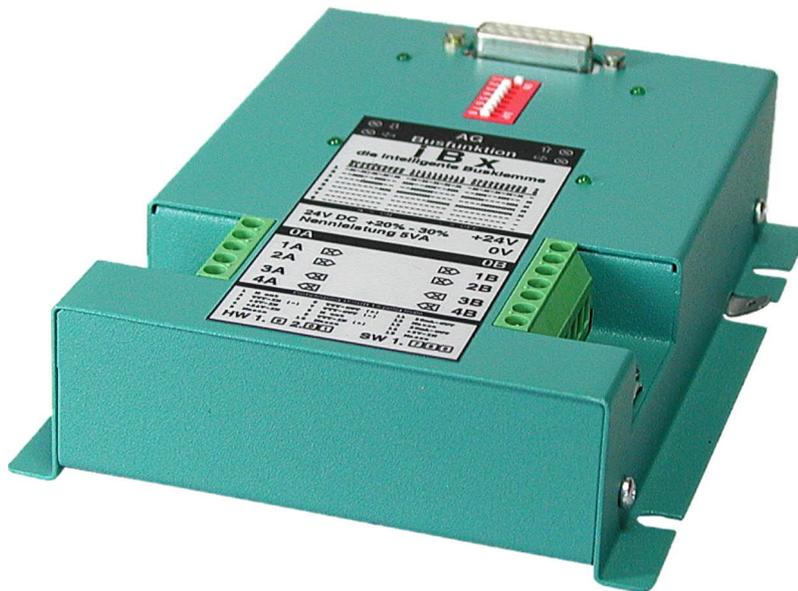


iBx-Busterminal user manual

(english)



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iBx-Busterminal

1 Description

With the intelligent busterminal iBx it is possible to program up to 30 PLC's with one PG directly without changing the PG-port. His integrated intelligence allows the iBx to control active the PG-bustrace, so it can recognize if the informations, which are on the bus, are destined to his connected PLC.

If the iBx recognized that the attached PLC was dialed, she makes independently a connection to the connected PLC. No cycle time of a PLC therefore is consumed while other participants communicate at the bus.

Since the iBx actively takes the selection the PLC doesn't have to take on this work and needs herefore no-one extra program.

No change of the software must be carried out since the address simply can be adjusted by Dip-Switch at the iBx to the attitude of the PG-Bus-address in the PLC.

At the attitude of the address 0 works the iBx in the through-connection (standard converter TTY - RS485), i.e. the supervision of the PLC selection is switched off.

A slavenumber must in this case individually be typed in the PLC-programm so that this work can be taken on by the PLC.

The iBx is with the 24V DC powersupply, the EMC interference immunity particularly, the mechanical construction and the powdercoated metalcage suitably for the rough industrial use.

Earth connection on PE:

In the right assembleflange the iBx has got extra an earthing connection (indicated correspondingly) available.

A good direct connection to the potential earth must absolutly be made at this earthing connection. Ensuring also around an optimal function of the bus system.

Important:

Before setting the device to work, please read the user's manual closely. There is no responsibility taken for damage due to incorrect connection or handling.

2 System requirements

2.1 Operating system (s)

- Windows 98 + SE
- Windows ME/NT/2000
- Windows XP
- Windows Vista
- Windows 7

2.2 Software for Path-connection

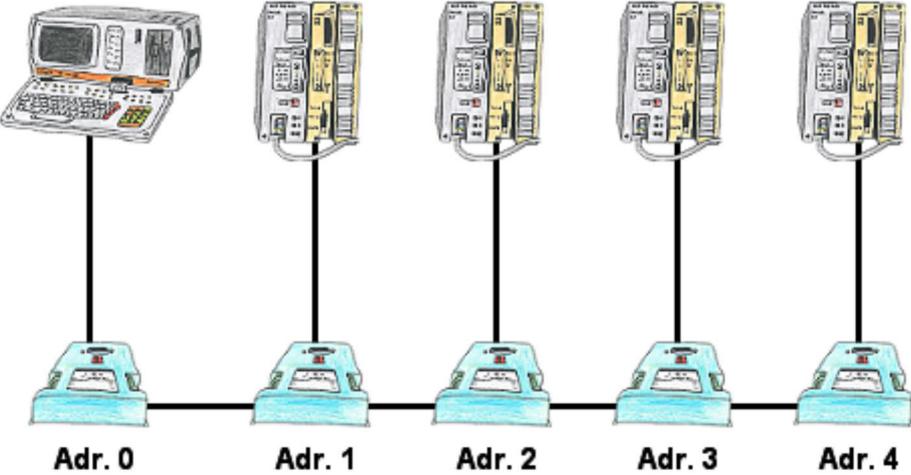
- Can be operated by all S5-compatible programming-software wich supports "PG-Bus-Anwahl"(PG-Path-Selection) correctly.

2.3 Hardware

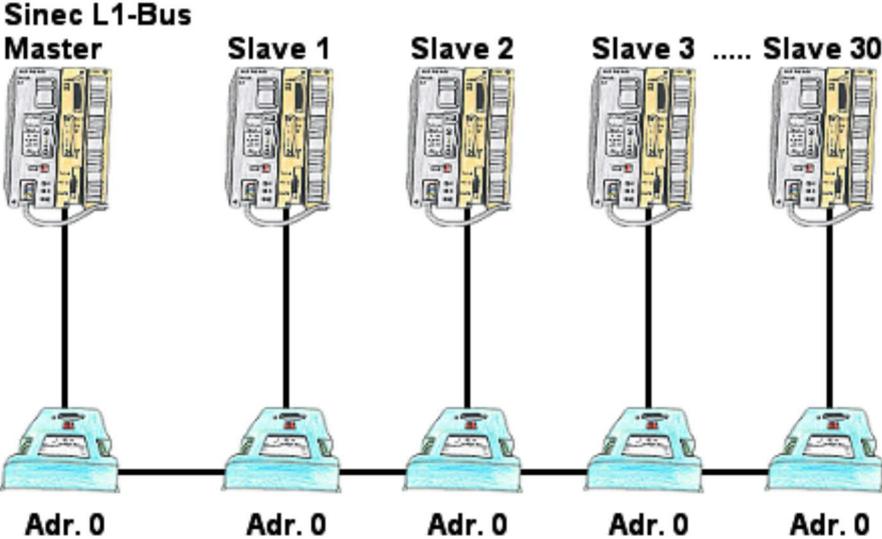
- 24V/DC Power supply voltage
- one for iBx-Busklemme compatible S5-controller

3 Connecting options

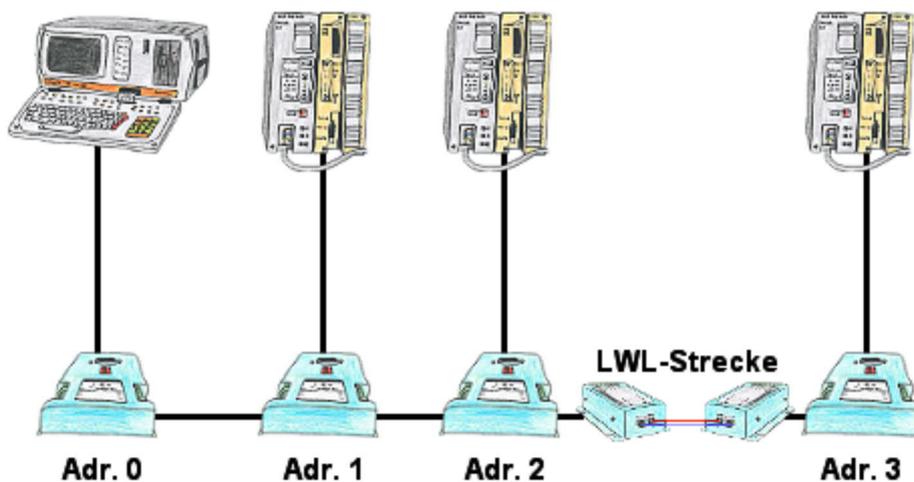
S5-controllers network without changing the PLC program



Sinec-L1-Bus build without BT-777-Klemme



Longer lines for L1-BUS via fiber optic cable



4 Installation

4.1 Hardware connection for the iBx

Recommended data cable between the iBx-terminals:

min. 2x2x0,25 in pairs twisted with shield.

At very big distances and also strong electronic disturbances should be used an 2x2x0,5 data-cable in pairs twisted with shield and additionally with a mainshield.

It is generally important, that a veins pair will be used for 1B + 2B/1A + 2A and the other veins pair for 3B + 4B/3A + 4A.

It must made sure, that the earth compensate is sticked on 0B/0A between two iBx-terminals.

- Hang up the shield on both sides on 0B respectively 0A to stop beats on the data path. The shield should be clamped under the additional strain relief.

- Connect PE connection to PE flag at the case with PE at the plant.

Connection cabel between iBx-terminals and PLC

iBx-SPS-cable (optionally available).

The angled side is told on the PLC (active iBx).

Connection cabel between iBx-terminal and PC (Com-Port):

- PG-Uni-cable (optionally available)

- **not** PG-COM-cable (iBx has no 5V to the 15 pin. Interface, that the PG-Com cable required for operation)

Connection cable between iBx-terminal and PG (e.g. PG685, PG720, PG740 ...):

- The normal cable which is normally used to connect with an PLC (PG-TTY)

other important things:

- The socket at the iBx is established identically to the X4, X5 interface.(except for 24V and 5V, these are entrances at the iBx-terminals. See point [technical data](#))

- No bus degree resistance required

- max. distance between two iBx-terminals: 1200m

- Power supply 24V:

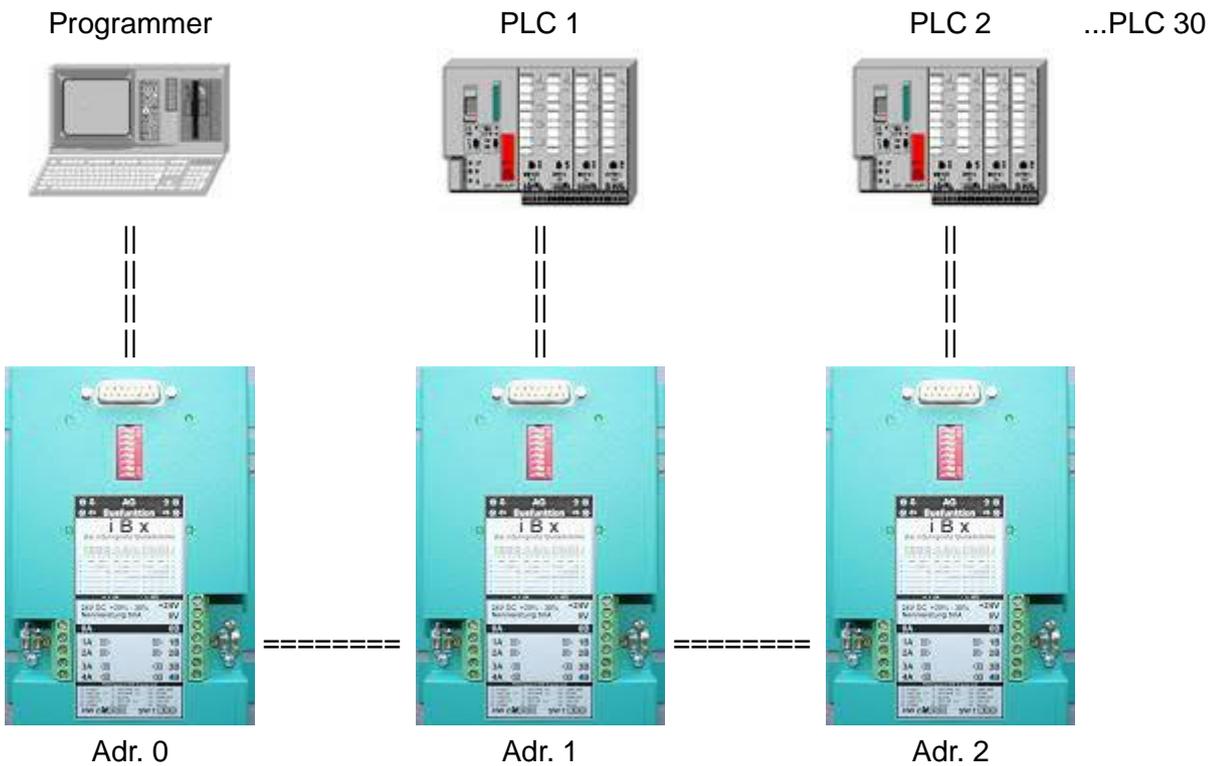
The 24V (and 5V) is taken from the PLC. If the PLC doesn't have the supply with this tension (or only unsatisfactory), is the iBx to provide connection for this one with 24V/5VA in front of this scheduledly.

- **observation:**

the power-supply from PLC-side and external-side at same time doesn't make any problems

- If the iBx is made uconnected to the powersupply the „A-“ and the „B-“ channels are directly through-connected.

4.1.1 iBx clamp on PG-Bus directly with a PG/PC



- The iBx-terminal on the PG must ext. be supplied with 24V DC and the iBx-terminal on the PLC must ext. be supplied with 24V DC, when the PLC no 24V and 5V are available.

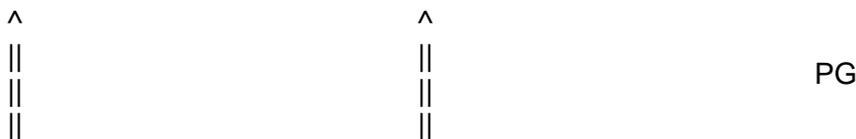
- To connect the PLC please use a iBx-PLC cable and to connect the PG please use a conventional PG to PLC cable.

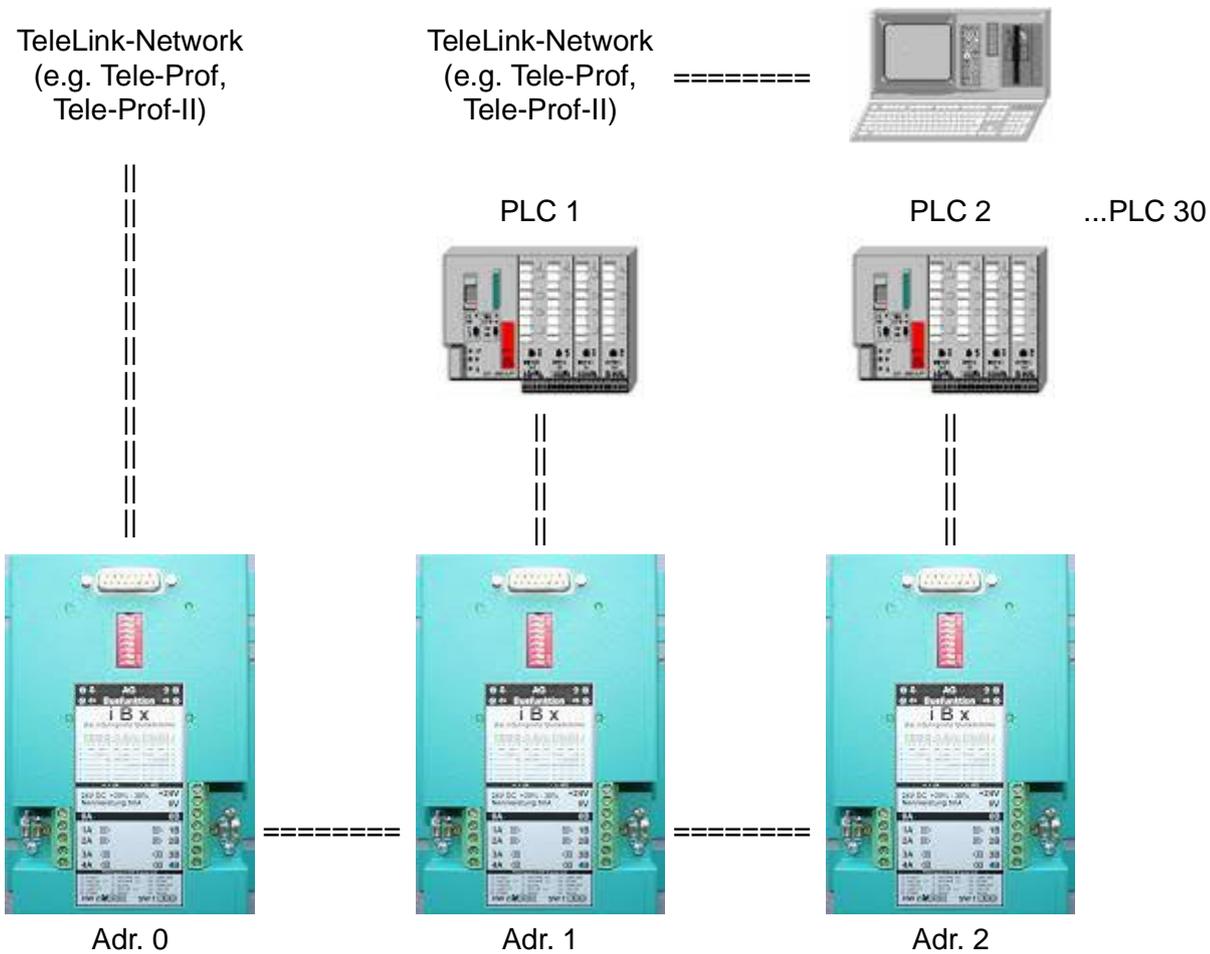
- The PLC- slavenumbers can be chosen in any possible way. The numbers must not be in a continuous form (it can be e.g. Nr 1, 5, 9, 15, 2, aso.)

- The PG must have the Adr.0 (Master). But it must not be on the left side like in this picture. It also can be in the middle of the bus.

4.1.2 iBx-terminal on the PG-Bus via TELELINK-NETWORK with a PG / PC

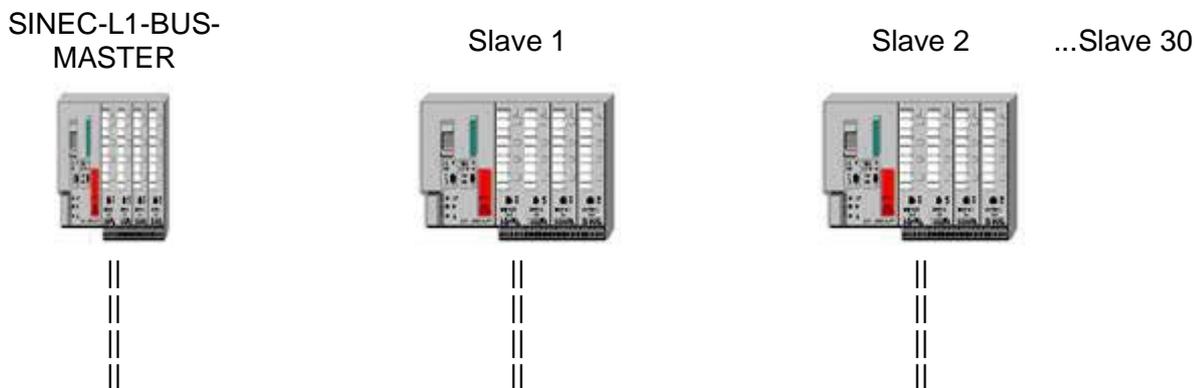
(Telecommunication-Net/GSM-Radio-Net)

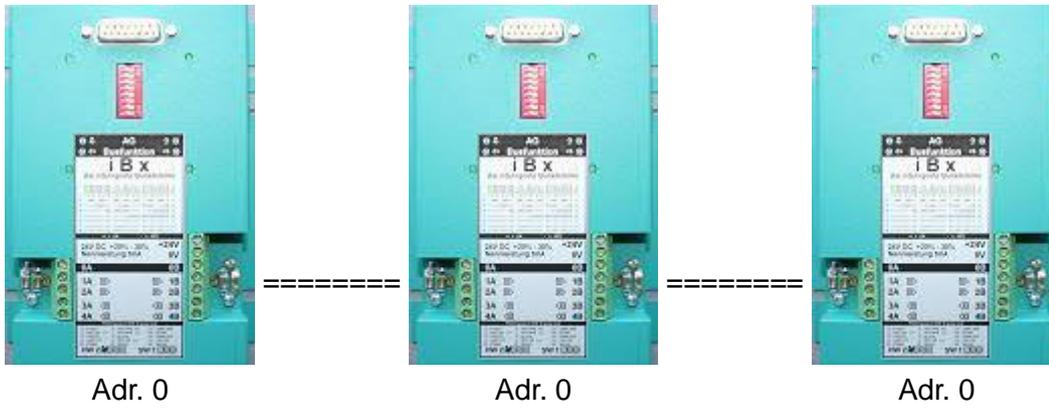




- The iBx terminals on the PLC and the Telelink-Network device must ext. be supplied with 24V DC, if the PLC and the Telelink-Network device no 24V and 5V are available..
- To connect the PLC please use a iBx-PLC cable and to connect the Telelink-Network device please use a conventional S5-cable (15 pin 1-1)
- The PLC- slavenumbers can be chosen in any possible way. The numbers must not be in a continuous form (it can be e.g. Nr 1, 5, 9, 15, 2, aso.)
- The PG must have the Adr.0 (Master). But it must not be on the left side like in this picture. It also can be in the middle of the bus.
- To this must be adjusted "KOR/MUX" in the TELELINK-NETWORK (iBx-side). Details in the TELELINK-NETWORK manual.

4.1.3 iBx-terminal on SINEC-L1-Bus with the SINEC-L1-Bus-MASTER





- in this case all iBx must have the Address "0". The PLCs then have to do the selection on their own and must have therefore the right L1-Slavenumber in their programm.
- To connect the PLC and the SINEC-L1-BUS-Master please use a iBx-PLC cable
- The iBx terminals must ext. be supplied with 24V DC if the connected PLC the 5V and 24V of iBx about the iBx PLC cable can not provide.

4.2 Software

Can be operated by all S5-compatible programming-software wich supports "PG-Bus-Anwahl" (PG-Path-Selection) correctly. (e.g. PG 2000, Step© 5).

5 Control elements

5.1 Control LEDs



Green LED Flashing:
RxD of IBX-clamp (data receipt from PLC)

Green LED Flashing:
TxD of IBX-clamp (data transfer to PLC)

Green LED Flashing:
data communication on the iBx-bus to the left side

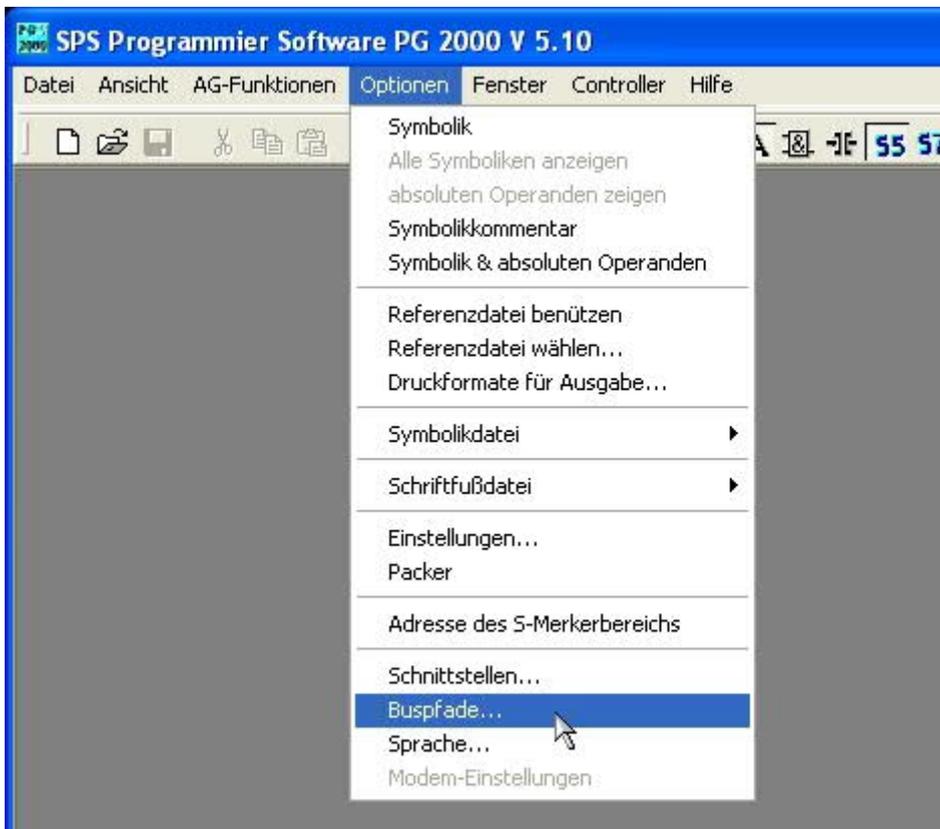
Green LED Flashing:
data communication on the iBx-bus to the right side

5.2 DIP-switch

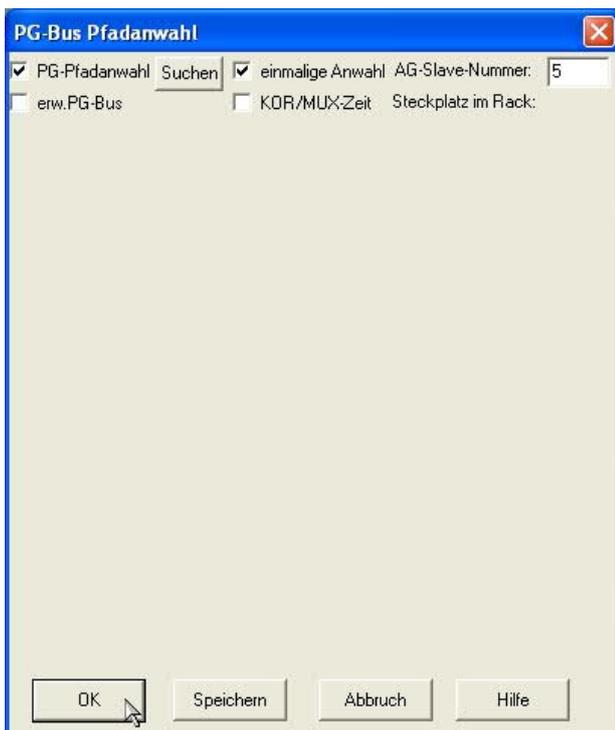
The respective addressing of a PLC is adjusted about the DIP-switches of the corresponding iBx-terminal. A possible slavenumber would be going through 1 to 30. Of address on one must not be respected.

!! Respect: A slavenumber may be available in the bus only one time!!

	1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3																														
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
DIP 1	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-	x	-
DIP 2	-	-	x	x	-	-	x	x	-	-	x	x	-	-	x	x	-	-	x	x	-	-	x	x	-	-	x	x	-	-	x
DIP 3	-	-	-	-	x	x	x	x	-	-	-	-	x	x	x	x	-	-	-	-	x	x	x	x	-	-	-	-	x	x	x



To define the access path you choose "Options" => "bus path ..."



Select the option "PG-path selection," which have left a checkmark.

Then select "unique selection" and enter the station number of the PLC you want to reach right of it in "AG-slave-number".

Confirm with "OK"

Now you can access and programm on the PLC as usual.

File => Open => AG

A list of blocks is displayed.

6.3.2 PD-BUS selection with Step© 5

At first edit the Bus-path (e.g. to SPS1):



select the right Bus-Path in the Online-menue and choose ONLINE:



7 Technical data

Supply voltage:	24V DC +/- 20%
Power consumption:	5 watt
Display:	4 status-LEDs
Handling/Configuration:	DIP-Switch for address Configuration
Interfaces:	<p>to the AG and PD/PC: TTY/20mA current loop (iBx-Klemme aktiv, PLC passiv)</p> <p>others: 10 x screw type terminal for bus connection A and B 2 x screw type terminal for 24V/DC power supply</p>
Operating temperature:	0 - 55°C
Case:	powder coated metal case with mounting flange
Dimensions:	97 x 149 x 36 mm
Scope of delivery:	iBx-Busterminal

7.1 Pin assignment TTY / 20mA current loop

Pin number	Short form	Designation	Direction
1	Mext	external mass	input
2	TTY IN –	receive data –	input
3	+5V	power supply+5V	input
4	+24V	power supply +24V	input
5	GND	internal mass	input
6	TTY OUT +	transmit data +	output
7	TTY OUT –	transmit data –	output
8	Mext	external mass	input
9	TTY IN +	receive data +	input
10	M24V	mass +24V	input
11	I-Tx	20mA power source transmitter	output
12	GND	internal mass	input
13	I-Rx	20mA power source receiver	output
14	+5V	power supply +5V	input
15	GND	internal mass	input

Note:

Pins 3, 4, and 14 are power supply inputs. Thereover the iBx take their operating voltage from the PLC. Except the pins 3, 4, and 14 of these connectors X4, X5-compatible.

By the current source bridges can be decided who should be active or passive.

If you want to use an interface cable between the PC and iBx , you must note that the iBx-clamp does not give out any voltage.

As a minimum connection reaches a 4-wire cable, but then the iBx clamp must be supplied with 24V external.

8 Troubleshooting

General: All controll-LEDs mustn't shine by a correct construction and connection!!!

LED-functions see point [Control elements](#) .

8.1 Foutl localization:

You can make a certain foutl localization if you look at the LEDs on the iBx:

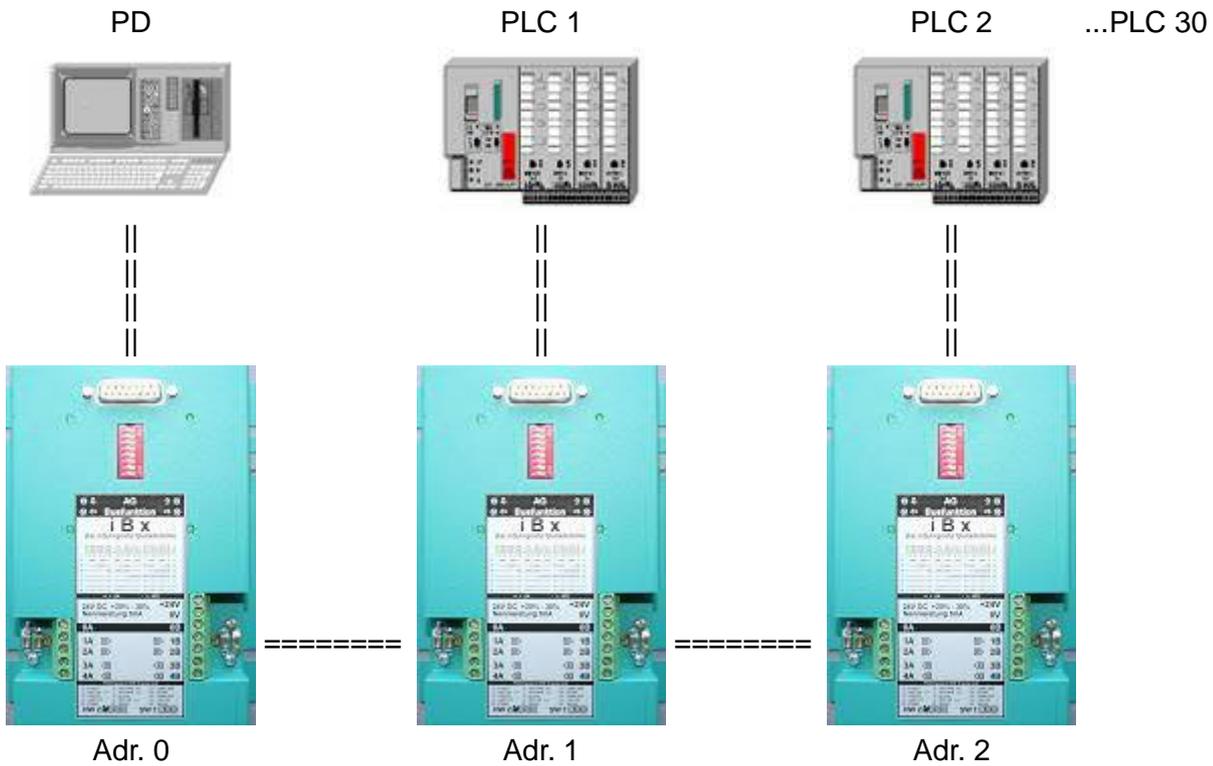
If a LEDs „AG“ is shining permanent , see [1. Fault condition](#) and following

If a Bus-LED is shining permanently (in most cases on several iBx always the same LED (except iBx with Adr.0), then it can be a foutl on the Bus-cable. See therefore from point [3. Fault condition](#) and following.

Should be the case that all LEDs are not shining (normal-case), but there is no communication possible, then see from point [6. Fault condition](#) and following.

8.1.1 1.Fault condition:

- These LED is shining permanently (fault-case)
- all others doesn't shine (ok)



The iBx with Adr.0 doesn't get any sign from PG/PC (the same as you disconnect the PG-cable out of the iBx)

possible cause:

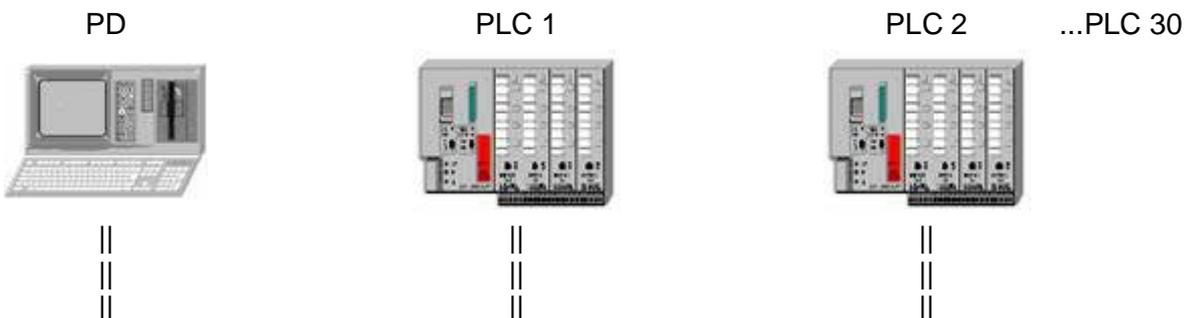
- wrong cable between iBx and PG (e.g. an interface cable which runs normally with the 5V from the PLC.
(24V- and 5V-Pin are entrances on the iBx)

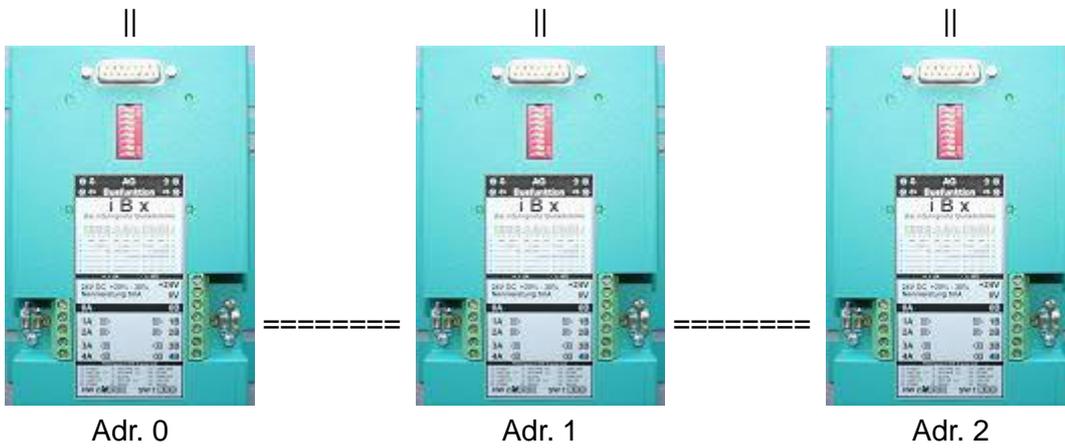
clear fault:

- take the interface cable, which does not need the 24V or 5V from the PLC-interface (in this case iBx-interface) e.g. PG-Uni-cable (not PG-COM-cable)
- Interface cables which required current sources can be connected (eg PG-Uni-cable) or use "active" programmer eg PG685, PG720, PG740, etc. with the appropriate cable PG to S5

8.1.2 2.Fault condition:

- The LED on the top left of the iBx with the address 1, 2 or both shining permanently (Error)
- all the others doesn't shine (ok)





the iBx clamp with Adr. 1 (or iBx with Adr. 2) doesn't get any sign from the PLC.

important:

- The iBx needs 24V for their internal current-sources(TTY) and 5V for the internal electronic. In this fault-case there are the 5V for the internal electronic present but no 24V for the current-sources.

possible cause:

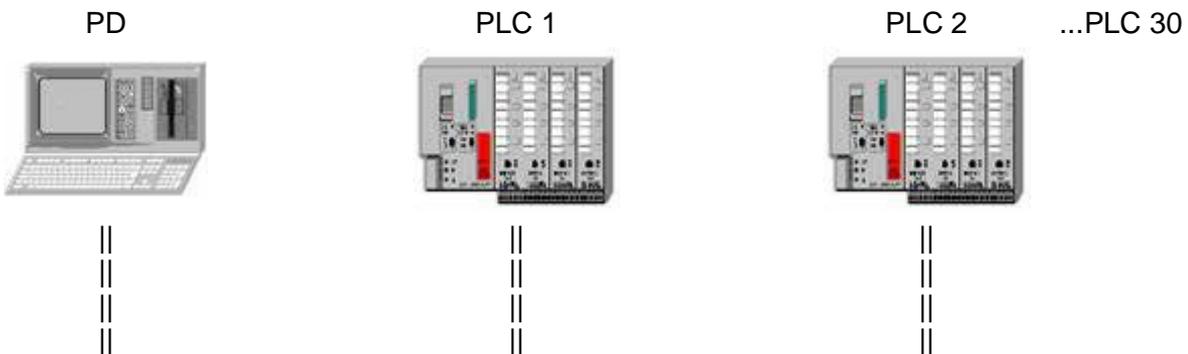
- The connected PLC doesn't have any 24V on their interface

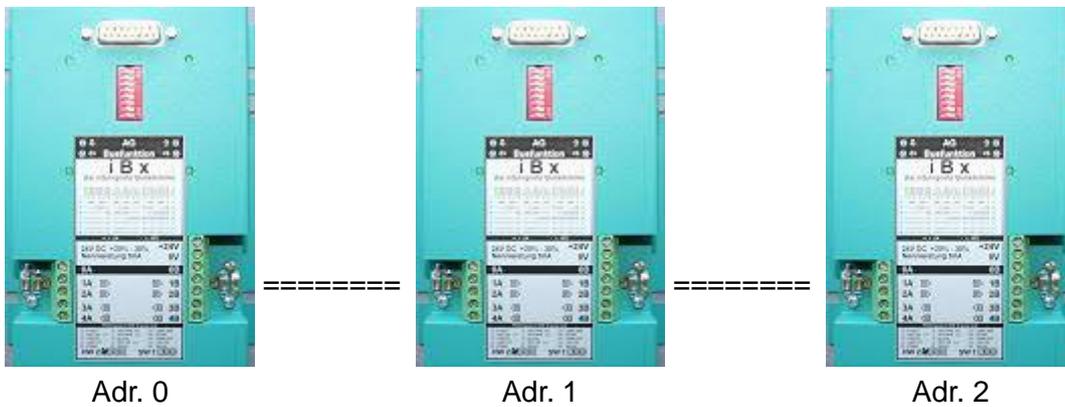
clear fault:

- Connect external 24V to the iBx (green phoenix clamps at the case)
- Rotate iBx PLC cable (stuck cable angled side on iBx). Thereby the power sources of the PLC are used and the iBx does not required external 24V (not only the 5V, which are then taken from the PLC).

8.1.3 3.Fault condition:

- On all iBx Bus Terminals or from a certain iBx bus terminal the same BUS LED lights continuously (error)
- all the others doesn't shine (ok)





possible cause:

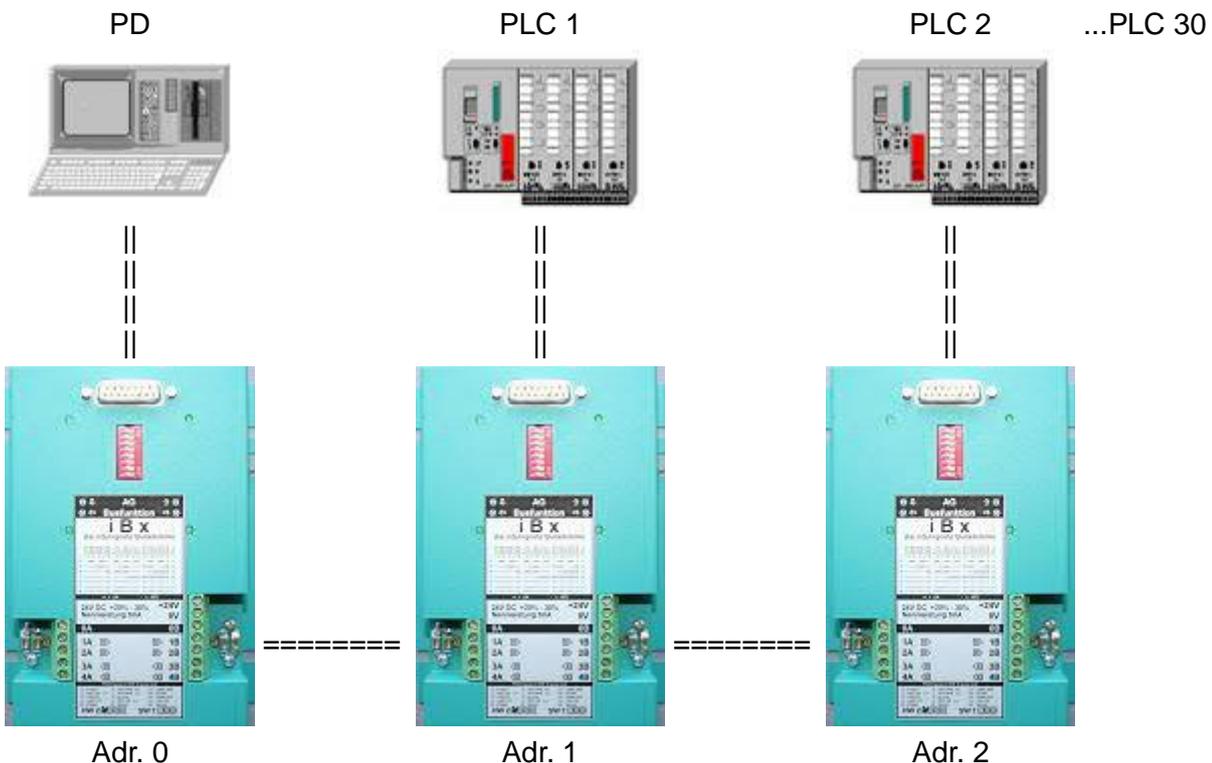
- between the iBx busclamp, when all lights are off and the first iBx bus clamp, one of the lights in the bus cable twist LEDs is available (eg from Adr.0 line 1B, 2B twisted with 1A, 2A of Adr 1)

Troubleshooting:

- Check the wiring between the iBx bus clamps, where is shining no LED and the iBx bus clamp where an LED is shining and correct it, if given.

8.1.4 4.Fault condition:

- on iBx with Adr. 0 are shining these two LEDs (LED from iBx to PG, and. one Bus-LED)
- all the others doesn't shine (ok)



Possible cause:

- between iBx with Adr. 0 and iBx with Adr.1 the Bus-cable is twisted
- the fault comes from the right side because the Bus LED left down is shining (this means : datas are coming from the right side and want to go on on the left side)
- If the PG with the iBx is more on the right side of the chain and the fault is coming from the left side, all the LEDs right down would shine.

Troubleshooting

- Check the wiring between the iBx Bus Terminals Adr 0 and 1 and correct them as necessary.

8.1.5 5.Fault condition:

All LEDs on the iBx doesn't shine (normal case) and all cabel are attached correctly.

But it isn't still possible to communicate with a PLC.

possible cause:

The PG-Software doesn't work correctly.

It is possible that certain software packages (or some versions of it) from some producers of programming software doesn't work correctly with the PG-Path-selection.

Or some software versions doesn't work with certain PC-types correctly.

clear fault:

- get possible an update from producer or distributor

- or funktion test with PG-2000 / Step5 Programming software (PI-Product).

The PG-2000 Programming software (Demo) is available under www.process-informatik.de and is full put in with an communication with an PLC (curtail of Demo-Version: it is only possible to edit the first three segments)

8.1.6 6.Fault condition:

- iBx is working with errors, e.g. is working in the night but not during the day
- iBx does not run when "approach" the performance parts

possible cause:

- instable data communication

clear fault:

- connect the shield of the bus-cable on both sides (0A ,0B under strain relief clamp)
- make shure that the iBx are all on the same electrical ground (measure the earth-clamp)

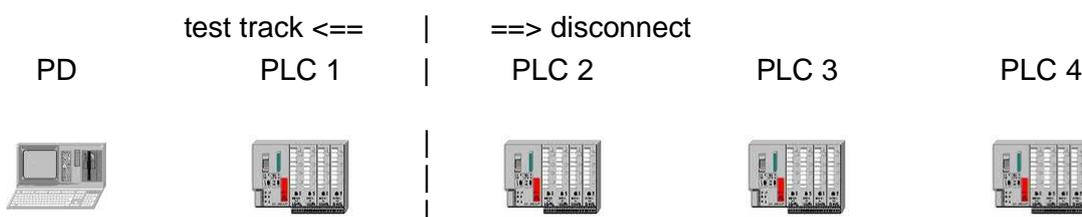
8.2 Step by Step fault localization:

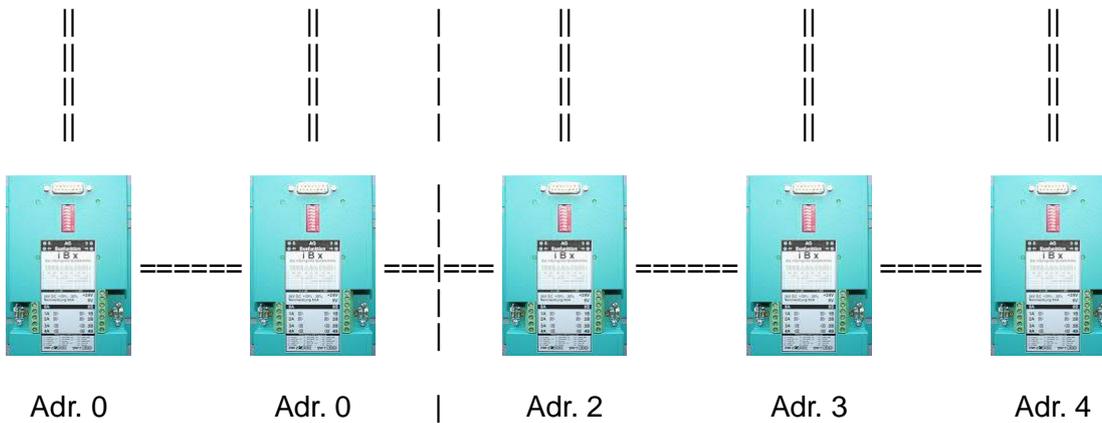
Should you after errors image 1 - 6, a hardware or software error still can not fix, we recommend a step by step review of each iBx terminals.

example: iBx-bus with 4 PLCs

- Test the iBx in the „transparent-mode“:

In this case every iBx must have the Adr.0 and are working without PG-Path-Selektion (iBx clamp is thereby pure conversion of TTY to L1-Bus)



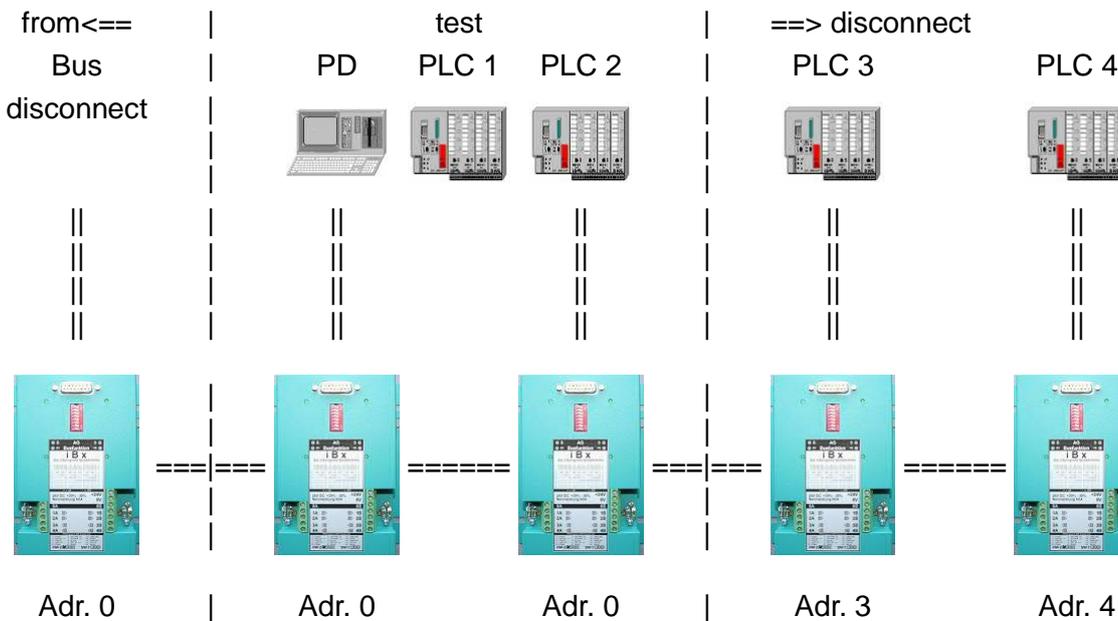


Switch the 2. Ibx to Adr.0 and reboot iBx

Then you can connect to your PLC directly (same as you are direct on the PLC-Interface)

If this constallation is working reswitch the Adr.1 to the 2. iBx (all the others are just disconnect) and retry to connect but at this time with the PG-path-selection.

If this constallation is also working correctly, put the test to one iBx to the right (see picture) and so on...



Remark:

A test track can also go over several terminals, only then you should make each iBx clamp energized connected between the test clamps (24V AND PLC stake).

In an idle state, a iBx-terminal switches completely through (1A to 1B, etc.). However keep in mind the maximum length of the iBx trail (max. 1200m).

9 Miscellaneous

9.1 LWL ADAPTER

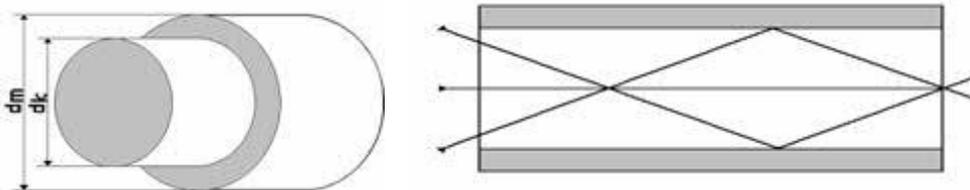
9.1.1 General to beam-waveguide

To the basic advantages to the LWL-technique opposite wiring with copper conductor belongs

among other things:

- Interference protection
 - * beam-waveguides are insensitive also without shielding opposite electromagnetic fields
 - * No "antenna effect" of the conductor
- potential separation
 - * beam-waveguides are insulators (ca.110kV/m).
 - * No current compensations due to various earth-potentials.
- Lightning protection
 - * beam-waveguides are insulators
- Ex-protection
 - * No spark genesis at separation or cable disruption.
- Bugging protection
 - * No crosstalk.
- Weight
 - * Low cable measures.

fiber (without coat) has a core and an outside skin which one another refraktionindex for the light. Around the fiber is because of one possible inductive disturbance a PVC or PE coat which protects the fiber from external interferences.



	glass fiber	synthetic material fiber
dk = diameter core	62,5µm	980µm
dm = diameter outsideskinn	125µm	1000µm

9.1.2 General to LWL-ADAPTER

There are two different models for the general application:

- LWL-Adapter für Kunststoffaser-Leitungen
(LWL-Adapter for synthetic material fiber lines)
- LWL-Adapter für Glasfaser-Leitungen
(LWL-Adapter for glass fiber lines)

The complete electronics are integrated in an industrial metal casing (which is prepared for the mounting of a switchgear cubicle or a switchboard). The device can be fastened directly to the switchboard.

Connection, mechanics, pin seizure and electrical data meet the respective iBx specification.

However, the LWL-System can individually be used by other userspecific hook-ups (RS485 4-wire interface).

9.1.3 Hardware connection on iBx-clamp

The entrance and exit represent a RS485 interface on the wired side of the LWL-Adapter. One of these interfaces of usual connection is needed therefore:

To use is a cable of the type 2 x 2 x 0.25 mm² in pairs with shield. This cable is attached by screwterminals at the LWL-Adapter.

9.1.4 Hardware connection between two LWL-Adapter

One in this case distinguishes between LWL-Adapter for **synthetic material fiber** and LWL-Adapter für **glass fiber**:

Important at both systems:

Should the cable get canned at own is open good polished fraying respect

- **LWL-Adapter for synthetic material fiber:**

Cable type: Duplex Typ POF (980µm/1000µm) coat PE or PVC

Plug type: DST-MV (Duplex-plug with locking system) [HP-Typ HFBR4516]
 DST-OV (Duplex-plug without locking system) [HP-Typ HFBR4506]
 Two cable fibers are summarized in a plug respectively

Länge: ca.145m

Wellenlänge: 665nm

LWL-Adapter for glass fiber:

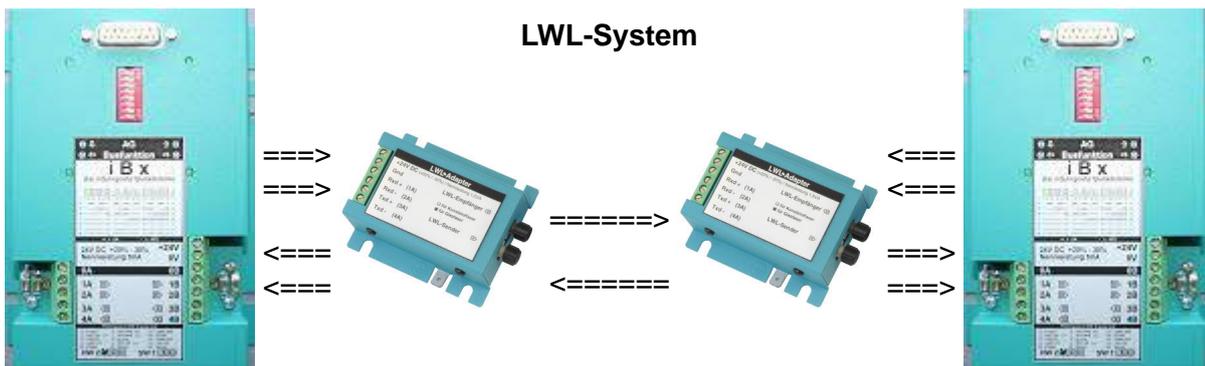
Cable type: only duplex Typ 6F 62,5 (62,5µm/125µm) coat PE or PVC (please do not use cable type GF 50, because the transmitter and receiver are designed for a fiber cross-section of 62.5 µm/125µm. A cross section of 50µm/100µm would bring heavy loss of quality with it.)

Plug type: F-SMA terminal with screwconnectors for every cable fiber one connector

Length: ca. 2,5km

Wavelength:: 820nm

9.1.5 Hook-up-example



9.1.6 Technical data LWL Adapter

power supply:	24V/DC +/- 20%
power draw:	1,5 power power VA
interfaces:	2 x screw terminals for the voltage connection 4 x screw terminal for differential transmission (TX & RX) 2 x socket, for F-SMA LWL connector

max. Length between two glass fiber = ca. 2,5 km
adapters: thetic material fiber = ca.145 m

working temperature: 5 to 55 Grad Celsius

case: powder coated metal case with mounting flange

dimensions: 75 x 65 x 30 mm