

PDP32.0

PROFIBUS DP-V1 Interface



Description

The PDP32 device allows the connection of the Universal Motor Controller UMC100.3 to a PROFIBUS DP network.

Please note the following

Target group

This description is intended for the use of trained specialists in electrical installation and control and automation engineering, who are familiar with the applicable national standards.

Safety requirements

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Using this Handbook

Symbols

This technical document contains sentinels to point the reader to important information, potential risks and precaution information. The following symbols are used:

	Sign to indicate a potential dangerous situation that can cause damage of the connected devices or the environment.
	Sign to indicate important information and conditions.
	Sign that indicates a potential dangerous situation that can cause human injuries.

Terms and Abbreviations

SMK3.0	Single Mounting Kit for the fieldbus interfaces and the active termination unit PDR31
UMC100.3	Universal Motor Controller
UTP22	USB to PROFIBUS interface
PDR31	Active termination unit for PROFIBUS networks

Related Documents

Technical Documentation	Document No.
UMC100.3 Technical Manual	2CDC135032Dxxxx

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Document History		
1	09.2014	Initial Document

Overview

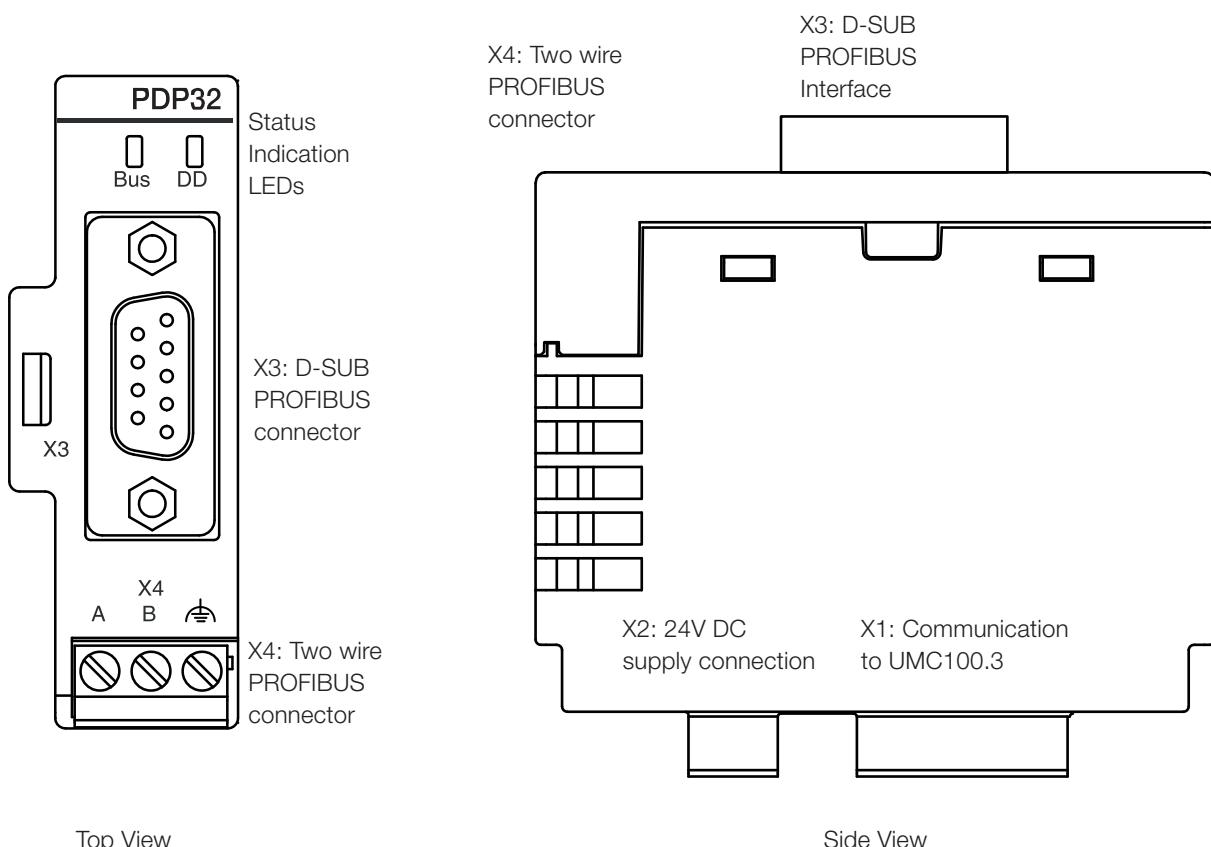
PROFIBUS is an open serial communication standard that enables data exchange between all kinds of automation components. The PDP32 communication interface is a PROFIBUS DP (Decentralised Periphery) slave on the PROFIBUS network. PROFIBUS DP is standardized in IEC 61158 together with other field bus protocols.

The physical transmission medium of the bus is a twisted pair cable (according to the RS-485 standard). The maximum length of the bus cable is 100 to 1200 meters, depending on the selected transmission rate. Up to 32 nodes can be connected to the same PROFIBUS network segment without the use of repeaters. With repeaters, it is possible to connect 126 nodes (including repeaters and a master station) to the network. In PROFIBUS communication, the master station – usually a programmable logic controller (PLC) or a distributed control system (DCS) – polls the nodes which respond and take the actions requested by the master. The PROFIBUS protocol family is specified in the IEC 61158 standard. For further information on PROFIBUS, refer to the above-mentioned standard.

The PDP32 PROFIBUS DP interface module is an optional device for the ABB motor controllers UMC100.3 which enables the connection of the UMC100.3 to a PROFIBUS network. The UMC100.3 with PDP32.0 is considered as a slave on the PROFIBUS network.

Through the adapter module you can:

- give control commands to the UMC100.3 (for example Start, Stop, Fault Reset)
- read status information and actual values from the UMC100.3
- read/write UMC100.3 parameter values

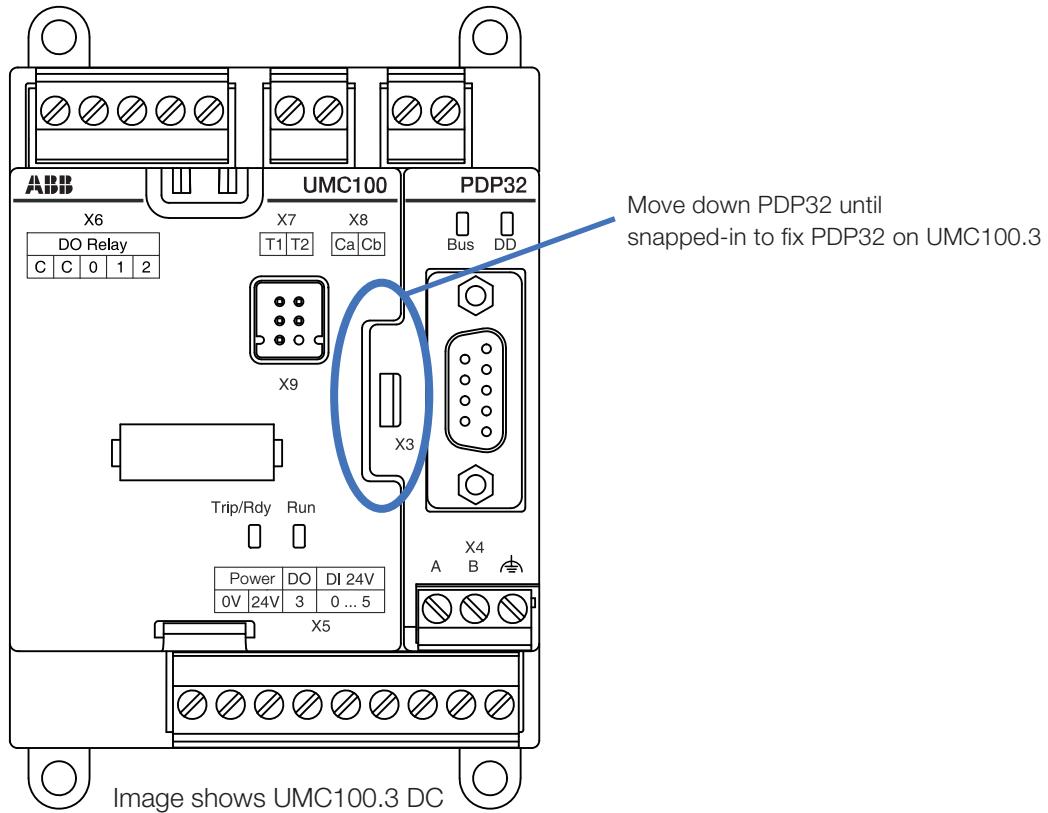


Mechanical installation

The PROFIBUS interface module PDP32 can be mounted either on the UMC100.3 itself or separately from the UMC100.3 using the single mounting kit (SMK3.0).

Mounting the PDP32 on the UMC100.3

When the module is installed directly on the UMC100.3 the UMC100.3 with PDP32 acts like a device with integrated PROFIBUS communication. No additional accessories are needed.



Mounting PDP32 remote from the UMC100.3

For remote mounting of the PDP32 the Single Mounting Kit (SMK3.0) must be used.

When remote mounted the PDP32 must be separately supplied to keep the PDP32 online even in the case when the drawer is removed. Ready made cables to connect the SMK3.0 with the drawer are available. But it is also possible to use own cables.

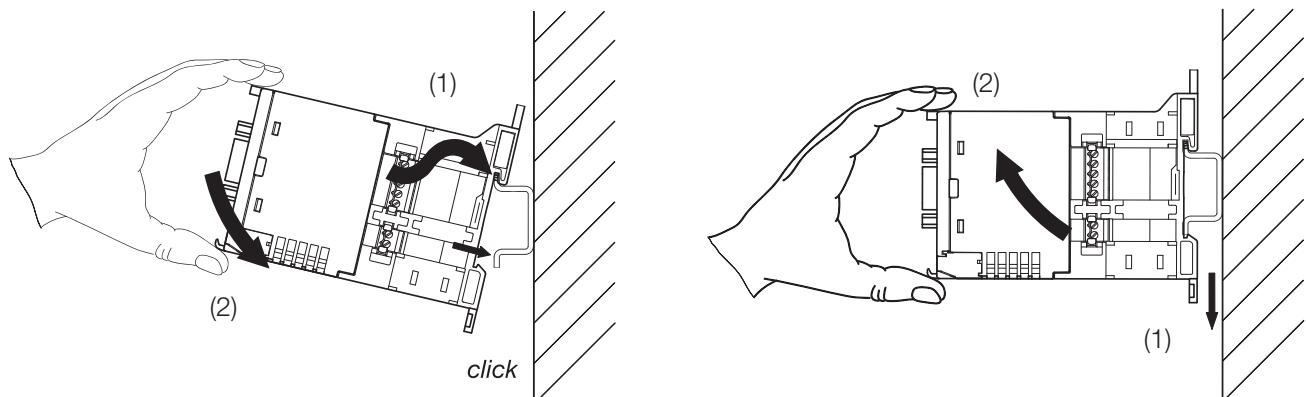
For more details see section „Using PDP32 in a Drawout System“.

Mounting the Single Mounting Kit

The single mounting kit (SMK3.0) can be either mounted on a DIN rail hat or fixed with screws on a fitting panel.

Assembly

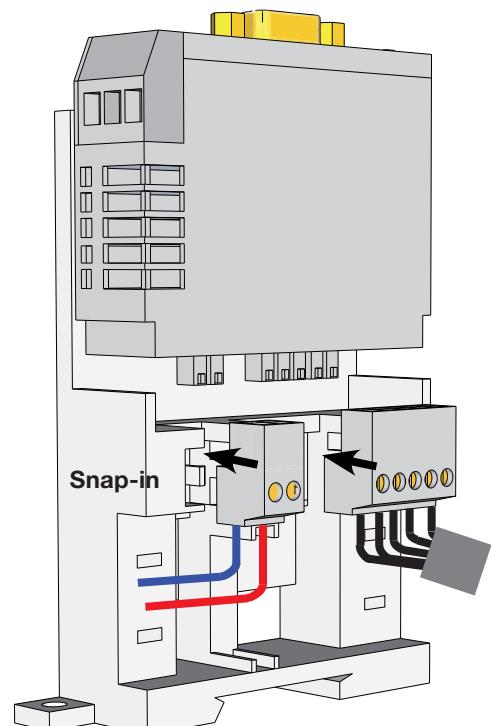
Disassembly



Mounting the PDP32/PDR31 on the Single Mounting Kit

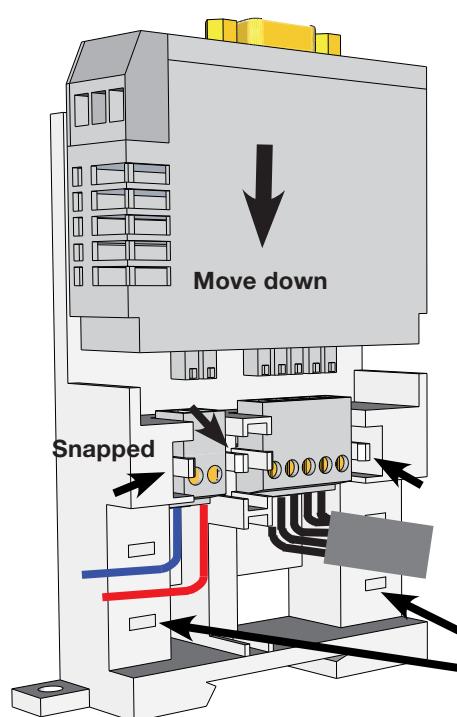
Step 1:

Snap in the communication and power supply connectors



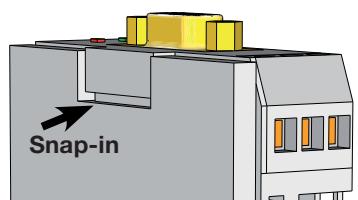
Step 2:

Move down the PDP32



Step 3:

Move down the PDP32 until snapped in

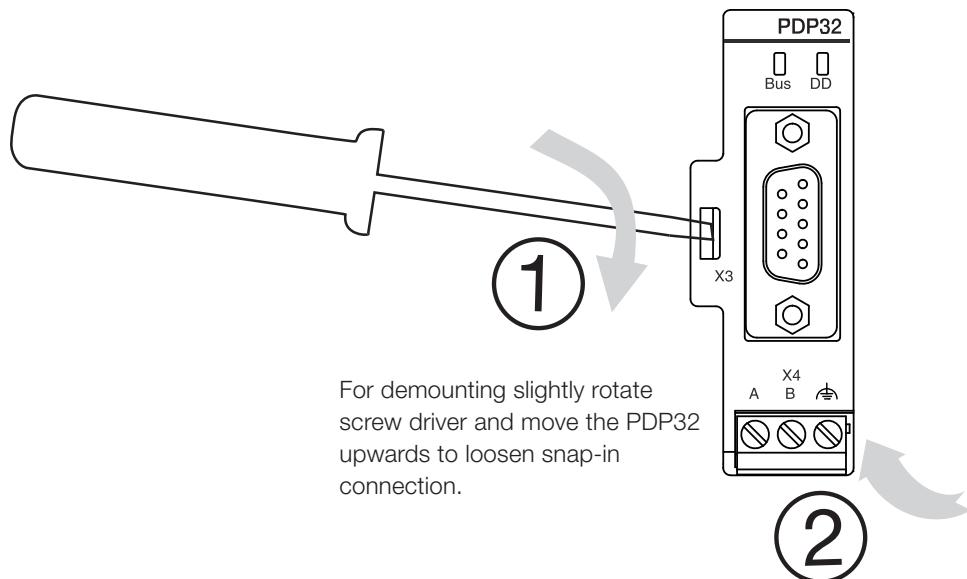


Step 4:

Fix cable with cable ties

Unmounting PDP32 and PDR31

Follow the shown procedure for demounting the PDP32 from UMC100.3 or SMK3.0



For demounting slightly rotate screw driver and move the PDP32 upwards to loosen snap-in connection.

Electrical installation

PROFIBUS Connection

PROFIBUS can be either connected on X3 and X4.

X3 allows to connect a standard D-SUB connector.

X4 can be used to connect standard 2-wire PROFIBUS cable directly.

General cabling instructions

- Arrange the bus cables as far away from the motor cables as possible.
- Avoid parallel runs
- Use bushings at cable entries

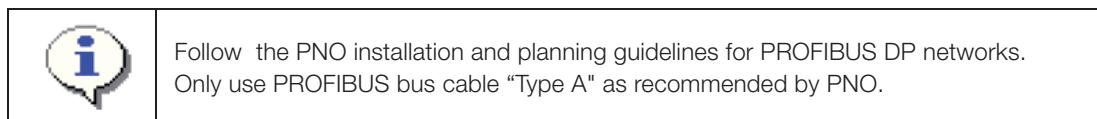
Further instructions can be found in the PROFIBUS installation instructions provided by the PROFIBUS User Organization (PNO).

X3	Description	
1		Not used
2		Not used
3	B	Data positive (Conductor 1 in twisted pair)
4		Not used
5	GND	Isolated ground
6	+5V	Isolated 5 V DC voltage supply (30 mA max.)
7		Not used
8	A	Data negative (Conductor 2 in twisted pair)
9		Not used

+5 V and GND can be used for bus termination only.

If no D-SUB connector is used, the PROFIBUS cable can be connected to the connector X4 of PROFIBUS module.

X4	Description	
1	SHLD	Alternate cable shield connection. Connected to connector housing
2	B	Data positive (Conductor 1 in twisted pair)
3	A	Data negative (Conductor 2 in twisted pair)



Bus termination

Bus termination is required to prevent signal reflections from the bus cable ends. The PROFIBUS communication interface PDP32 is not equipped with internal bus termination. Therefore, the PROFIBUS D-SUB connectors at the first and last PDP32 in a bus segment must have termination switched on.

In setups where the PDP32 is located in a drawer it is necessary to use an active bus termination at the end of the PROFIBUS line. Use PDR31 in that case.



Further information on PROFIBUS wiring is available from the publication *PROFIBUS RS485-IS User and Installation Guideline* from the PNO website.

Setting the bus address

The PROFIBUS module does not provide means to adjust the PROFIBUS address. The PROFIBUS address can be set in the UMC and is copied over to the PROFIBUS module during initial connection between UMC and PROFIBUS module. When changing the address later on perform a power cycle. See also description „UMC100.3 - section 6: Configuring the Fieldbus Communication“.

Baudrate versus network length

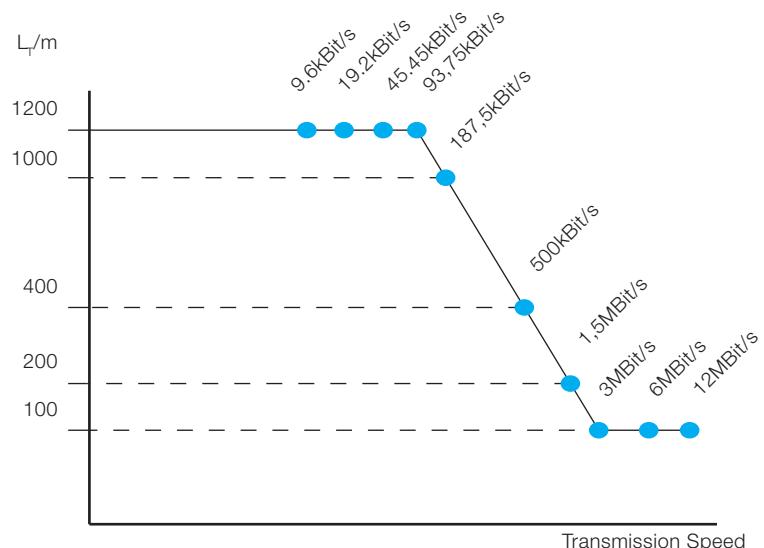
When planning a PROFIBUS network the following rules must be considered.

For the whole network i.e. starting at the DP Master up to the last DP Slave:

- approx. 4 up to 8 DP segments by Repeater (see data sheets of the Repeater)
- the slowest DP subscriber sets the transfer rate of the DP line
- number of PROFIBUS DP subscribers ≤ 126 (Addresses 0 ...125)

For a segment:

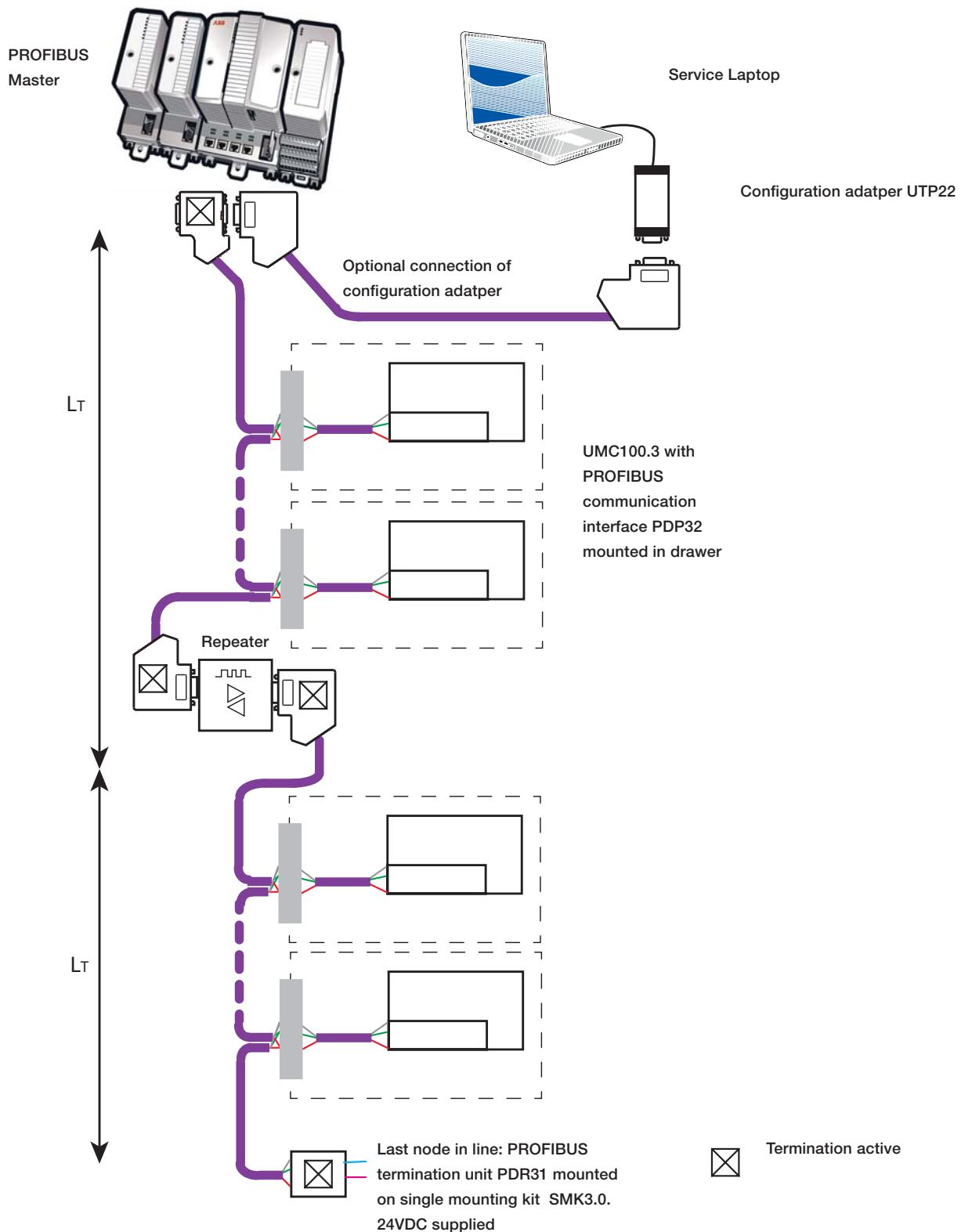
- number of DP subscriber ≤ 32 (subscriber = device with / without PROFIBUS address)
- bus termination each at the beginning and the end of every DP segment necessary!
- trunk cable length (LT) see diagram (length depending on transfer rate)



The maximum transmission distance that can be achieved using copper cables is directly related to the transmission speed chosen for the PROFIBUS network. As a result, these two variables must always be considered together.

PROFIBUS Line in Drawout Systems where PDP32 is installed on UMC100.3

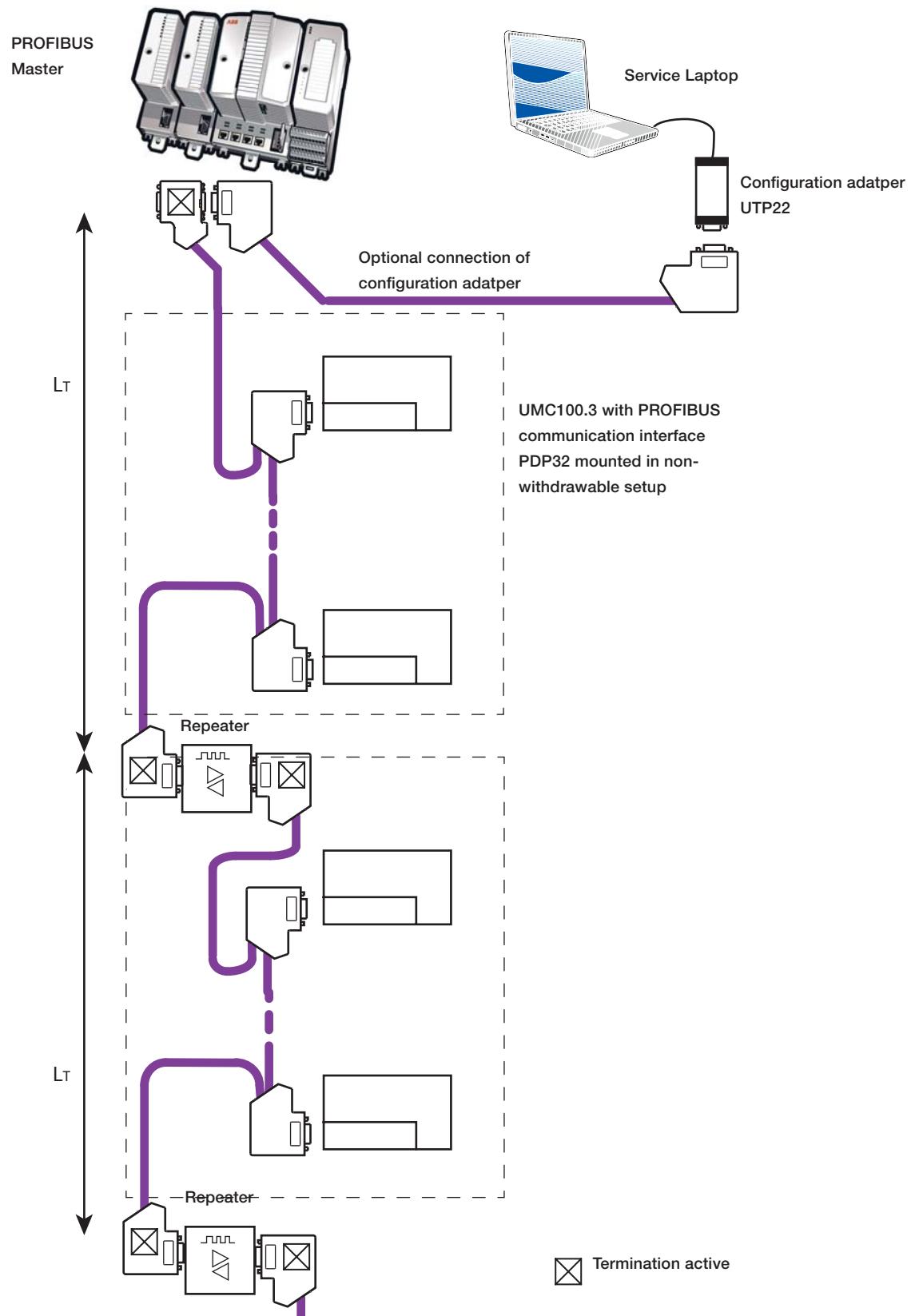
The following figure shows a simplified diagram on how to connect the UMC100.3 to a PROFIBUS network not using a 9-pin Sub-D connector. Required grounding of the PROFIBUS cable is not shown in this figure.



PROFIBUS Line in Fixed Installations

The following figure shows a simplified diagram on how to connect the UMC100.3 to a PROFIBUS network when using a 9-pin Sub-D connector for connecting the PROFIBUS communication interface PDP32.

Required grounding of the PROFIBUS cable is not shown in this figure.

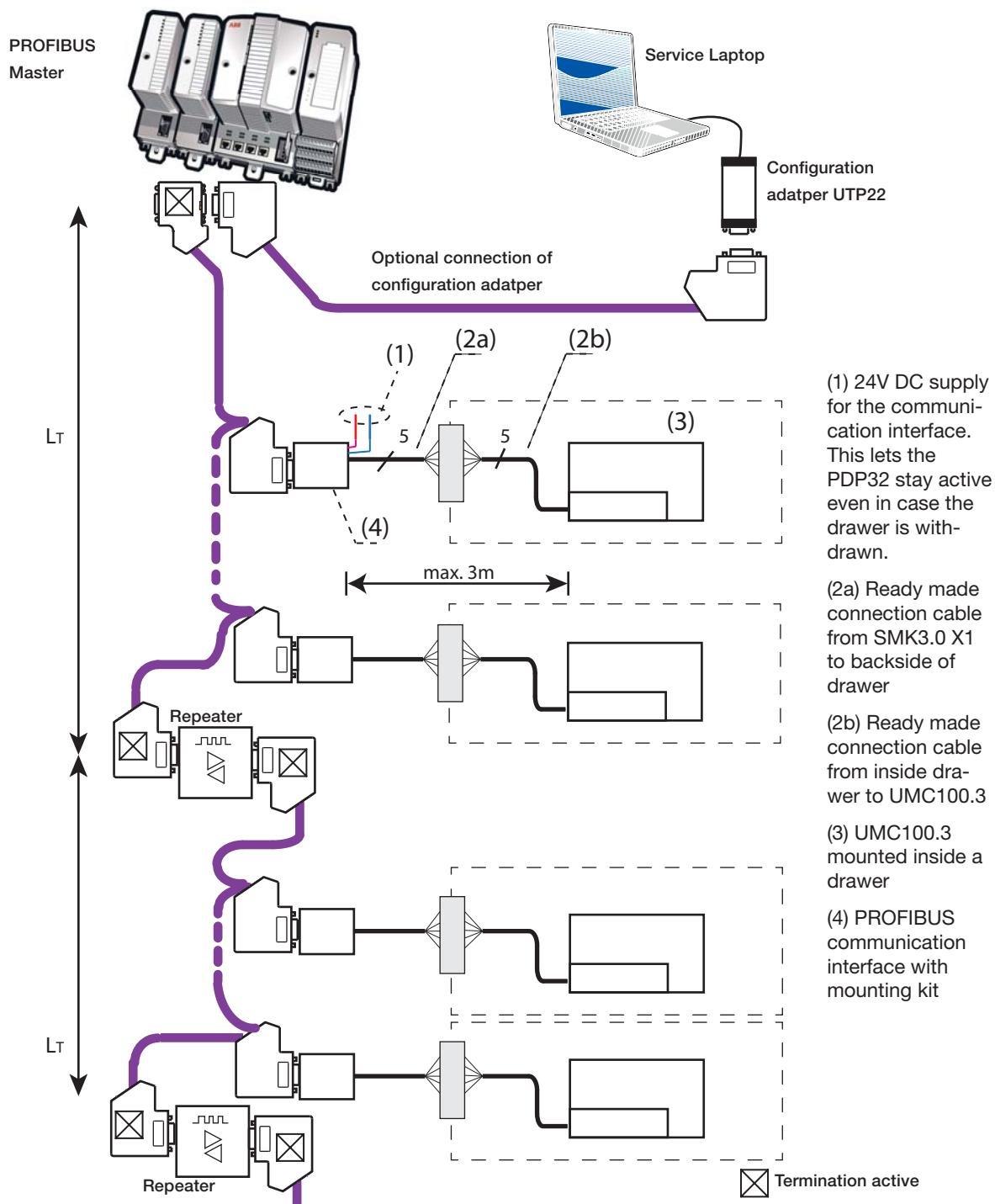


PROFIBUS Line in Drawout Systems where PDP32 is installed in Cable Chamber

The following figure shows a simplified diagram on how to connect the UMC100.3 to a PROFIBUS network if the UMC100.3 is inside a drawer and the PROFIBUS communication interface is mounted outside the drawer e.g. in the cable compartment. In drawout systems this solution has several benefits:

- PROFIBUS address is stored in the PROFIBUS communication interface in addition to the UMC100.3. In case of a drawer replacement the new - not addressed - UMC100.3 takes over the bus address automatically. Fast reparameterisation without manual interaction possible.
- Swapping of drawers detected if "Address Check" in UMC100.3 enabled. I.e. it is not possible to accidentally start the wrong motor because of swapped drawer.

Required grounding of the PROFIBUS cable is not shown in this figure.



Diagnosis

Diagnosis and behaviour in case of an error

- The PROFIBUS module provides detailed diagnosis information about the status of the connected device, its own status and the status of the PROFIBUS connection. Diagnosis information is shown
 - with the locally available lamps and
 - via the standard PROFIBUS services.

Local Diagnosis PDP32

Diagnosis information is locally shown with LEDs (Light Emitting Diodes) Bus and DD located on the front side of the PROFIBUS module. Meaning of the LED status is as follows:

LED Bus (red, green)	LED DD (red, green)	Meaning
Off	Off	Power Supply missing
Green flashing		- Connection to master missing - Bus address of UMC different form the one configured in the master - I/O size mismatch between device and master
Red flashing		Parameter mismatch between device and master
Red		Communication lost, supervision timeout time exceeded
Green		OK, normal data exchange
Amber flashing	Amber flashing	Initializing
	Green flashing	Waiting for communication from UMC
	Green	OK, normal data exchange
	Red flashing	Connection to UMC lost
	Red	Internal fault. Replace communication interface.

PROFIBUS Diagnosis

Standard Diagnosis: The format of the standard diagnosis data is defined within the PROFIBUS standards (IEC 61158).

It consists of 6 octets that cannot be influenced by the field device manufacturer. The diagnosis information is related to the communication layer and covers run-up diagnosis scenarios such as the device identification, communication mode information (FREEZE, SYNC), readiness, availabilities, watchdogs, parameterization and configuration faults.

For details see IEC 61158-6, 6.2.3.1 to 6.2.3.5. Bit 7 in octet 3 (the "Ext_Diag_Overflow" flag) is used by the PROFIBUS communication interface to indicate more diagnosis information then fits into the actual diagnosis message length.

Extended Diagnosis: PROFIBUS module offers extended diagnosis to make the diagnosis data of the connected devices available to the PROFIBUS master. Depending on the selected diagnosis format DP-V1 or DP-V0 the content of the diagnosis is slightly different.

The extended diagnosis telegram has the following format:

Byte in the extended diagnosis telegram	Meaning DP-V0	Meaning DP-V1
0	Block length: 10 = 10 Bytes	Block length: 13 = 13 Bytes
1	Communication status communication interface - UMC: Value(0) = "Communication OK" Value(1) = "Lost Communication to UMC100"	Status type (always 0x81 = Status Mode)
2	Diagnosis Byte 0 UMC (see UMC manual)	Slot number (always zero)
3	Diagnosis Byte 1 UMC (see UMC manual)	Status specifier (always zero)
4	Diagnosis Byte 2 UMC (see UMC manual)	Communication status communication interface - UMC: Value(0) = "Communication OK" Value(1) = "Lost Communication to UMC100"
5	Diagnosis Byte 3 UMC (see UMC manual)	Diagnosis Byte 0 UMC (see UMC manual)
6	Diagnosis Byte 4 UMC (see UMC manual)	Diagnosis Byte 1 UMC (see UMC manual)
7	Diagnosis Byte 5 UMC (see UMC manual)	Diagnosis Byte 2 UMC (see UMC manual)
8	Diagnosis Byte 6 UMC (see UMC manual)	Diagnosis Byte 3 UMC (see UMC manual)
9	Diagnosis Byte 7 UMC (see UMC manual)	Diagnosis Byte 4 UMC (see UMC manual)
10	-	Diagnosis Byte 5 UMC (see UMC manual)
11	-	Diagnosis Byte 6 UMC (see UMC manual)
12	-	Diagnosis Byte 7 UMC (see UMC manual)

For the PROFIBUS expert

The following section provides PROFIBUS know-how useful to better understand PROFIBUS functions.

Cold start: The CheckCfg telegram sent from the PROFIBUS master defines the reference configuration. It is accepted if it is error free. Otherwise a negative reply with appropriate diagnosis information is sent to the master. The PROFIBUS module arrives in the cyclical data exchange mode only if the reference configuration sent from the master corresponds with the configuration sent from the connected device (i.e. UMC100).

Next the PROFIBUS module waits for a parameter telegram from the bus master. Starting the cyclic PROFIBUS communication is only possible if a correct parameter telegram was received. The parameter telegram is sent to the connected devices if parameter „Ignore block parameters“ is not set to „Ignore“.

Online reconfiguration: PROFIBUS module does not support ‘Hot Configuration In Run’ as supported by some ABB control systems. Whenever a configuration change is done, the module must be restarted, to ensure that the configuration gets accepted.

Reaction on wrong configuration telegrams: Wrong configuration or parameter telegrams can occur if the used GSD file does not belong to a device or the device version. In this case the PROFIBUS module does not accept the configuration telegram and leaves cyclic operation mode or does not start the PROFIBUS communication.

Online re-parameterization of devices: Because parameter changes do not affect the structure of the I/O data re-compilation of the user application in the master is usually not necessary. In some control systems a restart of the master must be performed that makes online re-parameterization impossible. Other masters are not subject of this limitation and support online parameterization. UMC100 is able to receive parameter telegrams everytime without leaving the cyclic operation mode.

- The PROFIBUS specification allows the online re-parameterization only if the device is not operated in V1 mode. This means that no acyclic communication is allowed from the cyclic bus master (class one master). However systems using a so-called class 2 master for sending V1 requests and supporting sending a new parameter telegram whilst online are capable to do online re-parameterization.
If a specific control system is able to do online re-parameterization should be found in the documentation of this system.
- Sending new parameters during cyclic operation can be critical. If parameters are out of range or can not be accepted from the device for a specific reason a device might leave the cyclical operation mode and enter an error or fail-safe mode.
Please consult the manual of the connected devices for more information.

Reaction on Wrong Parameter Telegrams: The PROFIBUS module does not check the parameters itself. This can only be done from the connected devices. In case of a faulty parameter telegram was received (e. g. wrong length) the PDP32 leaves the cyclical operation mode and waits for a new parameter telegram.

V1 Requests from a Class1 Master: Different master classes are distinguished in a PROFIBUS DP-V1 network. The so-called C1 master mainly performs the cyclical data exchange with the slaves. A typical C1 master is a control system, such as a PLC or DCS that exchanges cyclical process data with the slave. If the DPV1 function has been activated via the GSD file, also acyclical connections between a C1 master and a slave can be established when the cyclical connection is being established. If a class 1 master uses V1 services, it is physically and logically the same bus node doing V0 and V1 communication.

Before acyclic messages can be used for the C1 master a device must have entered the cyclic operation mode. This means that the PDP32 must be first configured and parameterized before acyclic requests from a class 1 master are possible. PDP32 supports V1 requests from a class 1 master. Please see “Online re-parameterization” for further details.

V1 Requests from a Class2 Master: A C2 master can not perform cyclical data exchange with the slaves. It is logically a different bus node than a C1 master. Examples for a typical C2 master are visualization systems, temporary installed programming devices (Notebook / PC) or maintenance management tools.

The C2 master uses exclusively acyclical connections for the communication with the slaves. V1 connections allow for cyclical data exchange with the slaves by means of Read or Write services. Several C2 masters can be active in a DP-V1 network. The number of C2 connections, which are established to a slave simultaneously, are determined by the slave.
PDP32 supports up to 3 concurrent class 2 connections.

Technical data PDP32 / PDR31

Data at $T_a = 25^\circ\text{C}$ and rated values, unless otherwise indicated

General data	PDP32	PDR31
Supply voltage	24 V DC + 30% / - 20% (19.2 ... 31.2 V DC)	
Current consumption	55 mA (excl. load on 5 V supply for termination resistors)	28 mA
Supported Communication Protocols	PROFIBUS DP-V0/DP-V1	
Integrated termination resistors	no	yes
Possible bus addresses (set via UMC100)	1 ... 125	-
Max. baudrate	12 MBit/s	
Isolated +5 V supply available for bus termination circuitry (X3 pins 5 and 6).	30 mA max.	-
Pollution degree	3	

Standards / directives

Product standard	IEC 61158
RoHS Directive	2002/95/EC

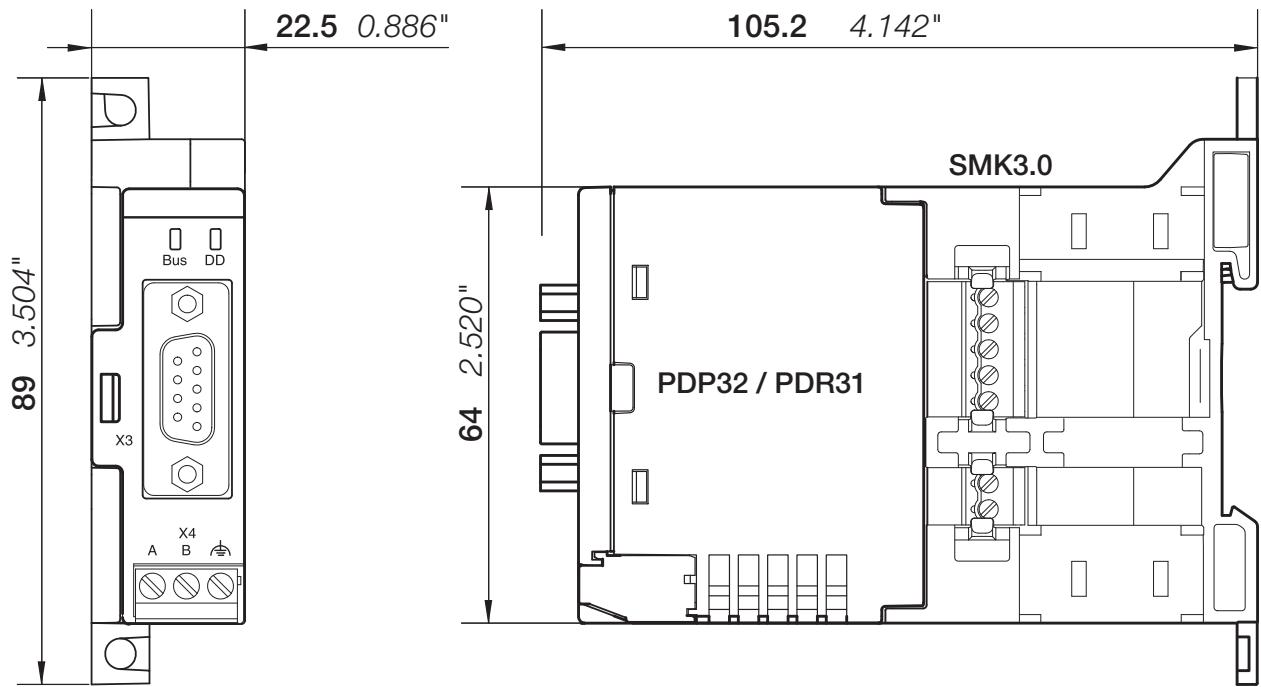
Environmental data

Ambient air temperature	Operation	0 ... +60 °C
	Storage	-25 ... +70 °C
Vibration (sinusoidal) acc. to IEC/EN 60068-2-6 (Fc)		4 g / 10 150 Hz (mounted on UMC100.3 / SMK3.0)
Shock (half-sine) acc. to IEC/EN 60068-2-27 (Ea)		15 g / 11 ms

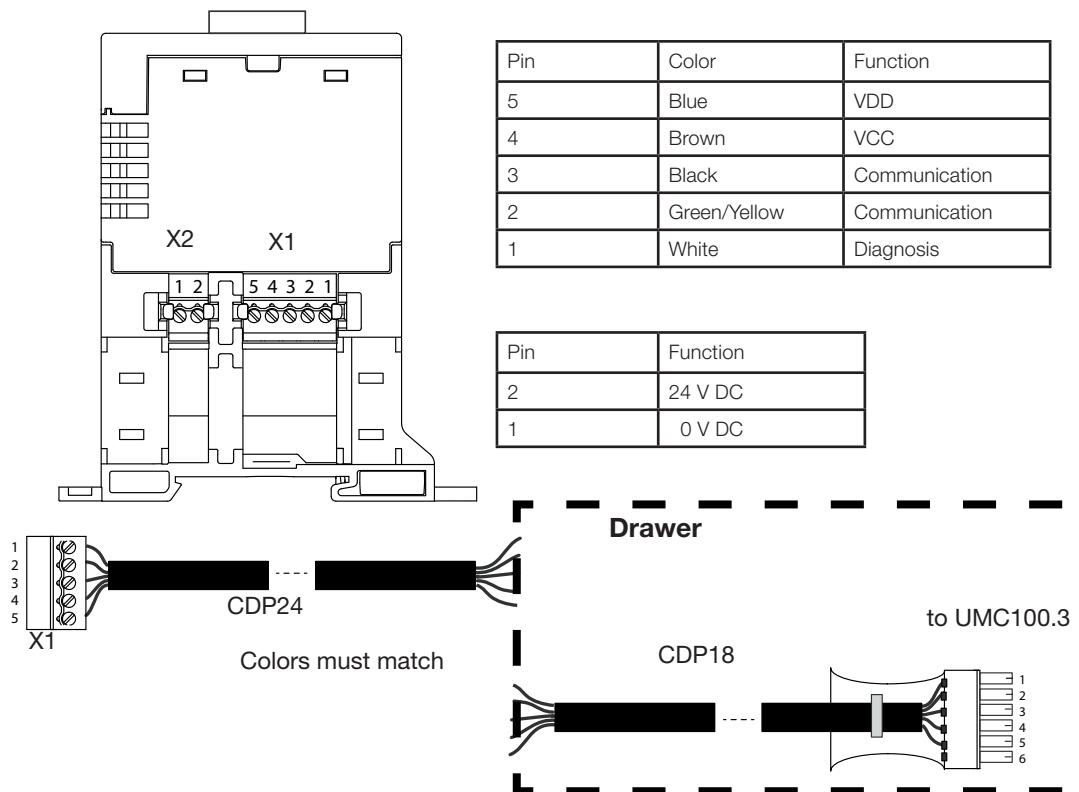
General Data

Degree of protection	IP20	
Mounting	UMC100.3 / SMK3.0	SMK3.0
Mounting position	Any	
Altitude	4000 m	
Duty time	100 %	
Weight	0,051 kg	0,047 kg

Dimensions



Connection Cables



Note: PDR31 does not have X1.

Order

Order Code	Type	Description
1SAJ929180R0015	CDP18-FBP.150	Cable between UMC100 and drawer / 1.5m Cable between Ethernet Interface and Drawer / 1.5m
1SAJ929240R0015	CDP24.150	Cable between single mounting kit and drawer / 1.5m
1SAJ929610R0001	SMK3-X2.10	Set of terminals X2 (2 pole), packaging unit 10 pcs
1SAJ929620R0001	SMK3-X1.10	Set of terminals X1 (5 pole), packaging unit 10 pcs
1SAJ929600R0001	SMK3.0	Single Mounting Kit for communication interfaces
1SAJ242000R0001	PDP32.0	Communication interface for PROFIBUS DP
1SAJ243000R0001	PDR31.0	Active termination unit for PROFIBUS networks

Detected an Error?

Your feedback helps us to constantly improve our products. We are grateful for your comments and suggestions. Please provide us with the following information if you have noticed an issue:

Name

Company / Department

Telephone / Email

Problem Description

- Steps to reproduce the problem
- Version of UMC (Ident number on nameplate and firmware version which is displayed on the UMC100-PAN)
- Version of PNQ (Ident number on nameplate)



MEMO

Contact

ABB STOTZ-KONTAKT GmbH

P. O. Box 10 16 80
69006 Heidelberg, Germany

Phone: +49 (0) 6221 7 01-0
Fax: +49 (0) 6221 7 01-240
E-Mail: info.desto@de.abb.com
Internet <http://www.abb.de/stotzkontakt>

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