Ifac-system isPro USBx12 Profibus USB Interface installation Documentation

with special emphasis in connecting a BRONKHORST EL-FLOW mass flow meter/controller

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Introduction

A “Profibus USB Interface” is a device used to control several industrial measurement devices using the Profibus-protocol, which is a serial bus protocol based on RS485. On the one hand it will be connected to the USB port of a PC on the other hand it will be connected to the Profibus-RS485 line as the master device. It reads the data from the measurement devices and passes them to a database suitable for time-dependent data using the OPC-standard (OPC is a standardised software interface allowing the exchange of different manufacturers data).

This documentation describes in detail the installation procedure of an Ifak-system isPro USBx12 Profibus USB Interface on a PC to be used for data acquisition. For the data acquisition several BRONKHORST EL-FLOW® mass flow meters/controllers as measurement devices are used, hence also the installation and configuration of the BRONKHORST EL-FLOW mass flow meters/controllers is described here. However, this documentation is also useful for other instruments to be connected to the Ifak-system isPro USBx12 Profibus USB Interface.

Several problems and software bugs are described and appropriate workarounds are given. The exact steps how to carry out the installation of both hardware and software as well as the proper configuration under Windows-XP are described, including ways, how to test the installed devices for their proper function. The composition of the data-record for one BRONKHORST EL-FLOW device within the data historian is described in detail.
Prerequisites:
Prerequisites for a successfully installation are:

− One PCs with Windows XP® operating system and Service Pack 2 installed. The device may also work with other operating systems however, the installation procedure may be slightly different. Attention: Possibly one needs to suppress some firewall functions of Windows XP® Service Pack 2 in order to make the device work.

− One (or more) ifak-system is-Pro USBx12 Profibus USB interface to be installed at the PC.

− The installation-CD for is-Plorer, is-Pro Configurator, is-OPC Konfigurator and is-OPC DemoClient.

− The program “IsProMultiServer.exe” coming with this description, which is a workaround and upgrade to the original program in order to make the ifak-system is-Pro USBx12 Profibus USB interface cooperate with the BRONKHORST EL-FLOW meter/controller!

− One USB-cable (flat connector at PC-side, square connector at is-Pro USBx12 side).

− One special Profibus-(RS485) cable for communication with the instruments. This cable needs one DB9-male connector to be connected to the ifak-system is-Pro USBx12 Profibus USB interface and at least for each instrument (e.g. for each BRONKHORST EL-FLOW meter/controller) one DB9-male connector switched parallel between the send/receive lines (see section: C&C for the is-Pro USBx12 Profibus Interface for pin-assignment).

For BRONKHORST EL-FLOW meter/controller:

− The number of BRONKHORST EL-FLOW meter/controllers you want to install.

− Power supply for each instrument. For the required voltage please see the description of the respective instrument. In case of a BRONKHORST EL-FLOW meter/controller series M4207554 a power of +24 V must be provided by a DB9-female connector (see section: C&C on the BRONKHORST EL-FLOW meter/controller side for pin-assignment).

− One special serial RS232 cable with power supply lines included (see section: C&C on the BRONKHORST EL-FLOW meter/controller side for pin-assignment).

− The program “FlowFix” coming on installation disks with the BRONKHORST EL-FLOW meter/controller.

Cables and connections (C&C)

C&C for the is-Pro USBx12 Profibus Interface

The is-Pro USBx12 Profibus Interface comes with 2 connectors, one standard USB square connector and one DB9-female connector.

Hence one standard USB-cable with a flat connector at PC-side and a square connector at is-Pro USBx12 side is necessary in order to connect the is-Pro USBx12 Profibus USB Interface to the PC.

The DB9-female connector of the is-Pro USBx12 Profibus USB Interface contains the Profibus interface, where your Profibus-instruments have to be connected to. This Profibus interface is based on the RS485 protocol in half-duplex mode. For a more detailed description of RS485 see [1]. However, the wiring to the instrument interface must be always so that the polarity is maintained, means Data+ ↔ Data+ and Data - ↔ Data-. Also the voltage (+5 Volt) and the mass should be connected to the respectively same pins on the instrument side(s) if available.

Since RS485 provides you with a bus, you may connect several instruments in parallel. It is possible that you need to terminate the Data+ and Data- wires of the RS485-bus by shortcutting them using a 120 Ohm resistor in order to prevent signal reflections.

Pin-wiring of the Profibus-interface at the is-Pro USBx12:

Since the connector on the is-Pro USBx12 Profibus is DB9-female, the connector on the cable must be DB9-male! The pin-wiring at the is-Pro USBx12 side reads as follows (see also [2] page 7):
<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>shield (optional, depending on the instrument)</td>
</tr>
<tr>
<td>3</td>
<td>Data+ (=Channel A)</td>
</tr>
<tr>
<td>5</td>
<td>Mass (optional)</td>
</tr>
<tr>
<td>6</td>
<td>+5 Volt (provided by the is-Pro USBx12 interface during operation)</td>
</tr>
<tr>
<td>8</td>
<td>Data- (=Channel B)</td>
</tr>
</tbody>
</table>

**Table 1:** Pin-wiring of the Profibus-interface at the is-Pro USBx12

For pin connections at the instrument side(s) see the respective description of the instrument(s), however usually the pin-wiring remains the same and the connectors on the cable need to be **DB9-male** as well.

Hence a cable with a **DB9-male connector** on the is-Pro USBx12 Profibus side, with a pin-wiring one can see in **Table 1** and several **DB9-male connectors** on the instrument’s side is required (see also section: **C&C on the BRONKHORST EL-FLOW meter/controller side**)

**C&C on the BRONKHORST EL-FLOW meter/controller side**

**Profibus-Connector:** The Profibus-connector on the BRONKHORST EL-FLOW meter/controller is a DB9-female connector, hence the connector on the cable must be **DB9-male**! The pin-wiring reads as follows (see also [7]):

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
</tr>
<tr>
<td>3</td>
<td>Data+ (=Channel A)</td>
</tr>
<tr>
<td>8</td>
<td>Data- (=Channel B)</td>
</tr>
</tbody>
</table>

**Table 2:** Profibus pin-wiring on the BRONKHORST EL-FLOW device

Pin 5 and 6 are not used by the BRONKHORST EL-FLOW meter/controller! You may connect several BRONKHORST EL-FLOW meter/controllers in parallel to the same cable.

**Power supply connector:** For a BRONKHORST EL-FLOW meter/controller power must be provided by a **DB9-female** connector. The required voltage depends on the exact type of instrument; hence it can be read in the description. In case of a BRONKHORST EL-FLOW meter/controller series M4207554 +24 V must be provided, the pin-wiring reads as follows (see also [7]):

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0 V</td>
</tr>
<tr>
<td>7</td>
<td>+24 V</td>
</tr>
<tr>
<td>8</td>
<td>0 V</td>
</tr>
<tr>
<td>9</td>
<td>shield/ground</td>
</tr>
</tbody>
</table>

**Table 3:** Pin-wiring for the BRONKHORST EL-FLOW power connector series M4207554

**RS232 connector (for pre-configuration):** The power connector of the BRONKHORST EL-FLOW meter/controller acts at the same time as RS232 connector. Via this RS232 interface the “Station address” of the instrument must be configured.

**Attention:** It was found that configuring the “Station address” via isPlorer using the Profibus-connector does not work! Also it was found that one mandatory must set a “Station address” via this interface, the factory-preset addresses do not work!

Since the BRONKHORST EL-FLOW meter/controller must be powered up during the setting of its “Station address”, a special cable is required. Here additionally to the pins for providing power (+24 V in case of a BRONKHORST EL-FLOW meter/controller series M4207554) as described in **Table 3**, pins for the serial RS232-interface must be connected. This requires a special **3-connector cable**, one **DB9-female** connector for the BRONKHORST EL-FLOW, another **DB9-female** connector for the Serial RS232 interface at the PC and one for the power supply (the connector type depending on the power supply). The pin-wiring for these connectors read in **Table 4**, where also the T-adapter cable 7.03.366 from Bronkhorst can be used (see also [7]):

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0 V</td>
</tr>
<tr>
<td>7</td>
<td>+24 V</td>
</tr>
<tr>
<td>9</td>
<td>shield/ground</td>
</tr>
</tbody>
</table>

**Table 4:** Pin-wiring of the 3-connector cable for the BRONKHORST EL-FLOW meter/controller series M4207554
<table>
<thead>
<tr>
<th>EL-Flow (DB9-female)</th>
<th>Power Supply</th>
<th>PC (RS232 DB9 female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1 (Tx to PC)</td>
<td></td>
<td>Pin 2 (Rx from EL-Flow)</td>
</tr>
<tr>
<td>Pin 4</td>
<td>0 V</td>
<td>Pin 5</td>
</tr>
<tr>
<td>Pin 6 (Rx from PC)</td>
<td></td>
<td>Pin 3 (Tx to EL-Flow)</td>
</tr>
<tr>
<td>Pin 7</td>
<td>+24 V</td>
<td>Pin 7 (shortcut to Pin 8)</td>
</tr>
<tr>
<td>Pin 8</td>
<td>0 V</td>
<td>Pin 8 (shortcut to Pin 7)</td>
</tr>
<tr>
<td>Pin 9</td>
<td>shield/ground</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4:** Pin-wiring of the *BRONKORST EL-FLOW* configuration cable (for series M4207554)
Installation of the **BRONKHORST EL-FLOW**

Before you can actually install the **BRONKHORST EL-FLOW** meter/controllers you must pre-configure them by actually assigning a “Station address” to them using the special 3-connector’s RS232 cable described in section C&C on the **BRONKHORST EL-FLOW** meter/controller side and using the software “FlowFix”.

**Attention:** It was found that on the **BRONKHORST EL-FLOW** meter/controller one mandatory must set a “Station address” via the RS232 interface, the factory-preset addresses do not work! Also it was found that configuring the “Station address” via isPlorer using the Profibus-connector does not work! Without configuring an address by the procedure described here, you may later not get any connection to the instrument using an OPC-client!

Hence as a first step install the software “FlowFix” coming on the **BRONKHORST EL-FLOW** meter/controller’s installation disks:

- Run the program “FlowFixSetup.exe” and follow the instructions, which are quite straight forward (e.g. click “Next” several times).

**Pre-configuration of the **BRONKHORST EL-FLOW** devices**

Before you configure the *isPro USBx12 Profibus Interface*, the address of all **BRONKHORST EL-FLOW** meter/controllers must be configured using the RS232 interface. In order to do so, use the software “FlowFix”.

- Use the special 3-connector’s RS232 cable described in section C&C on the **BRONKHORST EL-FLOW** meter/controller side for which the pin assignment can be found in Table 4 to interconnect the **BRONKHORST EL-FLOW** meter/controller with a computer’s RS232 port: Connect the combined RS232/power supply connector to the **BRONKHORST EL-FLOW** meter/controller, the RS232 connector to the computer’s RS232 port and the power port to your power supply and power up the instrument.
- Start the Program “FlowFix” by Start → Programs → Bronkhorst → Flow-Bus → FlowFix.
- Select the serial port (see Figure 1).

![Figure 1: FlowFix Choose Com-port](image1.png)

- Configure the “Station address” (see Figure 2). **Attention:** Make sure that you use a different “Station address” for each of your instrument(s) as well as for the *is-Pro USBx12 Profibus* device itself. In case the “Station address” of some instruments and/or the *is-Pro USBx12 Profibus* device match, you won’t see one or more of the devices in isPlorer!

![Figure 2: FlowFix – Configuration of “station address”](image2.png)
• Leave the program by File → Exit.

Repeat the procedure above for any device (e.g. BRONKHORST EL-FLOW meter/controller) you want to use with your isPro USBx12 Profibus Interface.

**Installation of the BRONKHORST EL-FLOW meter/controller**

After the pre-configuration simply install the BRONKHORST EL-FLOW meters/controllers by the following procedure:

- Connecting the BRONKHORST EL-FLOW devices to the gas-flow as indicated on them.
- Connect the BRONKHORST EL-FLOW devices to the Profibus-cable (described in section C&C for the is-Pro USBx12 Profibus Interface and Table 2).
- Connect the BRONKHORST EL-FLOW devices to the power cable (described in section C&C for the is-Pro USBx12 Profibus Interface and Table 3) and power of the instruments.
Installation of the *isPro USBx12 Profibus Interface*

- Install both the *isPro MultiDriver* and the *isPro MultiServer* on your PC. Make sure that you got the *isPro MultiDriver Version 3.0* or higher (if not obtain the latest version from [http://www.ifak-system.com](http://www.ifak-system.com)). This installation is straight forward however, take care about the following important points after the installation:
  - **Attention:** For some reason the *isPro MultiServer* program *isKonfigurator* is expecting the file “opc.pbc” within the directory path “x:\Program Files\ifak system\bin\” (x stands for the drive letter) whereas the installation routine puts the file under “x:\Program Files\ifak system\is Pro Multiserver\bin\”. Hence immediately after having installed the *isPro MultiServer* copy the contend of “x:\Program Files\ifak system\is Pro MultiServer\” to “x:\Program Files\ifak system\” in order to make the *isKonfigurator* run, see Figure 10!
  - **Attention:** The *isPro MultiServer* version 2.5.1 does not work with the *BRONKHORST EL-FLOW meter/controller*. It cannot handle that many parameters as this slave requires. You have to use a newer version or to copy the workaround “IsProMultiServer.exe”, coming with this description (from 26/07/2006, 270336 bytes), over it at the respective locations “x:\Program Files\ifak system\bin\” and “x:\Program Files\ifak system\is Pro Multiserver\bin\” (x stands for the drive letter)!
- Connect the *is-Pro USBx12 Profibus* to the Profibus cable (described in section C&C for the *is-Pro USBx12 Profibus Interface* and Table 2).
- Connect your *is-Pro USBx12 Profibus* to the PC via the USB cable. In case you see the *Found New Hardware Wizard* do the following:
  - On the question “Can Windows connect to Windows Update to search for software?” select “No, not this time” and click Next.
  - Select “Install the software automatically (Recommended)” if not yet done and click Next.
  - Within a possible window mentioning that the *isPRO USB Profibus-Adapter (isPROusb.sys)* has not passed Windows Logo testing to verify its compatibility with Windows XP click *Continue Anyway*.
  - Click Finish. The driver should be installed and ready for operation now.
Configuration of the *isPro USBx12 Profibus Interface*

- Start the *is Pro Configurator* (Start → ifak systems → *is Pro Multidriver* → *is Pro Configurator*), see Figure 3.
  - Add a device by clicking *Add*.

![Figure 3: isProConfigurator initial window](image)

- On the “Add Device” window select “USB” and click *OK*, see Figure 4.

![Figure 4: isProConfigurator → Add Device](image)

- Select the device you have just added with a left single mouse-click. On the right hand side a possibility appears to key in the serial number. Do so (you should find the serial number written on the *is-Pro USBx12 Profibus*), see Figure 5. You may obtain the serial number as well when clicking on the button “Search attached device”, select the appropriate device number and click *Select*.
  - Click *OK*.

![Figure 5: isProConfigurator Serial no. input](image)
• Start isPlorer (Start → ifak systems → is Pro Multidriver → is Plorer). You should see a Device and a Channel, see Figure 6 (you possibly have to expand the “Device” by clicking on “+” next to the “Device”).

![Figure 6: isPlorer initial window](image)

- Right mouse click on Channel and select Initialisieren. You will obtain a window “Busparameter laden”, see Figure 7.
- Within this window select the “Baudrate” (the same as on your instrument(s)) and a “Stationsadresse” (different from those you used on your instrument(s)), see Figure 7! You may select as well a few parameters concerning the Bus-Timing in the lower half of this window (of minor importance). Click OK and wait a few seconds (up to 30!). For setting the baudrate of your instruments please look to the respective manuals of the instruments.

![Figure 7: IsPlorer → Busparameter laden](image)

- After that you should get on the right hand side of this window “Master” icon representing the is-Pro USBx12 Profibus device itself together with its “Stationsadresse” indicated. This “Stationsadresse” in fact is the RS485-bus-address. Furthermore you should see the instruments as “Slaves”, again with their RS485-bus-addresses indicated, see Figure 8. You possibly need to right-click on the respective Cannel and select “neue Livelist” from the upcoming menu! For how to set the RS485-bus-addresses on your instruments please look to the respective manuals of the instruments or see section Pre-configuration of the BRONKHORST EL-FLOW devices in case of a BRONKHORST EL-FLOW meter/controller.
Figure 8: isPlorer final stage

- Leave isPlorer (Datei → beenden).
Configuration of the *BRONKHORST EL-Flow devices*

In order to configure the *BRONKHORST EL-FLOW mass flow meter/controller* to be used with the *IsPro USBx12 Profibus USB Interface* start *isKonfigurator* (Start → ifak systems → is Pro MultiServer → is OPC Konfigurator), see Figure 9.

**Figure 9: isKonfigurator – initial state**

**Attention:** Make sure that the file "opc.pbc" is within the directory path "x:\Program Files\ifak system\bin" (x stands for the drive letter of your system drive). If this is not the case, copy the content of "x:\Program Files\ifak system\is Pro MultiServer" to "x:\Program Files\ifak system\bin" in order to make the *isKonfigurator* run properly, see Figure 10!

**Figure 10: Correct location of the file opc.pbc**

Then do the following:

- Right-click on *OPC-Server* and select *Insert Object*. Give a name to this new *ProBoard-device* (see Figure 11) and click OK.
The Object is introduced in the *isKonfigurator* (see Figure 12).
- Right-click on this new *ProBoard*-device and select Properties.

- Within the tag "Hardware configuration" select the Device Type "is Pro USB" (see Figure 13) and click OK.
• Again right-click on this new ProBoard-device and select Insert Object. Give a name to this ProSegment-device (see Figure 14) and click OK.

![Figure 14: Insert Object – ProSegment](image)

The Object is introduced in the isKonfigurator (see Figure 15).

![Figure 15: isKonfigurator with ProSegment](image)

- Right-click on this new ProSegment-device and select Properties.
- Within the tag “FDL-Parameter” select the parameters, especially the “Baud Rate” and the “Station Address” (see Figure 16) and click OK or Übernehmen. **Attention:** It may happen that the “Station Address” will not be stored after you have changed it (in case you did). This can be foreseen on the fact, that the button “Übernehmen” does not become active after typing the new “Station Address”. In this case temporarily change the “Baud Rate”, take care that the button “Übernehmen” had became active, type the new “Station Address”, change the “Baud Rate” back to its original value and click OK or “Übernehmen”. The “Station Address” should be changed now (better check it). **Attention:** Make sure that you used a different “Station Address” here on the is-Pro USBx12 Profibus device than the addresses of your instrument(s). In case this address and the address of one of your instruments match, you won’t see the instrument in isPlorer!
• Again right-click on this new ProSegment-device and select “Insert Object”. Give a name to this ProDevice-device (see Figure 17) and click OK.

The Object is introduced in the isKonfigurator (see Figure 18).
– Right-click on this new ProDevice-device and select “Properties”.

Figure 16: Properties of ProSegment

Figure 17: Insert Object – ProDevice

Figure 18: isKonfigurator with ProDevice
Within the tag “Device Properties” specify the address of your instrument under “Address” and the type of access (you probably want cyclic). Then click on the button “Übernehmen” (see Figure 19).

For the next step go to the tag “cycl. Parameter 1”. Here within the group “Offset” fill the box for “Input data” (see Figure 20) with the sum of all bytes of the data records of all previously defined ProDevices. If this is the first ProDevice you define, you may skip this point.

The bytes of a data record for a ProDevice can be seen in the group “Length” of the tag “cycl. Parameter 1” after the configuration of the “GSD”-tag of the ProDevice, when these fields will automatically be filled (see Figure 24). Hence sum up all numbers of “Input data” + “Output data” of the group “Length” for all previously defined ProDevices and write the result in “Input data” of the group “Offset” (see also section A configuration example for further explanation of the composition of a data record)! Then click on the button “Übernehmen” (see Figure 20). **Attention**: Leaving a tag in isKonfigurator without prior clicking the button “Übernehmen” may result in loss of the data just defined in that tag!
Go to the tag “GSD”. Within this tag click on the button “…” (see Figure 21).

Figure 21: Properties of ProDevice – tag GSD (empty)

A menu pops up (see Figure 22) which allows you to navigate through the file structure of your PC. Select the respective *.gsd file which came with your instrument and click on Open. (Best copy this *.gsd file on the same location, where you installed a possibly driver software from your instrument vendor, means under “x:\Program Files...” (where x stands for the respective drive letter of your system drive). **Attention**: The “is OPC Konfigurator” from ifak mandatory requires the values you see in the tag “cycl. Parameter 2” to be in **hexadecimal format**. Some *.gsd files **including that one from the BRONKHORST EL-FLOW** give these values in decimal format.

Figure 22: Load GSD-file into properties of ProDevice – tag GSD

In this case you need to change these values within the *.gsd file manually in hexadecimal format using an editor before you import this file! Also for some reason the mandatory data is not read into the field “PrmData” (see Figure 23). You will have to fill it by hand later.

- Sequentially select a slot from the list “Slot” and assign one of the variables from the list “Modul” to it (see Figure 23), which you want to read or write to/from the instrument (by mouse-click on the respective value). You have to use a **different** slot for each value from the list “Modul”! Repeat this procedure for each value from the list “Modul” you want to use. The slots range from 0 to 49, so all in all there are 50 values to read or write available.
This will compile the record as it is used in the database using the parameters you selected by this procedure. The record consists of 2 parts: First the input-part of all read-variables followed by the output-part of all write-variables. The compilation of the record will be done according to the following procedure: In a first step the input-data part (read) of the record is compiled in the order of assignment of slot-numbers. For this first, input part of the data-record all write-variables are skipped! Then, in a second step, the output part of the record is compiled also in the order of assignment of slot-numbers, where all read-variables are skipped! Hence it is recommended either to proceed first all read-variables and after that all write-variables or to proceed the write-variables just after the respective read-variable (which will lead to the same order within the write-part of the record). For further explanations and an example, how the data-record is compiled, see section A configuration example. Note down the sequence (in slot-numbers) how you assigned the variables to the respective slots, you will need it during the next configuration-step! Then click on “Apply to Device Configuration”. The fields within the tag “cycl. Parameter 1” (see Figure 24) should then be filled automatically and they should be updated when you click the button “Apply to Device Configuration”.

Figure 23: Properties of ProDevice – tag GSD, GSD-file loaded

Figure 24: Properties of ProDevice – tag cycl. Parameter 1
Also when you click the button “Apply to Device Configuration” the respective data for the selected module should be added to the field “Cfg-Data” within the tag “cycl. Parameter 2” (see Figure 25). **Attention:** For some reason the values for the field “User-Prm-Data” within the tag “cycl. Parameter 2” (see Figure 25) are not read into this field “User-Prm-Data”, just in contrary, each time you click the button “Apply to Device Configuration” this field is deleted. However, this field needs mandatory to be filled with the correct values in hexadecimal form.

Hence you have to fill it by hand using all constants as they appear sequentially in the *.gsd file within the section “Parameter data (Set Variables)”, best using copy and paste. The correct values to be filled in this field “User-Prm-Data” for a Profibus BRONKHORST EL-FLOW mass flow meter/controller in hexadecimal form are: “00 00 0A 00 40 01 04 00 00 01 02 01 00 00 10 00 00 61 03 00 00 61 01 01 00 00 61 02 01 00 00 61 05 00 00 61 06 01 00 00 61 07 00 03 61 09 00 0F 68 08 00 00 68 02 00 00 68 03 03 00 00 00 68 05 00 00 68 06 01 00 00 68 09 00 07 73 02 00 FF 00 0A 00 00”. Do so after you have selected all the values within the list “Modul” (see Figure 26), since every click on “Apply to Device Configuration” will empty this list again.

− Click “Übernehmen” (see Figure 26). After that click “OK”. **Attention:** Leaving a tag in isKonfigurator without prior clicking the button “Übernehmen” may result in loss of the data just defined in that tag!
- For each value you have defined in the previous step from the list “Module” do the following:
  - Right click on the previous defined ProDevice-device and select “Insert Parameter”.
  - Start with the first parameter you have defined in the previous step from the list “Module” and give its name to this new parameter, see Figure 27. The name does not need to be identical to this previously defined “Module” however, it is highly recommended to use a similar name and click OK!

  ![Figure 27: Insert Parameter](image)

  - Right click on this new parameter and select “Properties”. A window “ProValue” will come up (see Figure 28).
  - On the tag “Data access” select the data-type and possibly the length (e.g. in case of data type char, for which you have to select “VisibleString”), see Figure 28.

  ![Figure 28: Window “ProValue” – tag “Data access”](image)

  - Then go to the tag “Profibus” (see Figure 29). There in the field “Slot/Position” key in the address-offset (in byte, starting with 0) where the respective variable appears within the record of the data base (you compiled this record in the ProDevice-device during the previous step when you assigned the variables from the list “Module” to the respective slots). The detailed procedure, how the data-record is compiled and the offset must be calculated can be found in section: A configuration example. Then select whether it is an “Input” parameter (means “read”) or an “Output” parameter (means “write”) and click “OK”. The order (in time) in which you define the variables is not important, however the offset must be given precisely! **Attention:** The offset calculates separately for the read-variables and the write-variables. It means the number of bytes from the start of the input-data for the read-variables and the number of bytes from the start of the output-data for the write-variables respectively. For example if you have 3 different read-modules, the first one int16, the second float, the third one char[5], use for the first one as offset “0”, for the second one the offset “2” and for the third one the offset “6”. For the next read-module you would have to use the offset “11”. Hence for each value from the list “Module” you need to look up its length in bytes from the manual.

1 You also find the length of each module within the *.gsd file: Each module is represented there with a line, starting with “Module = “, following by the module name and some numbers. The second number plus one represents the number of bytes used for this module (e.g. if the second number is 3 the number of bytes used would be 4).
Repeat this procedure for each value you have defined in the ProDevice-device during the previous step from the list “Module”.

- The isKonfigurator should now look like you see it in Figure 30. Save the configuration (e.g. using File → Save) and exit isKonfigurator.

A configuration example
Since the way how to compile a data-record and how to calculate the offsets of the variables within this data record is rather complicated, this should be demonstrated at a small example:

Assume we want to read/write the following variables from/to a BRONKHORST EL-FLOW mass flow meter/controller, see Table 5:

for this module is 4). Attention: This number may be given in hexadecimal format, which is then indicated by a prefix of “0x”!

— Figure 29: Window “ProValue” – tag “Profibus”

— Figure 30: isKonfigurator with Parameters
Table 5: Variables to be read and/or written

<table>
<thead>
<tr>
<th>Variable</th>
<th>Action</th>
<th>Data type (from manual)</th>
<th>No. of bytes (from manual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setpoint, integer</td>
<td>read + write</td>
<td>Integer 16</td>
<td>2</td>
</tr>
<tr>
<td>Setpoint slope, integer</td>
<td>read + write</td>
<td>Integer 16</td>
<td>2</td>
</tr>
<tr>
<td>Valve output</td>
<td>read</td>
<td>Integer 32</td>
<td>4</td>
</tr>
<tr>
<td>Measure, integer</td>
<td>read</td>
<td>Integer 16</td>
<td>2</td>
</tr>
<tr>
<td>Serial number</td>
<td>read</td>
<td>Char(20)</td>
<td>20</td>
</tr>
</tbody>
</table>

Variables, which are both input (read) and output (write), means “Setpoint” and “Setpoint slope” need to be defined separately for input and output, “Setpoint, integer (write)” and “Setpoint, integer (read)” (“Setpoint slope, integer (write)” and “Setpoint slope, integer (read)” respectively). During the configuration of the ProDevice device these variables have to be assigned to different slot-numbers, see Figure 23. There are several possibilities for doing so (see Table 6) while maintaining the same order of the variables within the data-record:

Table 6: Several possibilities for slot assignment leading to the same offsets

<table>
<thead>
<tr>
<th>Variable from list “Module”</th>
<th>Slot (Possib. 1)</th>
<th>Slot (Possib. 2)</th>
<th>Slot (Possib. 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setpoint, integer (read)</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Setpoint, integer (write)</td>
<td>1</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>Setpoint slope, integer (read)</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Setpoint slope, integer (write)</td>
<td>3</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>Valve output (read)</td>
<td>4</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Measure, integer (read)</td>
<td>5</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Serial number (read)</td>
<td>6</td>
<td>4</td>
<td>25</td>
</tr>
</tbody>
</table>

The data record is compiled from this assignment of the variables to the slots. In a first step the input-data part (read) of the record is compiled in the order of assignment of slot-numbers. For this first, input part of the data-record all write-variables are skipped! Then, in a second step, the output part of the record is compiled also in the order of assignment of slot-numbers, where all read-variables are skipped! Hence the record is composed in all cases as it is shown in Figure 31: “Setpoint, integer (read)”; “Setpoint slope, integer (read)”; “Valve output (read)”; “Measure, integer (read)”; “Serial number (read)” for the input part, followed by “Setpoint, integer (write)” and “Setpoint slope, integer (write)” for the output part. The length (30 and 4 bytes) and offset (0 and 30 bytes) for the input and output parts are calculated automatically as one can see it in Figure 24.

However, during the configuration of the parameters itself the offset of the respective parameter has to be defined within the field “Slot/Position” of the window “ProValue” tag “Profibus”, see Figure 29. This offset calculates as number of bytes from the start of the input-data for the read-variables and as number of bytes from the start of the output-data for the write-variables respectively. This holds for all cases of slot-assignment you see in Table 6, since all these cases lead to the same record composition which you can see in Figure 31. In order to calculate these offsets you must look up the length of the variables used from the manual or from the *.gsd file*. The offsets for the variables are shown in Table 7.

2 You also find the length of each module within the *.gsd file: Each module is represented there with a line, starting with “Module = "”, following by the module name and some numbers. The second number plus one represents the number of bytes used for this module (e.g. if the second number is 3 the number of bytes used for this module is 4). Attention: This number may be given in hexadecimal format, which is then indicated by a prefix of “0x”!

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Figure 31: The data record

Table 7: Data-offset in bytes within the record
Test the *isPro USBx12 Profibus USB Interface*

In order to test the *isPro USBx12 Profibus USB Interface* you may use the “*is OPC DemoClient*”:
- Start the *is OPC DemoClient* (Start → ifak systems → is Pro MultiServer → *is OPC DemoClient*).
- Within the upcoming window select *isPro.MultiServer.1* as localserver (see Figure 32) and click “OK”. Wait a few seconds, the *is OPC DemoClient* is starting up.

![Figure 32: Is OPC DemoClient – Server Selection](image)

- Within the upcoming window click within the area “Server” the “Add Group” button (see Figure 33). Give a Group Name (or leave the default name “TestGroup”) and click “OK”, see Figure 34.

![Figure 33: Is OPC DemoClient – initial window](image)

![Figure 34: Is OPC DemoClient – group definition](image)

You should then find the respective group in the left hand side of the window under the respective server name (e.g. “TestGroup” under “localserver”, see Figure 35).

![Figure 35: Is OPC DemoClient – With group](image)
• Again within the area “Server” click “Browse”. In the lower part of the upcoming window you find the devices, objects and parameters you have configured during the previous configuration procedure (you need to expand the objects by clicking on “+”, see Figure 36).

![Figure 36: is OPC DemoClient – parameter selection](image1)

Select the parameter you want to test and click “Mark to Add”. When you have marked all parameters you want, click on “OK, add to current Group”. You should then find the respective parameter in the left hand side of the window under the respective group name (e.g. the parameter “dp/device/device2/object1/readInteger” under “TestGroup”, see Figure 37).

• Select one of these parameters and click “Read” in order to read the current value of this parameter out of the device via the isPro USBx12 Profibus USB Interface (respective click “Write” in order to write a value to a parameter onto the slave device). In case you write a variable which are both input (read) and output (write) you must be able to read back the same value which you did write to the variable before.

![Figure 37: is OPC DemoClient – read/write parameters](image2)
Remarks

Bugs or incompatibilities:

- **Attention:** Possibly one needs to suppress some firewall functions of Windows XP® Service Pack 2 in order to make the device work.
- **Attention:** It was found that on the BRONKHORST EL-FLOW meter/controller one mandatory must set a “Station address” via the RS232 interface, the factory-preset addresses do not work! Without configuring an address by the RS232 interface, one may later not get any connection to the instrument using an OPC-client!
- **Attention:** It was found that configuring the “Stationadresse” via isPlorer using the Profibus-connector does not work!
- **Attention:** For some reason the isPro MultiServer program isKonfigurator is expecting the file “opc.pbc” within the directory path “x:\Program Files\ifak system\bin\” (x stands for the drive letter of your system drive) whereas the installation routine puts the file under “x:\Program Files\ifak system\is Pro MultiServer\bin\”. Hence immediately after having installed the isPro MultiServer copy the contend of “x:\Program Files\ifak system\is Pro MultiServer\” to “x:\Program Files\ifak system\” in order to make the isKonfigurator run, see Figure 10!
- **Attention:** Sometimes when running isPlorer, during the initialisation of your channel you may receive a message “das Initialisieren des Gerätes schlug fehl”. Usually once you got this message you need to reboot your PC in order to make the program run correctly again.
- **Attention:** Make sure that you use a different “Stationadresse” on the is-Pro USBx12 Profibus device than the addresses of your instrument(s). In case this “Stationadresse” and the “Station Address” of one of your instruments match, you won’t see the instrument in isPlorer!
- **Attention:** Using isKonfigurator it may happen that the “Station Address” of a ProSegment-device will not be stored after you have changed it. This can be foreseen on the fact, that the button “Übernehmen” does not become active after typing the new “Station Address”. In this case temporarily change the “Baud Rate”, take care that the button “Übernehmen” had became active, type the new “Station Address”, change the “Baud Rate” back to its original value and click OK or “Übernehmen”. The “Station Address” should be changed now (better check it).
- **Attention:** The is OPC Konfigurator from ifak mandatory requires the values you see in the tag “cycl. Parameter 2” to be in hexadecimal format. Some *.gsd files give these values in decimal format. In this case you need to change these values within the *.gsd file manually in hexadecimal format using an editor before you import this file using the is OPC Konfigurator.
- **Attention:** Leaving a tag or simply clicking on “OK” in isKonfigurator without prior clicking the button “Übernehmen” may result in loss of the data just defined in that tag!
- **Attention:** The is PRO MultiServer version 2.5.1 does not work with the BRONKHORST EL-FLOW meter/controller. It cannot handle that many parameters as this slave requires. You have to use a newer version or to copy the workaround “IsProMultiServer.exe”, coming with this description over it.
- **Attention:** During the configuration of the ProSegment-device using isKonfigurator: For some reason the values for the field “User-Prm-Data” within the tag “cycl. Parameter 2” are not read into this field, see Figure 25. However, this field needs mandatory to be filled with the correct values in hexadecimal format. Hence you have to fill it by hand using all constants as they appear sequentially in the *.gsd file within the section “Parameter data (Set Variables)”, best using copy and paste, see Figure 26. The correct values to be filled in this field “User-Prm-Data” for a Profibus BRONKHORST EL-FLOW mass flow meter/controller in hexadecimal form are: “00 00 0A 00 40 01 04 00 00 01 02 01 00 00 01 10 00 00 61 03 00 00 61 01 01 00 00 61 02 01 00 00 61 05 00 00 61 06 01 00 00 61 07 00 03 61 09 00 0F 6B 08 00 00 6B 02 00 00 6B 03 03 00 00 00 00 6B 05 00 00 6B 06 01 00 00 6B 09 00 07 73 02 00 FF 00 0A 00 00”. Do so after you have selected all the values within the list “Modul”, since every click on “Apply to Device Configuration” will empty this list again.
References

Abstract

A “Profibus USB Interface” is a device used to control several industrial measurement devices using the Profibus-protocol, which is a serial bus protocol based on RS485. On the one hand it will be connected to the USB port of a PC on the other hand it will be connected to the Profibus-RS485 line as the master device. It reads the data from the measurement devices and passes them to a database suitable for time-dependent data (data historian) using the OPC-standard (OPC is a standardised software interface allowing the exchange of different manufacturers data).

This article describes in detail the installation procedure of an Ifak-system isPro USBx12 Profibus USB Interface. For this installation procedure the example of connecting several BRONKHORST EL-FLOW mass flow meters/controllers as measurement devices is used. Several problems and software bugs are described and appropriate workarounds are given. This includes the necessity of a new driver software, which had to be developed by the vendor of Ifak-system, in order to make the isPro USBx12 Profibus USB Interface collaborate with the BRONKHORST EL-FLOW mass flow meter/controller. The exact steps how to carry out the installation of both hardware and software as well as the proper configuration under Windows-XP are given, including ways, how to test the installed devices for their proper function. The composition of the data-record for one BRONKHORST EL-FLOW device within the data historian is described in detail. Appropriate references are given as well.
The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.