

*Metrology*



# INSTRUCTION MANUAL

## ***IMBus*** **IBR Measuring Bus**

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**Messtechnik GmbH & Co. KG**

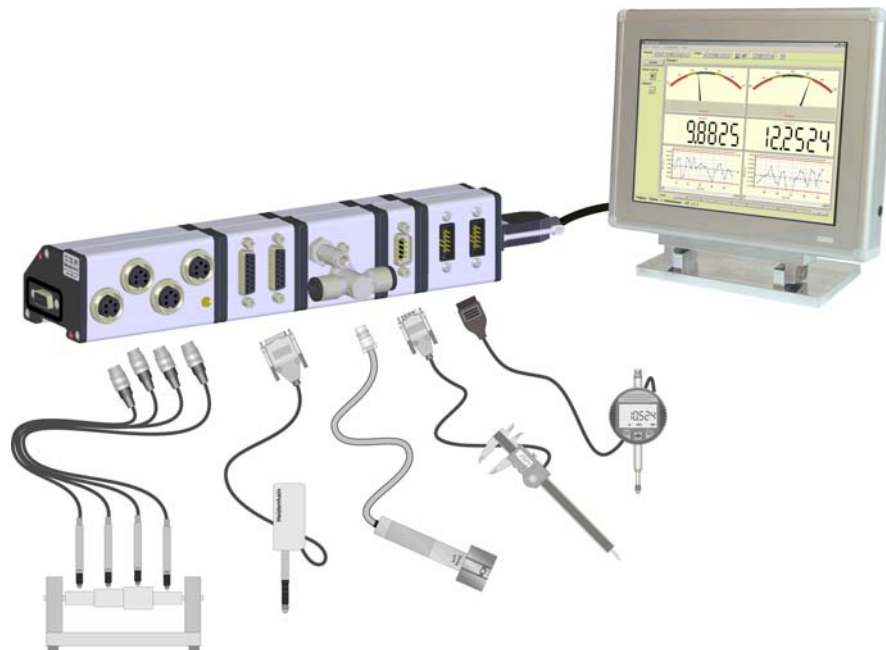


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## 1. Introduction

### 1.1 General information



The IBR Measuring Bus [ IMBus ] is a technology step in the metrology and interface technology. Powerful connection modules for all sensors and gauges as well as a maximum of flexibility by the connection at current computer interfaces characterize the IMBus - Series.

The specially developed module case is very robust and can be mounted without tools. The modules can be placed onto a table or can be clicked onto mounting rails. The electronics satisfies all demands from practice regarding flexibility, speed and resolution at maximum measuring accuracy. The address setting on IMBus occurs automatically ( Plug & Play ). The modular structure of 1 to 512 connections and the possibility to connect the modules via cables with a maximum length of 1200 m ( 4000 ft ) allow an universal use.

A complete range of software for simple applications up to complex measuring applications with control sequences completes the new IMBus series to an universal tool for measuring data collection, analysis and displaying.

### 1.2 Features of IMBus

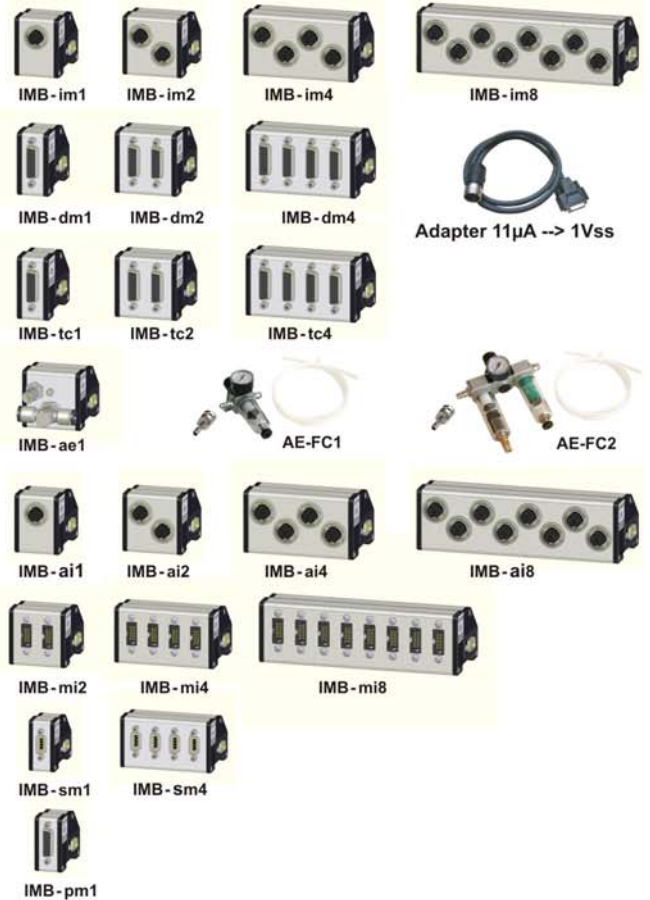
- Connections for all inductive probe types
- Connections for all incremental probe types, linear scales and rotary encoders
- Connections for all pneumatic gauge heads
- Connections for all analogue signals ( current, voltage, ... )
- Connections for all serial interfaces ( universal programmable transfer- und data format )
- Connections for all parallel interfaces ( BCD, Binary, ... )
- Galvanic separated outputs and inputs ( SPS - compatible )
- Flexible PC- and PLC connections by USB, RS232, Ethernet, Wireless LAN, Profibus



## 1.3 Overview over the IMBus module types

### IMBus Measuring and Interface modules

- IMB-im1** [ F122 061 ] Measuring modules for the connection of 1, 2, 4 or 8 inductive probes
- im2** [ F122 062 ]
- im4** [ F122 064 ]
- im8** [ F122 068 ]
  
- IMB-dm1** [ F122 071 ] Measuring modules for the connection of 1, 2 or 4 incremental measuring probes, rotary encoders and linear scales with 1Vpp - output
- dm2** [ F122 072 ]
- dm4** [ F122 074 ]
  
- IMB-tc1** [ F122 111 ] Measuring modules for the connection of 1, 2 or 4 incremental measuring probes, rotary encoders and linear scales with TTL - output
- tc2** [ F122 112 ]
- tc4** [ F122 114 ]
  
- IMB-ae1** [ F122 081 ] Measuring module for the connection of pneumatic gauge heads
  
- IMB-ai1** [ F122 041 ] Measuring modules with 1, 2, 4 or 8 analogue inputs
- ai2** [ F122 042 ]
- ai4** [ F122 064 ]
- ai8** [ F122 068 ]
  
- IMB-mi2** [ F122 022 ] Interface modules for the connection of 2, 4 or 8 measuring gauges with Mitutoyo Digimatic output
- mi4** [ F122 024 ]
- mi8** [ F122 028 ]
  
- IMB-sm1** [ F122 011 ] Interface modules for the connection of 1, 2 or 4 measuring gauges with RS232 output
- sm2** [ F122 012 ]
- sm4** [ F122 014 ]
  
- IMB-pm1** [ F122 031 ] Interface module with parallel input



### IMBus Power supply modules

- IMB-ps2** [ F121 020 ] Switching power supply module (Input 85 ... 260V / AC)
- IMB-dc1** [ F121 040 ] Power supply module (Input 24V / DC)
- IMB-acc** [ F121 030 ] Battery module for portable applications



### IMBus Computer - Connections

- IMB-usb** [ F120 010 ] Connection cable for USB -Ports
- IMB-232** [ F120 020 ] Connection cable for serial ports (COM 1 ... 8)
- IMB-lan** [ F120 030 ] Connection module for Ethernet (Computer networks)
- IMB-pb** [ F120 040 ] Connection module for Profibus
- IMB-wla** [ F120 050 ] Connection module for Wireless Lan



### IMBus Windows CE Computer

- IMB-pc1** [ F123 010 ] Computer for measuring and controlling applications with Windows CE
- IMB-pc2** [ F124 010 ] Computer with Windows CE and 15" TFT





**IMBus switching modules**

- IMB-io4** [ F122 091 ] Switching module with 4 in- & 4 outputs
- ci8** [ F122 092 ] Switching module with 8 inputs
- co8** [ F122 093 ] Switching module with 8 outputs



**IMBus Accessories**

**IMB-Foot switch**

**IMB-Hand switch**



**IMB-Extension cable**



**2. Mounting of IMBus modules**

**2.1 Mechanic connection of IMBus modules**

- 1.) Push the red leavers of the first module out and turn them up.
- 2.) Connect the modules together.
- 3.) Turn red levers down to lock the modules.
- 4.) Connect further modules by the same way.



**2.2 Connection of IMB-Connection cable ( IMB-usb / IMB-232 )**

- 1.) For fixing the IMB-Connection cable replace the two screws by pins  
**!!! The pins are part of the shipment of the IMB-Connection cable**



- 2.) Secure the IMB-Connection cable on the pins by screwing :



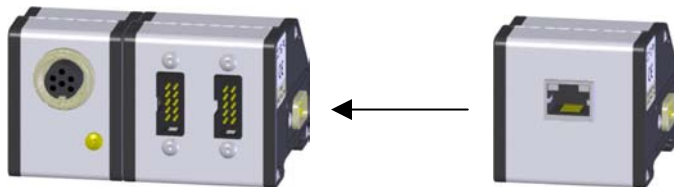
On extended bus systems or on IMB-232 connection cables an IMB power supply module ( IMB-ps2, IMB-dc1, IMB-acc ) is required. This power supply module must be connected between the IMB measuring modules and the IMB-Connection cable :



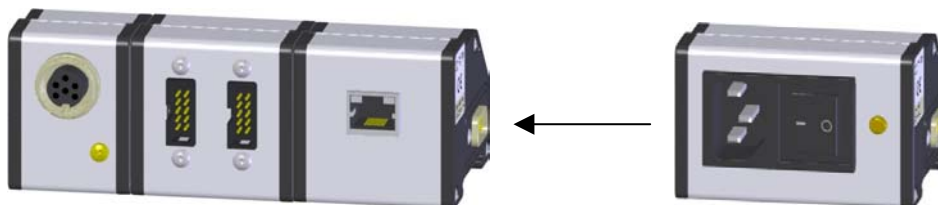


## 2.3 Connection of IMB-Connection module ( IMB-lan / IMB-wla / IMB-pb )

- 1.) Connect the IMB-Connection module ( IMB-lan, IMB-wla, IMB-pb ) to the IMBus measuring modules.  
( see 2.1 )



- 2.) Connect the IMB-Power supply module ( IMB-ps2, IMB-dc1, IMB-acc ) to the IMB-Connection module.  
( see 2.1 )



## 2.4 Mounting of bus terminator

The bus terminator as well as two additional pins are part of the shipment of the IMB-Connection cables or modules.

The mounting of the bus terminator occurs to the under 2.2 or 2.3 built IMBus systems :



- 1.) Replace the screws by pins.
- 2.) Plug bus terminator in and screw it fix.

## 2.5 Mounting to DIN rail mount

- 1.) Plug modules on DIN rail mount.
- 2.) Pull modules into springs and push modules down.  
( The modules are automatically secured on the rail by the springs )



## 2.6 Connection of IMB-Extension cables

The IMBus modules can be connected together by IMB-Extension cables with a total length of up to 1200m. The IMB-Extension cables can be connected between the IMBus modules at any position.



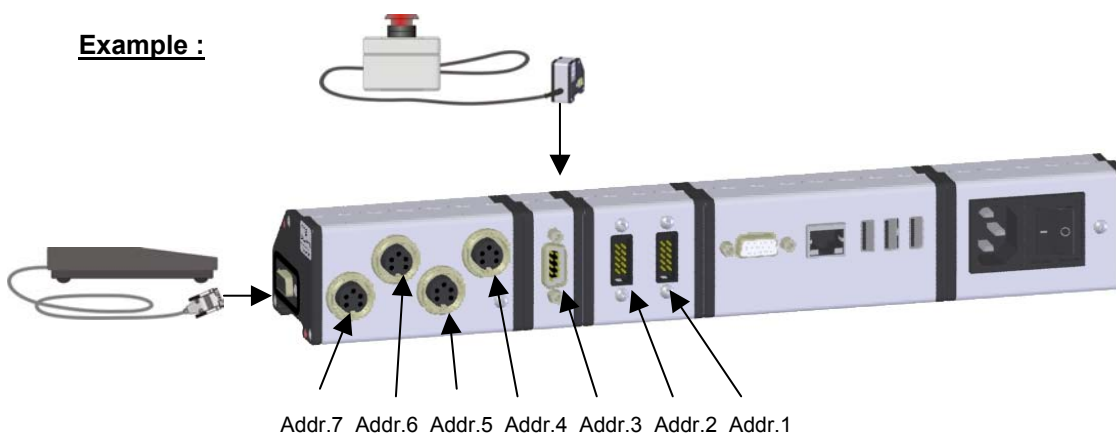


- 1.) Replace the screws at the IMBus modules by the pins included in the shipment of the IMB-Extension cables.
- 2.) Plug IMB-Extension cable in and screw it fix.

## 2.7 Connection of hand / foot switches

The IMBus allows the management of several hand / foot switches. To each IMBus module a separate hand / foot switch can be connected.

**Example :**

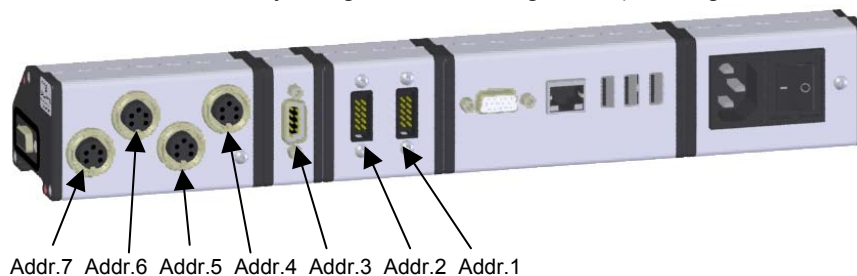


Addr.7 Addr.6 Addr.5 Addr.4 Addr.3 Addr.2 Addr.1

The hand switch affects the module with Addr.1 & Addr.2.  
The foot switch affects the two modules with Addr.3 to Addr.7.

## 2.8 Connection of gauges and sensors

- 1.) Plug gauge / sensor cable in.
- 2.) The addresses are automatically assigned in following order ( starting at the PC connection ) :



Addr.7 Addr.6 Addr.5 Addr.4 Addr.3 Addr.2 Addr.1



## 3. Power supply

### 3.1 IMB power supply modules

The power supply of an IMBus can be carried out by the USB port of the PC on using an IMB-usb connection cable. If the power consumption does not exceeds the specified value of the particular USB-port, then there is no extra IMB power supply module necessary. On all other IMB-Connection cables / modules an extra IMB power supply module is necessary.

Approximate power supply by USB ports :

- Standard USB ports : Iout = 500 mA ( max. )
- USB ports of devices supplied by batteries : Iout = 100 mA ( max. )
- USB ports of USB-hubs without external power supply : Iout = 100 mA ( max. )

**!!! Please mind the technical specification of the USB port of your device**

**IMB power supply modules :**

IMB-ps2 ( <i>Switching power supply with wide voltage input 85 – 260 V AC</i> )	1200 mA
IMB-dc1 ( <i>DC voltage converter for input voltages 9 – 32 V DC</i> )	1200 mA
IMB-acc ( <i>Accumulator module for portable units</i> )	1200 mA

### 3.2 Power consumption of IMBus measuring and interface modules

IMB-im1	< 20 mA
IMB-im2	< 25 mA
IMB-im4	< 35 mA
IMB-im8	< 45 mA
IMB-dm1	< 20 mA (*1)
IMB-dm2	< 30 mA (*1)
IMB-dm4	< 50 mA (*1)
IMB-tc1	< 20 mA (*1)
IMB-tc2	< 30 mA (*1)
IMB-tc4	< 50 mA (*1)
IMB-ae1	< 60 mA
IMB-ai1	< 20 mA
IMB-ai2	< 25 mA
IMB-ai4	< 35 mA
IMB-ai8	< 45 mA
IMB-mi2	< 10 mA
IMB-mi4	< 10 mA
IMB-mi8	< 10 mA
IMB-sm1	< 10 mA
IMB-sm2	< 20 mA
IMB-sm4	< 35 mA
IMB-pm1	< 10 mA
IMB-io4	< 40 mA
IMB-ci8	< 35 mA
IMB-co8	< 40 mA
IMB-lan	< 150 mA
IMB-wla	< 250 mA
IMB-pb	< 200 mA

(\*1) without measuring system; Power consumption : see manual of measuring system





With the table it can be calculated, how many IMB power supply modules are needed. The IMB power supply module can be inserted at any position if necessary into the IMBus.

Additional the life time of one accumulator load of the IMB-acc module can be calculated.

( Available accumulators : 1850 mAh, 4000 mAh, 5500 mAh )

On the usage of IMB-Extension cables there are brownouts on the lines. Because of this it is possible that on longer extension cables additional IMB power supply modules are necessary.

Please request design documentation !

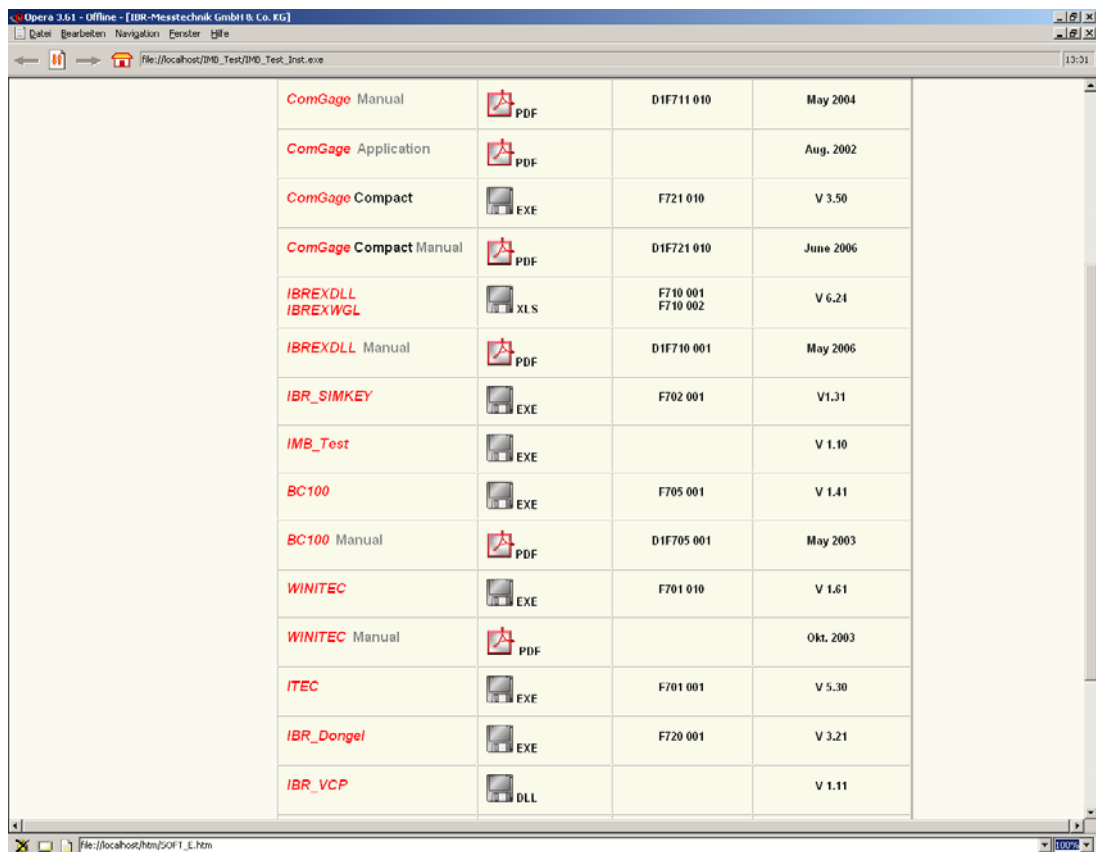
## 4. Connection of IMBus to a Computer or to a PLC

### 4.1 PC-Software for configuration and test of IMBus modules

#### 1. Installation

For configuration and test of IMBus modules the software **IMB\_Test** is available.

- a) Insert the in the delivery included CD into the CD-Rom drive.
- b) The window for selection of the software is automatically opened :



Click in the selection window on the disk icon of **IMB\_Test**.

- c) The installation programme of **IMB\_Test** software is started.
- d) In the first window the language of the installation programme is selected.  
Confirm by **Next-Button**.
- e) In the second window the user can read general information regarding the installation.  
Confirm by **Next-Button**.



- f) In the third window the directory for **IMB\_Test** can be selected. Confirm by **Next-Button**.
- g) In the fourth window the folder in **Start / Programme** for **IMB\_Test** can be selected. Confirm by **Next-Button**.
- h) The fifth window shows the installation settings for check and can be confirmed by **Next-Button**.

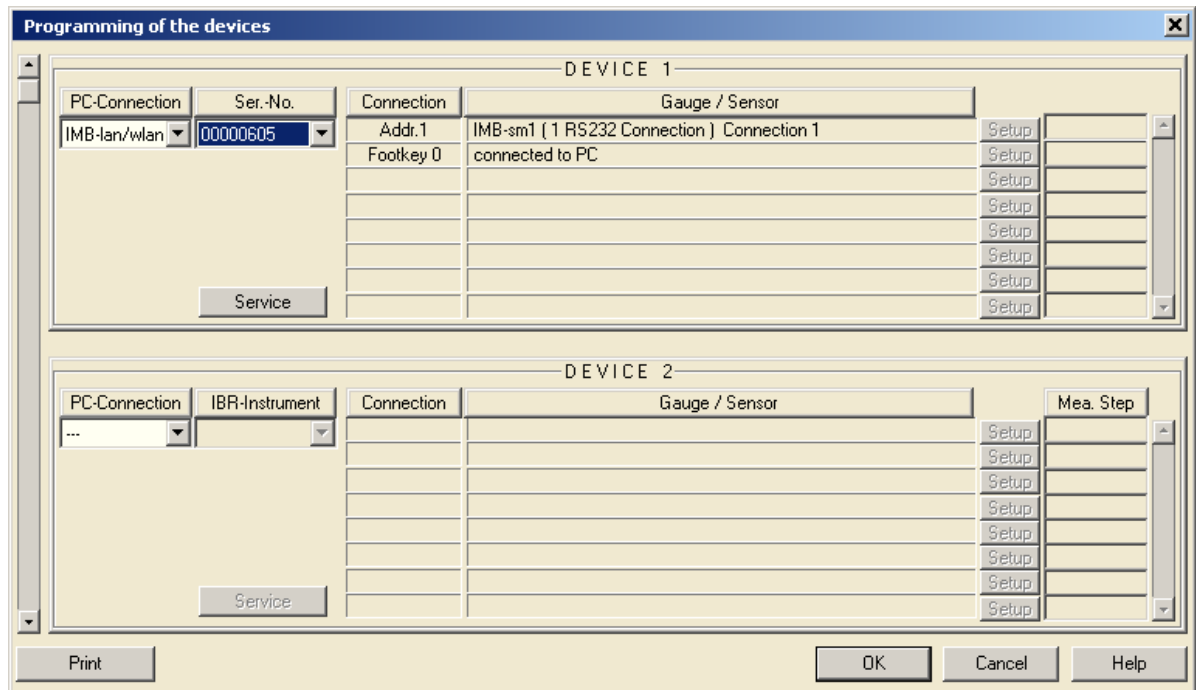
**Now the Installation takes place !!!**

## 2. Setup settings in IMB-Test Software

After the first start of the **IMB\_Test** software the **Setup-Button** must be pressed.

**!!! Note : The Setup window is part of all programmes listed under 9.1 ... 9.6.**

**!!! Note : On the IMB-usb the Windows device driver must be installed before opening the window ( see 4.3)**



Select the **PC-Connection** ( i.e. COM 1, USB or IMB-lan/wlan ) and after that as **IBR-instrument** the **IMBus** or as **Ser-No.** the serial number of your IMB-lan / IMB-wla connection module.

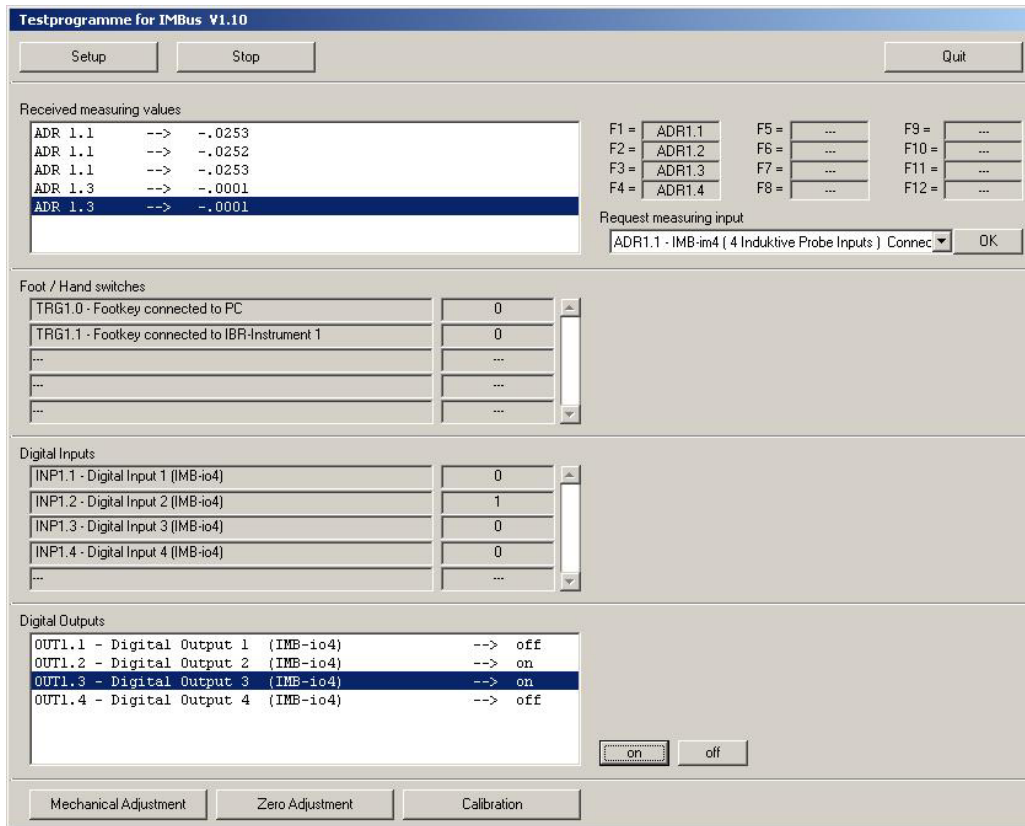
After the selection of the PC connection and the IBR-instrument the columns **Connection** and **Gauge / Sensor** are automatically filled by the found IMBus modules and the addresses are automatically assigned to the IMBus modules.

Leave the setup window by **OK**.



### 3. Test of IMBus modules

After pressing the **Start** button the test window appears :



**Received measurement values :**

- Display of transferred measuring value in the list ( which are i.e. transferred by data key of gauge )
- Display of the measuring values requested from PC ( i.e. by the function keys F1..12 or by OK-Button )
- In the upper right corner the assignment of the function keys to the inputs is displayed

**Foot / Hand switches :**

- Display of the state ( 0=not pressed / 1=pressed ) of the hand / foot switches ( see 2.4 )

**Digital Inputs :**

- Display of the state ( 0=not set / 1=set ) of the digit inputs

**Digital Outputs :**

- By the **on / off** Buttons the digital outputs can be set

**Mechanical Adjustment / Zeroadjustment / Calibration :**

- are described in chapter 5.1.3 ... 5.1.5.

## 4.2 Start-up of IMB-232 connection cables

### 1. Advantages of RS232-interface ( COM-Port ) :

- Because the RS232 is the only interrupt controlled interface, it is the most suitable interface for Real-time applications
- There are no latency times on data transmission and so with the RS232 the highest measuring data rate is reached in combination with IMBus



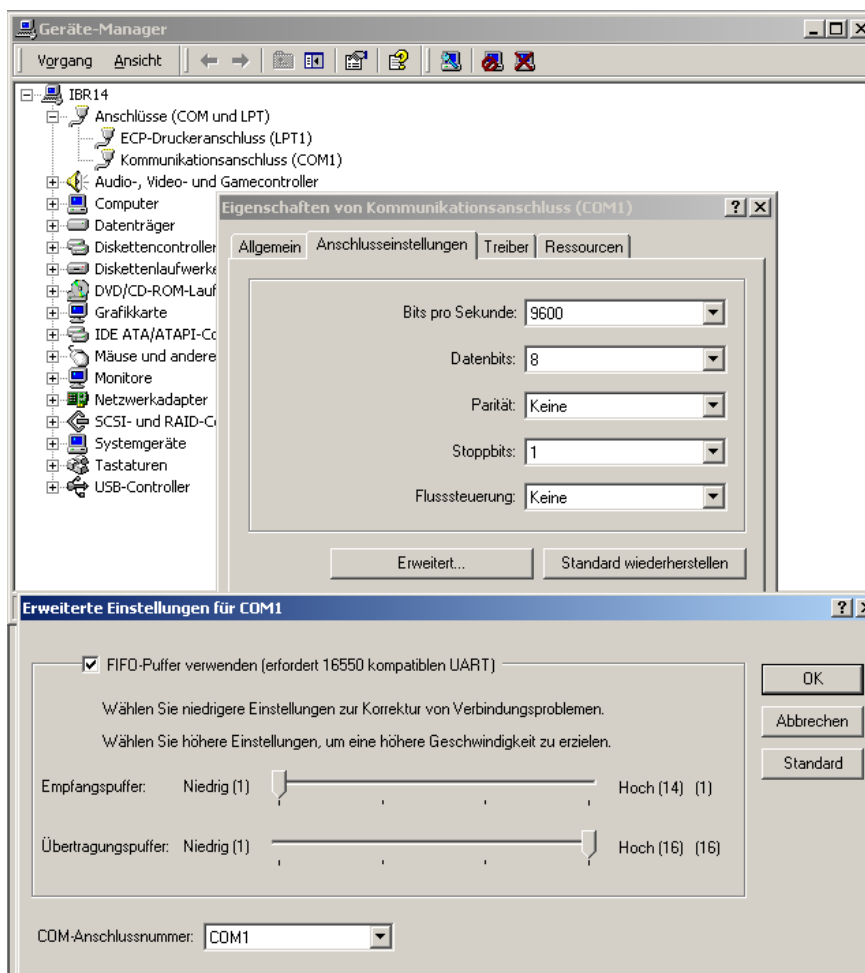


## 2. Electrical connection :

- Connect the IMB-232 to IMBus as described under 2.2.
- Connect the free end of the connection cable to a COM-Port of the PC.
- Switch the IMB power supply module on.

## 3. Installation / Configuration :

- For using the IMB-232 no driver installation on the PC is necessary.
- For very fast dynamic measurements with IMBus the receiver buffer of the COM-Port FIFO must be set to 1, otherwise the RS232 interface has a latency time of 400  $\mu$ sec, which reduces the measuring data rate noticeable :
  - Call „**Start / Settings / Control Panel / System**“
  - Select register card „**Hardware**“ and press button „**Device-Manager**“
  - Select the COM-Port under **Ports (COM and LPT)**
  - Press Button **Properties**
  - Select Register card „**Port settings**“ and press Button „**Advanced**“
  - Set receiver buffer to 1



## 4.3 Start-up of IMB-usb connection cables

### 1. Advantages of USB-interface :

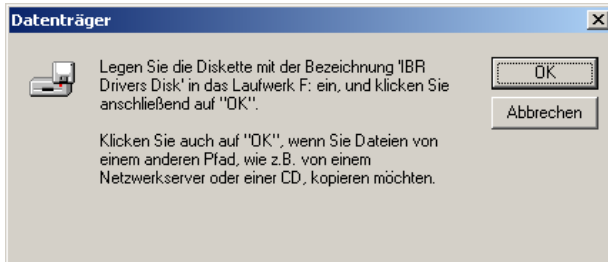
- Standard interface on all PCs
- Power supply of external devices over USB

## 2. Electrical connection :

- Connect the IMB-usb to IMBus as described under 2.2.
- Connect the free end of the connection cable to an USB-Port of the PC.

## 3. Installation of the USB driver under Windows 98 / ME :

- a) The PC automatically recognizes on plugging in the IMB-usb connection cable that a driver must be installed and opens the following window :

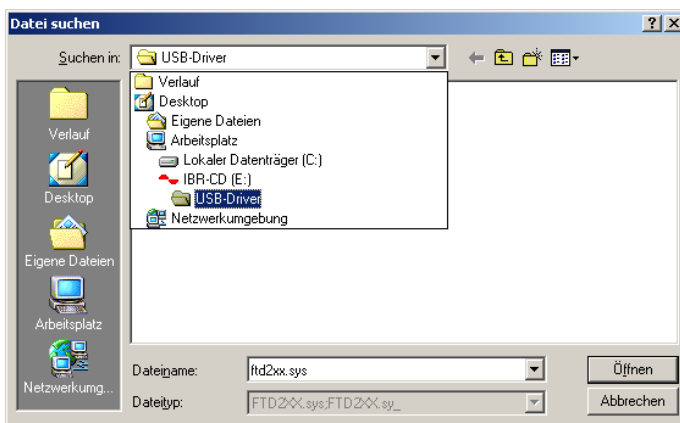


- Please insert IBR-Support-CD
- Press **OK**

- b) A new window for inputting the name of the directory with the driver is opened :



- c) Press the Button **Search...** A new window for selecting the driver's source directory is opened.



Select the directory **USB - Driver** on your CD and confirm by clicking on the button **Open**

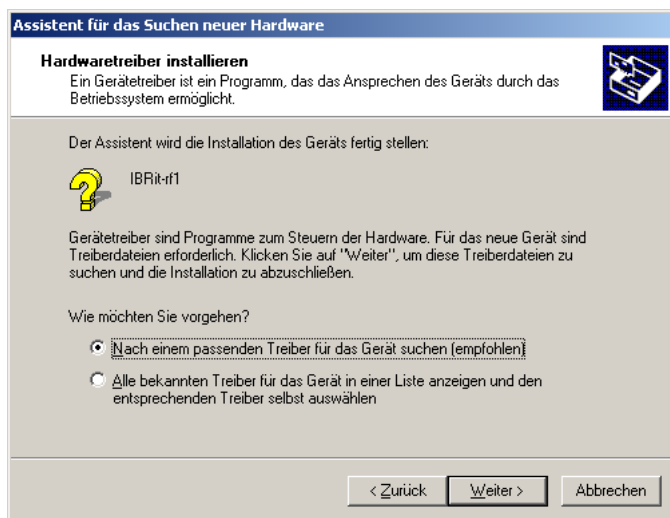
- d) By clicking on the **OK** Button the installation is started.

## 4. Installation of the USB driver under Windows 2000 / XP :

- a) The PC automatically recognizes on plugging in the IMB-usb connection cable that a driver must be installed :
- Please insert IBR-Support-CD
  - Press **OK**

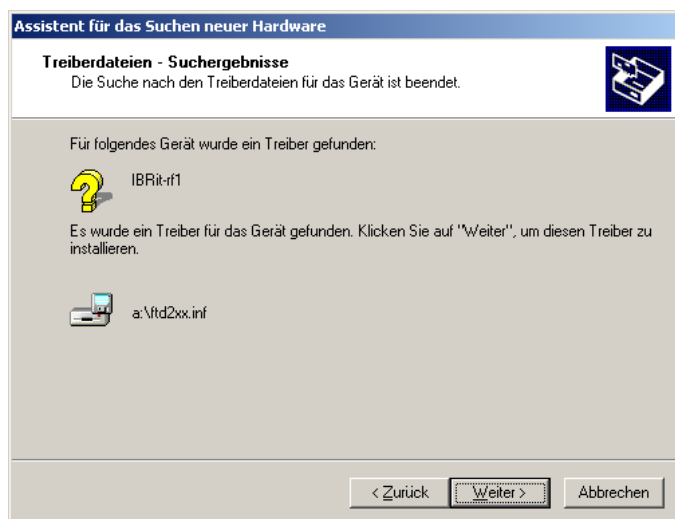


b) Select the option *Search driver* :



c) Select CD-ROM drive as data source and confirm the window by **Next>** Button.

d) The driver is searched on the CD :



e) By clicking on the **OK** Button the installation is started.

## 4.4 Start-up of IMB-lan connection modules

### 1. Advantages of LAN-interface :

- Standard interface for connection of devices in a network.
- Simple connection of IMBus on the usage of Terminal Servers, because the mapping of i.e. COM-Ports is not required.

### 2. Electrical connection :

- Connect the IMB-lan module to IMBus as described under 2.3.
- Connect the IMB-lan module to network with the correct cable.  
There are two different cables in the shipment :
  - Cable with green connectors → Cross-Over-Cable for direct connection to a stand-alone PC
  - Cable with grey connectors → 1-to-1-Cable for connection to a Switch, Hub, Router, ...
- Switch IMB power supply module on.



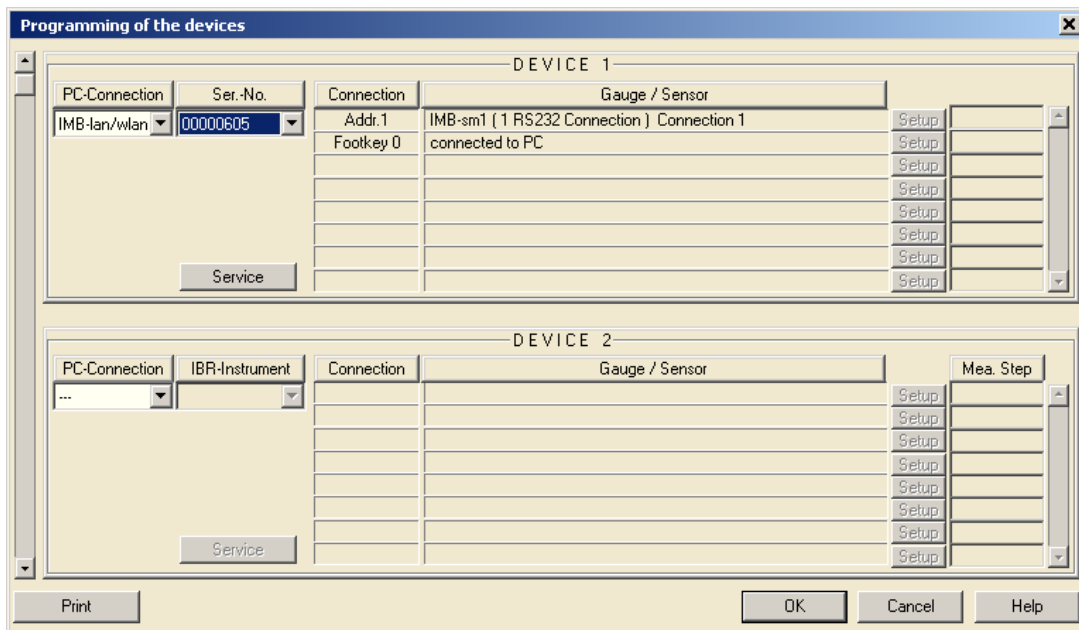
### 3. General information for connection of IMB-lan modules to a network

- a) On default the IMB-lan module waits for the IP address setting by a DHCP Server. If no DHCP Server is available, then the IMB-lan module automatically takes after 20 sec an IP-Address out of the address range **169.254.x.x**. ( *Subnet mask : 255.255.0.0* )
- b) The IMB-lan modules require sometimes up to 30 sec after power-on, till they are available in the company network.
- c) The IMB-lan modules use for the communication 3 different TCP-Ports :  
( These TCP-Ports must be unlocked in the Firewall )

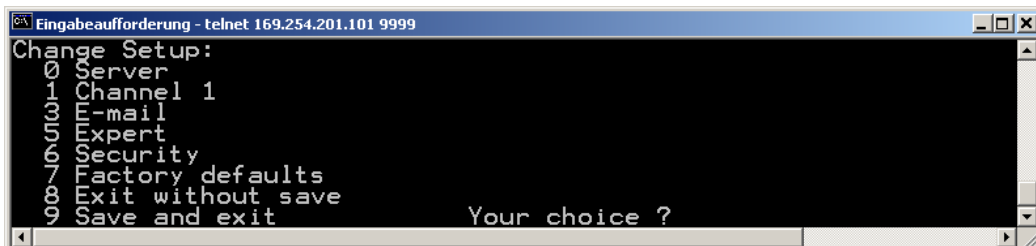
TCP-Port	Function
0x2711 ( 10001 )	Communication with IMBus-Modules ( Measuring data, ... )
0x77FE ( 30718 )	Detection of connected IMB-lan Modules in network
0x77F0 ( 30704 )	IMBus Control

### 4. Configuration of IMB-lan modules by TelNet

- Open the Setup-Window of **IMB\_Test** programme
- Selection of **IMB-lan/wlan** as **PC-Connection** and after that selection of the **Serial number** of the IMB-lan module, which shall be programmed :



- Press Button **Service**
- Press Button **Prog. IMB-lan/wlan ( Telnet )**
- By Telnet the programming of the IMB-lan modules occurs :







- Telnet Menu „Server“ :

```

Eingabeaufforderung - telnet 169.254.201.101 9999
7 Factory defaults
8 Exit without save
9 Save and exit
Your choice ? 0
IP Address : (000) 0.(000) 0.(000) 0.(000) 0
Set Gateway IP Address (N) N
Netmask: Number of Bits for Host Part (0=default) (16)
Change telnet config password (N) N
Change DHCP device name (IMB-LAN) ? (N)
    
```

- IP-Address :**  
IP-Address of the IMB-lan module ( 0.0.0.0 = Address setting by DHCP )
- Set Gateway IP Address :**  
IP-Address of the router, which serves as gateway for IMB-lan module  
This IP-Address must contain an address of the local network.
- Netmask :**  
8 = 255.0.0.0, 16 = 255.255.0.0, 24 = 255.255.255.0
- Change telnet config password :**  
4 Byte TelNet password
- Change DHCP device name:**  
Assignment of a DHCP name to the IMB-lan module

- Telnet Menus „Channel 1“, „E-Mail“, „Expert“, „Security“ und „Factory Defaults“ :  
***These settings must not be changed !!!***

## 5. Short description : Configuration of IMB-lan modules for network connection by a notebook

- Set IP-Address of Notebook to i.e. 169.254.100.100
- Connect IMB-lan module by the cable with green connectors to the notebook
- Install **IMB\_Test** and open the Setup-Window
- By Telnet the IMB-lan module can be configured

## 4.5 Start-up of IMB-wla connection modules

### 1. Advantages of WLAN-interface :

- Standard interface for **wireless** connection of devices in a network.
- Simple connection of IMBus on the usage of Terminal Servers, because the mapping of i.e. COM-Ports is not required.

### 2. Electrical connection :

- Connect the IMB-wla module to IMBus as described under 2.3.
- Mount antenna to IMB-wla module.
- Switch IMB power supply module on.

### 3. General information for connection of IMB-wla modules to a network

- a) On default the IMB-wla module waits for the IP address setting by a DHCP Server. If no DHCP Server is available, then the IMB-wla module automatically takes after 20 sec an IP-Address out of the address range **169.254.x.x**. ( *Subnet mask : 255.255.0.0* )
- b) The IMB-wla modules require sometimes up to 30 sec after power-on, till they are available in the company network.
- c) Default Wireless LAN settings of IMB-wla modules :  
Network type = Ad-hoc  
Network name = LTRX\_IBSS





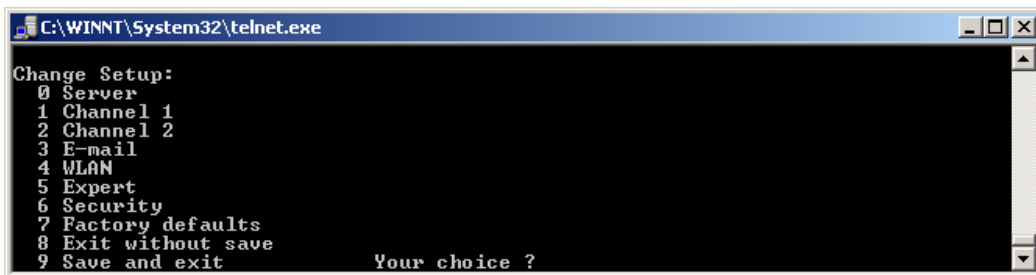
Country = US  
 Channel = 11  
 WEP = deactivated  
 Data rate = 54 Mbps

- d) The IMB-wla modules use for the communication 3 different TCP-Ports :  
 ( These TCP-Ports must be unlocked in the Firewall )

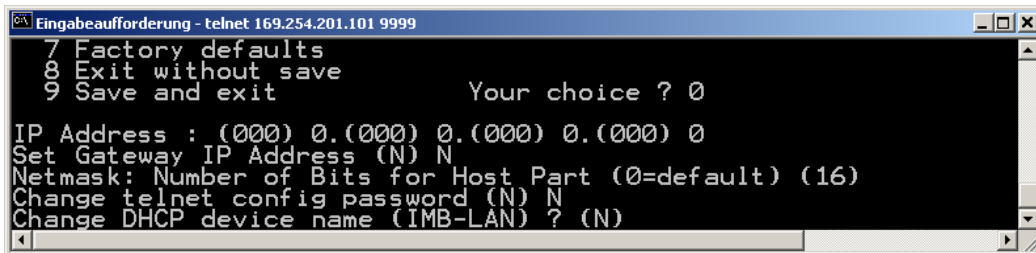
TCP-Port	Function
0x2711 ( 10001 )	Communication with IMBus-Modules ( Measuring data, ... )
0x77FE ( 30718 )	Detection of connected IMB-wla modules in network
0x77F0 ( 30704 )	IMBus Control

#### 4. Configuration of IMB-wla modules by TelNet

- Open the Setup-Window of **IMB\_Test** programme
- Selection of **IMB-lan/wlan** as **PC-Connection** and after that selection of the **Serial number** of the IMB-wla module, which shall be programmed ( see 4.4 )
- Press Button **Service**
- Press Button **Prog. IMB-lan/wlan ( Telnet )**
- By Telnet the programming of the IMB-wla modules occurs :



- Telnet Menu „Server“ :



**IP-Address :**  
 IP-Address of the IMB-wla module ( 0.0.0.0 = Address setting by DHCP )

**Set Gateway IP Address :**  
 IP-Address of the router, which serves as gateway for IMB-wla module  
 This IP-Address must contain an address of the local network.

**Netmask :**  
 8 = 255.0.0.0, 16 = 255.255.0.0, 24 = 255.255.255.0

**Change telnet config password :**  
 4 Byte TelNet password

**Change DHCP device name:**  
 Assignment of a DHCP name to the IMB-wla module





- Telnet Menu „WLAN“ :

```

C:\WINNT\System32\telnet.exe
6 Security
7 Factory defaults
8 Exit without save
9 Save and exit          Your choice ? 4

Enable WLAN <Y> ? Y
Find network name <LTRX_IBSS> ?
Enable Ad Hoc network creation <Y> ?
Name <LTRX_IBSS> ?
Country 0=US, 1=FR, 2=JP, 3=Other <0> ?
Channel <11> ?
Security 0=none, 1=WEP <0> ?
Data rate, Only : 0=1, 1=2, 2=5.5, 3=11 Mbps or
Up to: 4=2, 5=5.5, 6=11 Mbps <6> ?
Enable power management <N> ? _
    
```

**Enable WLAN :**

By this menu point the WLAN interface of the IMB-wla module is activated / deactivated. *This menu point MUST be set in any case to „Y“.*

**Find Network Name :**

Network name of IMB-wla module

**Enable Ad Hoc Network Creation :**

Settings of Ad Hoc Network ( Network Name, Country and WLAN-Channel ). On deactivation an Infrastructure network is activated.

**Security :**

Activation of WEP

**Data Rate :**

WLAN data rate

**Power Management :**

Activation of the Power Management  
*The Power Management MUST not be activated.*

**Note : Be careful with these WLAN settings because a RESET to default settings is only possible by demounting the IMB-wla in the factory.**

- Telnet Menus „Channel 1“, „Channel 2“, „E-Mail“, „Expert“, „Security“ and „Factory Defaults“ :  
***These settings must not be changed !!!***

**5. Short description : Configuration of IMB-wla modules for network connection by a notebook**

- Set IP-Address of Notebook to i.e. 169.254.100.100
- The IMB-wla module must be found after power-on as W-LAN Network „**LTRX\_IBSS**“ on the Notebook  
**!!! Note :**  
*- On the Notebook the usage of Ad-hoc networks must be activated.*
- Install **IMB\_Test** and open the Setup-Window
- By Telnet the IMB-wla module can be configured

**4.6 Start-up of IMB-pb connection modules**

**1. Advantages of Profibus-interface :**

- Standard interface for the connection of devices to PLC control units.
- Simple implementation of IMB-pb modules in a PLC-software.

**2. Electrical connection :**

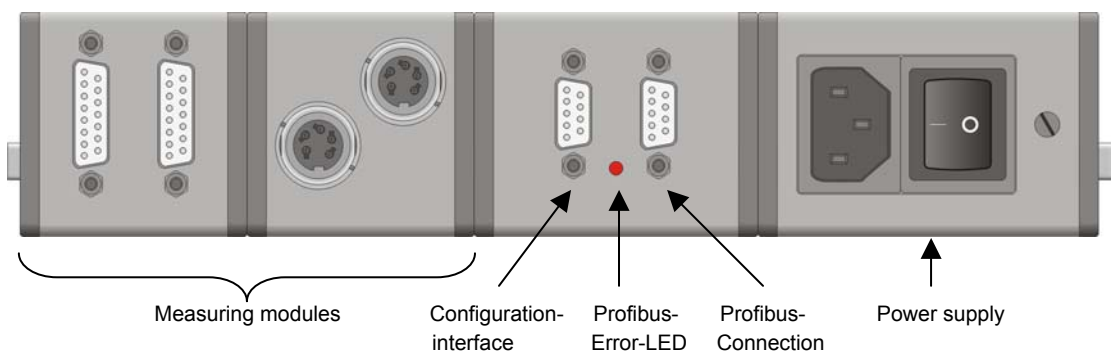
- Connect the IMB-pb module to IMBus as described under 2.3.
- Connect Profibus connection cable ( *is NOT part of the shipment* ) to IMB-pb module.
- Switch IMB power supply module on.





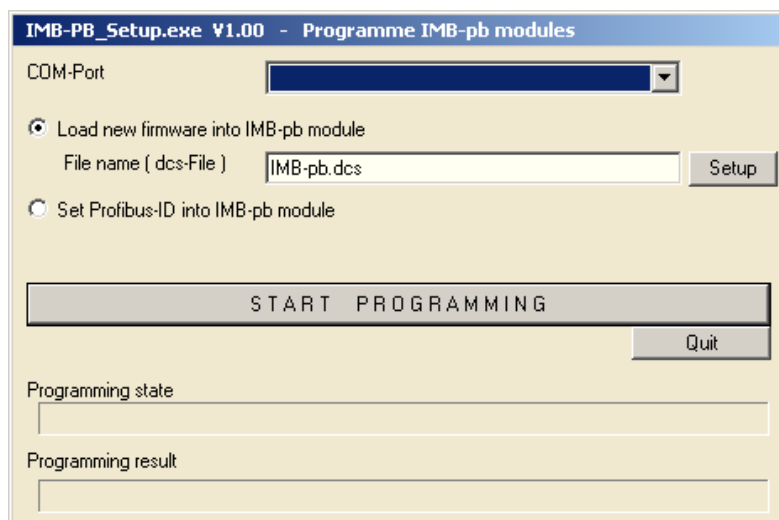
### 3. General information for IMB-pb modules

- The IMB-pb modules read continuously the actual measuring values of the connected IMB measuring modules and provide them on the Profibus.
- On the delivered Support-CD there is the programme **IMB-PB\_Setup.EXE** for setting the Profibus and for firmware update of IMB-pb modules as well as the GSD-file.  
**!!! The attached 1-to-1 cable does NOT serve for Profibus communication. It is for configuration of IMB-pb modules !!!**
- On the communication with a Siemens PLC and data packets > 4 Byte the communication must occur with **SFC14 & SFC15**.
- With the **IMB\_Test** programme no communication is possible with IMB-pb modules. Because of this there is an additional IMB-usb / IMB-232 cable for the configuration of the IMB measuring modules ( which are connected to IMB-pb module ) necessary.



### 4. IMB-PB\_Setup.EXE ( Configuration-Software for IMB-pb modules )

1. Connect the IMB-pb connection module over the configuration interface by 1-to-1-cable in delivery to the COM-Port of the PC.
2. Start of die Software „IMB-PB\_Setup.EXE“ from Support-CD in delivery. ( An installation of the software is not necessary. )



3. Select the COM-Port and the file with the new firmware or the Profibus-Address ( Profibus-ID ).  
**!!! A Firmware-Update is only necessary for special applications and must be clarified with manufacturer.**  
**!!! If the Addr. 126 is programmed, then the Profibus Master can assign the Profibus-ID to the IMB-pb.**
4. Press button „Start Programming“ and follow the instructions.



## 5. Measuring value format of IMB-pb modules

### 5.1. Initialisation :

After power-on the IMB-pb module waits for its initialisation by Profibus Master, this means the Profibus Master must assign the address range to IMB-pb module.

Over the assigned data block size ( = address range ) the IMB-pb module knows the number of bytes to write on Profibus and calculates from this value how many IMBus measuring inputs shall be collected and provided on the Profibus.

One measuring value consists of 4 bytes, this means when the assigned data block has a size of 4 bytes then the IMB-pb reads only address 1 from IMBus, on an assigned data block size of 32 bytes the addresses 1...8 are read and provided on Profibus.

( If some addresses are physically not available, then the particular measuring value block is marked with a flag. )

The maximum assigned data block size can be 244 Byte, this means at maximum 61 measuring inputs can be read by IMB-pb module. If more than 61 measuring inputs are needed, then further addresses can be provided by a second IMB-pb module with another Profibus address.

#### Example :

The Profibus Master has assigned 19 Bytes data block size to IMB-pb module.

➔ The IMB-pb module reads continuously from the IMBus Addresses 1..4 the measuring values ( even if more measuring inputs are available in IMBus ) and sends the 19 bytes data block to the Profibus Master :

Value Adr. 1 (4 Byte)	Value Adr. 2 (4 Byte)	Value Adr. 3 (4 Byte)	Value Adr. 4 (4 Byte)	3 Byte not used (=00h)
-----------------------	-----------------------	-----------------------	-----------------------	------------------------

### 5.2. Measuring data block :

One measuring value data block consists of 4 bytes :

Byte 1 ( = state information )

- Bit 7 :            0 = Error ( see bit 6..3 )
- 1 = Measuring value in Bytes 2..4 is valid
- Bit 6 .. 3 :        Error code : ( only valid on bit 7 = 0 )
- 0 = Measuring value could not be read ( i.e. gauge is not connected to IMBus interface module )
- >0 = see manual of IMBus module
- Bit 2 .. 0 :        Number of digits behind decimal point of value ( 0=1, 1=0.1, 2=0.01, ... )

Byte 2..4 ( = measuring value )

- 24 Bit integer value in 2er complement beginning with high byte
- The measuring value is only valid if Byte 1 / Bit 7 = 1.
- The decimal point position is defined by Byte 1 / Bit 2..0.

**!!! Note :** On successful connection of IMB-pb to Profibus, the Bus-Error LED of IMB-pb is switched off.

## 5. Configuration of IMBus measuring and interface modules

### 5.1 IMB-im1/2/4/8

#### 1. Short description :

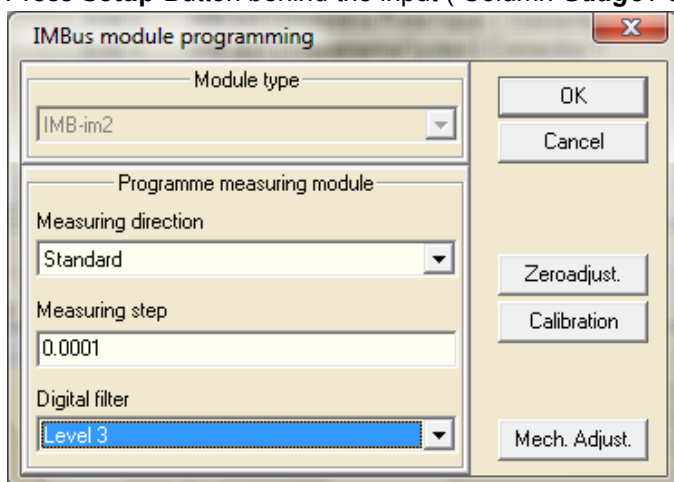
- The IMB-im1/2/4/8 modules allow the connection of inductive probes.
- On default the modules are configured for Tesa halfbridge probes, but the modules can also be delivered for each other probe type.





## 2. Configuration :

- Open Setup-Window of **IMB\_Test** programme.
- Press **Setup**-Button behind the input ( Column **Gauge / Sensor** ) :



- **Measuring direction :**
  - Standard* : On pressing in the probe the measuring value becomes bigger.
  - Inverse* : On pressing in the probe the measuring value becomes smaller. ( Setting is used on probes used in *Bore gauges* )
- **Measuring step :**
  - 0.0001* : Setting for most probes with +/-1 mm, +/-2 mm measuring range. ( i.e. Tesa GT21 / GT22 )
  - 0.00025* : Setting for i.e. Tesa GT61 / GT62 probes
  - !!! Please request this setting from the IMBus manufacturer or distributor.**
- **Digital Filter :** ( for filtering i.e. vibrations on the machine )
  - off* : Digital Filter off
  - Level 1* : Smallest Filter level
  - ....
  - Level 8* : Highest Filter level

## 3. Mechanical adjustment of inductive probes ( = Button „Mech. Adjust.“ ):

- The menu „Mech. Adj.“ allows the mechanical adjustment of the probes in the fixture.
- The inductive probes contain their smallest linearity error near their mechanical zero point and so the probes must be clamped near their mechanical zero point.
- Insert master into the fixture.
- Insert probe into the fixture and move it in position, that the column display of the particular probe is green.
- Fix screw for clamping the probes in this position. ( Note : The screw must not be tightened too strong, otherwise the probe can be damaged ).

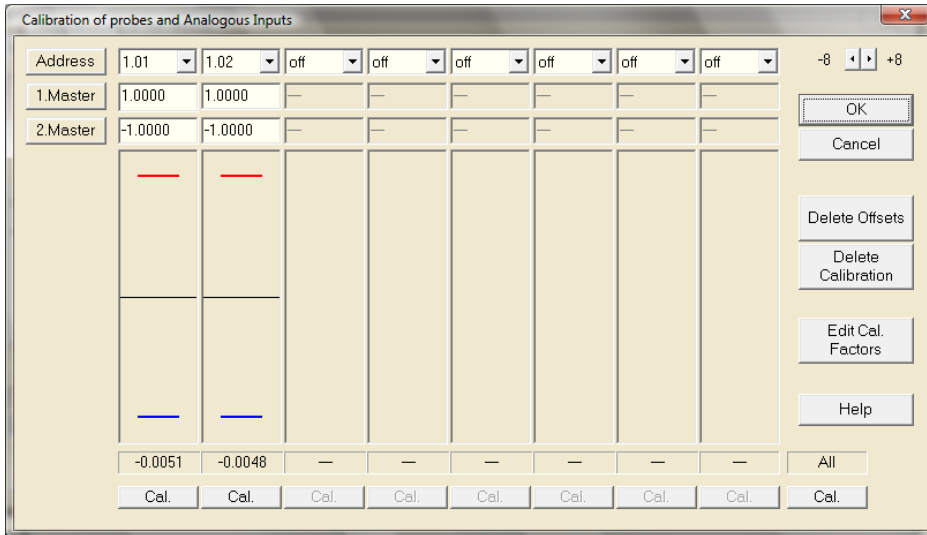
## 4. Zero adjustment with one master ( = Button „Zeroadjust.“ ):

- The menu „Zeroadj.“ allows to set the probes on the master to zero.
- This menu is unnecessary together with most software packets ( like ComGage, IBREXDLL, ... ) because most application software packets have an own zero-adjustment possibility.
- Insert master into the fixture.
- Press button „Adj“ of particular probe.



**5. Calibration with 2 masters ( = Button „Calibration“ ):**

- The menu „Calibration” allows the calibration of the measuring inputs with 2 masters.
- The calling of the menu is only necessary in some special cases, because the IMB-im1/2/4/8 modules are calibrated at the manufacturer with special reference calibration equipment.
- Input password „scal“.
- Input the master values.



- Press the „Cal“-Button of the particular measuring input.
- After that the software requests to insert the first master and then to insert the second master. After collection of the measuring values of both masters the software calculates automatically the gain and offset and stores both values inside the module.

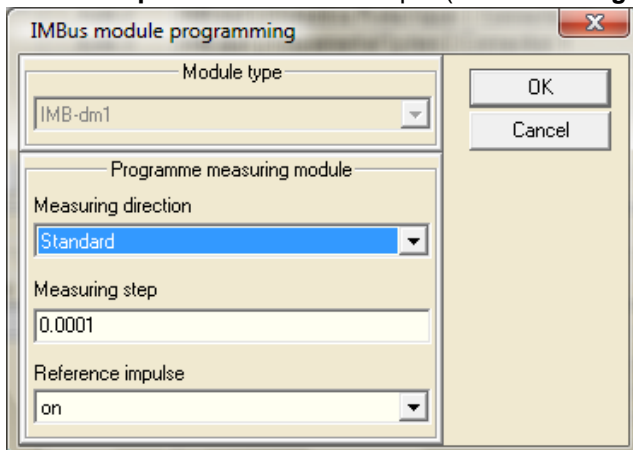
**5.2 IMB-dm1/2/4**

**1. Short description :**

- The IMB-dm1/2/4 modules allow the connection of incremental measuring systems with 1Vpp output or together with a special adapter cable the connection of measuring systems with 11µA output.
- The pinning fulfils the Heidenhain Standard.

**2. Configuration :**

- Open Setup-Window of *IMB\_Test* programme.
- Press **Setup**-Button behind the input ( Column *Gauge / Sensor* ) :







- **Measuring direction :**
  - Standard :* On pressing in the probe the measuring value becomes bigger.
  - Inverse :* On pressing in the probe the measuring value becomes smaller. ( Setting is used on probes used in *Bore gauges* )
- **Measuring step :**
  - 0.0001 :* Setting for measuring systems with 20µm period. ( see datasheet of measuring system )
  - 0.0002 :* Setting for measuring systems with 40µm period.
  - 0.00005 :* Setting for measuring systems with 10µm period.
  - ....
- **Reference impulse :**
  - Activation / Deactivation of the automatic measuring value reset ( = zero adjustment ) on passing a reference mark.

## 5.3 IMB-tc1/2/4

### 1. Short description :

- The IMB-tc1/2/4 modules allow the connection of incremental measuring systems with TTL output.
- The pinning fulfils the Heidenhain Standard.

### 2. Configuration :

- see 5.2.2.

## 5.4 IMB-ae1

### 1. Short description :

- The IMB-ae1 modules allow the connection of pneumatic measuring systems.

### 2. Configuration :

- see separate „IMB-ae1“ manual

## 5.5 IMB-ai1/2/4/8

### 1. Short description :

- The IMB-ai1/2/4/8 modules allow the connection of sensors and gauges with analogue output.
- In addition to the IMB-ai1/2/4/8 modules wiring adapters for the connection of measuring bridges, temperature sensors, ... are offered.

### 2. Configuration :

- see 5.1.2.

## 5.6 IMB-mi2/4/8

### 1. Short description :

- The IMB-mi2/4/8 modules allow the connection of gauges with Mitutoyo Digimatic output.

### 2. Configuration :

- There is no additional configuration necessary.

## 5.7 IMB-sm1/2/4

### 1. Short description :

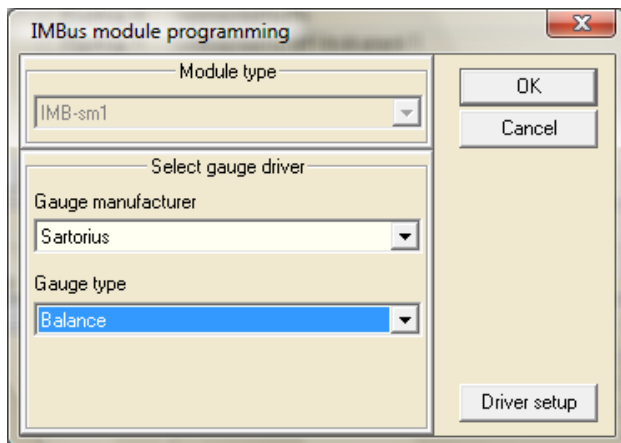
- The IMB-sm1/2/4 modules allow the connection of gauges with RS232 output. ( = serial interface )



- In addition to the IMB-sm1/2/4 modules connection cables / -adapters for the connection of the particular gauges are offered.

## 2. Configuration :

- Open Setup-Window of **IMB\_Test** programme.
- Press **Setup**-Button behind the input ( Column **Gauge / Sensor** ) :



- Selection of the gauge

## 5.8 IMB-pm1

### 1. Short description :

- The IMB-pm1 modules allow the connection of gauges with „old“ parallel interface.

### 2. Configuration :

- see 5.7.2.

## 6 Wiring of IMBus switching modules

### 6.1 IMB-io4

#### 1. Short description :

- The IMBus input and output modules are all galvanically ( 2kV ) separated.
- The inputs are compatible to PLC optocoupler inputs and work in a wide voltage area.
- The outputs are ESD proofed, short circuit proofed and contain a high driver power.
- Each in-/output contains a state LED.
- The connections are done by plugable terminal strips.

#### 2. Technical data :

#### Electrical characteristics "Input"

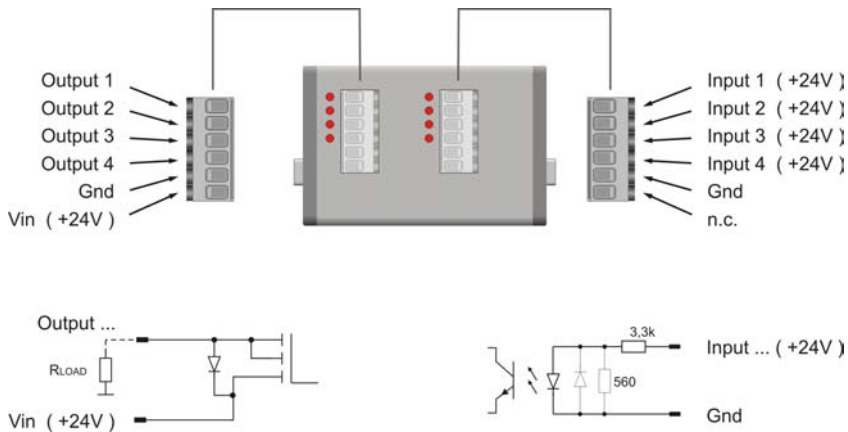
Nominal input voltage	24 V DC
Input voltage signal "High"	13 V ... 30 V
Input voltage signal "Low"	-30 V ... + 5 V
Input current signal "High"	typ. 7 mA
Connection of 2-wire-BEROS is possible	max. current 1,5 mA
Isolation voltage	2000 V



## Electrical characteristics "Output"

Operating voltage	12 V ... 32 V DC
Max. output current	1 A per channel
On – state resistance $R_{ON}$	200 m $\Omega$
Current limitation	4 A

### 3. Wiring :



## 6.2 IMB-ci8

### 1. Short description :

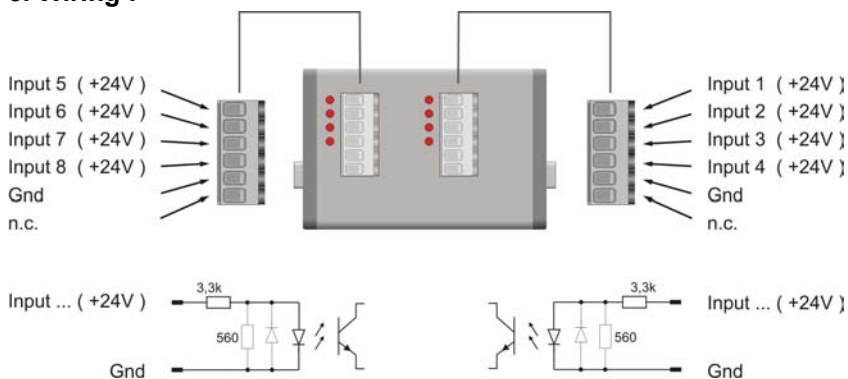
- The IMBus input and output modules are all galvanically ( 2kV ) separated.
- The inputs are compatible to PLC optocoupler inputs and work in a wide voltage area.
- Each in-/output contains a state LED.
- The connections are done by pluggable terminal strips.

### 2. Technical data :

## Electrical characteristics "Input"

Nominal input voltage	24 V DC
Input voltage signal "High"	13 V ... 30 V
Input voltage signal "Low"	-30 V ... + 5 V
Input current signal "High"	typ. 7 mA
Connection of 2-wire-BEROS is possible	max. current 1,5 mA
Isolation voltage	2000 V

### 3. Wiring :





## 6.3 IMB-co8

### 1. Short description :

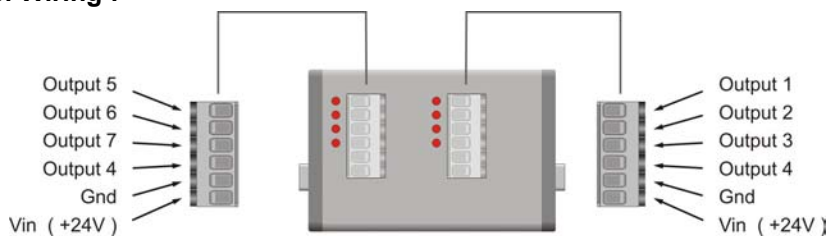
- The IMBus input and output modules are all galvanically ( 2kV ) separated.
- The outputs are ESD proofed, short circuit proofed and contain a high driver power.
- Each in-/output contains a state LED.
- The connections are done by pluggable terminal strips.

### 2. Technical data :

#### Electrical characteristics "Output"

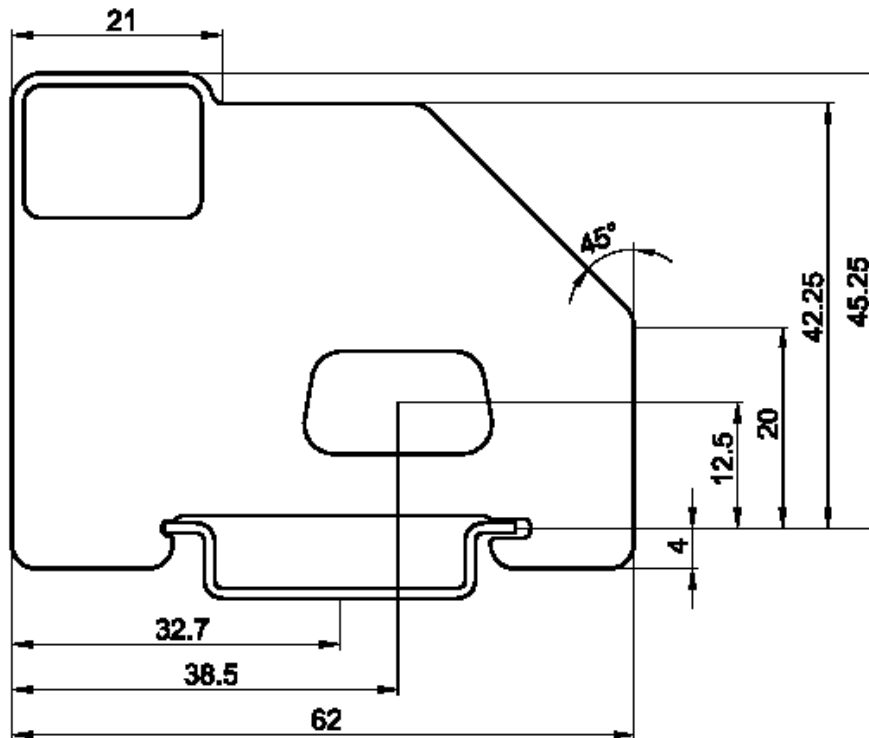
Operating voltage	12 V ... 32 V DC
Max. output current	1 A per channel
On – state resistance RON	200 mΩ
Current limitation	4 A

### 3. Wiring :



**7. Technical data of IMBus modules**

**Mechanical sizes :**



Width of the different module types :

<b>IMBus – Module type</b>	<b>Module width</b>
IMB-dm1, IMB-tc1, IMB-pm1, IMB-sm1	25 mm
IMB-im1, IMB-ai1	37,5 mm
IMB-lan, IMB-wla, IMB-im2, IMB-dm2, IMB-tc2, IMB-ae1, IMB-ai2, IMB-mi2, IMB-sm2	50 mm
IMB-ps2, IMB-dc1, IMB-io4, IMB-ci8, IMB-co8	75 mm
IMB-im4, IMB-dm4, IMB-tc4, IMB-ai4, IMB-mi4, IMB-sm4	87,5 mm
IMB-acc, IMB-pc1	100 mm
IMB-im8, IMB-mi8, IMB-ai8	162,5 mm



### IMB-im1/2/4/8 : ( Measuring modules for connection of inductive probes )

Supported inductive probe types	All manufacturers and types Standard : Tesa Halfbridge and compatible
Frequency, Input impedance, ...	Corresponding to the probe specifications
Resolution / measuring range	16 Bit +/- 3,0 mm on 0,1 $\mu$ m +/- 30,0 mm on 1 $\mu$ m
Measuring rate	1800 Measuring values / sec / channel
Temperature drift Gain	< 0.005 % / K
Temperature drift Zeropoint	< 0.002 % / K
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

### IMB-dm1/2/4 : ( Measuring modules for connection of incremental measuring systems [ 1Vpp ] )

Supported interfaces	1 Vpp 11 $\mu$ A ( by adapter cable )
Exploitation	200 times ( Example : 0,1 $\mu$ m on 20 $\mu$ m period )
Counter	24 / 32 Bit ( for- / backward counter )
Measuring rate	1600 Measuring values / sec / channel
Reference mark / Failure signal	Activatable / Deactivatable
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

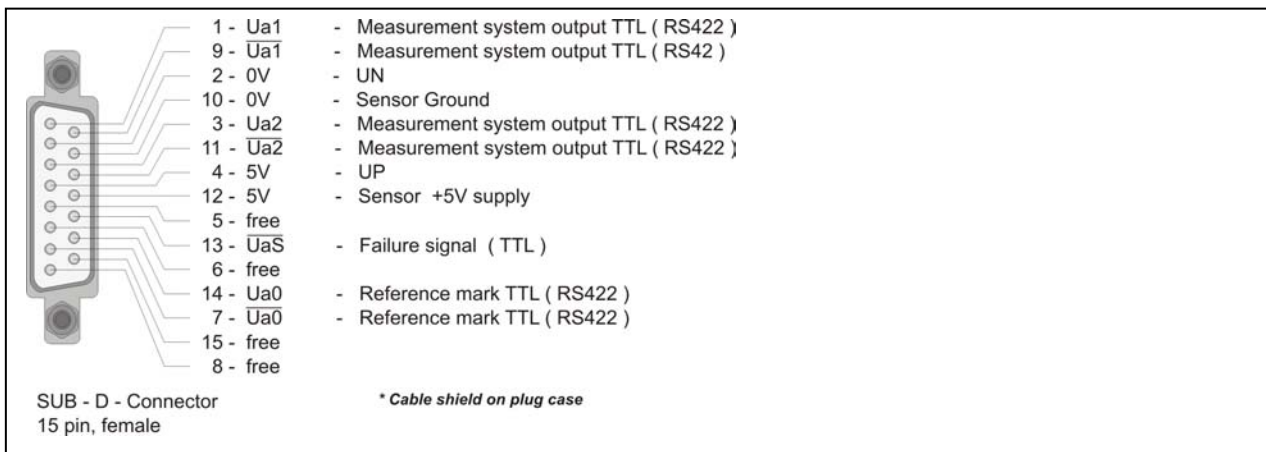
1 - A+	- Measurement system output ( 1Vpp )
9 - A-	- Measurement system output ( 1Vpp )
2 - 0V	- U <sub>N</sub>
10 - 0V	- Sensor Ground
3 - B+	- Measurement system output ( 1Vpp )
11 - B-	- Measurement system output ( 1Vpp )
4 - 5V	- U <sub>P</sub>
12 - 5V	- Sensor +5V supply
5 - free	
13 - free	
6 - free	
14 - R+	- Reference mark ( 1Vpp )
7 - R-	- Reference mark ( 1Vpp )
15 - free	
8 - free	

SUB - D - Connector  
15 pin, female

\* Cable shield on plug case

### IMB-tc1/2/4 : ( Measuring modules for connection of incremental measuring systems [ TTL ] )

Supported interfaces	TTL ( RS422 )
Impulse width	> 70 nsec
Counter	24 / 32 Bit ( for- / backward counter )
Measuring rate	1600 Messwerte / sec / Kanal
Reference mark / Failure signal	Activatable / Deactivatable
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C



### IMB-ae1 : ( Measuring modules for connection of pneumatic gauge heads )

Air pressure supply connection	Quick connector for PU hose 8/6mm
Air pressure supply of the <b>AE - FC1</b>	4 - 8 bar / 60 - 120 psi
Air pressure supply of the <b>IMB-ae1</b> ( filtered air < 5µm, free from water and oil )	2,6...2,8 bar / 40 psi
Outlet of measuring air	Coupling DN2,7
Connection of gauge head	Nipple DN2,7 for PU hose 6/4 mm
Measuring principle	Differential pressure measuring with Piezo sensors
Pneumatic measuring range	... ±80µm / ... ±0,003inch ( depends on the gauge head )
Measuring rate	1800 Measuring values / sec / channel
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C
Type of protection	IP65 (CEI / IEC 529)

### IMB-ai1/2/4/8 : ( Measuring modules for connection of analogue voltages and currents )

Resolution / measuring range	16 Bit +/- 10,0 V on 0,5 mV ( Standard type ) +/- 2,0 V on 0,1 mV
Measuring rate	1800 Measuring values / sec / channel
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

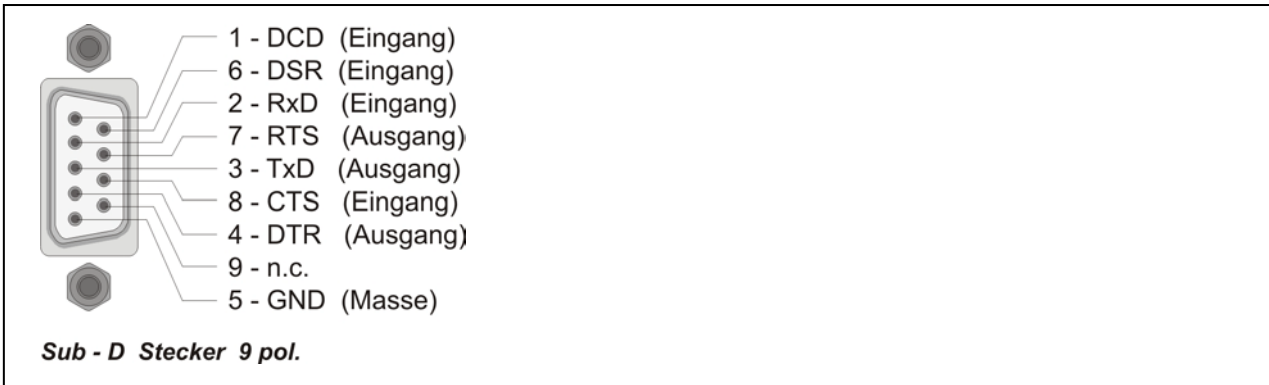
### IMB-mi2/4/8 : ( Interface modules for gauges with Mitutoyo Digimatic output )

Connection	Gauges with Mitutoyo Digimatic output
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

### IMB-sm1/2/4 : ( Universal serial interface module )

Connection	Gauges with RS232 output
Universal configurable	By loading gauge drivers from IBR library ( Standard : Opto-RS232 )
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C





**IMB-pm1 :** ( *Universal parallel interface module* )

Connection	Gauges with parallel interface ( BCD, binary, ... )
Universal configurable	By loading gauge drivers
Adaptation of the wiring for the gauge connector	By adapters <i>par/adp1</i> and <i>par/adp2</i>
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

**IMB-ps2 :** ( *Switching power supply* )

Input voltage	85 ... 260 V AC
Frequency range	45 ... 65 Hz
Output voltage	5 V
Nominal output current I <sub>N</sub> ( till 50°C )	1,2 A
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

**IMB-dc1 :** ( *DC voltage converter* )

Input voltage	9 ... 32 V DC ( Safety extra-low voltage )
Output voltage	5 V
Nominal output current I <sub>N</sub> ( till 50°C )	1,2 A
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

**Anschlussbelegung**

	+9 ... 30V DC
	Gnd ( Masse )
	Schutzleiter ( PE )



**IMB-acc :** ( *Accumulator module for portable units* )

Available Accumulators	1850 mAh ( part of shipment ) 4000 mAh 5500 mAh
Changing of accumulators	Fast and simple
Power plug from loader	Can be used instead of the accumulator for power supply of the IMB-acc module
Output voltage	5 V
Nominal output current I <sub>N</sub> ( till 50°C )	1,2 A
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

**IMB-232 :** ( *Connection cable for IMBus to serial ports* )

Connectable to	COM1 ... 8 of a PC RS232 interfaces of other systems
Max. measuring data rate on 1x IMB-im1	1800 Measuring values / sec
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

**IMB-usb :** ( *Connection cable for IMBus to USB ports* )

Connectable to	USB 1.1 - Ports USB 2.0 - Ports
USB-Mode	Full Speed ( 12 MBaud )
Max. measuring data rate on 1x IMB-im1	500 Measuring values / sec
Additional function	The USB-Port can be used for power supply of IMBus modules
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

**IMB-lan :** ( *Connection module for IMBus to LAN networks* )

Connectable to	10/100 Mbit Ethernet
Max. measuring data rate on 1x IMB-im1	65 Messwerte / sec
Additional function	Support of IP-Address setting by DHCP
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

**IMB-wla :** ( *Connection module for IMBus to Wireless LAN networks* )

Connectable to	1 ... 54 Mbit Wireless LAN Netzwerk
Max. measuring data rate on 1x IMB-im1	65 Messwerte / sec
Additional function	Support of IP-Address setting by DHCP
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C

**IMB-pb :** ( *Connection module for IMBus to Profibus* )

Connectable to	Profibus DP ( max. 12 MBaud )
Support of	DPV1 / DPV2
Operation temperature range	0 ... 45 °C
Storage temperature range	-20 ... 80 °C



## 8. Delivered items

**IMB-232 :** ( Connection cable for IMBus to serial ports )

IMB-232 Connection cable
Support-CD with drivers, IMB_Test Software and manual
4 x pins for fixing the IMB-232 and bus terminator to IMBus
Bus terminator

**IMB-usb :** ( Connection cable for IMBus to USB ports )

IMB-usb Connection cable
Support-CD with drivers, IMB_Test Software and manual
4 x pins for fixing the IMB-232 and bus terminator to IMBus
Bus terminator

**IMB-lan :** ( Connection module for IMBus to LAN networks )

IMB-lan Connection module
Cross Over Cable
1-to-1-Cable
Support-CD with drivers, IMB_Test Software and manual
4 x pins for fixing the Bus terminator and closing cover
Bus terminator
Closing Cover

**IMB-wla :** ( Connection module for IMBus to Wireless LAN networks )

IMB-wla Connection module
Antenna
Support-CD with drivers, IMB_Test Software and manual
4 x pins for fixing the Bus terminator and closing cover
Bus terminator
Closing Cover

**IMB-pb :** ( Connection module for IMBus to Profibus )

IMB-pb Connection module
1-to-1-RS232-Cable for configuration
Support-CD with GSD-file, drivers, IMB_Test Software and manual
4 x pins for fixing the Bus terminator and closing cover
Bus terminator
Closing Cover

**IMB-im1/2/4/8 :** ( Measuring modules for connection of inductive probes )

IMB-im1/2/4/8 Measuring module
--------------------------------

**IMB-dm1/2/4 :** ( Measuring modules for connection of incremental measuring systems [ 1Vpp ] )

IMB-dm1/2/4 Measuring module
------------------------------

**IMB-tc1/2/4 :** ( Measuring modules for connection of incremental measuring systems [ TTL ] )

IMB-tc1/2/4 Measuring module
------------------------------



**IMB-ae1 :**    ( *Measuring modules for connection of pneumatic gauge heads* )

IMB-ae1 Measuring module
Connection nibble
Closing plug

**IMB-ai1/2/4/8 :**    ( *Measuring modules for connection of analogue voltages and currents* )

IMB-ai1/2/4/8 Measuring module
--------------------------------

**IMB-mi2/4/8 :**    ( *Interface modules for gauges with Mitutoyo Digimatic output* )

IMB-mi2/4/8 Interface module
------------------------------

**IMB-sm1/2/4 :**    ( *Universal serial interface module* )

IMB-sm1/2/4 Interface module
------------------------------

**IMB-pm1 :**    ( *Universal parallel interface module* )

IMB-pm1 Interface module
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**IMB-ci8/co8/io4 :**    ( *Switching modules* )

IMB-ci8/co8/io4
2 x 6 pol. plugable terminal strips incl. cover

**IMB-ps2 :**    ( *Switching power supply* )

IMB-ps2 power supply module
2 x screws
Cable for power supply

**IMB-dc1 :**    ( *DC voltage converter* )

IMB-dc1 power supply module
1 x 3 pol. plugable terminal strip incl. cover

**IMB-acc :**    ( *Accumulator module for portable units* )

IMB-acc Accumulator module
1850 mAh Accumulator



## 9. Available PC software

### IBR\_DDK.DLL

For reading measuring values in 32 Bit- Windows applications the **IBR\_Device Driver Kit = IBR\_DDK.DLL** is available *for programmers*.

The IBR\_DDK.DLL offers an API-interface as well as a COM-interface ( ActiveX ) and can be downloaded without cost from the web side [www.IBRit.com](http://www.IBRit.com).

### Features of IBR\_DDK.DLL

- ◆ Parallel operation of up to 8 interfaces ( COM or USB )
- ◆ Universal interface to all IBR-Interface- and measuring instruments
- ◆ Examples for VB, VC++ and Delphi

### IBR\_SimKey

The software **IBR\_SimKey** receives the measuring values in the background and transfers them over the keyboard buffer to other programmes. This means that each software, which allows measuring data input by keyboard, can be used for measuring data collection with **IBR\_SimKey**.

**IBR\_SimKey** allows only the measuring data transfer by data key of the gauge. Hand / Foot switches are not supported in standard **IBR\_SimKey** version.

### IBR\_VCP

The programme **IBR\_VCP** provides a software interface between IMBus and any application software. It simulates the COM-Port on a Windows-PC, which can be opened by the application software and simulates the command / measuring data format of other multiplexers on the market ( i.e. IBRit-mc/md, MUX10, MUX50, Opto-RS232, ... ).

The **IBR\_VCP** software overtakes the communication between IMBus and the application software ( as a software bridge ).



### IBREXDLL ( Data collection of measuring data into MS-Excel )

With the **IBREXDLL** measured data can be read from all IBR interface- and measuring instruments into Excel and can be assigned freely to cells in any Excel - workbook.

The measuring values can be collected by data key of the gauge, by function key, by foot / hand switch or automatically by timer and can be inserted in any EXCEL-table sorted by characteristics.

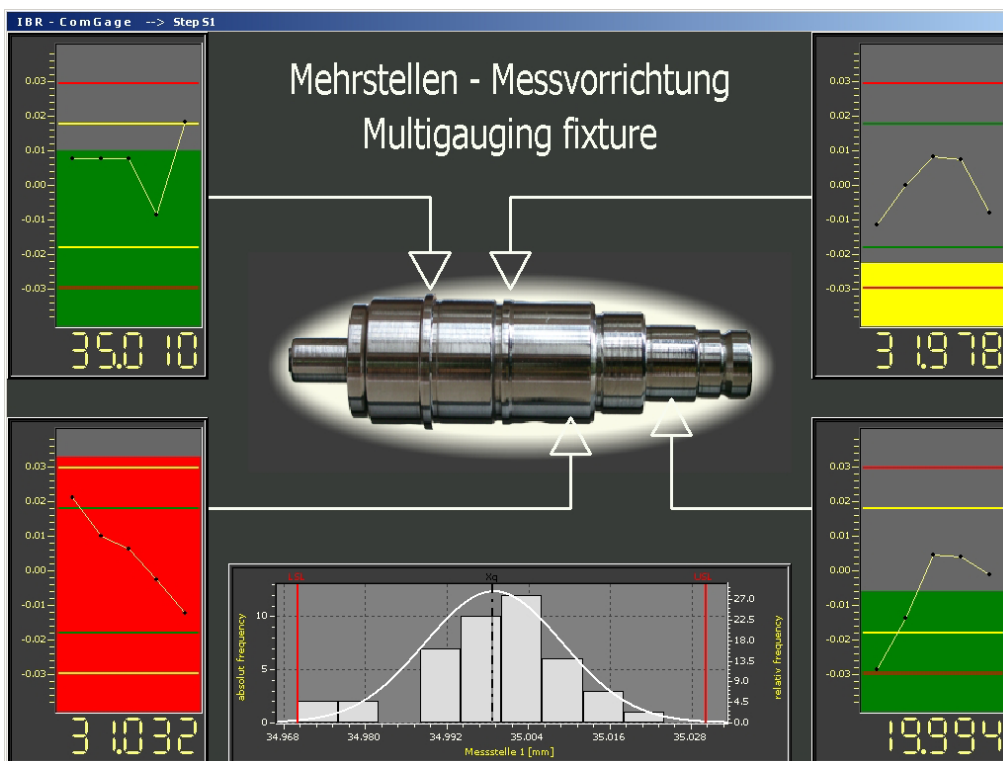
The expansion module **IBREXWGL** allows the continuous visualisation of up to 8 measured values as numeric- and column displays. For each display the unit, the resolution, the nominal size, the upper and lower tolerance and the column display range can be programmed.

The expansion module **IBREXSPC** allows the statistical analysis of the collected measuring data with control charts, run charts, histograms and statistical data in MS-Excel

## ComGage ( Universal Software for metrology and SPC in the production )

ComGage is a software for the metrology and statistical process control in the production. The software is suitable for simple displaying of measured values up to complex measuring applications with control sequences, as well as for the test of components with several characteristics in small and large series. With statistical functions the software delivers additional information for the control of production processes. Additionally by using ComGage small PLC units can be saved.

A 30-days Demoverision as well as further information are available under [www.IBRit.com](http://www.IBRit.com).



## Software packets of other companies

The IBR driver is already included in many software packets and so the connection of IMBus to these software packets is possible without problems.

The IBR-driver is included in the software packets of the following manufacturers :

- SAP
- Q-DAS
- DDW
- Böhme & Weihs
- IBS AG
- IBS Sinic
- Rectron
- Dr. Eilebrecht
- IDOS
- Gewatec
- DasyLab
- Pickert & Partner
- ...



## 10. Declaration of conformity

Thank you very much for your confidence in purchasing this product. We herewith certify that it was manufactured and inspected in our works.

We declare under our sole responsibility that this product is in conformity with technical data as specified in this instruction manual.

On addition, we certify that the measuring equipment used to check this product refers to national master standards. The trace ability of measuring values is guaranteed by our Quality Assurance.

## 11. Guarantee

The quality of this instrument is guaranteed for a period of 12 months from the date of delivery. This guarantee covers all materials and manufacturing defects. Our liability is confined to repair, or should we deem it necessary, replacing or crediting the goods.

The following are not covered by the guarantee :

- ◆ *Damages due to incorrect handling,*
- ◆ *Disregard of operating instructions,*
- ◆ *Tampering by unauthorised staff,*
- ◆ *Attempts by any unauthorised person to repair the instrument.*

**In no case any consequences are covered by the guarantee which are connected either directly or indirectly to the instrument or its use.**

**Notice :** If returning the instrument under guarantee please use the original packaging.

Should you detect an irregularity of any kind, please contact one of our authorised distributors or our Service department.

D-36166 Haunetal, 13.09.2006

**I B R Messtechnik GmbH & Co. KG**

A. Schneider  
*Quality Assurance Manager*