FBP FieldBusPlug

PROFIBUS FieldBusPlug
PDQ22-FBP
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:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Sign to indicate a potential dangerous situation that can cause damage of the PDQ22 or connected devices or the environment.</td>
</tr>
<tr>
<td>i</td>
<td>Sign to indicate important information and conditions.</td>
</tr>
<tr>
<td>x</td>
<td>Sign that indicates a potential dangerous situation that can cause human injuries.</td>
</tr>
</tbody>
</table>

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDT/DTM</td>
<td>FDT (Field Device Tool) is a technology for managing field devices. This technology has been established as an open specification and is therefore vendor independent. Device manufacturers add to their individual field devices a piece of software called Device Type Manager or DTM. See <a href="http://www.fdt-jig.org">http://www.fdt-jig.org</a> for more information.</td>
</tr>
<tr>
<td>GSD</td>
<td>Geräte Stammdatei (German) which means a electronic data sheet of a device</td>
</tr>
<tr>
<td>DCS</td>
<td>Distributed Control System</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Ladder Controller</td>
</tr>
<tr>
<td>HWD</td>
<td>Hardware Definition File is similar to a GSD file and required for ABB's 800M Control Builder software to integrate field devices.</td>
</tr>
<tr>
<td>UPS</td>
<td>Uninterruptible Power Supply</td>
</tr>
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</table>

Related Documents

<table>
<thead>
<tr>
<th>Technical Documentation</th>
<th>Document No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDP21-FBP/PDP22-FBP</td>
<td>2CDC 192 001 D02xx</td>
</tr>
<tr>
<td>PROFIBUS DP Accessories</td>
<td>2CDC 192 004 D02xx</td>
</tr>
<tr>
<td>FBP System Accessories</td>
<td>2CDC 190 011 D02xx</td>
</tr>
<tr>
<td>UMC22-FBP (Software version 3.4)</td>
<td>2CDC 135 001 D02xx</td>
</tr>
<tr>
<td>UMC22-FBP Atex (Software version 3.2)</td>
<td>2CDC 135 004 D02xx</td>
</tr>
</tbody>
</table>
PDQ22-FBP PROFIBUS DP  FieldBusPlug

V 6  Technical Description

Content

1. Overview...............................................................................................................................................4
  1.1 System Overview..........................................................................................................................4
  1.2. Product Overview ........................................................................................................................5
  1.3. Required Components................................................................................................................7
  1.4  PROFIBUS Master Requirements................................................................................................7
  1.5  System Limits ................................................................................................................................8
     1.5.1  Number of PROFIBUS Slaves ...........................................................................................7
     1.5.2  Number of Connected Devices ..........................................................................................7
     1.5.3  Cable length between PDQ22 and connected Devices .......................................................7
  2. Quick Start ...........................................................................................................................................8
  3. PDQ22 as a Modular PROFIBUS Slave .............................................................................................11
     3.1. PROFIBUS in a Nutshell ............................................................................................................11
     3.2  Building a PROFIBUS Network with PROFIBUS DP FBP .........................................................12
         Topology Examples ...................................................................................................................13
         Setting the PROFIBUS Node Address .....................................................................................15
         Connecting devices to PDP22 ......................................................................................................15
  4.  Control System Integration................................................................................................................16
     4.1. Configuring the PDQ22 .............................................................................................................16
     4.2. Parameterization.......................................................................................................................17
     4.3. Integration with the GSD File ....................................................................................................19
     4.4. Integration with the Device Type Manager (DTM) ..................................................................20
     4.5. Cyclic Data Exchange ...............................................................................................................21
         4.5.1. Transmission of I/O Data ................................................................................................21
         4.5.2. Cyclic Diagnostics Information........................................................................................21
     4.6. Acyclic Data Exchange (DP-V1) ...............................................................................................22
  5.  Diagnosis / Behaviour in Case of an Error ........................................................................................23
     5.1. Local Diagnosis .......................................................................................................................23
     5.2. PROFIBUS Diagnosis ..............................................................................................................25
  6.  Power Supply ....................................................................................................................................26
     6.1. Power Supply via Bus Cable – Points to Consider ...................................................................26
     6.2. Example Calculation ................................................................................................................28
  7.  Mounting, Grounding and Shielding..................................................................................................30
  8.  Application Examples .......................................................................................................................31
  9.  Technical Data ...................................................................................................................................35
 10. Ordering Data ....................................................................................................................................38
1. Overview

1.1 System Overview

The FieldBusPlug PDQ22-FBP connects automation, switch – or controlgear devices with a PROFIBUS DP network. Up to four devices can be connected with one PDQ22-FBP.

Figure 1 shows a typical plant set-up that can be realized with the PDQ22-FBP.

In this example motor starters MSD11-FBP and motor controllers UMC22-FBP are connected to the PDQ22-FBP. PDQ22-FBP can be directly used together with PDP21-FBP / PDP22-FBP but also with any other PROFIBUS devices using the available accessories.
1.2. Product Overview

PDQ22 is a member of the ABB FieldBusPlug family of bus connectors. Presently plugs for PROFIBUS DP, DeviceNet, AS-i and Modbus RTU are available. PDQ22 allows the connection of up to four devices to PROFIBUS DP. This makes the integration of PROFIBUS devices that are located physically nearby more cost-effective. Up to four times more devices can be connected this way to a single PROFIBUS line.

Mixed configurations are supported. This makes it possible to connect different devices such as MSD, MSR, UMC22 at the same PDQ22. Also different versions of a device can be connected at the same time.

Devices are treated as single modules from the PROFIBUS point of view. This allows efficient engineering and simple integration into control systems and transparent access to each single device.

Parameters can be set for each device separately. PDQ22 buffers the device parameters sent from the master during start-up. If a device is replaced it automatically gets the stored parameters. Monitoring and diagnosis data is collected from the devices and sent to the PROFIBUS master.

PDQ22 allows building robust solutions. Intelligent devices such as UMC22 connected to PDQ22 are cyclically monitored. If devices fail the other devices are not affected. PDQ22 keeps running with the remaining devices and sends default values for the failed ones. Status LEDs for the bus and each device are available. In addition, you can also access status information via the field bus: this makes it possible to evaluate the details from a PLC or control system. Time-consuming searches for faults are therefore a thing of the past and maintenance times are kept to a minimum.

PDQ22 supports PROFIBUS DP-V1. This means tools that use DP-V1 services for both configuration and parameterization can be used without limitations. Also maintenance and service tools accessing service data of the connected devices are well supported (e.g. ABB’s 800xA Asset Management Solution).

All FieldBusPlugs including PDQ22 are supplied via the bus cable. This means if the power supply of a device breaks the bus node is still alive and can signal the problem to the control system. It also provides the option to feed the plugs from a central UPS to increase the PROFIBUS availability.

A bus line built with PROFIBUS FieldBusPlugs PDQ22 and PDP21 / PDP22 is a real party line without branches or drops. This means that the maximal PROFIBUS baud rate of 12 Mbit/s is possible, supposed the termination on both ends is done correctly and the maximal bus length is not exceeded. Because of the connection schema it is ensured that only at the ends of the PROFIBUS line termination resistors are used.

Regarding the situation that many of the problems in conventional wired PROFINET lines are caused by loose contacts or wrong terminations, the FieldBusPlug system guarantees a faultless data transmission line between the master and the slaves and a simplified commissioning phase.

For the connection between PDQ22-FBP and the devices standard Sensor/Actor extension cable can be used.
The figure above shows the PDQ22-FBP. Devices such as the UMC22-FBP or other FieldBusPlug compatible devices can be connected at the upper four M12 (1...4) connectors. Only standard M12/M12 extension cable is required to connect the devices.

As with all other FieldBusPlugs the M12 cable includes 24 V DC that can be used to supply the connected devices.

A label per plug is foreseen for plant specific labelling. The PROFIBUS address can be set between 0 … 99 via two decode switches protected from a lucent cover.

The lower two M12 connectors – marked in light-grey – are provided to connect the incoming and outgoing PROFIBUS line. PDQ22 realizes a real t-piece which automatically results in a party line topology.

The LEDs on the bottom left corner are used for status indication of the PDQ22 and the PROFIBUS. See section 5 for details.

All screwed shells are internally connected to the ground connector. With the help of the accessory CDA11-FBP.0 the PDQ22 can be DIN rail mounted

Do not connect devices to the light-grey marked PROFIBUS connectors or vice versa. This can destroy the PDQ22, connected devices or other devices connected on the PROFIBUS bus!
1.3. Required Components

To connect four devices (e.g. UMC22) to PROFIBUS the following components are needed:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x PDQ22-FBP</td>
<td>FieldBusPlug PROFIBUS DP</td>
</tr>
<tr>
<td>1 x PDA11-FBP</td>
<td>PROFIBUS DP adapter cable Dsub9-M12 for connection to the PROFIBUS Master</td>
</tr>
<tr>
<td>1 - 4 x UMC22</td>
<td>Universal Motor Controller (only for the quickstart tutorial)</td>
</tr>
<tr>
<td>1 - 4 x ACS100-PAN</td>
<td>Control panel for UMC22 (only for the quickstart tutorial)</td>
</tr>
<tr>
<td>1 - 4 x CDP15-FBP.150</td>
<td>Device connection with M12/M12 extension cable</td>
</tr>
<tr>
<td>1 x CDA11-FBP.0 DIN Rail Connector (optional)</td>
<td>Accessory to make it possible to mount the PDQ22 directly on a DIN Rail.</td>
</tr>
</tbody>
</table>

1.4 PROFIBUS Master Requirements

PDQ22 can be connected to all PLC or DCS systems that provide PROFIBUS DP connectivity. The following functions of PDQ22 can be accessed via PROFIBUS DP-V0:

- Configuration and parameterization after power on
- PDQ22 diagnosis messages
- Cyclic exchange of real-time data provided by the connected devices between PROFIBUS master and PDQ22

To use the full capabilities of connected devices it is beneficial that the master also supports PROFIBUS DP-V1 services. This allows:

- Acyclic read/write access to all parameter data offered from a device
- Online re-parameterization of a device from a class two master
- Integration of the devices into modern maintenance management systems such as 800xA's Asset Management System.

1.5 System Limits

1.5.1 Number of PROFIBUS Slaves

Via PROFIBUS at most 127 devices can be addressed in a network. Without repeaters only 32 devices can be operated per segment because of physical limitations of the RS485 standard line drivers and receivers. The number of 32 includes also repeaters and similar components!

For every segment the maximum possible cable length is defined by the given baud rate. For more than 32 stations or larger segment length repeaters or RS485 to optical fibre converters can be used.

1.5.2 Number of Connected Devices

Up to four devices can be connected to the PDQ22 at the same time. All the modules available in the PDQ22 GSD file “ABB_0A09.GSD” can be connected in any combination as required by the user. If connectors are not used, an *empty module* must be configured. The maximum frame sizes defined by PROFIBUS are ensured from the GSD in combination with the used master configuration tool.

1.5.3 Cable length between PDQ22 and connected Devices

Cable length should not exceed 2 m. It is highly recommended to use shielded cable for the connection.
2. Quick Start

The following quick start tutorial shows how to set-up a small system consisting of a PROFIBUS bus master, the PDQ22 as a PROFIBUS slave and one or more UMC22 devices. Because there are so many different bus masters available only a general description can be provided. It is assumed that the reader is familiar with the concrete master in use. To follow the tutorial the parts described in section 1.3 (Required Components) are needed. The following figure shows the hardware set-up.

**Installation and commissioning of the PDQ22 step by step:**

**PDQ22 set-up:**
- Mount the PDQ22 either on a DIN rail or fix it with screws in your control cabinet
- Set the PDQ22 slave address to 14.
- Use the PDA11 (Adapter Cable Dsub9-M12) to connect the PDQ22 with the bus master.
- Connect the red (+) and blue (-) strand of the PDA11 with a 24 V DC power supply.
- Set the termination switch on the PDA11 (green) to ON.
- For this setup no active PROFIBUS termination unit (PDR11) is required

**Connecting devices:**
- Mount the UMC22 device
- UMC22 can be supplied from the PDQ22. Therefore set the switch on UMC22 to int
- Connect the UMC22 devices with the PDQ22 using a standard M12/M12 extension cable (Sensor/Actor cable).
Switch on the power supply:

- Both devices start working
- Set the UMC22 device address.

Starting from the configured bus address (here 14) the device connected to port one must use address 41, the one connected to port two 42 and so on.

In this example UMC22 is connected to the fourth port. Therefore UMC22 must use address 44.

To change the UMC22 device address press the up button until `<Edit>` appears and press `<Enter>`. Press the down button until `<Addr>` appears and press `<Enter>` again.

Set the address to 44 as shown:

![Address Setting](image)

for more info on how to configure the UMC22 see the technical manual of UMC22.

- Because the PROFIBUS master is not yet configured the red PROFIBUS diagnosis LED is flashing and the green diagnosis LED is on.
- Device diagnosis LEDs ports 1 to 3: The green LEDs are on because PDQ22 is not yet configured and no device is connected.
- Device diagnosis LED of port 4: After a few seconds the green LED is on and the red LED is flashing. This indicates a repairable error i.e. wrong device type connected or wrong address of the connected device.

Configuration:

- Configuration and parameterization of the devices must be done in the configuration tool provided by the bus master vendor. In principle the following steps are usually required:
  - Import the GSD file of the PDQ22 (ABB_0A09.GSD) into the configuration tool. Now the configuration tool ‘knows’ the device and can use it.
  - Create a slave ‘below’ the master. Usually this can be done in tree view representing the configured devices. Take care that the slave address matches the address is set at the PDQ22
  - Insert two empty modules for port one and two. Insert a UMC22 for ports three and four.
  - Leave the parameters of the two configured UMC22 as it is for now

- The figure below shows how the configuration looks like in the ABB control system (Freelance)
Now the configuration is complete. Usually a kind of download process must be done to store and activate the new configuration in the PROFIBUS master. Perform this step for your system now.

Commissioning

- Reboot the PDQ22 (remove the PROFIBUS cable for a few seconds). This forces the bus master to send the new configuration to the PDQ22. Please note: When the configuration (i.e. number or type of connected devices) changes the PDQ22 must always be rebooted.
- After initialization only the green PROFIBUS diagnosis LED should light which indicates the cyclic PROFIBUS communication is up and running.
- The green diagnosis LEDs of port one and port two are on to indicate ‘no error’.
- The red LED of port 3 is flashing indicating that the connection to the configured device is missing.
- The green LED of port 4 is on indicating normal operation with the connected UMC22.

Summary

During this short tutorial you have
- Set-up a simple PROFIBUS network with PDQ22 and UMC22
- Set the PDQ22 PROFIBUS address
- Connected a UMC22 to PDQ22 and set the correct device address
- Configured the PDQ22 in your PROFIBUS master using the GSD file
- Downloaded and activated the cyclic PROFIBUS communication

To learn more about the device diagnosis capabilities of PDQ22 perform the following experiments and observe the diagnosis LEDs of the related ports. Detailed explanation about the LEDs can be found in section 5 “Diagnosis / Behaviour in Case of an Error”
- Remove the UMC22 from port four and leave it unconnected (device missing)
- Reconnect the UMC22 to port two (wrong device connected)
- Change the UMC device address to 43 and connect it again back to port four (device with wrong address connected)
3. PDQ22 as a Modular PROFIBUS Slave

3.1. PROFIBUS in a Nutshell

PROFIBUS DP is at present the most common field bus for industrial applications worldwide and is standardised in IEC61158 together with other field bus protocols. The definition of the PROFIBUS is based on the experience concerning data transmission collected during long years. One basis is the ISO/OSI layer model that represents an ordering and description scheme for data transmission systems. It divides the way between the CPU interface and the physical medium into seven layers. Fieldbus systems normally use only three of them:

<table>
<thead>
<tr>
<th>Layer 7</th>
<th>Transmitting CPU</th>
<th>Receiving CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application layer</td>
<td>Application layer</td>
<td></td>
</tr>
</tbody>
</table>

- Interface to the application program (CPU) with application oriented commands (read, write)

<table>
<thead>
<tr>
<th>Layer 2</th>
<th>Transmitting CPU</th>
<th>Receiving CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data-link layer</td>
<td>Data-link layer</td>
<td></td>
</tr>
</tbody>
</table>

- Access (to the line) control, telegram (start, length, ...), data security (e.g. CRC=Cyclic Redundancy Code)

<table>
<thead>
<tr>
<th>Layer 1</th>
<th>Transmitting CPU</th>
<th>Receiving CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical layer</td>
<td>Physical layer</td>
<td></td>
</tr>
</tbody>
</table>

- Definition of the medium (Twinax, optical fiber, ...), coding ("1" = - 4 V), transmission speed (baud rate).

As a result of the ISO/OSI layer model each layer can be defined separately and (nearly) independent of the other layers. Indeed it is possible and common to use conventional cables but also optical fibers as physical layer for the PROFIBUS DP or have a mixture of both in a single bus configuration. For the application layer there are also different versions possible e.g. PROFIBUS DP-V0, PROFIBUS DP-V1 but also others that are not regarded here. The PROFIBUS standard has defined different network topologies. The most commonly used one is the ‘Party Line’ topology where one device is connected after the other.

PROFIBUS has evolved over time. The first services offered by PROFIBUS are the so-called V0 services. They define block parameterization, configuration, cyclic data exchange and diagnosis information exchange. DP-V0 only allows writing the complete parameter set in one block. The bus master sends the parameter block to the slave during power-up of the slave/device. Some control systems also allow sending the parameter block during normal operation. Later on the PROFIBUS DP-V1 specification introduced new acyclical read/write services within the context of the PROFIBUS DP-V1 expansions. These acyclical services are inserted into special telegrams during ongoing cyclic bus operation and thus ensure compatibility between PROFIBUS DP-V0 and PROFIBUS DP-V1.

Via diagnosis telegrams detailed information about the device status can be transmitted to a master. Beside device related diagnosis also process related diagnosis is provided by modern field devices. Take a trip caused by overload of a motor as an example. Diagnosis data are automatically read by the PROFIBUS master if it receives a fault info within a monitoring telegram. With V1 also the handling and the content of diagnosis data was further standardized and is different from V0.
3.2 Building a PROFIBUS Network with PROFIBUS DP FBP

Networks with PROFIBUS DP FieldBusPlug

The main feature of the FieldBusPlug system is that all devices with the neutral FBP interface can be connected to several field busses using the appropriate FieldBusPlug. This means that a PROFIBUS DP slave is built up of a device with the neutral interface and the PROFIBUS DP FieldBusPlug PDQ22.

The existing PROFIBUS DP plugs such as the PDP22 and PDP21 can be used in the same network without any problems. All plugs follow the same system concept.

Important Features of Bus Lines Created with PDQ22

- The PDQ22 represents a real tee unit (T-unit). This means: If the bus node built in the PDQ22 fails all remaining FieldBusPlugs are still connected with the bus master.
- All FieldBusPlugs including PDQ22 are supplied via the bus cable. This has several benefits:
  - If the power supply of a device fails the bus node is still alive and can signal the problem to the control system. This is of special value in Motor Control Centers (MCCs) where the bus node is often mounted outside a drawer. Even if the drawer is removed the bus node is still alive and can signal this condition to the control system.
  - It also provides the option to feed the plugs from a central UPS to increase the PROFIBUS availability even further.
  - Under some circumstances it is possible to supply the devices via the bus cable with 24 VDC saving local supplies.
- A bus line built with PDQ22 is a real party line without branches or drops. This means: The maximum baud rate 12 Mbit/s is possible, supposed the termination on both ends is done correctly and the maximum bus length is not exceeded.
- The contacts - pins and jacks - are gold plated. This means: Concerning the contacts the PDQ22 avoid that faults caused by loose or bad contacts.
- Only at the ends of the bus line termination resistors are possible. This means: In the standard topology as shown below only at the ends of the line terminations are possible. At the DSUB9 connector mounted on the bus master the termination resistor set has to be switched ON and at the other end of the bus line the bus termination unit must to be mounted.
- On one bus line the FieldBus Plugs PDQ22 and PDP21/PDP22 can be used directly together in any combination. The products implement the same system idea.

Regarding the situation that most of the problems in conventional wired PROFIBUS lines is caused by loose contact or wrong termination, the FieldBus Plug system guarantees a faultless data transmission line between the master and the slaves.
Topology Examples

This subsection describes some possible topologies that can be realized using PDQ22 and PDP22 FieldbusPlug. Pure FieldbusPlug lines as well as mixed configurations are described.

Figure 5: Topology Example 1: Only PDQ22-FBP as Slaves

Figure 6: Topology Example 2: PDQ22-FBP and PDP22-FBP as Slaves
If the distance between the bus master and the slaves is longer it may be necessary to feed in 24 V DC for the FieldBusPlugs on a second place. Check with: „Supply Calculation“ scheme.

**Figure 7: Topology Example 3: Long Bus Cables (Feed In)**

**Figure 8: Topology Example 4: PROFIBUS line with Repeater**
Technical Description

Setting the PROFIBUS Node Address

The PROFIBUS master uses the unique slave address for addressing the slave. The slave address of PDQ22 can be set using two rotary decode switches. The left one is used to set the decade the right one to set the ones column. The node address can be set between 01 ... 99. The default setting is 99.

After changing the PROFIBUS node address a power down and up cycle must be performed. Address 00 is reserved and must not be used.

Theoretically 127 nodes can be connected to a PROFIBUS network. In practise the number of connectable slaves is smaller because also the cyclic (class one) and optional acyclic (class two) masters counts as nodes. Also every repeater counts as a node. Furthermore the physical length of a network and the load must be considered (see section 6).

Each device connected to a PROFIBUS network must have a unique PROFIBUS node address. If two devices have the same address both devices leave cyclic data exchange. Dependant of the master implementation other unintentional effects may happen (e.g. the whole line is shut down).

Connecting devices to PDQ22

At creation time of this document it is possible to connect the following devices to PDQ22:

UMC22-FBP (V3.0 - V3.4), MFI21-FBP, MSD11-FBP, MSR22-FBP, Sensors, WDI100

A up to date overview is provided always in the latest GSD file (ABB0A09.GSD) (see section 4.3).

Connecting intelligent devices to PDQ22

All intelligent devices that can be connected to PDQ22 usually maintain their own device address. PDQ22 uses this device address to ensure that no device with a wrong address is operated via the PDQ22. This prevents a user to accidentally connect a device to a wrong port (e.g. when mounting a drawer in a wrong position).

There is a fix device address associated with each port. This address is derived from the PROFIBUS node address. The ones column of the PROFIBUS node address becomes the tens column of the device address. The port number where the device is connected to becomes the ones column of the device address.

Example: The selected PROFIBUS node address is 14.
The resulting address for the devices are 41, 42, 43 and 44 as shown in the figure below.

If a particular scheme is taken into account when allocating the Profibus addresses, an interchanging of devices can be prevented in a Motor Control Center (see section 8).

Connecting simple devices to PDQ22

M12 sensors such as proximity switches or actors like the MSD11-FBP can also be connected to the PDQ22. In this case the corresponding PDQ22 port operates in the so-called I/O mode where two digital inputs and one digital output are available per port. No device address needs to be set in this case.

It is possible to create mixed configurations where both, simple and intelligent devices, are connected at the same time.
4. Control System Integration

Device integration can be realized for practically every control system via the GSD file. For a more advanced integration (e.g. function blocks, face-plates etc.) control system vendors typically offer an integration service. Please contact the according control system vendor to find out the available option.

Control system integration of PROFIBUS devices consists of two steps – configuration and parameterization. The following sections describe these two steps.

4.1. Configuring the PDQ22

In the PROFIBUS world configuration means the arrangement of the different modules available in a modular slave.

This usually results in a change of the organization or a change in the length of the cyclic data sent to or received from the master. Therefore it is necessary to restart the PDQ22 once after the configuration was changed.

PDQ22 offers the possibility of mixed configurations. This means it is possible to connect different modules to the same PDQ22 at the same time. E.g. it is possible to connect two UMCs and two MSDs or any other combination. It is also possible to connect different versions of the same device e.g. three UMCs with software version 3.1 and one UMC with software version 3.3. The GSD-file/DTM provided with the PDQ22 automatically ensures that in all supported combinations the maximum frame size of PROFIBUS is not exceeded.

PDQ22 requires that always four modules are configured. In the case that not all ports are required an “empty” module must be configured.

For the PROFIBUS expert

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 PDQ22 arrives in the cyclical data exchange mode even if the reference configuration sent from the master does not correspond with the actual configuration found during device start-up!

This makes it possible to do engineering of a plant even if the modules are not yet physically available and plugged into the PDQ22. For not yet connected devices the PDQ22 sends default values (zeros) and sets the appropriate diagnosis information.

Online Reconfiguration

PDQ22 does not support ‘Hot Configuration In Run’ as supported by some ABB control systems.

Whenever a configuration change is done, the PDQ22 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 that does not belong to a device or the device version. In this case the PDQ22 does not accept the configuration telegram and leaves cyclic operation mode or does not start the PROFIBUS communication.
4.2. Parameterization

In the PROFIBUS world parameterization means the definition of properties of already configured modules. E.g. changing the value of a parameter.

The following parameters are provided by the PDQ22 itself:

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Values</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block-Parameter Port 1</td>
<td>Use Block-Parameters Port 1 (default setting)</td>
<td>If this parameter is set to “Use Block Parameters Port x” the PDQ22 forwards parameters sent from the master during bus start to the device connected at port x. Else the parameters are not forwarded. This parameter is useful if devices are preconfigured in the factory (e.g. panel builder) and the configuration should not be overwritten from the PROFIBUS bus master during commissioning of a plant.</td>
</tr>
<tr>
<td>Block-Parameter Port 2</td>
<td>Use Block-Parameters Port 2 (default setting)</td>
<td></td>
</tr>
<tr>
<td>Block-Parameter Port 3</td>
<td>Use Block-Parameters Port 3 (default setting)</td>
<td></td>
</tr>
<tr>
<td>Block-Parameter Port 4</td>
<td>Use Block-Parameters Port 4 (default setting)</td>
<td></td>
</tr>
</tbody>
</table>

The parameters of the connected devices are available on module level.
For the PROFIBUS expert

Behaviour at cold start
During start-up the PDQ22 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 then split into parts and sent to the connected devices.

If wrong parameters were sent (e.g. parameter out of range) the devices (not the PDQ22) may signal an error condition which is translated into an appropriate device specific diagnosis message.

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.

PDQ22 and FieldBusPlug devices such as the UMC22 are able to receive parameter telegrams 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 of fail-save mode.

Please consult the manual of the connected devices for more information.

Reaction on Wrong Parameter Telegrams
The PDQ22 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 PDQ22 leaves the cyclical operation mode and waits for a new parameter telegram.
4.3. Integration with the GSD File

Besides the physical connection of a device to a PROFIBUS line, the engineering of the whole PROFIBUS system in the PROFIBUS master is necessary. Every modern PLC (Programmable Ladder Controller) or DCS (Distributed Control System), that can be used as PROFIBUS master, offer the possibility to configure and parameterize devices connected to the master.

As a basis electronic data sheets are used for that purpose. In the PROFIBUS world these electronic data sheets are called GSD files. Within these files the all properties relevant for operating the slave are described (e.g. supported baud rates, max. number of modules etc.).

The GSD file ABB_0A09.GSD is contained in the Software Engineering Package

PBE91-FBP.010x 1SAJ924091R010x.ZIP

The ZIP file can be obtained from ABB’s web site (http://www.abb.de/stotz-kontakt) or on the FBP System CD (2CDC 190 008 E04xx). Please ask your local sales office for it.

The GSD file is a normal text file and can be changed with any text editor. Proper function of the slave can be only guaranteed with the original file provided by ABB. Manipulation of the GSD file can cause critical errors and is at your own risk.

PDQ22 is a so-called modular slave. The configuration of a modular slave is in opposite to a compact slave flexible regarding the number of connectable modules. In the GSD file each module supported from PDQ22 is described including all its properties.

This includes:

- Amount of data sent from the master to the slave (output data)
- Amount of data sent from the salve to the master (input or monitoring data)
- Adjustable parameters
- Diagnostics Information

In addition system limitations are defined such as the maximum number of connectable devices etc.
4.4. Integration with the Device Type Manager (DTM)

Beside the option to integrate devices with GSD files more and more modern control systems support the FDT/DTM concept. FDT (Field Device Tool) technology standardizes the communication interface between field devices and systems. The device supplier develops a new Device Type Manager (DTM) for each of its devices or group of devices.

The DTM encapsulates all the device-specific data, functions and business rules such as the device structure, its communication capabilities, internal dependencies, and the Human Machine Interface (HMI) structure. The DTMs provide functions for accessing device parameters, configuring and operating the devices, and diagnosing problems.

At creation time of this document, the DTM is not available. The development is under preparation.
4.5. Cyclic Data Exchange

4.5.1. Transmission of I/O Data

Transmission of input - and output data (or command – and monitoring data) from the connected devices is the major task of the PDQ22.

PDQ22 receives input data from the master, slits it into parts as defined by the configured modules and sends it to the connected devices.

On the other side it receives data from the devices, assembles it to a transmit frame and sends it to the PROFIBUS master. The following figure shows this process.

---

4.5.2. Cyclic Diagnostics Information

As part of the cyclic data frame there is the possibility to signal the availability of diagnosis (so-called extended diagnosis) to the master.

As soon as one of the connected devices or the PDQ22 itself has signalled that diagnosis data is available this bit is set. For a description of the extended diagnosis frame see section 5.2 PROFIBUS Diagnosis.
4.6. Acyclic Data Exchange (DP-V1)

This section describes the functions and terms used for operating PDQ22 on PROFIBUS DP-V1 masters. Refer to the PROFIBUS user organization or visit www.profi bus.com for extensive technical information on PROFIBUS DP-V1. Beside the cyclic data exchange PROFIBUS has defined an option to exchange data on an acyclic basis with is called DP-V1.

The data organization i.e. where data can be accessed is defined by the so-called slot/index addressing schema. The PROFIBUS specification allows free assignment of available data to slots and indexes. Therefore a mapping schema on how data can be access at connected devices was defined for PDQ22. The PDQ22 itself is accessible at slot 0. Devices are accessible beginning at slot 1. The following table provides an overview about the mapping:

<table>
<thead>
<tr>
<th>Incoming V1 request on address</th>
<th>Mapping to device connected to plug</th>
<th>Slot index from device point of view</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot 0, Index 0 … 255</td>
<td>PDQ22 itself</td>
<td>Slot 0 (index 255 is reserved for I&amp;M functions)</td>
</tr>
<tr>
<td>Slot 1…5, Index 0 … 253</td>
<td>Port 1</td>
<td>Slot 0 … 4</td>
</tr>
<tr>
<td>Slot 6 … 10, Index 0 … 253</td>
<td>Port 2</td>
<td>Slot 0 … 4</td>
</tr>
<tr>
<td>Slot 11…15, Index 0 … 253</td>
<td>Port 3</td>
<td>Slot 0 … 4</td>
</tr>
<tr>
<td>Slot 16 …20, Index 0 … 253</td>
<td>Port 4</td>
<td>Slot 0 … 4</td>
</tr>
<tr>
<td>Slot 21 … 255, Index 0 … 253</td>
<td>PDQ22 itself</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

The maximum of 255 slots can be used (0…254). Acyclic services can be initiated from a class 1 or a class 2 master. The class 1 master is at the same time the master driving the cyclical data exchange. Class 2 masters are usually only temporarily connected to a PROFIBUS line e.g. a PC with a PROFIBUS interface card. The class 1 master can access all data provided from the device.

Unfortunately the GSD file does not specify which data is available via V1. The meaning of the data accessible via V1 is in principle vendor specific. But for some devices standardization took place by the PNO (Profi bus Nutzer Organisation). This specification is called profile and should allow a vendor independent interpretation of the data. For more information see the PNO website.
For the PROFI BUS expert

V1 Requests from a Class 1 Master

Different master classes are distinguished in a PROFI BUS 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 o 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 PDQ22 must be first configured and parameterized before acyclic requests from a class 1 master are possible. PDQ22 supports V1 requests from a class 1 master.
Please see section “Online Re-Parameterization” for further details.

V1 Requests from a Class 2 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. PDQ22 supports up to 3 concurrent class 2 connections.

5. Diagnosis / Behaviour in Case of an Error

PDQ22 provides detailed diagnosis information about the status of the connected devices, its own status and the status of the PROFI BUS connection.
Diagnosis information is shown
a) with the locally available lamps and
b) via the standard PROFI BUS services.
The possibilities of locally available diagnostics are described in the next section.
PROFI BUS diagnosis is described in the section following the next section.

5.1. Local Diagnosis

Diagnosis information is locally displayed using two LEDs (Light Emitting Diodes) located beside each M12 device connector.
Four LEDs located at the bottom left of the PDQ22 indicate the status of the PDQ22 itself.
The following figure explains the status codes used for the device connectors one to four. In this case the upper left connector (port 1) is shown as an example.

![Status Codes Diagram](image)

<table>
<thead>
<tr>
<th>LED 3 Green</th>
<th>LED 4 Red</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>Power supply missing</td>
</tr>
<tr>
<td>On</td>
<td>Flashing</td>
<td>Serious error. Possible cases are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No connection to PROFIBUS master established</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Different slave addresses configured in the master and the PDQ22</td>
</tr>
<tr>
<td>Flashing</td>
<td>On</td>
<td>Wrong number of parameters received.</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>PROFIBUS timeout: Connection to the PROFIBUS master was longer interrupted than configured. Please note that the timeout time must be configured in the master.</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Normal operation</td>
</tr>
<tr>
<td>Flashing</td>
<td>Flashing</td>
<td>Self-test during power on running.</td>
</tr>
</tbody>
</table>

*) Only for intelligent devices
5.2. 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 PDQ22 to indicate more diagnosis information
then fits into the actual diagnosis message length.

Extended Diagnosis:
PDQ22 offers extended diagnosis to make the diagnosis data of the connected devices available to the
PROFIBUS master.

The extended diagnosis telegram has the following format:

<table>
<thead>
<tr>
<th>Byte in the extended diagnosis telegram</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Block length (always 44 with PDQ22)</td>
</tr>
<tr>
<td>1</td>
<td>Status type (always 0x81 = Status Mode)</td>
</tr>
<tr>
<td>2</td>
<td>Slot number (always zero)</td>
</tr>
<tr>
<td>3</td>
<td>Status specifier (always zero)</td>
</tr>
<tr>
<td>4 ... 11</td>
<td>Diagnosis status of PDQ22 itself</td>
</tr>
<tr>
<td>12 ... 19</td>
<td>Diagnosis data of device connected to port 1</td>
</tr>
<tr>
<td>20 ... 27</td>
<td>Diagnosis data of device connected to port 2</td>
</tr>
<tr>
<td>28 ... 35</td>
<td>Diagnosis data of device connected to port 3</td>
</tr>
<tr>
<td>36 ... 43</td>
<td>Diagnosis data of device connected to port 4</td>
</tr>
</tbody>
</table>

The content of byte 12 to 43 is defined by the devices connected to PDQ22.
PDQ22 does not touch the content of these bytes.
Please consult the device’s technical manual about their content.

Bytes 4 to 11 are reserved for the PDQ22 itself. Bytes 4 to 7 provides port related diagnosis.
Byte 4 belongs to port 1, byte 5 to port 2 and so on.
If all bits of a byte are zero, the process data sent for this device is valid.
If any of the bits is set to one, process data of the related port is invalid.
As a consequence PDQ22 forces the cyclic process data of this port to zero.

For each port the following diagnosis information is available:

```
<table>
<thead>
<tr>
<th>7 6 5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
</tr>
<tr>
<td>Intelligent device with wrong device address connected</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>Intelligent device connected, but wrong device type</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>Intelligent device engineered in master, no intelligent device identified (not connected or non intelligent device connected e.g. sensor).</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>No device engineered - If the plug should not be used an empty module has to be engineered.</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>Byte 4 to 7 reserved</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>
```
6. Power Supply

The supply of the PDQ22 is always made via the bus cable. This enables the PDQ22 to send the actual – e.g. faulty – status to the control station even when the connection to a device is removed or when a device is switched off.

Additionally it is possible to supply simple components such as proximity switches or actors like the MSD11 and MSR22 via the PDQ22. Some devices allow to be supplied externally (via terminals) or internally (via bus cable) setting the EXT/INT switch to EXT or INT respectively. Consult documentation of these devices.

Larger devices cannot be supplied via the bus line. The supply current per port should not exceed 200 mA (4 x 200 mA per PDQ22).

Maximum current for the PROFIBUS line in total is 4 Ampere (without additional feed-in connectors) and must be protected with a fuse (T4 or 4 A gL/gG).

To be noticed:
- Prefer separate supply units or separately fused supply circuits for the FieldBusPlug line and the devices.
- Check the supply situation using the calculation scheme in the chapter below.

Don’t forget to check the total bus length.

6.1. Power Supply via Bus Cable – Points to Consider

Supposing all devices are supplied externally, the supply has to feed all FieldbusPlugs connected to the bus (PDQ22 and PDP22 if available).

Their supply current depends on the voltage (below typical values for PDQ22):

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>19.2 V (min. allowed supply voltage)</th>
<th>24 V</th>
<th>31.2 V (max. allowed supply voltage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply current typ.</td>
<td>39 mA</td>
<td>31 mA</td>
<td>24 mA</td>
</tr>
</tbody>
</table>
To simplify the calculation the scheme below uses the highest of the currents but - on the other hand - does not regard the increased copper resistance and voltage loss for higher environment temperatures. All slaves even the slave most distant from the supply unit need to be supplied with min. 19.2 V DC including ripple. That means that the power supply unit at the beginning of the line has to provide a higher voltage to compensate the loss due to the line resistance.

The recommended power supply unit can be adjusted to 28 V DC

- Power Supply 24V / 5A adjustable
- Order code: 1SVR 423 416 R0100
- Type: CP-24/5.0

Remark:
The maximum number of physical stations on one bus segment is 32, defined by the RS485 standard. For more than 31 slaves an additional segment (coupled with repeater) has to be provided. That needs normally a separate supply unit.

In accordance with this fact the calculation below provides max 31 slaves + one master. Normally each repeater and RS485 / fiber-optic converter represents also one physical station each on the RS485 bus line.

The calculation with the calculation scheme below takes into account:

- The most distant slave - situated at the end of the scheme - needs at least 19.2 V DC
- Line resistance (0.5 mm²) (can be changed): 0.075 Ω/m

Additional info:

- Max. output voltage of above recommended supply unit: 28 V
6.2. Example Calculation

In this section a sample calculation is shown to check that, with a given bus cable length, current consumption per node and number of nodes per line can be supplied. For this calculation an Excel sheet is provided.

The excel file is contained in the Software Engineering Package

PBE91-FBP:010x 1SAJ924091R010x.ZIP

The ZIP file can be obtained from ABB’s web site (http://www.abb.de/stotz-kontakt) or on the FBP System CD (2CDC 190 008 E04xx). Please ask your local sales office for it.

Calculation procedure

1. Set number of slaves, e.g. including 10% spare slaves, in the blue field in the Excel sheet.
2. Set average length of the bus line between the slaves in the green field of the Excel sheet.
   It is necessary to consider also the max. length of the signal lines. Individual length can be filled in the green cells near the slaves.
3. Fill in current of the slaves in the yellow field. Individual currents can be filled in the yellow cells near the slaves.

With this figures the Excel sheet calculates the supply voltage available for each slave and the total current consumption. The blue mark shows where the master is located. If the voltage or current exceeds the maximum allowed values the according fields (sum current or voltage on slave) are marked in red. Red indication starts with the slave where the max. allowed value is exceeded the first time.

The following figures are cutouts from the Excel sheet

!*PROFIBUS-DP_PowerSupply-via-Bus-Cable_Calculation.xls*
Example calculation for a line with 31 slaves, with a current consumption of 40 mA each and 3.0 m distance between each slave.

The result of the calculation is:
- The network can be realized
- The power supply unit has to deliver min. 23,7 V / 1280 mA incl. ripple and tolerances
- The bus length is <100 m.

Consider that the cable length can be also being reached with the baud rate you want to set in the PROFIBUS master. The longer the network the lower the achievable baud rates.
7. Mounting, Grounding and Shielding

The PDQ22-FBP module must be mounted on a flat plane with at least 2 screws.

<table>
<thead>
<tr>
<th>Way of installation</th>
<th>Screw</th>
<th>Stud torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>flat</td>
<td>M4x25/30</td>
<td>1,0 Nm</td>
</tr>
<tr>
<td>sidewise</td>
<td>M4x70/80</td>
<td>1,0 Nm</td>
</tr>
</tbody>
</table>

In all ways of installation a grommet has to be used.

To discharge parasitic currents and for EMC reasons the PDQ22 has an earthing lead. It is required to connect the earthing lead with a low impedance connection with earth. In case of a grounded mounting plane the connection can be done directly with the connecting screws (not in sidewise mounting position). In case of a non grounded mounting plane or in sidewise mounting position an earthing strip or an adequate ground connector must be used.

No separate grounding of the PROFIBUS cable shield at the PDQ22 is necessary as the PROFIBUS M12 shells are also connected to the earthing lead.

Nevertheless it is urgently recommended to connect the PROFIBUS cable shield to ground:

- at the PROFIBUS DP master and
- when entering / leaving a cabinet and
- when connecting other (non FieldBusPlug slaves) in accordance with the manufacturer’s instruction.

With the accessory CDA11-FBP DIN Rail Adapter, it is possible to mount the PDQ22 directly on a DIN rail. Figure 12 shows several ways of mounting and earthing.
8. Application Examples

Use in Motor Control Centers

Motor control and supervision devices are frequently installed in so-called Motor Control Centers (MCC). Different system concepts are used for MCCs such as drawer systems or fixed panel systems. The FieldBusPlugs together with the UMC22 do well support these different system concepts. An example for a drawer system design is presented below. In the middle part – the drawer range – the motor control units are located. They are fed with power from the supply chamber on the back side of the cabinet. On the side of the cabinet the connections to the motors and field bus communication infrastructure is installed.

Figure 13: Example Drawer System
A typical problem the control cabinet builder is confronted with is that for some products the fieldbus interface is embedded in the motor control device itself. This means that the PROFIBUS line must be fed into the drawers. In simple installations this is realized creating lots of drops that decrease the maximal possible baud rate. Other solution feed in the PROFIBUS into the drawers and feed them out again to keep the targeted party line structure.

PDQ22 offers a much better solution because of its concept to separate bus node and device. The PROFIBUS node can stay in the cable chamber whereas the UMC22 is installed in the drawer. This way a robust PROFIBUS installation can be realized in the control chamber as it is shown in the figure below. Standard connection cables are used for the communication between the PDQ22 and the UMCs. ABB Stotz-Kontakt offers all the necessary installation accessories to realize this concept. See the FBP product catalogue for further info.

Another important aspect is that the PROFIBUS node stays alive even if the drawer is pulled out. The PDQ22 can detect that a device is missing and can inform the control system. As soon as the drawer is plugged in again it gets re-parameterized from the PDQ22 and is ready for operation.

Figure 14: PDQ22-FBP, example with drawers
Figure 15: PDQ22-FBP, Example with a fixed panel setup
PDP22 already offered support for an “Address Check”. I.e. if the PDP22 fieldbus plug was plugged at a device – e.g. UMC22 – and both had a different address the UMC22 did not start but indicates this on its local display. This allows the onsite staff to fix the conflict and to set the correct address.

With PDQ22 this behaviour was further improved. Now it is possible to detect if any swapping of drawers within a cabinet took place. The only thing a user has to follow is a certain addressing schema of the devices and PDQ22 devices. For each device connected to the PDQ22 a unique address must be set. The device address is built up from the PROFIBUS slave address and the port number of the PDQ22. The PDQ22 checks if the right devices are connected during start-up. Wrongly connected devices are detected from the PDQ22 and lead to an error on that port. See section 5 (Diagnosis / Behaviour in Case of an Error) for further information.

The following table shows how device addresses are built:

<table>
<thead>
<tr>
<th>PROFIBUS Address</th>
<th>Address of device connected to port zero</th>
<th>Address of device connected to port one</th>
<th>Address of device connected to port two</th>
<th>Address of device connected to port three</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 / 11 / …</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>02 / 12 / …</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>03 / 13 / …</td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>34</td>
</tr>
<tr>
<td>04 / 14 / …</td>
<td>41</td>
<td>42</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>05 / 15 / …</td>
<td>51</td>
<td>52</td>
<td>53</td>
<td>54</td>
</tr>
<tr>
<td>06 / 16 / …</td>
<td>61</td>
<td>62</td>
<td>63</td>
<td>64</td>
</tr>
<tr>
<td>07 / 17 / …</td>
<td>71</td>
<td>72</td>
<td>73</td>
<td>74</td>
</tr>
<tr>
<td>08 / 18 / …</td>
<td>81</td>
<td>82</td>
<td>83</td>
<td>84</td>
</tr>
<tr>
<td>09 / 19 / …</td>
<td>91</td>
<td>92</td>
<td>93</td>
<td>94</td>
</tr>
<tr>
<td>10 / 20 / …</td>
<td>01</td>
<td>02</td>
<td>03</td>
<td>04</td>
</tr>
</tbody>
</table>

Following the addressing schema as shown in the table above allows identifying 40 devices uniquely within an MCC. Any swapping of drawers can be reliably detected from the PDQ22 itself!
9. Technical Data
Pin Assignment

Field bus neutral interface
to the terminal device

Pin assignment for parallel mode:
1  +24V (standard power supply unit)
2  digital input (DI 1)
3  0 V (standard power supply unit)
4  digital input (DI 0)
5  digital output (DO 0)

Pin assignment for serial mode:
1  +24V (standard power supply unit)
2  Diagnosis pin
3  0 V (standard power supply unit)
4  Serial data
5  Serial data

PROFIBUS-DP A-coded
Pin assignment:
1  +24 V DC    (brown)
2  Bus-N = A   (green)
3  0 V DC        (blue)
4  Bus-P = B   (red)
5  Shield          (bare)

Figure 16: PDQ22-FBP, pin assignment
Figure 17: PDQ22-FBP, mechanical dimensions
Internal potential separation

![Diagram](2CDC43006f_006-e.png)

Figure 18: Internal potential separation

### Facts and Figures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>24 V DC + 30% / - 20% (19.2 ... 31.2 V DC)</td>
</tr>
<tr>
<td>Safety insulation</td>
<td>PELV according to EN60950</td>
</tr>
<tr>
<td>Current consumption</td>
<td></td>
</tr>
<tr>
<td>at 19.2 V</td>
<td>39 mA</td>
</tr>
<tr>
<td>at 24.0 V</td>
<td>31 mA</td>
</tr>
<tr>
<td>at 31.2 V</td>
<td>24 mA</td>
</tr>
<tr>
<td>Mounting</td>
<td>On a mounting plate or a DIN Rail Adapter, Fastening with screws</td>
</tr>
<tr>
<td>Power line failure bridging time, to be performed by the power supply unit</td>
<td>min. 10 ms</td>
</tr>
<tr>
<td>Recommended power supply unit</td>
<td>Type: CP-24/5.0 adj. Order number: 1 SVR423416R01 00</td>
</tr>
<tr>
<td>Bus termination</td>
<td>Active bus-line terminator 150 Ohms at both ends of the bus, the bus master units (or repeaters) often offer a bus-line terminator at the start of the bus line. Recommanded type PDR11-FBP:150</td>
</tr>
<tr>
<td>Modes of data communication between FieldBusPlug and device</td>
<td>parallel and serial</td>
</tr>
<tr>
<td>Scope of data</td>
<td>according to PROFIBUS DP specifications</td>
</tr>
<tr>
<td>Max. PROFIBUS Bitrate</td>
<td>12 MBit/s</td>
</tr>
<tr>
<td><strong>Warning:</strong></td>
<td>Interchanging of bus signal lines with supply lines can cause destruction of the plug. Interchange of device connection cables with bus cables can cause destruction of the plug</td>
</tr>
<tr>
<td>Load capacity of plugs and cables</td>
<td>max. 4 A</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 65</td>
</tr>
<tr>
<td>Ambient temperature:</td>
<td>-20...+70 °C / 0...+55 °C</td>
</tr>
<tr>
<td>Dimensions</td>
<td>see figure 17</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>0.75 W at 24 V</td>
</tr>
<tr>
<td>Weight</td>
<td>0.2 kg</td>
</tr>
<tr>
<td>Bus address setting</td>
<td>With address switches directly on the device</td>
</tr>
<tr>
<td>Address range</td>
<td>1 ... 99</td>
</tr>
<tr>
<td>Diagnosis with LEDs</td>
<td>See section Diagnosis</td>
</tr>
<tr>
<td>Cable length between PDQ22 and devices</td>
<td>It is strongly recommended to limit the cable length to 2 m and to use shielded cable for the connection. Recommanded type CDP15-FBP:150 Standard 5-pole Sensor/Actor extension cable can be used</td>
</tr>
</tbody>
</table>
## 10. Ordering Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDQ22-FBP</td>
<td>PROFIBUS FieldBusPlug</td>
<td>1SAJ 240 200 R0050</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDA11-FBP050</td>
<td>PROFIBUS DP Adapter Cable Dsub9-M12</td>
<td>1SAJ924009R0005</td>
</tr>
<tr>
<td>PDA12-FBP050</td>
<td>PROFIBUS DP Adapter Cable M12-Dsub9-M12</td>
<td>1SAJ924010R0005</td>
</tr>
<tr>
<td>CDA11-FBP0</td>
<td>DIN Rail Connector</td>
<td>1SAJ929300R0001</td>
</tr>
<tr>
<td>CDP15-FBP150</td>
<td>Extension cable (female/male), shielded</td>
<td>1SAJ929140R0015</td>
</tr>
<tr>
<td>CDP16-FBP150</td>
<td>Extension cable (male/open), shielded</td>
<td>1SAJ929150R0015</td>
</tr>
</tbody>
</table>

For more accessories see the latest catalogues

* "Automation Components" Doc.No.: 2CDC 003 005 C02xx
  or

* "Building and Automation Products" section 'Automation Devices’ Doc.No.: 1SDC 007 200 C02xx