24 V via terminals. The ”repeater” switch must be set to ”ON”.

There are many different repeater manufacturers, whose products have to be connected accordingly. Ensure in all cases that the segment with the digiCLIP group is electrically isolated from the rest of the nodes on the PROFIBUS network.

4.6 Selecting the module address

Address 3 to address 99 can be set as the module address.



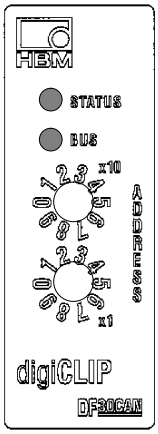
Example:

Address 12 is set

4.7 Automatic bit rate detection

The Profibus devices of the digiCLIP device series all support automatic bit rate detection up to a transmission speed of 12 Mbit.

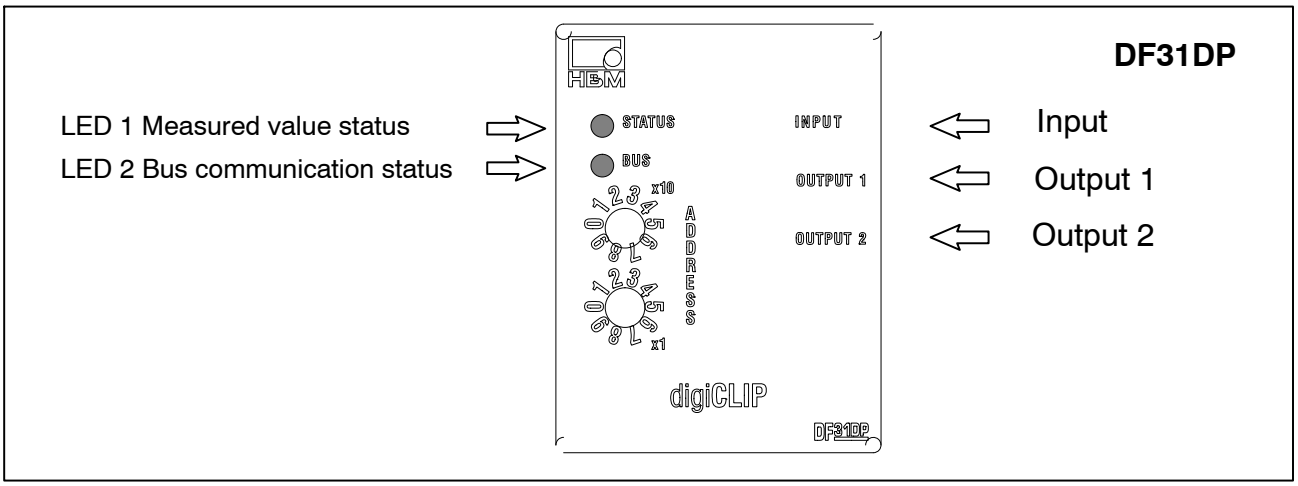
4.8 Display LED status, error messages



DF30DP

⇦ LED 1 Measured value status

⇦ LED 2 Bus communication status



When the device is activated, the LEDs indicate the following states:

STATUS LED (top): Measured value status	
Green	No error, normal operation, measured values valid.
Flashing green	No error, normal operation. However, the amplifier does not acquire the transducer signal, it acquires the internal reference signals
Orange	No error, normal operation, measured values valid, but out-of-range or limit value switch active.
Red	Error, measured values invalid. As there could be a number of different causes, you should use Device ” Show device status, in the digiCLIP Assistant to call the status window and evaluate the detailed displays that are shown there.

BUS LED (bottom): Communication status	
Green	No error at the interface, normal operation. Real-time data exchange is active.
Orange	No error at the interface, normal operation. Real-time data exchange is not active.
Flickering orange-dark or green-dark	No error at the interface, normal operation with data traffic on the PROFI-BUS
Flashing orange-red	Automatic bit rate detection is running; should this status continue, check the bus termination.
Red	Error on the PROFIBUS, the digiCLIP is not working.

CAUTION

If the two LEDs flash red, quickly and alternately, there is a firmware error in the flash memory area, because a firmware update was incomplete, for example. Transfer the firmware again (see Software update, Firmware update). The digiCLIP does not work.

If the two LEDS show permanently red, an internal error is stopping the digiCLIP working. Switch the digiCLIP off and then back on again, to test whether the error is still present. If the error keeps occurring, please contact HBM Technical Support.

5 Commissioning

Mount one or more digiCLIP modules and connect the transducers.

- Activate bus termination resistance for the first and last modules
- Connect the power supply
- Synchronization is performed automatically
- Set the address for each module; addresses must not be duplicated
- The bit rate is set automatically

5.1 Operation with the digiCLIP Assistant

The digiCLIP Assistant allows you to set and scaling this measurement system, the display and measured value recording.

The software only shows devices of the digiCLIP product family. All other PROFIBUS nodes are ignored.

All the settings that can be made with the digiCLIP Assistant are made using the Profibus Class 2 protocol (DPV1−C2). If your control supports this protocol, you can also make these settings independently of the digiCLIP Assistant. All the setting options and values can be found in the object dictionary of this manual (Section 7.6).

Procedure

- The digiCLIP must be ready for operation.
- Connect the PC's PROFIBUS interface to the digiCLIP (this can also be done while operation is ongoing).
- The digiClip Assistant works with Hilscher and Siemens brand Profibus cards.
- Make sure that only one DPV1 Class 2 Master accesses the digiCLIP.
- Start the digiCLIP Assistant.
- When you start the software for the first time, you must choose the Profibus Master in a window. If you select *Use as standard*, this network will be chosen automatically the next time the system starts up.
- The digiCLIP Assistant finds all the devices and displays them in a list in the Devices area with their PROFIBUS address and serial number.
- Start a new search for connected devices via Interface −−− Devices.

Important

You can obtain the latest version of the relevant Assistant free of charge from http://www.hbm.com/support/ .

5.2 No devices can be found on the PROFIBUS

- Check that your PROFIBUS interface is correctly installed on the PC (manufacturer's instructions). Also refer to the operating requirements.
- If the digiCLIP is not using the same bit rate (also called the baud rate) as the PROFIBUS, with the digiCLIP active, use the rotary switches to temporarily set a different address. Each time an address is changed, the bit rate used by the PROFIBUS is re-checked and if necessary, the particular bit rate is changed. Then use the digiCLIP Assistant to find devices again.
- The digiCLIP only supports bit rates between 45.45 kbit/s and 12 Mbit/s. Check that the PROFIBUS network uses a permissible bit rate.
- On the PROFIBUS, verify for several devices that each digiCLIP has its own PROFIBUS address (that there are no duplicate addresses in the network).
- The upper switch on the digiCLIP gives the more significant digit: a setting of 1 above and 2 below corresponds to the decimal address 12.
- Check that the termination resistors on the PROFIBUS bus are correctly set: the resistors for the first and last devices on the bus (or PC) must be activated (slide switch of PROFIBUS plug). If you are using more than one device, no resistors can be activated on any of the other devices.

6 Settings via the digiCLIP Assistant

First check that the sensor connection is healthy: Open the Status window by double−clicking on the displayed measured value or with *Device → Show device status*. Red LEDs for *Sensor connection* indicate whether and if so which wiring faults exist.

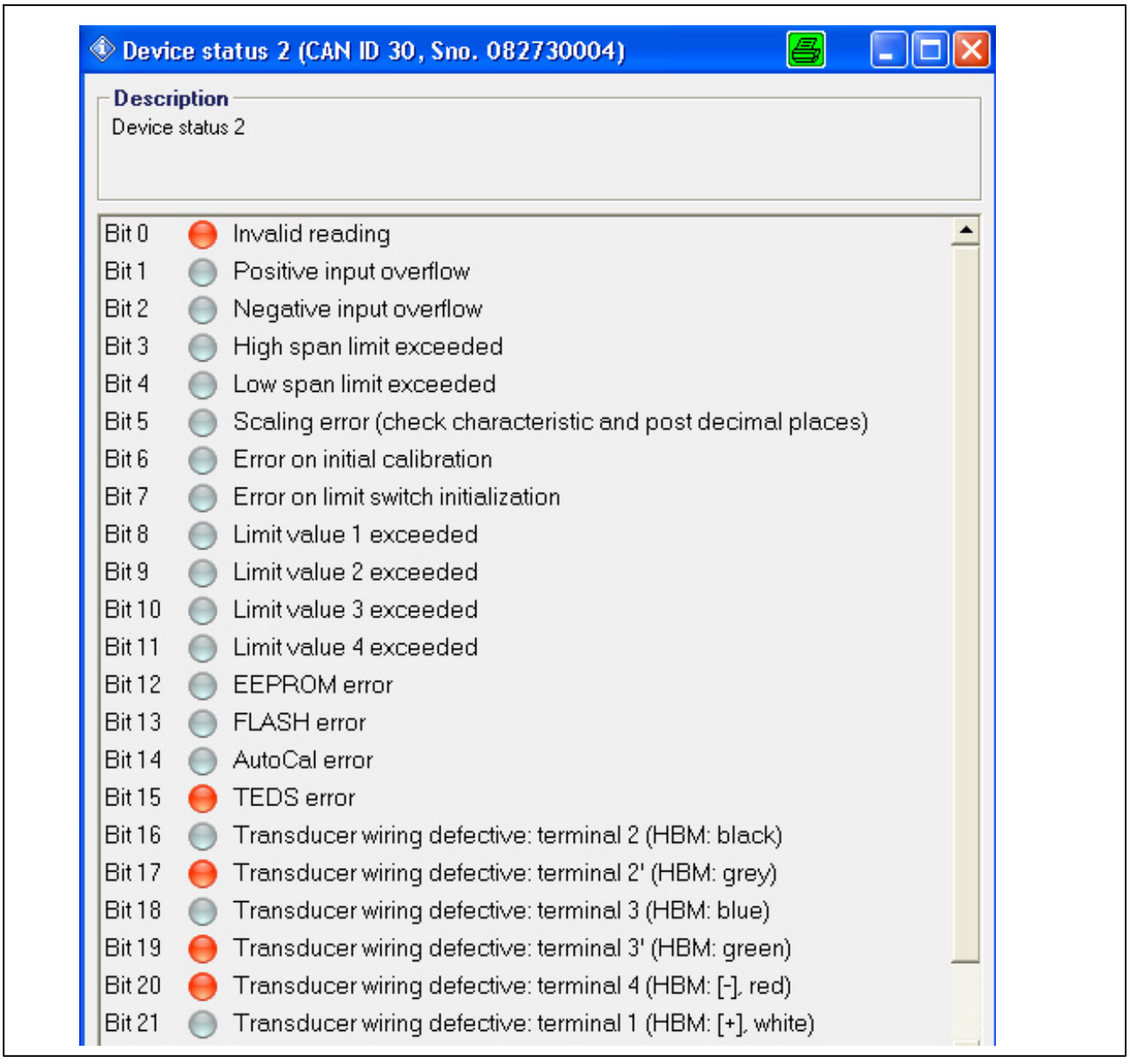


Fig. 6.1: Assistant: Device status

Then use the Assistant menus to set all the other device parameters.

Extensive Help is also available in the Assistant. The parameters are then present in the digiCLIP RAM.

To make them available again after a power failure, they still have to be saved in the digiCLIP EEprom memory (Assistant dialog: Save/load parameters –> Save parameters in device).

After a loss of voltage, or after switching the digiCLIP back on, all the parameters last available in the EEprom are automatically reloaded into the device (RAM).

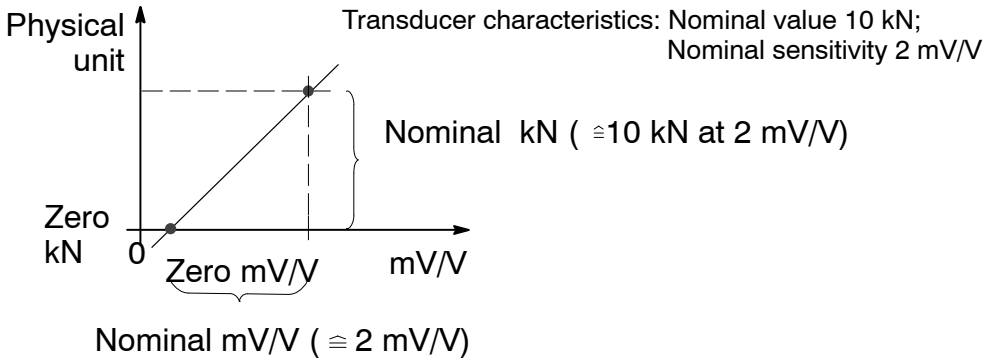
Note

Apart from the factory settings, the digiCLIP only has one parameter set (measurement program) that can be stored in the device. But additional parameter sets can be stored on a PC and then reloaded, using the Assistant. There is no offline mode, that is, creating / changing a parameter set without a connected device.

6.1 Clarification of significant settings

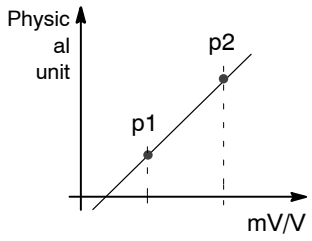
Scaling

Scaling in accordance with transducer characteristics



Alternative: 2–point scaling

Example: A calibration weight of 4 kg is used to calibrate a 10 kg load cell



1. Relieve the load on the transducer

Measure point 1	0.0457 mV/V
Char. curve point 1 physically	enter 0 kg

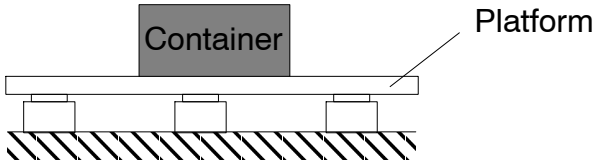
2. Load transducer with 4 kg

Measure point 2	0.873 mV/V
Char. curve point 2 physically	enter 4 kg

Taring / zeroing

Difference between taring and a zero balance: A zero balance (>0<) affects the gross and the net value. Taring (>T<) only affects the net value.

The difference between a zero balance and taring is made clear in this example:

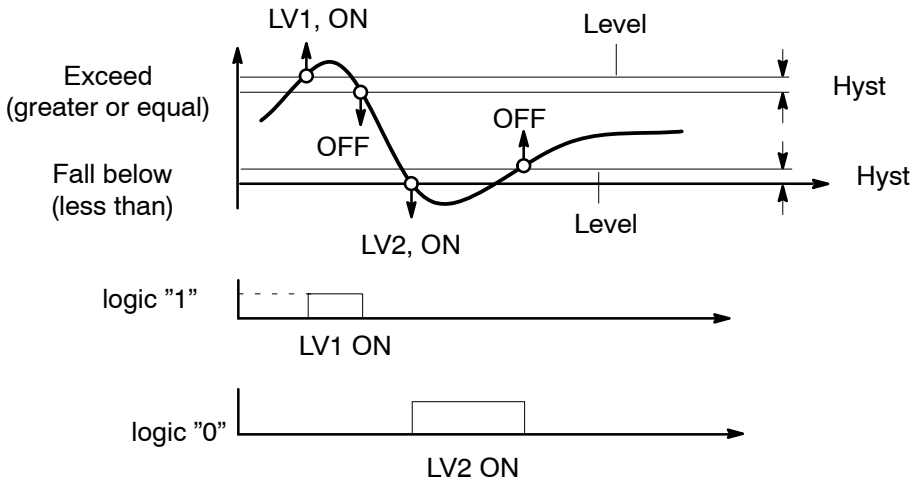


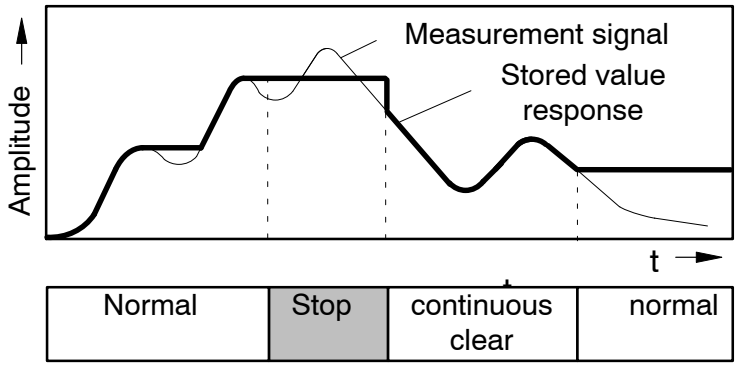
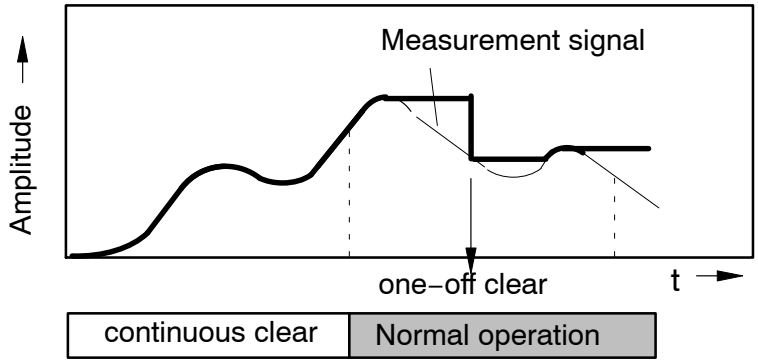
Weighing steps	Action	Display Gross	Net
Put on the platform (35 kg)	> 0<	before 35 kg after 0 kg	before 35 kg after 0 kg
Put on the container (8 kg)	> T<	before 8 kg after 8 kg	before 8 kg after 0 kg

Filters / frequencies	0.05 Hz 1 Hz 20 Hz 0.1 Hz 2 Hz 50 Hz 0.2 Hz 5 Hz 100 Hz 0.5 Hz 10 Hz
Autocal	The Autocal function briefly interrupts the measurement function to link the amplifier input with an internal reference. This evens out errors caused by ageing and temperature. This function is executed **once** on demand.

Limit value switches 1...4	The choice of source for the limit value signal is: gross, net, peak value max/min/peak–to–peak

Limit value functions and parameters



The choice of source for the peak value signal is: gross, net	
The peak value can be cleared.	
Peak values	Example 1 
	Example 2 

6.2 Setting with TEDS

6.2.1 Electrical connection with TEDS

TEDS stands for ”Transducer Electronic Data Sheet”.

A transducer with an electronic data sheet as defined in the IEEE 1451.4 standard can be connected to the digiCLIP, making it possible for the amplifier to be set up automatically. A suitably equipped amplifier imports the transducer characteristics (electronic data sheet), translates them into its own settings and measurement can then start.

Six–wire circuitry must be used for TEDS to be connected.

6.2.2 Setting

If a transducer with TEDS, containing the parameterization data for a full bridge is connected, this can be used to set the amplifier automatically.

When the digiCLIP is activated, it automatically detects whether a TEDS is connected. When the transducer is replaced in the activated state, the new TEDS is also detected automatically.

Check the ”Always use TEDS” box to monitor TEDS functionality and protect scaling from manual intervention. If a transducer is being used without TEDS, this checkmark must be cleared.

To enable the data stored in the TEDS to be used for scaling, a setting must be made in the digiCLIP to indicate the physical unit in which the measured values are to be displayed. The scaling values stored in the TEDS are then automatically converted to the required unit. By specifying this conversion unit, scaling can also take place to a power of ten (e.g. ”kN”) or English units can be used both for the display and in the TEDS.

In the digiCLIP Assistant, in the ”TEDS” area, choose the desired conversion unit from the selection menu. If instead you want to use the unit stored in the TEDS directly, set this value to ”(auto)”.

When the TEDS is activated, its scaling data will be read out and converted to the required physical unit. Should the unit stored in the TEDS and the required conversion unit be incompatible because they describe different quantities (e.g.: torque transducer connected, conversion unit is ”N”), the status word is set and scaling does not take place.

If automatic activation of TEDS is set (checkmark: ”Always use TEDS”) the TEDS is read out automatically and scaling performed accordingly, whenever the digiCLIP supply voltage is turned on or a new transducer is connected in the on state.

If a scaling error is reported once the TEDS is activated, the reason may be that the value range specified by the two characteristic curve points is so great or so small, that the measured values cannot be displayed with the set decimal places. You then need to adapt the number of decimal places in the ”Scaling” area. It may possibly help to change to a different power of ten, such as. ”N” after ”kN”. To obtain more information, click on ”TEDS error status” in the digiCLIP Assistant. If you have not connected any transducers with TEDS, make sure that the ”TEDS always available” box is not checked.

For an accurate analysis, it is advisable to display the data stored in the TEDS. To do this, in the digiCLIP Assistant, click on ”Details” in the ”TEDS” area.

No TEDS transducers connected:
Make sure that the ”Always use TEDS” box is not checked.

Example 1:
Torque transducer connected, display required in kilonewton meters, ”kNm”

Stored in the TEDS:

Minimum Force/Weight	1.0 Nm
Maximum Force/Weight	2500.0 Nm
Minimum Electrical Value	0.1 mV/V
Maximum Electrical Value	1.5 mV/V
Reference unit set in the digiCLIP (”kNm”)	03560000 (hex)

After scaling by TEDS, the scaling points are set as follows:

Char. curve point 1, physical	0.001 kNm
Char. curve point 1, electrical	0.1 mV/V
Char. curve point 1, physical	2.5 kNm
Char. curve point 1, electrical	1.5 mV/V

Example 2:

Force transducer connected, display required in English pounds, ”lb”.

Stored in the TEDS are:

Minimum Force/Weight	1.0 Nm
Maximum Force/Weight	1000.0 Nm
Minimum Electrical Value	–0.1 mV/V
Maximum Electrical Value	4.0 mV/V
Reference unit set in the digiCLIP (”lb”)	00EF0001 (hex)

After scaling by TEDS, the scaling points are set as follows:

Char. curve point 1, physical	0.225 lb
Char. curve point 1, electrical	–0.1 mV/V
Char. curve point 2, physical	224.81 lb
Char. curve point 2, electrical	4.0 mV/V

The data for the minimum and maximum excitation voltage in the TEDS is also checked. If the excitation voltage is too high or too low, it is automatically adapted in the digiCLIP. An excitation voltage of 2.5 V is preferable.

If, instead of using the digiCLIP Assistant, you are parameterizing directly with DPV1, you must use Slot 1, Index 21 to set the required conversion unit before activating the TEDS. The units available to you correspond to the selection list provided by the digiCLIP Assistant and can be found in the table below. If value = ”00000000” is set, the unit used for conversion is the one stored in the TEDS.

Once the TEDS is successfully activated, the value in Slot 1, Index 34 is also changed accordingly.

The DPV1 objects for using TEDS are located in Section 7.6.8 .

Note

If several transducer full bridges are connected to a digiCLIP amplifier input in parallel, their TEDS data should not be used for automatic scaling, as in this case, the distribution of the forces could lead to unwanted scaling. Clear the ”Always use TEDS” checkmark.

6.2.3 Parameters of the required physical conversion unit

Value (hex)	Required unit	Conversion
FA4B0000	µg	$1 \cdot 10^{-6}$ g
FD4B0000	mg	$1 \cdot 10^{-3}$ g
004B0000	g	
00020000	kg	
03020000	t	1000 kg
00210000	N	
03210000	kN	1000 N
06210000	MN	$1 \cdot 10^{6}$ N
00EF0001	lb	4.44822 N
00EE0001	oz	0.278 N
00ED0001	kgf	9.8 N
FE560000	Ncm	0.01 Nm
00560000	Nm	
03560000	kNm	1000 Nm
06560000	MNm	$1 \cdot 10^{6}$ Nm
00EA0001	ozf–in	$7.06 \cdot 10^{-3}$ Nm
00E90001	ozf–ft	84.73 10^{-3} Nm
00E80001	lbf–in	1.12 Nm
00E70001	lbf–ft	1.35 Nm
00E60001	in oz	$7.06 \cdot 10^{-3}$ Nm
00E50001	ozf–ft	$84.73 \cdot 10^{-3}$ Nm
00E40001	in lb	$1.12 \cdot 10^{-1}$ Nm
00E30001	ft lb	1.35 Nm
004E0000	bar	$1 \cdot 10^{5}$ Pa
034E0000	kbar	1000 bar
FD4E0000	mbar	100.0 Pa
00220000	Pa	
02220000	hPa	100.0 Pa
03220000	kPa	1000 Pa
06220000	MPa	$1 \cdot 10^{6}$ Pa
09220000	GPa	$1 \cdot 10^{9}$ Pa
00AB0000	psi	6894.757 Pa
00010000	m	
FD010000	mm	$1 \cdot 10^{-3}$ m
FE010000	cm	$1 \cdot 10^{-2}$ m
FA010000	µm	$1 \cdot 10^{-6}$ m
00EC0001	in	$25.4 \cdot 10^{-3}$ m
00EB0001	ft	0.3048 m

Value (hex)	Required unit	Conversion
00010300	m/s	
00EB0301	fps	0.304 m/s
00014700	m/min	1.66 m/s
FD550000	mm/s^2	$1 \cdot 10^{-3}$ m/s^2
00550000	m/s^2	
00EB5701	ft/s^2	$3.048 \cdot 10^{-1}$ m/s^2
00EC5701	in/s^2	$2.54 \cdot 10^{-2}$ m/s^2
FA010100	µm/m	$1 \cdot 10^{-6}$ m/m
FE000000	%	
FD000000	‰	0.1 %
FA000000	ppm	$0.1 \cdot 10^{-3}$ %

7 PROFIBUS interface description

DP series digiCLIP modules have a PROFIBUS DP interface option (distributed peripherals) with a maximum transmission rate of 12 MBit. They are designed to meet requirements for fast and efficient data exchange between a control/PLC (PC/control system) and the distributed peripherals.
A DP system usually comprises a Master and – including repeaters – up to 126 Slaves. The Master reads input data from the Slaves in cycles and writes output data to the Slaves. Individual Slaves can fail or be deactivated, without disrupting ongoing bus operation. The full bus configuration is stored in the Master.
If a bus system has several Masters, each Master has its own, permanently assigned Slaves. The Master always exchanges the same number of data bytes with each of its Slaves, one after the other (in turn and always in a circle). This ensures that the total runtime is always constant:

- Each Slave must respond within a fixed time slot.
- The Slave must always respond with the same data length.
- With DF30DP or DF31DP, a maximum of 64 bytes are possible for each response. They can be split between input or output data as desired.

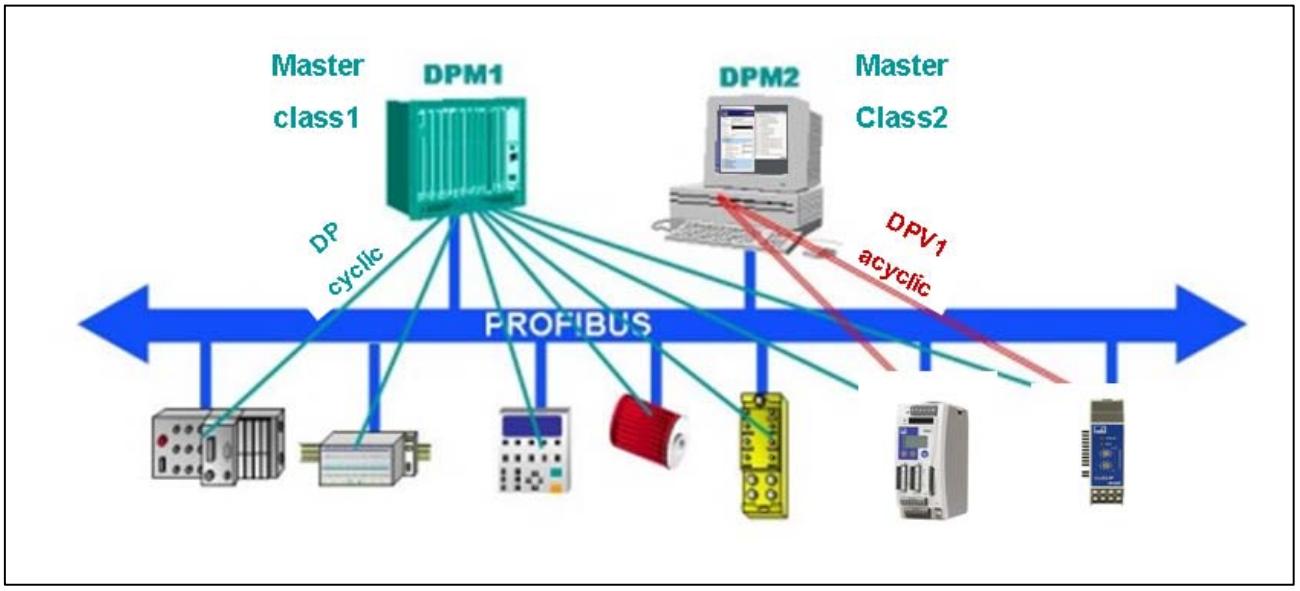


Fig. 7.1: Design and configuration of a Profibus DP system

Profibus DP Slave

A Slave is a peripheral device (I/O, drives, HMI, valves, measurement transmitters), that reads in input information and provides output information to peripherals. The amount of input and output information depends on the device, and there can be max. 246 bytes of input data and max. 246 bytes of output data.

DP Master class 1 (DPM1)

These Masters control the cyclic data traffic, that is, they exchange process data with the slaves in a defined message cycle. Typical devices are a PLC or a PC.

DP Master class 2 (DPM2)

These Masters are engineering or operating units. They access the bus acyclically and allow intelligent field devices to be configured and parameterized.

7.1 Cyclic data exchange

Before you can communicate with the digiCLIP DF30DP/DF31DP on Profibus, you have to configure and parameterize the message contents. To do this, start your configuration software (such as Step 7) and load the GSD files from the digiCLIP system CD. You can then configure the information relevant to your application from the ”hardware catalog”.

NOTE:

The latest GSD file is always available as a free download on the HBM WebSite at http:://www.hbm.com/Support/Firmware

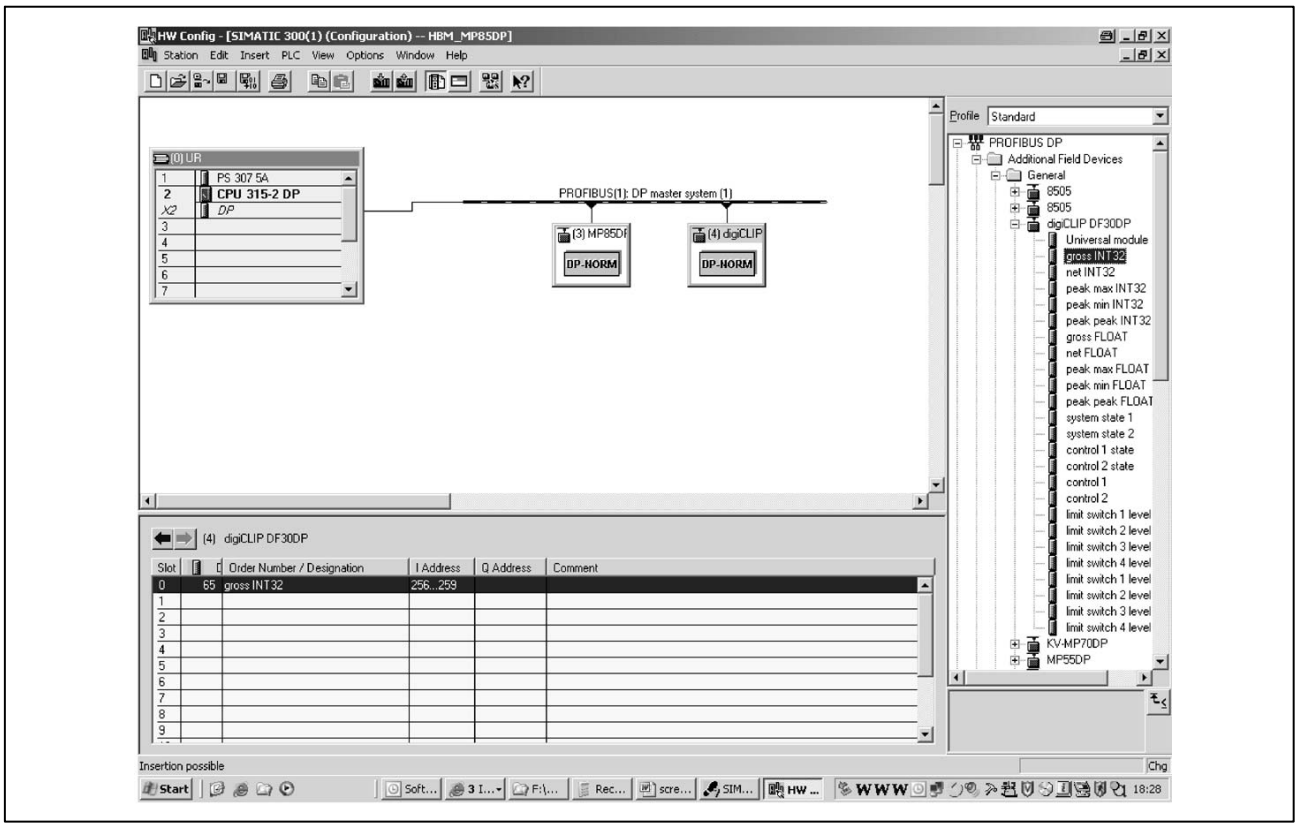


Fig. 7.2: DF30DP/DF31DP configuration

Using the control templates in digiCLIP Assistant, individual functions that are to be triggered via control word (interface command) can be blocked or enabled through control bits. All functions are enabled in the default settings.

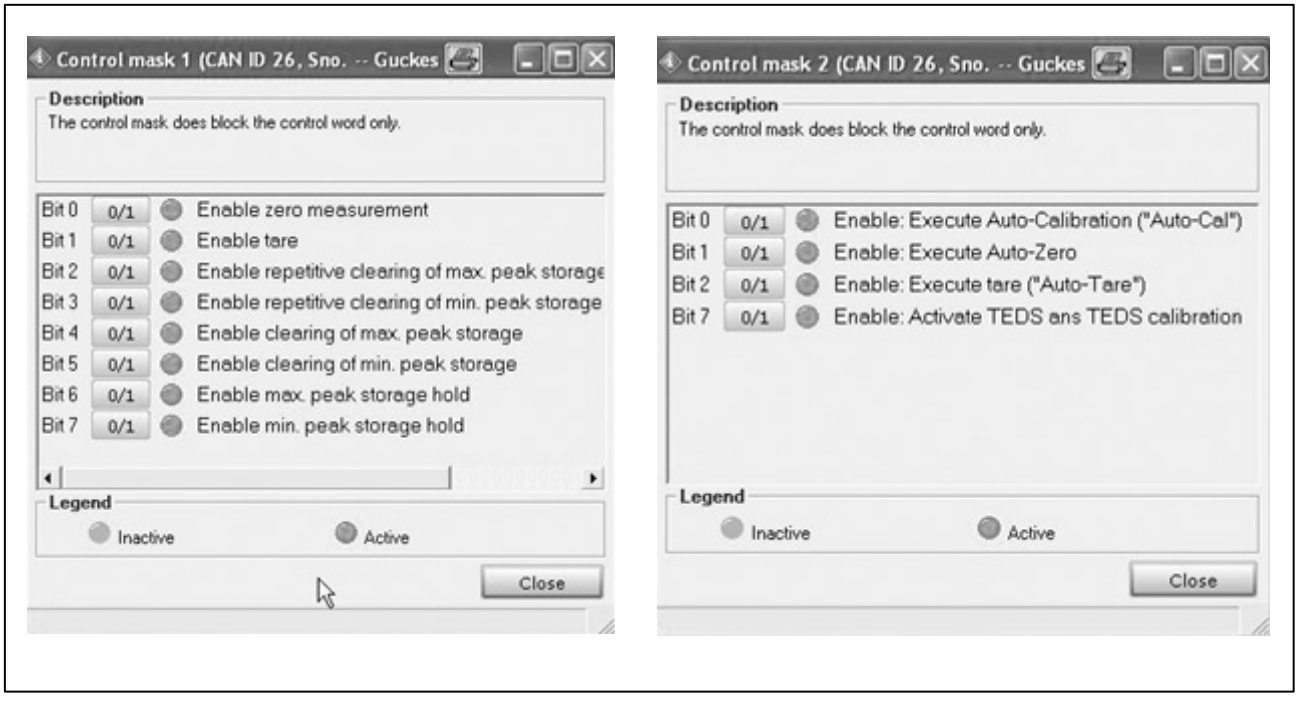


Fig. 7.3: digiCLIP parameterization

Notes for Simatic S7 PLC users:

- To transmit consistent data of 4 bytes, you must use special function block SFC14 to read and SFC15.
- With S7 3xx, a maximum of 32 bytes of consistent data can be transmitted.

7.1.1 **Input data** (from DF30DP/DF31DP to PLC)

The DF30DP/DF31DP allows the cyclic data described below to be transmitted via PROFIBUS DP.

Measured values are transmitted as a 32-bit floating−point number (FLOAT, 4 bytes) or a 32-bit fixed−point number (INT32, 4 bytes, two's complement, the decimal place must be known to the reading position).

Mixed representation is possible in a configuration. The number of decimal places set previously with the digiCLIP Assistant (Section 5.1) is taken as the basis for determining the values in a fixed−point representation.

The byte sequence corresponds to the Profibus standard. The most significant byte is always first (Motorola format). Non−documented bits are reserved and sometimes assigned with internal functions.

Name	Description	Length
Gross	Gross measured value	4 bytes
Net	Net measured value (gross less tare value)	4 bytes
Max	The contents of the Maximum memory	4 bytes
Min	The contents of the Minimum memory	4 bytes
Pk−Pk	Peak−to−Peak (difference between Max and Min)	4 bytes
System status 1	Status of the limit value switches and the general error bits	1 byte
System status 2	Double word with differentiated error identification	4 bytes
Status control 1	Acknowledgment of control byte 1	1 byte
Status control 2	Acknowledgment of control byte 2	1 byte
Container Read	Value of the requested Read Container	4 bytes
Container Status	Error code and toggle bit of the Read/Write Container	1 byte

System status 1:

Bit 0	Measured value invalid (due to overload, scaling error, hardware defect, for example)
Bit 1	Measurement input overloaded
Bit 2	Measuring range exceeded
Bit 3	0 (reserved)
Bit 4	Limit value switch 1 triggered
Bit 5	Limit value switch 1 triggered
Bit 6	Limit value switch 1 triggered
Bit 7	Limit value switch 1 triggered

The signal is activated when the bit is set.

System status 2:

Bit 0	Measured value invalid (as system status 1, bit 0)
Bit 1	Positive measurement input overload
Bit 2	Negative measurement input overload
Bit 3	Positive measurement input overrange
Bit 4	Negative measurement input overrange
Bit 5	Scaling error
Bit 6	Incorrect initial calibration values
Bit 7	Error when initializing limit value switches
Bits 8...11	Limit value switches 1...4 triggered
Bit 12	Hardware error: parameter memory (EEPROM)
Bit 13	Hardware error: parameter memory (FLASH)
Bit 14	Hardware error: autocalibration
Bit 15	TEDS cannot be read [1)]
Bits 16...21	0 (reserved)
Bit 16	Terminal 2, HBM: black
Bit 17	Terminal 2', HBM: gray
Bit 18	Terminal 3, HBM: blue
Bit 19	Terminal 3', HBM: green
Bit 20	Terminal 4 (–), HBM: red
Bit 21	Terminal 1 (+), HBM: white
Bits 22...31	0 (reserved)

1) TEDS data availability is only monitored if this has been activated (digiCLIP Assistant: "Always use TEDS" checked)

The signal is activated when the bit is set.

7.1.2 **Output data** (from PLC to DF30DP/DF31DP)

Name	Description	Length
Control byte 1	Control byte for triggering zeroing, taring, stopping and clearing peak−value memory	1 byte
Control byte 2	Control byte for triggering zeroing, taring, autocalibration, scaling by TEDS, clearing the hysteresis states of the limit values	1 byte
Limit value switches 1...4, level, INT32	Threshold value, separately for each limit value switch as an integer with a previously defined number of decimal places	4 bytes each
Limit value switches 1...4, level, FLOAT	Threshold value, separately for each limit value switch as a floating point number	4 bytes each
Read container	Write DPV1 Class 2 object	6 bytes
Read container	Read DPV1 Class 2 object; specify slot and index	2 bytes

Control 1:

Bit 0	Run zeroing
Bit 1	Run taring
Bit 2	Continuous clear of max. peak−values
Bit 3	Continuous clear of min. peak−values
Bit 4	One−off clear of max. peak−value memory
Bit 5	One−off clear of min. peak−value memory
Bit 6	Hold max. peak−value memory
Bit 7	Hold max. peak−value memory

If several control bits are set simultaneously, this sequence applies:

zeroing, taring, edit peak−value memory.

If several bits are set to control the peak−value memory, this is the priority that is applied (the first−named has the highest priority):

continuous clear, one−off clear

Control 2:

Bit 0	Run autocalibration
Bit 1	Run zeroing
Bit 2	Run taring
Bit 3	Clear the hysteresis status of all limit value switches
Bits 4..6	reserved
Bit 7	Read out TEDS and trigger scaling

If several control bits are set simultaneously, this sequence applies:

zeroing, taring, clear hysteresis states, autocalibration

Bit 7, for scaling by TEDS, must not be set at the same time as other control bits.

When setting with the digiCLIP Assistant, the two control bytes can each be given a bit mask. Then only the cleared functions can be run in cyclic operation. In the factory setting, all functions are cleared. It is possible to read back the control bytes as an acknowledgement.

With one–off functions (zeroing, taring, one–off clear of peak value memory, autocalibration and TEDS scaling), the function is only run when the bit is changed from ”0” to ”1”.

If several bits are set to control the peak–value memory, this is the priority that is applied (the first–named has the highest priority):

continuous clear, one–off clear

7.1.3 Diagnosis

The DF30DP/DF31DP module makes a 5 bytes long device diagnosis available as an external diagnosis. A bit is reserved each time in the fifth byte for the various error causes. The particular bit is set as long as the malfunction exists.

Byte	Bit	Value	Significance
1		5	
2		129	
3		0	
4		0	
5	0	0 / 1	Measured value invalid
5	1	0 / 1	Input overloaded
5	2	0 / 1	Scaling error
5	3	0 / 1	Sensor connection faulty
5	4	0 / 1	Autocal error
5	5	0 / 1	Hardware defect
5	6	0	reserved
5	7	0	reserved

7.2 GSD-Datei

The physical properties of the device (e.g. bit rate, specific bit times, transmitted/received bytes per cycle) are described in a GSD file. The structure, content and coding of these device master data are standardized, so that configuration devices from different manufacturers can be used to configure any DP Slaves.

The GSD file does not indicate which data are transferred or how these have to be interpreted. You can find these elements in this operating manual and program them accordingly in the master.

The GSD files for the digiCLIP Profibus modules can be found on the digiCLIP system-CD or at www.hbm.com/support.

7.3 DPV1 parameterization

So−called DPV1 parameterization allows asynchronous parameterization messages to be exchanged parallel to Profibus DP mode with cyclic data exchange between the Master module and the DF30DP/DF31DP.

Alternatively, they can be sent from the DP Master (for example the PLC, the so−called Class 1 Master), or even in parallel from a second, so−called diagnostic Master (for example the programming unit, the Class 2 Master).

If the customer wishes to make use of DPV1 parameterization the relevant service routines must be called in the PLC. A basic distinction is made between setting up and releasing a connection and between read and write access to parameters.

The various parameters are addressed by so−called index numbers and slot numbers.

The DF30DP/DF31DP maps these index numbers to the commands described in the Operating Manual (see Tables below).

TIPP:

Siemens Step7 Profibus DPV1 examples for DF30DP and DF31DP, for consistent (contiguous) data transmission over the Profibus with blocks SFC14 and SFC15 and amplifier parameterization via DPV1 functions using SFB52, can be found on the digiCLIP system-CD and at www.hbm.com/support.

More detailed information on DPV1 mode can be obtained from the manufacturer of the Master module.

From Siemens, for example:
www.ad.siemens.de/support
Document number: 10259221
S7 integration of DPV1 slaves

7.3.1 Acyclic data transmission (required data)

Acyclic transmission of data is necessary for all slave devices with many different parameters or options that have to be modified or optimized during operation. Typical examples include the setting and optimization parameters of a drive, such as limit values for rotational speed or torque, the mode of operation, or the error list.

Acyclic data are handled in parallel with, and in addition to, the cyclic transmission of process data, but with a lower priority. This should minimize any effect on the timing of the high-priority, cyclic transmission of process data.

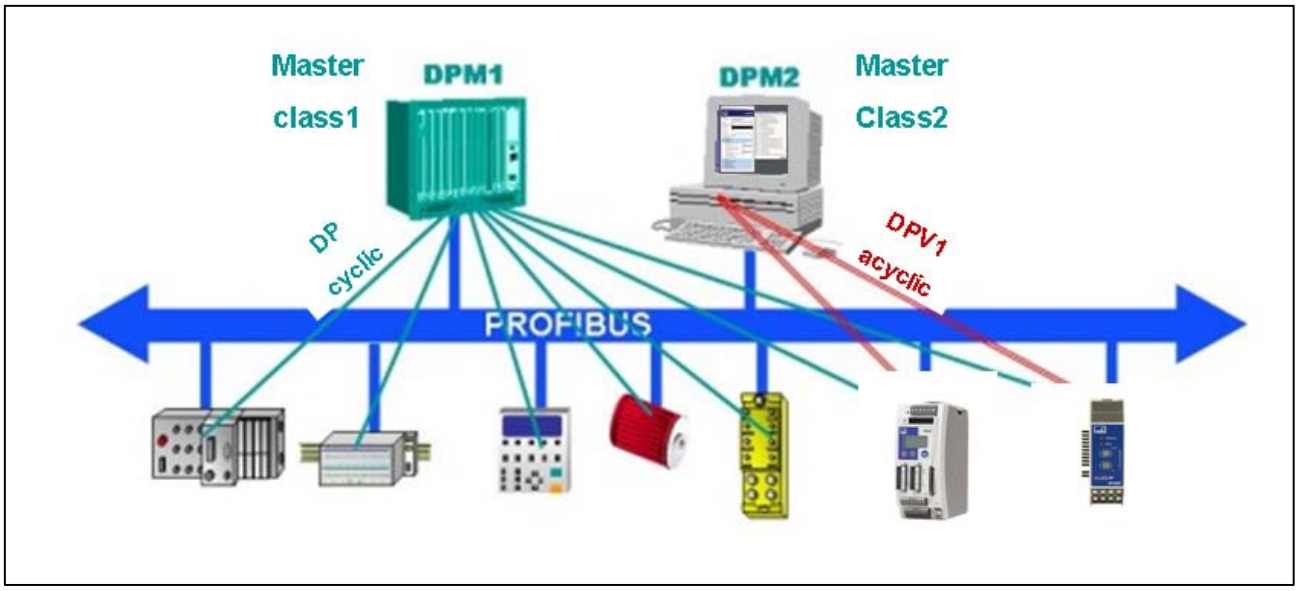


Fig. 7.4: Cyclic and acyclic data transfer in a PROFIBUS network

7.3.2 Addressing required data

Required data are addressed device-related, by specifying slot, index and length. Data and parameters are addressed by specifying the slot number and index.

7.3.3 Addressing required data

Required data are addressed device-related, by specifying slot, index and length. Data and parameters are addressed by specifying the slot number and index.

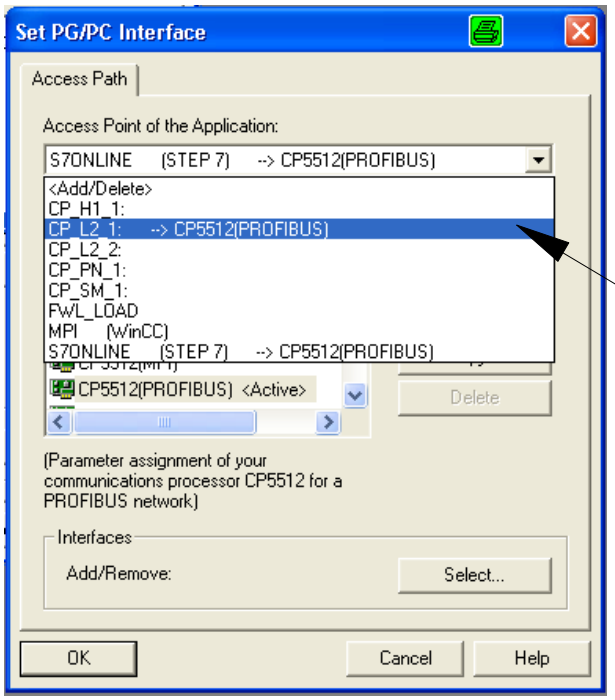
7.3.4 Use with SIEMENS SPS–S7

To enable proper access to the digiCLIP modules in Class 2 Master mode through digiCLIP Assistant, please observe the following:

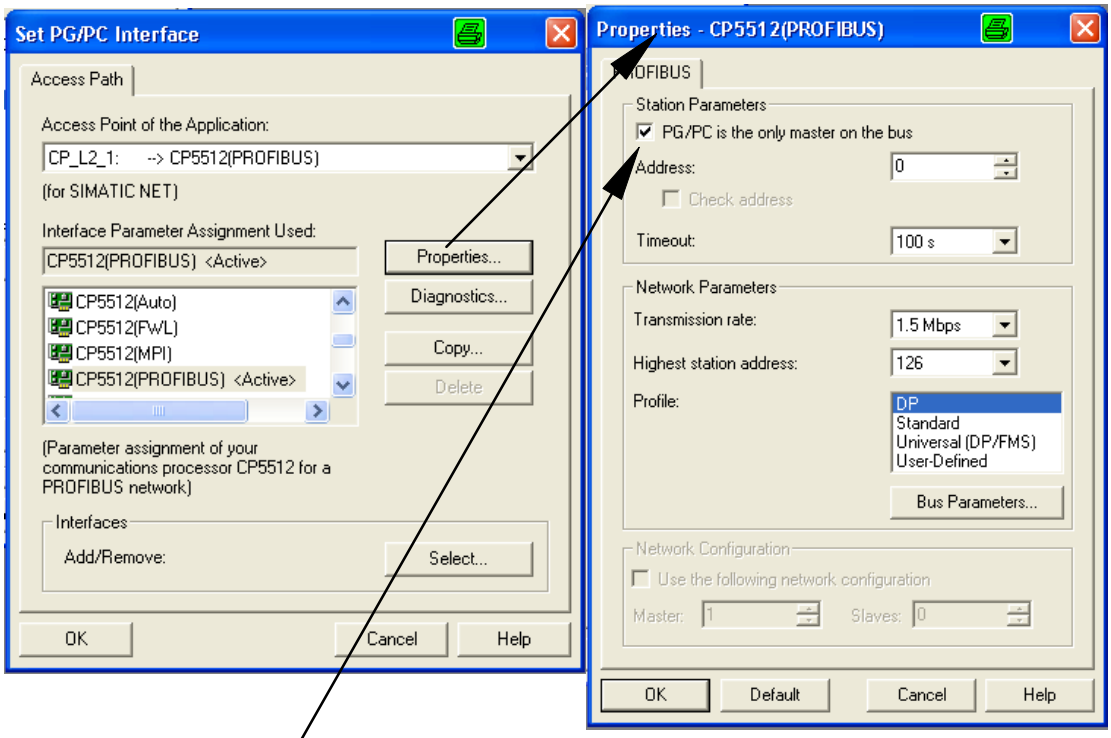
- Ensure that SiematicNet is installed. Please note that with Step7V5.3 SiematicNet is not automatically included in installation. Please contact SIEMENS for the latest SiematicNet packages.
- Please use the latest CP5512 SIEMENS card with Windows XP connection.

For testing the connection and the connected Profibus modules, the SIEMENS tool ”SiematicNet einstellen (Diagnose)” (Configure SiematicNet (diagnosis)) can be used as follows. To call this tool  , use the Windows Control Panel.

- Depending on the connected programming device, select CP_L2_1 as ”Access Point” for example:



Select the CP_L2_1 Profibus protocol assigned to your card, e.g. CP5512 (Profibus).

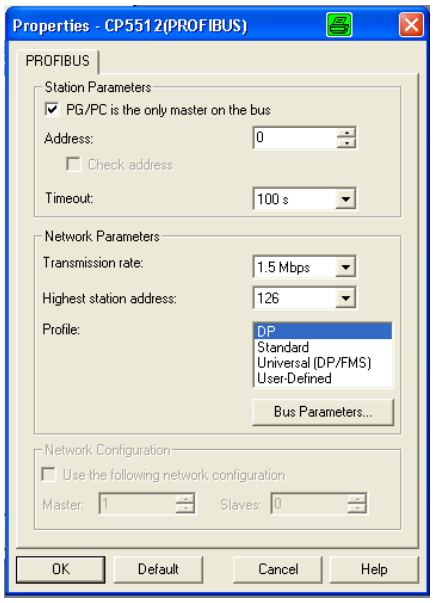


Check the box only if **one** master (PC or CP5512) is connected to the Profibus.
If a control (PLC e.g. CP315) is connected to the bus in addition, you **must not** check the box (multiple masters).

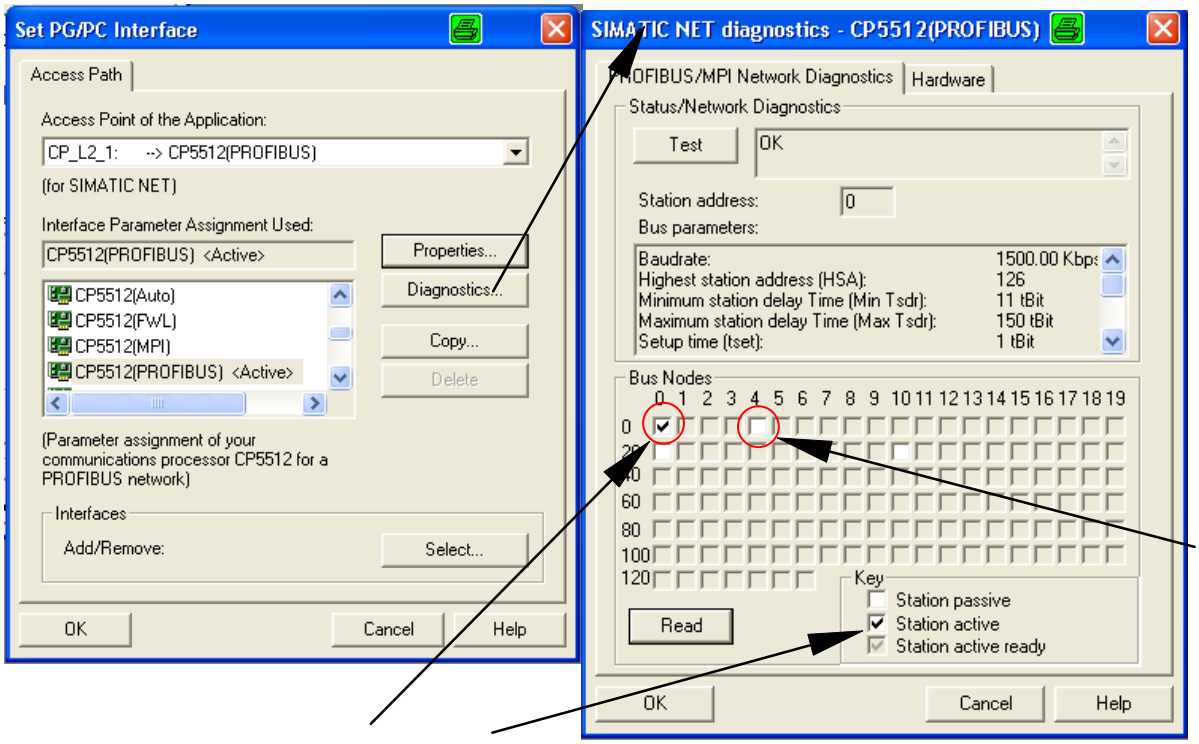
Note

If you only use a 1:1 connection of programming device and digiCLIP modules, check "PG/PC is the only master on the bus" ("Properties" tab).

Here the transmission rate and the Profibus profile (Profibus–DP) are also configured:



– To perform a system check, click the ”Test” button:



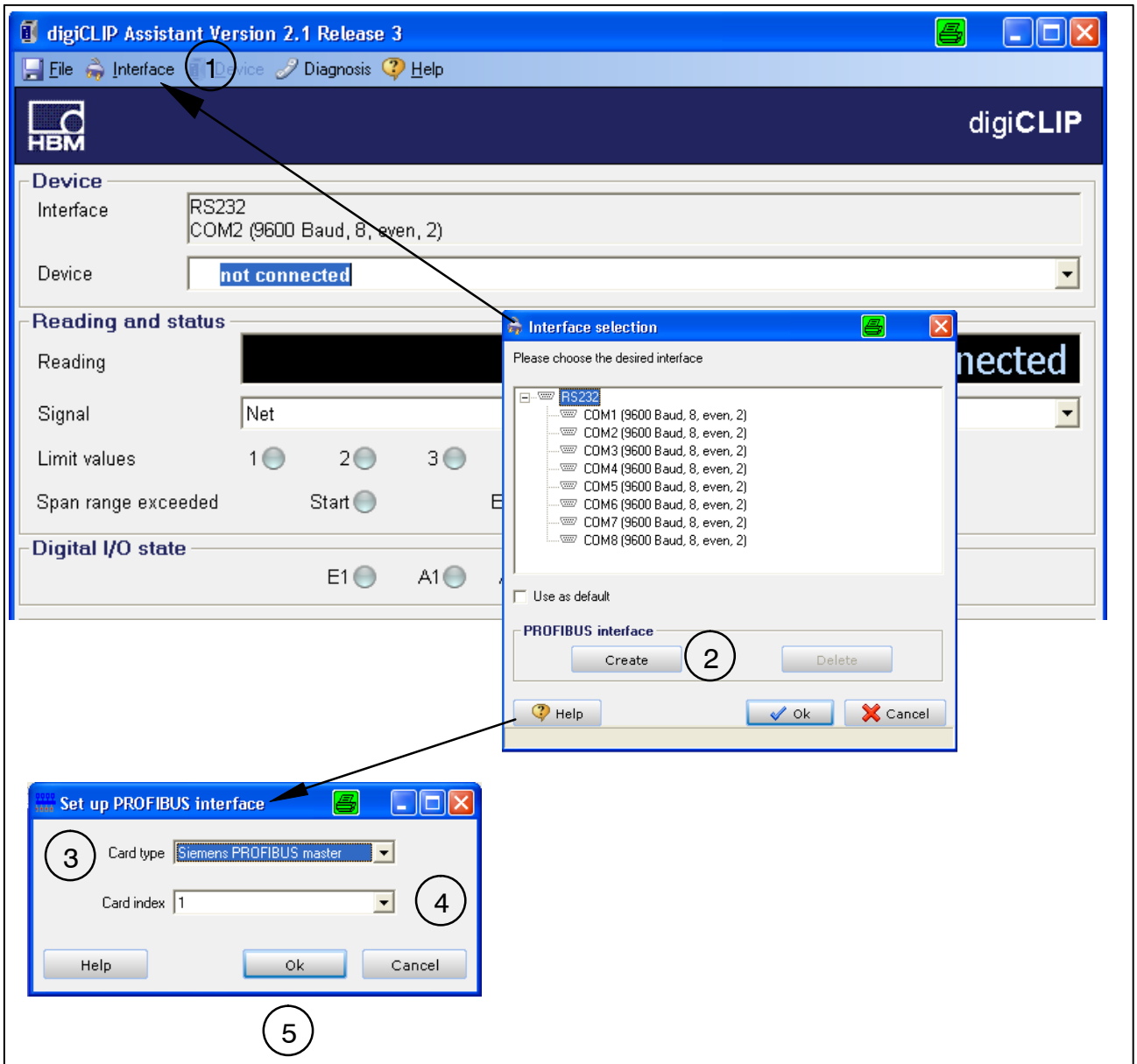
Master CP5512 and PLC, here only the PC is connected to the bus as the only master.

NOTE

Confirm all windows with OK after testing.

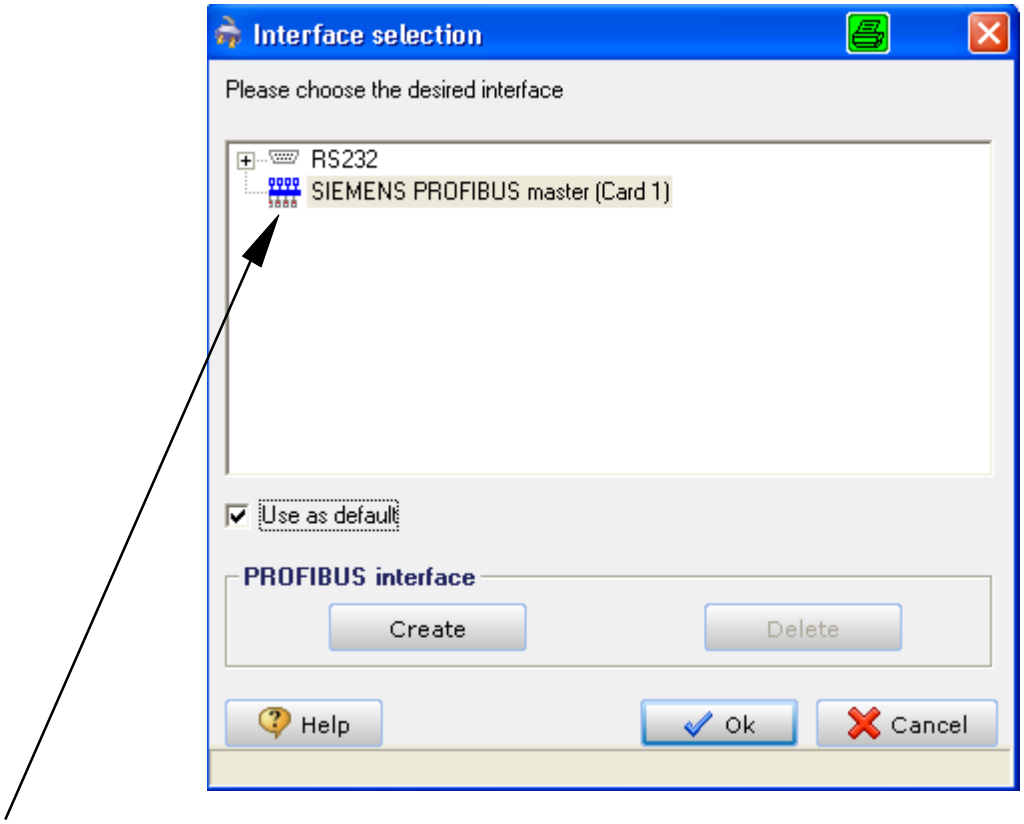
If the TEST is successful (message OK), the modules located on the bus can be displayed with the ”Read” button. Masters are shown as active stations and slaves as passive stations.

Making settings in the digiCLIP Assistant:

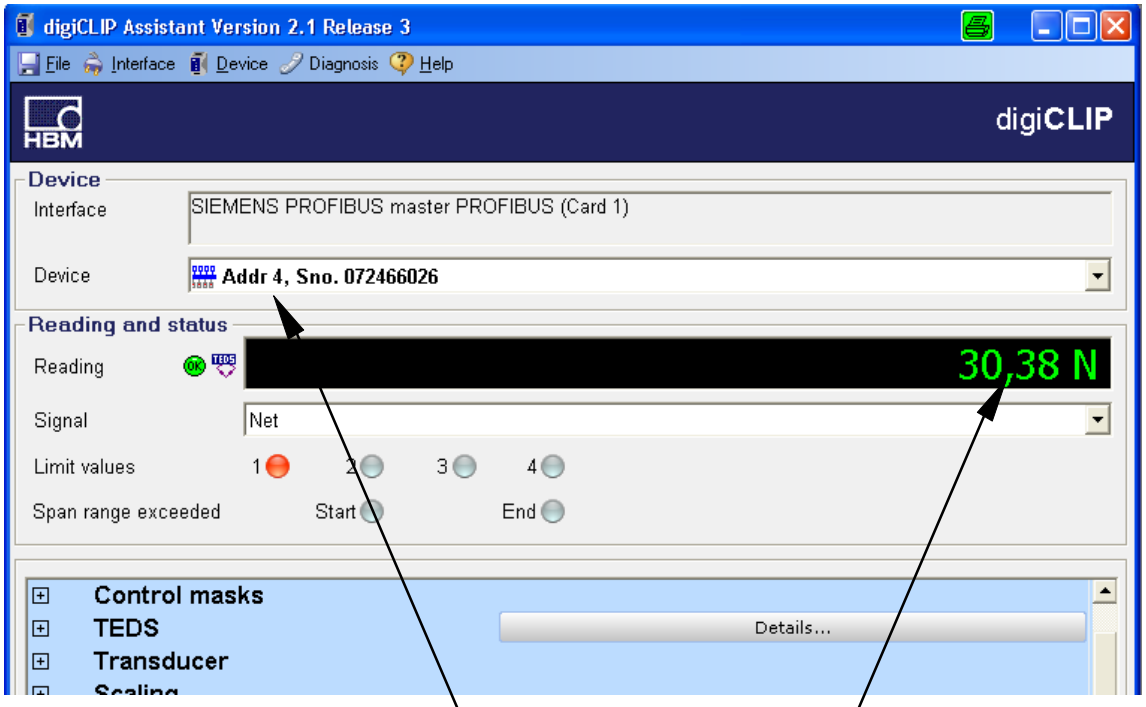


Open the digiCLIP Assistant; if an error message appears, cancel the error message and enter a Profibus interface.

1. Open the interface selection
2. Select or enter a new interface
3. Select the card type
4. Set the index to 1
5. Confirm with OK



Select the new Profibus interface and confirm with OK.



digiCLIP Profibus address and serial number

Measured value

The digiCLIP devices connected to the network are identified in a short period of time and can be parameterized.

7.4 Read/Write Container for transmitting DPV1 Class 2 commands in the real−time channel

With Read and Write Containers, it is possible to use objects from the DPV1 dictionary in the real−time channel to set up and read out the measuring amplifier. This means that these objects will then also be available to users who do not have a master with DPV1 functionality available.

Read, write and status parameters are set up in the real−time message for this. If the entry in the Read or Write Container changes, this is edited and the toggle bit is then changed in the container status. The data must be written consistently.

All the objects from the object dictionary given a 1, 2 or 4 byte length by the data type are available. Objects with the ”VisibleString” and ”OctetString” data types cannot be used

7.4.1 Container Write

The write container sets a setting value in the amplifier as the output data, or triggers the relevant commands.

Output data format:

DPV1−C2−Slot (1 byte)	DPV1−C2−Index (1 byte)	Value (4 byte)

The value must always be written as 4 bytes. If the data type is shorter than 4 bytes, the data must be entered ”right aligned”. For example, a value 2 bytes in length is written with two leading zero bytes.

As soon as the entry in the Write Container changes, the associated command is executed once and the Status Container is re−written.

7.4.2 Container Status

The Container Status provides status information of the last editing of the Write/Read Container as one byte long input data. A toggle bit signals the conclusion of command editing.

The toggle bit of the Container command is transmitted in bit 3. Bit 7 to bit 4 include the error code of the last Read/Write Container. After a Write or Read Container has been changed, the change of the Container Status first has to be considered and the error bits have to be analyzed according to the below table.

As the error code and the toggle bit are reset for each edited command, only either a Read or a Write Container may ever be changed at the same time.

Bit 7 ... 4	Bit 3	Bit 2...0
0	Toggle bit	Error code

Error codes of the Container Status:

Error code	Description
0	No error
1	Invalid value, function not implemented
2	Values outside valid range of values, setting not implemented
3	Access blocked (e. g. object not available or ReadOnly status)
4	Object not available or function not available
5	Function already started and not yet concluded (e. g. Auto−Cal)
6	Hardware error
7	Other error state

Hinweis:

Note: If a setting is to be made to the transducer characteristic which has been blocked, because the function ”Always use TEDS” has been activated, the latter is not implemented and error code 3 is set.

If a Write or a Read command are to be executed repeatedly, a container change must be transmitted between each command. A ”dummy” command that does not change the settings or the measured values is available for this, at Slot 0, Index 00.

7.4.3 Container Read

The read container is used to read out the setting values from the amplifier. The DPV1 Slot and Index output data must be written for this. The input data are then described with the current value from the amplifier and the Container Status is updated.

Output data format:

DPV1−C2−Slot (1 byte)	DPV1−C2−Index (1 byte)

Input data format:

Value (4 bytes)

As noted for the Write Container, the value is output ”right justified”. Accordingly, a value of the 2−byte long data type is generated with two leading zero bytes.

Once the value is updated, the toggle bit in Container Status is changed. In cases of incorrect access or other read errors, the error code is set accordingly and, in addition, all the bits of the container input data are set (value = FFFFFFFF hex).

Example:

In real−time mode, the filter frequency is to be changed, the current filter frequency checked and the threshold value of limit value switch 1 changed.

The associated messages are described as follows:

Reading the Container Status:

Container Status input data:

00

Setting the filter frequency of 10 Hz (Slot = 1, Index = 31 hex, value = 75 hex, 1−byte data type):

Container Write output data:

01	31	00	00	00	75

Reading the Container Status:

Container Status input data:

08

Reading the current filter frequency (Slot = 1, Index = 31 hex, 1−byte data type):

Container Write output data:

01	31

Input data:

00	00	00	75

Reading the Container Status:

Container Status input data:

00

Setting the limit value level to 1.30 (Slot = 1 hex, Index = 42 hex, floating point value = 3FA66666 hex, 4−byte data type):

Container Write output data:

01	42	3F	A6	66	66

Reading the Container Status:

Container Status input data:

08

For more application examples, e. g. about programming a SIEMENS STEP7, please visit our website at http://www.hbm.com Support Download Software

7.5 Data types

Name	Description	Abbreviation in the following tables
Boolean	Byte with the information in the least significant bit (Bit 0)	b8
Unsigned8	Unsigned byte 8 bits in length	u8
Unsigned16	Unsigned word 16 bits in length	u16
Unsigned32	Unsigned integer 32 bits in length	u32
Integer16	Integer signed in the most significant bit and 16 bits in length	i16
Integer32	Integer signed in the most significant bit and 32 bits in length	i32
Real32	Signed floating−point number, 32 bits in length	r32
VisibleString	String that does not have to be concluded with a zero character (00 hex). The length of the string is defined in the object dictionary and must be adhered to exactly. In the following tables, the number of admissible characters is given in each case	VS
OctetString	Sequence of bytes each 8 bits in length	OS

7.6 PROFIBUS DPV1 object dictionary, sorted by function groups

7.6.1 Identification

Slot C2	Index (hex)	Access[1]	Data type[2]	Value	Description	Parameter set[3]
0	02	RO	VS	Visible string	Manufacturer device name (20 characters)	–
0	03	RO	VS	Visible string	Manufacturer hardware version (13 characters)	–
0	04	RO	VS	Visible string	Manufacturer firmware version (8 characters)	–
0	05	RO	u32	011D(hex)	Manufacturer ID	–
0	06	RO	u32	0701(hex)	Manufacturer product ID	–
0	07	RO	VS	Visible String (12 characters)	HBM serial number	–
0	16	RW	u32	Number of days since January 1, 1984	Calibration date; write with password protection	–
1	60	RW	VS	Visible String „HBM digiCLIP DF31DP“ (factory setting) (20 characters)	Channel name, defined individually by user	A

1) RW: Read and Write access
RO: Read access only
WO: Write access only

2) The format describes the data type, as noted in Section 7.5.

3) Parameter set column: A: Value is stored in the parameter set; – : Value is not stored in the parameter set

7.6.2 Parameter set and factory setting

Slot C2	Index (hex)	Access[1)]	Data type	Value	Description	Parameter set
0	09	RW	u32	Write: 65766173 hex	All the current parameters marked with ”A” in the ”Parameter set” column are protected	–
0	0D	RW	u32	Write: 64616F6C hex	Restore the parameter factory settings (re–start then required)	–
0	15	RW	u32	Write: 746F6F62 hex Read: 0: Normal operation, 1: System in restart	Write: Run a system restart; Read: System state	–

7.6.3 Measured values

Slot C2	Index (hex)	Access[1)]	Data type	Value	Description	Parameter set[3)]
1	00	RO	r32		Gross measured value	–
1	01	RO	r32		Net measured value	–
1	02	RO	r32		Max. peaks measured value	–
1	03	RO	r32		Min. peaks measured value	–
1	04	RO	r32		Peak–to–peak measured value	–

7.6.4 Device status

Slot C2	Index (hex)	Access[1)]	Data type	Value	Description	Parameter set[3)]
1	05	RO	u8	System status 1 Bit 0: Measured value invalid Bit 1: Measurement input overloaded Bit 2: Measuring range exceeded Bits 4…7: Limit value switches 1…4 triggered		–
1	06	RO	u32	System status 2 Bit 0: Measured value invalid Bit 1: Positive measurement input overload Bit 2: Negative measurement input overload Bit 3: Pos. measuring range overflow Bit 4: Neg. measuring range overflow Bit 5: Scaling error Bit 6: Incorrect initial calibration values Bit 7: Error when initializing limit value switches Bits 8…11: Limit value switches 1…4 triggered Bit 12: Hardware error: Parameter memory (EEPROM) Bit 13: Hardware error: Program memory (FLASH) Bit 14: Hardware error: Autocalibration Bit 15: TEDS error [1)] Bits 16…21: Transducer connection faulty: Bit 16: Terminal 2', HBM: black Bit 17: Terminal 2, HBM: gray Bit 18: Terminal 3, HBM: blue Bit 19: Terminal 3', HBM: green Bit 20: Terminal 4 [–], HBM: red Bit 21: Terminal 1 [+], HBM: white Bits 22…31: *reserved*		–
0	11	RO	u8	0: digiCLIP is SLAVE 1: digiCLIP is MASTER	Hardware synchronization	–
0	10	RO	u8	0: identical 1: not identical	Check whether the current application parameters match the data in the EE-PROM	–

1) TEDS data availability is only monitored if this has been activated (digiCLIP Assistant: "Always use TEDS" checked)

7.6.5 Device control

Slot C2	Index (hex)	Access[1]	Data type	Value	Description	Parameter set[3]
1	07	RW	u8	Control byte 1:[1] Bit 0: Run zeroing Bit 1: Run taring Bit 2: Continuous clear of max. peak−value memory Bit 3: Continuous clear of min. peak−value memory Bit 4: One−off clear of max. peak−value memory Bit 5: One−off clear of min. peak−value memory Bit 6: Hold max. peak−value memory Bit 7: Hold min. peak−value memory Factory setting; all Bit = 0		A[2]
1	08	RW	u8	Bit n = 1: Function enabled Bit n = 0: Function disabled	Control byte 1 Mask When bit = 1, the corresponding bit of control byte 1 is executed; when bit = 0, the corresponding bit of control byte 1 is ignored and assumed to be ”0”.	A
				Factory setting: all Bit = 1		
1	09	RW	u8	Control byte 2[3] : Bit 0: Run autocalibration (”Auto−Cal”) Bit 1: Run zeroing (”Auto−Zero”) Bit 2: Run taring (”Auto−Tare”) Bit 3: Clear all the limit value switch hysteresis states Bit 7: Read out TEDS and trigger TEDS calibration Factory setting; all Bit = 0		–
1	0A	RW	u8	Bit n = 1: Function enabled Bit n = 0: Function disabled	Control byte 2 Mask When bit = 1, the corresponding bit of control byte 2 is executed; when bit = 0, the corresponding bit of control byte 2 is ignored and assumed to be ”0”.	A
				Factory setting: all Bit = 1		
1	0B	WO	u32	696C6163 hex (constant)	Trigger one−off autocalibration (”Auto−Cal”)	–
1	0C	WO	u32	7A65726F hex (constant)	Trigger zeroing (”Auto−Zero”)	–
1	0D	WO	u32	74617261 hex (constant)	Trigger taring (”Auto−Tare”)	–

1) If several command bits are set at the same time, this is the sequence that is followed: zeroing, taring, edit peak−value memory. If several bits are set to control the peak−value memory, this is the priority that is applied (the first−named has the highest priority): continuous clear, one−off clear, hold. The functions of bits 0, 1, 4 and 5 are only executed when there is a change of state from logic 0 to 1.

2) Only the state of bits 2, 3, 6 and 7 is protected in the application parameter set.

3) If several control bits are set simultaneously, this sequence applies: zeroing, taring, clearing hysteresis states, autocalibration. Bit 7, for calibration by TEDS, must not be set at the same time as other control bits. Functions are only executed when there is a change of state from logic 0 to 1.

7.6.6 Peak−value memory control

Slot C2	Index (hex)	Access[1)]	Data type	Value	Description	Parameter set[3)]
1	10	RW	u8	0: Gross measured value (Factory setting) 1: Net measured value	Input signal for max. peak−value memory	A
1	11	RW	u8	0: Gross measured value (Factory setting) 1: Net measured value	Input signal for min. peak−value memory	A
1	12	RW	u8	0: Normal operation 1: one−off clear	One−off clear of max. peak−value memory: The next measured value is the current max. peak value. Read returns = 1 until clearing has been executed in the device	−
1	13	RW	u8	0: Normal operation 1: one−off clear	One−off clear of min. peak−value memory: The next measured value is the current min. peak value. Read returns = 1 until clearing has been executed in the device	−

7.6.7 Scaling

There are three scaling methods available: With HBM transducers, the zero value and the span are most often available as scaling data. Two−point scaling can be used as an alternative. If a transducer with TEDS is connected, the scaling values can also be set with TEDS. The objects for TEDS can be found in Section 7.6.8 . If a scaling value is changed, the scaling values in the other representation are adapted automatically.

Slot C2	Index (hex)	Access[1)]	Data type[2)]	Value	Description	Parameter set[3)]
1	1A	RW	r32	0.0 (Factory setting)	Span scaling: Scaling value: mV/V zero point	A
1	1B	RW	r32	0.0 (Factory setting)	Span scaling: Scaling value: phys. zero point	A
1	1C	RW	r32	1.0 (Factory setting)	Span scaling: Scaling value: mV/V span	A
1	1D	RW	r32	1.0 (Factory setting)	Span scaling: Scaling value: phys. span.	A
1	14	WO	u32	31746573 hex	Two−point scaling: Calibrate X1: Set current internal mV/V measured value as scaling value point 1	–
1	15	WO	u32	32746573 hex	Two−point scaling: Calibrate X2: Set current internal mV/V measured value as scaling value point 2	–
1	16	RW	r32	0.0 (Factory setting)	Two−point scaling: Scaling value: mV/V point 1	A
1	17	RW	r32	0.0 (Factory setting)	Two−point scaling: Scaling value: phys. point 1	A
1	18	RW	r32	1.0 (Factory setting)	Two−point scaling: Scaling value: mV/V point 2	A
1	19	RW	r32	1.0 (Factory setting)	Two−point scaling: Scaling value: phys. point 2	A
1	35	RW	u8	0…9 3 (Factory setting)	Decimal point position, the value range can be further restricted, subject to scaling.	A
1	38	RW	R32	0…9	Scaling acc. to y=m·x +b: slope m.	A
1	39	RW	R32	0…9	Scaling acc. to y=m·x +b: offset b.	A

7.6.8 TEDS

If several transducers with TEDS are connected to an amplifier input, it is only ever the first TEDS to be found that is evaluated. In this case, automatic scaling by TEDS and the ”Always use TEDS” function should be dispensed with.

Slot C2	Index (hex)	Access	Data type	Value	Description	Parameter set[3]
1	20	RW	u8		Write: Parameter = 1: Contact the first TEDS and load the data to the device memory[1]. Read: Return value = 1, if the data has been successfully read and is available, otherwise return value = 0	A
1	21	RW	u32	0 (Factory setting)	Physical reference unit, into which TEDS data are to be converted[2]	A
1	22	WO	u32	73646574 hex	Activate scaling by TEDS	–
1	23	RO	i16		TEDS: Read out the last calibration date (number of days since January 1, 1998)	–
1	24	RO	i16		TEDS: Read out the calibration period	–
1	25	RO	VS	Visible string (3 characters)	TEDS: Read out the initials of the calibrator	–
1	26	RO	VS	Visible string (45 characters)	TEDS: Read out the transducer comments	–
1	27	OS	i16	OctetString (8 bytes)	TEDS: Read out transducer identification (T–ID)	–

1) Whenever a transducer is connected and each time the device is re–started, the TEDS data are read into the device automatically, so that it is not normally necessary to address the TEDS specifically.

2) The physical reference unit is the quantity into which the scaling values are converted, when a TEDS has been read out. This method also allows non–metric units to be supported or a conversion, for example, from newtons (as stored in the TEDS) to kilonewtons (as required in the digiCLIP application). In many cases, the user will set the same unit here, as for displaying the measured values. If a required unit is not compatible with the TEDS data because, for example, a torque transducer has been connected, but newtons, the force transducer unit, have been selected, the error bit is set in the TEDS status word.

Slot C2	Index (hex)	Access[1)]	Data type[2)]	Value	Description	Parameter set[3)]
1	28	RW	u8	0: Do not use TEDS automatically (Factory setting) 1: Always use TEDS	Always use TEDS[1)]	A
1	29	RO	u8	0: Manual scaling 1: Current scaling corresponds to the TEDS data	Current scaling took place on account of TEDS activation	–
1	2A	RO	u8	Bit 0: TEDS not available/cannot be read Bit 1: Scaling not possible (check decimal places) Bit 2: Required conversion unit does not match the transducer Bit 3: The excitation voltage in the TEDS is not supported	TEDS-error status	–
1	2B	RO	u16		Basic-TEDS-Template: “Manufacturer”	–
1	2C	RO	u16		Basic-TEDS-Template: “Model”	–
1	2D	RO	u8		Basic-TEDS-Template: “Version letter”	–
1	2E	RO	u16		Basic-TEDS-Template: “Version number”	–
1	2F	RO	u32		Basic-TEDS-Template: “Serial number”	–

1) ”Always use TEDS” causes the availability of the TEDS data to be monitored, the TEDS activates and scaling takes place in accordance with the TEDS data. Write access to scaling values is then declined.

7.6.9 Transducer settings

Slot C2	Index (hex)	Access[1]	Data type[2]	Value	Description	Parameter set[3]
1	1E	RW	u8	0: 2.5 V (Factory setting) 1: 1.0 V	Excitation voltage, 2.5 V sets the measuring range to ±4 mV/V, 1.0 V sets the measuring range to ±10 mV/V,	A
1	1F	RO	u8	0:±4 mV/V 1:±10 mV/V	Measuring range	–
1	0E	RW	u8	0: Normal measurement mode 1: Internal zero signal 2: Internal calibration signal	Selecting the input amplifier signal. Normal measurement mode is always set after a restart.	–

7.6.10 Signal conditioning

Slot C2	Index (hex)	Access	Data type	Value (dez)	Description	Parameter set[3]
1	30	RW	r32	100.0 (Factory setting)	Write: Choice of filter frequency in Hz. [1] Reading the index returns the actually active filter frequency in Hz.	A
1	31	RW	u8	120: 100 Hz, (Factory setting) 119: 50 Hz, 118: 20 Hz, 117: 10 Hz, 116: 5 Hz, 115: 2 Hz, 114: 1 Hz, 113: 0.5 Hz 112: 0.2 Hz, 111: 0.1 Hz, 110: 0.05 Hz	Filter frequency, Bessel–like	A
1	32	RW	r32	0.0 (Factory setting)	Zero point	A
1	33	RW	r32	0.0 (Factory setting)	Tare value	A
1	34	RW	VS	Visible string “(empty)” (Factory setting)	Physical unit as a string, exactly 12 characters in length. [2]	A
1	35	RW	u8	0…9 3 (Factory setting)	Decimal point position, the value range can be further restricted, subject to scaling.	A

[1] If the required frequency is not available in the device, the next highest possible one is set as the frequency. When a frequency higher than the highest possible one is chosen, the error state is indicated and the previous filter coefficients are not changed. Writing this object re–sets Slot 1, Index 31.

[2] These values are only stored in the device, they are not evaluated. Scaling by TEDS also causes this entry to change.

7.6.11 Range monitoring

Range monitoring does not lead to an error message when the limit value is exceeded. Instead, corresponding status bits are set to ”measuring range monitoring”.

Slot C2	Index (hex)	Access[1]	Data type[2]	Value	Description	Parameter set[3]
1	36	RW	r32	$-1 \cdot 10^{10}$ (Factory setting)	Gross measured value range monitoring: Lower limit	A
1	37	RW	r32	$+1 \cdot 10^{10}$ (Factory setting)	Gross measured value range monitoring: Upper limit	A

7.6.12 Limit value monitoring

Slot C2	Index (hex)	Access[1]	Data type[2]	Value	Description	Parameter set[3]
1	40	RW	u32	Compare with: *Gross measured value:* 61300120 hex or 91300120 hex (Factory setting) *Net measured value:* 61400120 hex or 91400120 hex *Max. peak measured value:* 20020120 hex or 30020120 hex *Min. peak measured value:* 20030120 hex or 30030120 hex *Peak–to–peak measured value:* 20040120 hex or 30040120 hex	Measured value source for limit value switch 1	A
1	41	RW	u8	inactive: 0 (Factory setting) greater or equal: 2 less: 3	Level reference for limit value switch 1	A
1	42	RW	r32	0.0 (Factory setting)	Threshold value for limit value switch 1, physical quantity	A
1	43	RW	r32	Value >= 0 0.0 (Factory setting)	Hysteresis for limit value switch 1, physical quantity	A
1	44	RO	b8	0: not triggered 1: triggered	State of limit value switch 1	–

Slot C2	Index (hex)	Access[1]	Data type[2]	Value	Description	Parameter set[3]
1	45	WO	b8	0: no action 1: clear	Clear hysteresis state of limit value switch 1	–
1	48	RW	u32	see Slot 1, Index 40	Measured value source for limit value switch 2	A
1	49	RW	u8	see Slot 1, Index 41	Level reference for limit value switch 2	A
1	4A	RW	r32	0.0 (Factory setting)	Threshold value for limit value switch 2	A
1	4B	RW	r32	Value >= 0 0.0 (Factory setting)	Hysteresis for limit value switch 2	A
1	4C	RO	b8	0: not triggered 1: triggered	State of limit value switch 2	–
1	4D	WO	b8	0: no action 1: clear	Clear hysteresis state of limit value switch 2	–
1	50	RW	u32	see Slot 1, Index 40	Measured value source for limit value switch 3	A
1	51	RW	u8	see Slot 1, Index 41	Level reference for limit value switch 3	A
1	52	RW	r32	0.0 (Factory setting)	Threshold value for limit value switch 3	A
1	53	RW	r32	Value >= 0 0.0 (Factory setting)	Hysteresis for limit value switch 3	A
1	54	RO	b8	0: not triggered 1: triggered	State of limit value switch 3	–
1	55	WO	b8	0: no action 1: clear	Clear hysteresis state of limit value switch 3	–
1	58	RW	u32	see Slot 1, Index 40	Measured value source for limit value switch 4	A
1	59	RW	u8	see Slot 1, Index 41	Level reference for limit value switch 4	A
1	5A	RW	r32	0.0 (Factory setting)	Threshold value for limit value switch 4	A
1	5B	RW	r32	Value >= 0 0.0 (Factory setting)	Hysteresis for limit value switch 4	A

Slot C2	Index (hex)	Access[1]	Data type[2]	Value	Description	Parameter set[3]
1	5C	RO	b8	0: not triggered 1: triggered	State of limit value switch 4	–
1	5D	WO	b8	0: no action 1: clear	Clear hysteresis state of limit value switch 4	–
1	5E	RO	u8	Bit 0 = switch 1 … Bit 3 = switch 4	State of limit value switches 1…4	A
1	5F	WO	b8	0: no action 1: clear all switches	Clear hysteresis states of all limit value switches	A

7.6.13 Digital inputs and outputs (DF31DP only)

Slot C2	Index (hex)	Access	Data type	Value	Description	Parameter set
1	80	RW	u8	Bit 0: input polarity Bit 4: output 1 polarity Bit 5: output 2 polarity	Polarity of digital input and digital outputs: inverting when bit set	A
				Factory settings: all bits = 0		
1	81	RW	u8	Action of digital input: [1] Bit 0: run zero balance Bit 1: run taring Bit 2: continuous clear of max. peak-value memory Bit 3: continuous clear of min. Peak-value memory Bit 4: one−off clear of max. Peak-value memory Bit 5: one−off clear of min. Peak-value memory Bit 6: stop max. Peak-value memory Bit 7: stop min. Peak-value memory Factory settings: all bits = 1		A
1	82	RO	u8	Bit 0: input status Bit 4: output 1 status Bit 5: output 2 status	Electrical status of digital input and digital outputs [2]: bit set when 24 V	–
1	83	RO	u8	Bit 0: input status Bit 4: output 1 status Bit 5: output 2 status	Logic state of digital input and digital outputs, taking polarity into consideration: bit set when action active	–

1) If several bits are set at the same time, this is the sequence that is followed: zero balance, taring, edit peak−value memory. If several bits are set to control the peak-value memory, this is the priority that is applied (first-named has the highest priority): continuous clear, one-off clear, stop. The actions for bit 0, bit 1, bit 4 and bit 5 are carried out precisely when the input voltage changes from the quiescent level to the active level. The actions for bit 2, bit 3, bit 6 and bit 7 are carried out as long as the input voltage corresponds to the active level. The quiescent or active levels are defined with index 2300. The response occurs with the next but one measured value at the latest. The latency time of the electronic digital input can be found in the current data sheet.

2) Short circuit of digital output is not recognized.

Slot C2	Index (hex)	Access	Data type	Value	Description	Parameter set
1	85	RW	u8	Signal source of digital output 1: [3] Bit 0: limit value switch 1 Bit 1: limit value switch 2 Bit 2: limit value switch 3 Bit 3: limit value switch 4 Bit 4: positive out-of-range Bit 5: negative out-of-range Bit 6: overload of input amplifier Bit 7: general error with invalid measured value Factory settings: all bits = 0		A
1	86	RW	u8	Signal source of digital output 2: bit assignment as for digital output 1 Factory settings: all bits = 1		A

3) Several bits can be set simultaneously. The logic states are then assigned ”or-linked” to the digital output. The switching states of bits 0 to 6 are updated with every measured value. The status of bit 7 indicates general errors that lead to invalid measured values, such as transducer, scaling or TEDS errors.
A response time greater than 400 ms must be assumed here. The latency time of the electronic digital input can be found in the current data sheet.

8 DigiCLIP data memory in the sensor

This functionality is not available until the following firmware versions:

DF30DP: ab Version 1.38

DF31DP: ab Version 1.24

14 data memories are available. Each data memory has a maximum data length of 32 bits of user data. The data format is ”unsigned”.

The read or write request only returns once the request has been processed in full. Should an error occur here, because, for example, the object has been incorrectly addressed, there is a transmission error that could not be automatically corrected, or the data memory is damaged, the request returns with an error message. Reading from the sensor usually takes less than 500 ms, writing to the sensor about 1 second. Processing can last up to 3 seconds if there is no sensor with TEDS connected, or in rare cases, when there are transmission faults.

Objects are available to set a data memory to a defined value, as well as objects to automatically increment the current value in the data memory with an incremental value communicated as a parameter.

Before it can be set, the data memory must first be unlocked. Then a constant value can be written once to a data memory. To set a data memory once again, locking first has to be deactivated again. This prevents the wrongful setting of a data memory that is used as an incremental counter.

The relevant object can be directly used to increment the counter in the data memory. There is no active locking for this. If the type of increment that is written would exceed the 32-bit number range, FFFFFFFF (hex) is written to the data memory and no error is generated.

WARNING

- As access to the data memories in the sensor is via the measuring lead, there can be no measurement while the data memories in the sensor are being accessed. In this case, the measured values are not updated. The data memory in the sensor is then accessed when the data memory is to be written, or when the data memory is to be read out after the module is switched on, after a sensor replacement or wire break. If the reading of a data memory is repeated, the numerical value stored temporarily in the digiCLIP module is transmitted. Consequently, measurement is not disturbed by repeated readout.

– Suitable measures are applied to increase data security in the digiCLIP module. The aim here is to make sure that module power failure, or removal of the sensor while writing a data memory does not destroy it. However, the reliability of this process cannot be assured to the extent that it is suitable for applications relevant to safety.

– Users must consider that a maximum of 50,000 write accesses can be expected if you add up all the write accesses to the data memories. There is no established limit to the number of read accesses.

– If a tool that has not been approved by HBM is used to write the TEDS data in the sensor, it is possible that data memories will be overwritten. We therefore strongly advise that you only use modules and software from HBM

8.1 Objects for Profibus DPV1

UINT32: unsigned integer 32 bit; RW: read and write; WO: write only

Slot (Hex)	Index (Hex)	Access	Data type	Description
00	A0	RW	u32	Data memory 1 Write: The parameter value is added as a positive increment to the existing numerical value and stored in the data memory. Should incrementation cause the 32-bit number range to be exceeded, the value **FFFFFFFF** (hex) is written and no error is generated. Read: The parameter delivers the current numerical value in the data memory.
00	A1	RW	u32	Data memory 2
00	…	RW	u32	…
00	AD	RW	u32	Data memory 14

Slot (Hex)	Index (Hex)	Access	Data type	Description
00	B0	RW	u32	Data memory 1 Write: The parameter value is written to the data memory. Object **00**/**BF** must first have been transmitted to deactivate write locking. After writing, locking is automatically reactivated. Read: The parameter delivers the current numerical value in the data memory.
00	B1	RW	u32	Data memory 2
00	…	RW	u32	…
00	BD	RW	u32	Data memory 14

Slot (Hex)	Index (Hex)	Access	Data type	Description
00	BF	WO	u32	Data memory 1 Deactivating locking to set a constant value in a data memory (see **00**/**B0** …**00**/**BD**). Write: Locking is only deactivated when the parameter value is **6B636C75** (hex). All the other parameter values generate an error message.

If a DPV1–update is not available, all named objects can also be used via the ”Read / Write container” that is available in the DPV0 with the process data flow.

9 Examples

The following example uses a measurement task to illustrate device functionality and the requisite settings.

Problem:

The forming process in a press is to be monitored, in order to achieve uniform product quality. The maximum force exerted by the press in each cycle is to be recorded. To safeguard the production process, this maximum force must lie between the lower (F1) and the upper (F2) force limit values.

Solution:

The force response measured by a strain gage force transducer (such as the C9B/10 kN; 1 mV/V) is amplified and assessed by the digiCLIP. The maximum force is recorded with the aid of the (maximum) peak−value memory and assessed with two limit value switches with regard to the upper and lower limits.

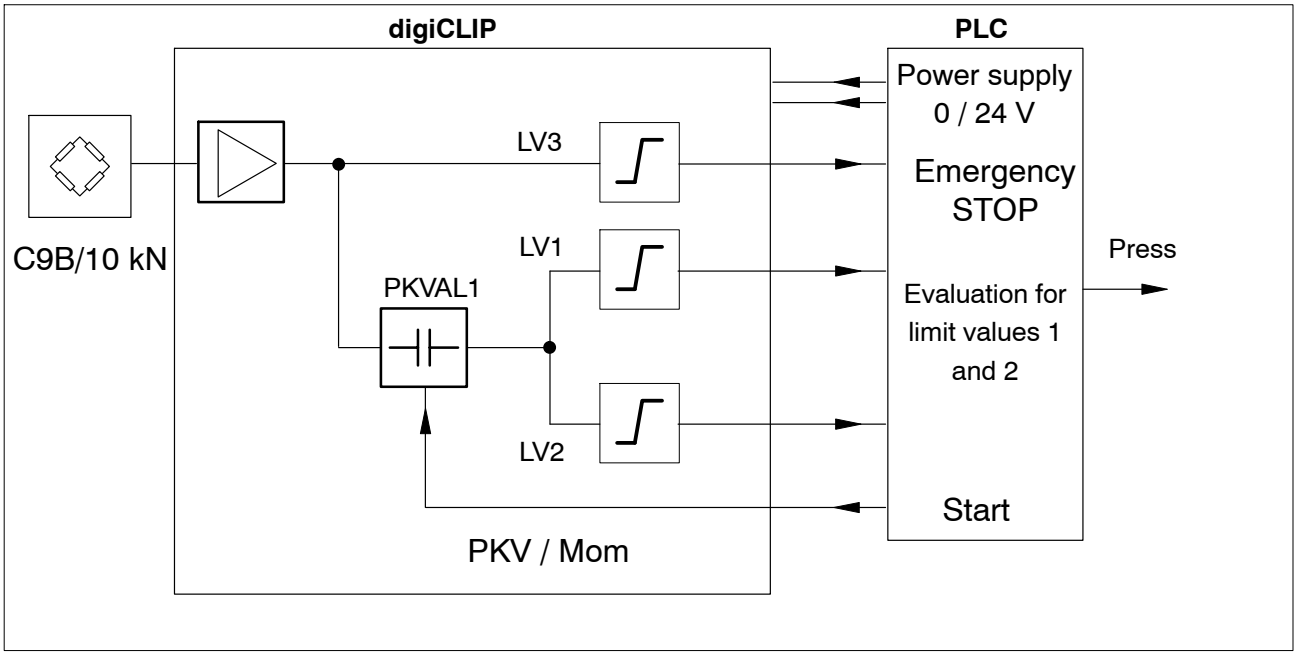
The state of limit value switches 1...4 is read regularly.

LV1 source = net measured value

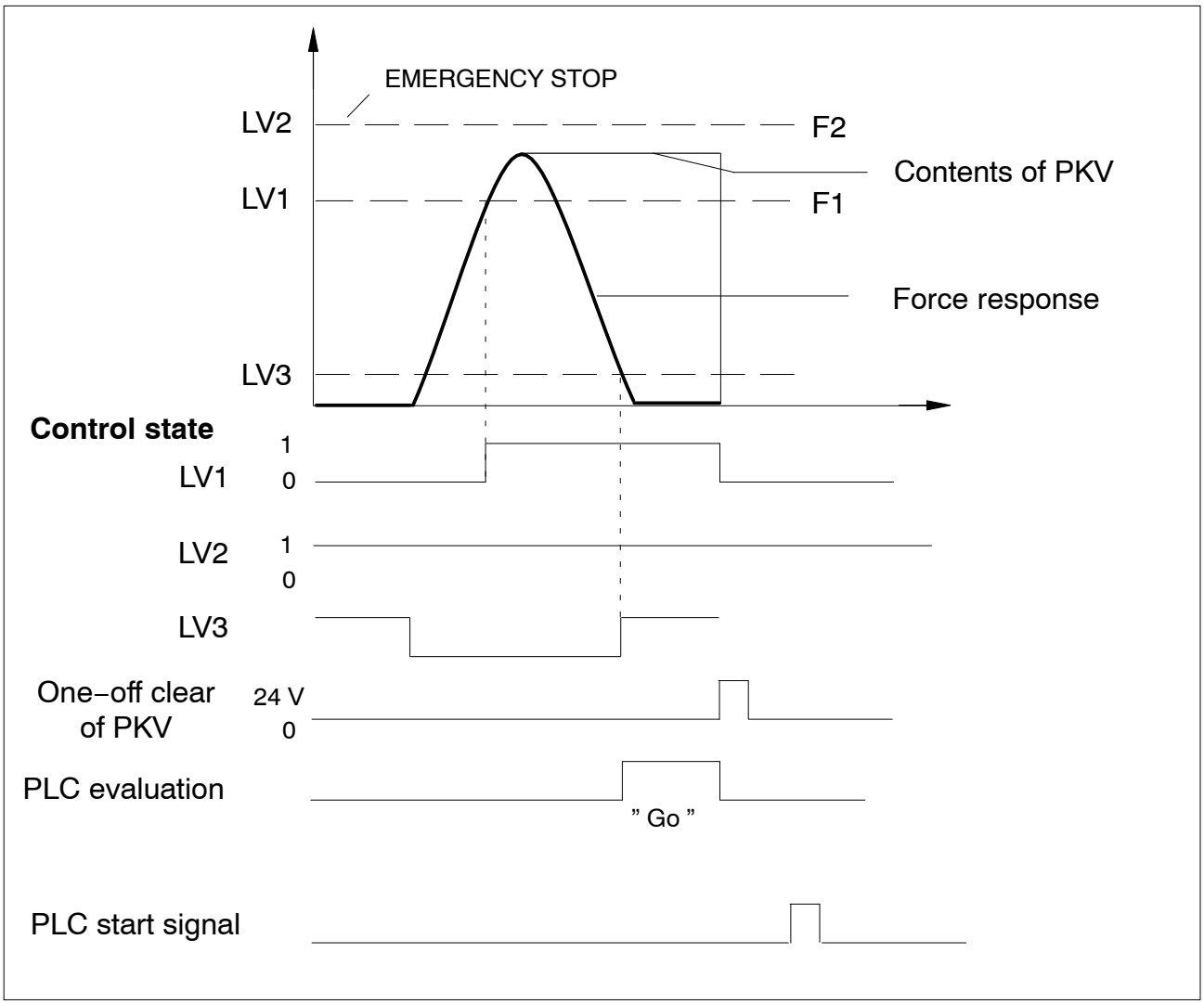
LV2 = gross measured value (machine protection)

A PLC takes over process control. As well as the control commands for the press, it gives the digiCLIP a start signal when the press cycle begins and once the process has run, enlists the help of the limit value outputs for ”Go/No−Go testing”.
The PLC start signal clears the contents of the peak−value memory via a digiCLIP control input.

Wiring diagram:



Timing diagram:



The following settings must be chosen:

LV1 Checks whether the lower force limit (F1) has been reached. The input signal is the output of the peak−value memory (maximum value). If limit LV1 is exceeded, a High signal is generated. A positive actuating direction with positive output logic must be set for this.

LV2 Checks whether the maximum load limit for the machine is exceeded (Emergency STOP function). The input signal is the gross measured value. Exceeding limit LV2 is indicated in 1 and 2. This is read immediately by the PLC and ensures that the press is quickly shut down.

LV3 Checks whether the press has returned to its starting position. This has to happen before the PLC can start ” Go / No−Go testing”.

PKV Records the maximum peak value of the force response. The input signal is the net measured value. The PKV is cleared by setting the relevant bit in the control byte.

PLC evaluation of the limit value report:

	Go	**Reject**	
LV1	1	0	1
LV2	1	1	0

10 Technical support

Should you have any questions when working with the PMX measuring amplifier system, HBM's technical support can provide:

E−mail support
support@hbm.com

Extended support can be obtained through a maintenance contract.
Fax support
06151 803−288 (within Germany)
+49 6151 803−288 (international)

The following options are also available:
HBM on the Internet
http://www.hbm.de

Download software updates from HBM
http://www.hbm.com/Software

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