Metrology

INSTRUCTION MANUAL

IMB-ae1

Pneumatic measurement converter

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Messtechnik GmbH & Co. KG

Contents

1. Introduction

1.1 General information

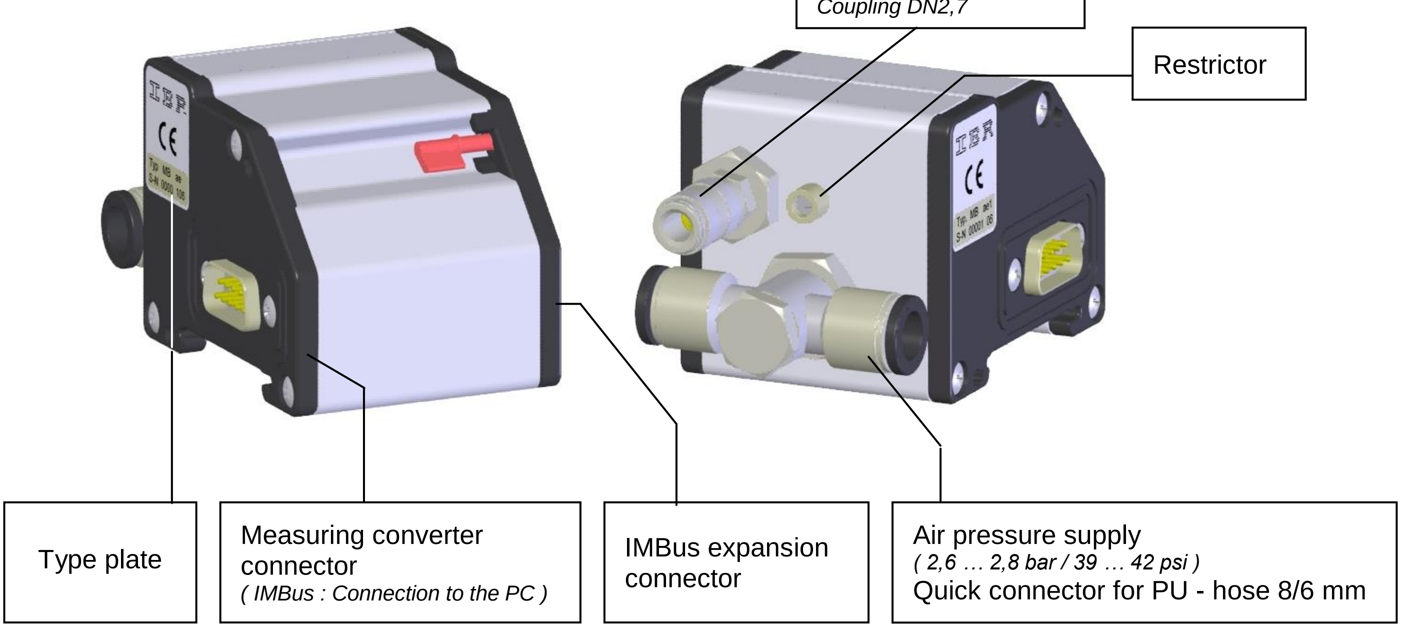
The pneumatic converter IMB-ae1 is a difference pressure measuring system with piezo sensors and measuring electronics with bus connection. The modular design supports the cascading and the connection of 1 ... 64 IMB-ae1 measuring convertes to one computer interface. The measuring electronics of the IMB-ae1 converter in conjunction with the measuring programme ComGage simplifies pneumatic measuring and allows automatic calibration. The constructive design allows the connection of all pneumatic air spindles, air rings, ... on minimal linearity error. Quick couplings simplify the exchange of gauge heads.

Figure pneumatic measuring converter IMB-ae1

1.2 Measuring principle

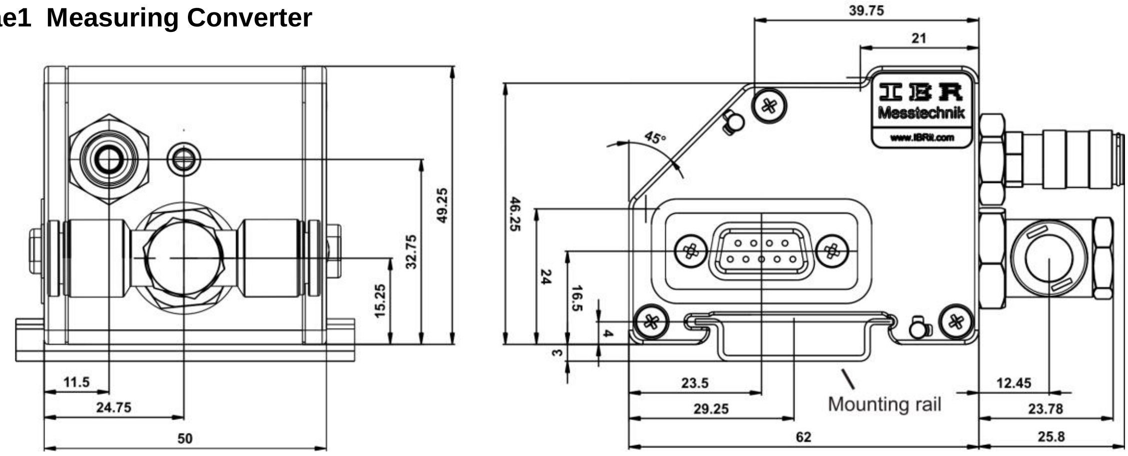
Pneumatic measuring works contact less and can also be used under rugged operating conditions. Robust and effective gauge heads automatically clean the component during measuring. The high sensitivity allows resolutions up to 0,1µm.
The design of the pneumatic converter IMB-ae1 with compensation of air pressure fluctuations reduces the influence of external disturbances. Piezo sensors with new electronics allow highest precision and stability. The expensive use and mechanical adjustment of inductive probes as well as the narrow measuring ranges and errors of membranes for pressure / stroke conversion are not longer necessary.
A special restrictor in the pneumatic measuring branch allows an optimal adjustment and a minimal linearity error on the connection of different gauge heads.

1.3 Front and rear panel



1.4 Dimensions

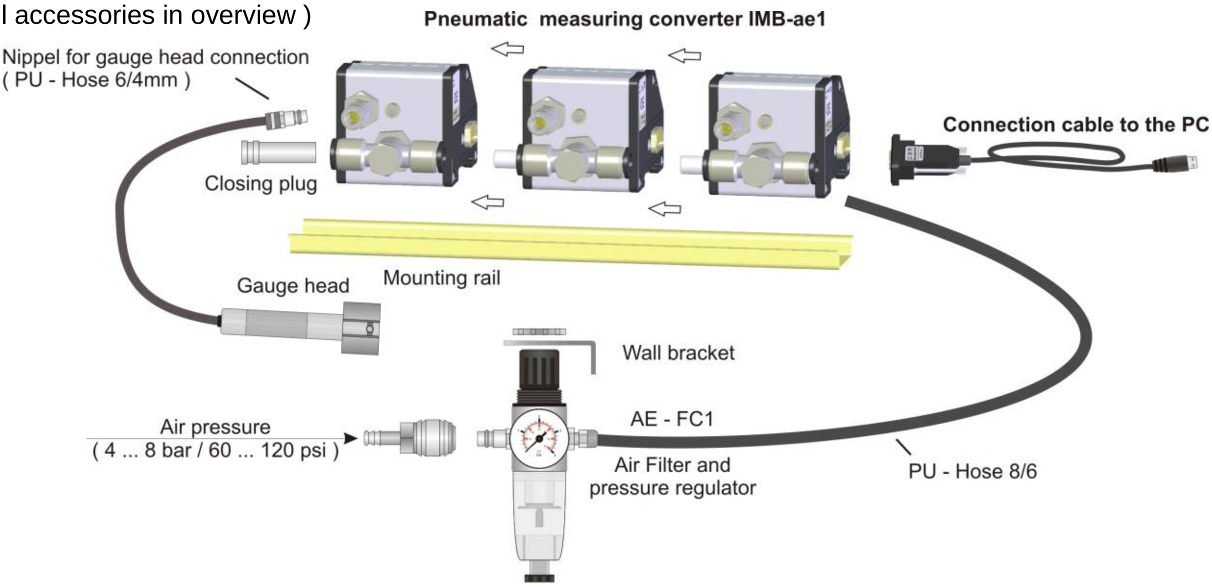
IMB-ae1 Measuring Converter



By the integrated springs the IMBus – Module can be easily clicked onto mounting rails.
(Mounting rail NS35 / 7,5 EN60715)

1.5 Connectors round-up

(all accessories in overview)



Connection cables to the PC :

1. **IMB-usb** allows the direct connection of the IMB-ae1 modules to an USB - Port of the PC.
   On smaller applications of up to 5 IMB-ae1 the power supply can occur out of the USB - Port.
2. **IMB-232** allows the direct connection of the IMB-ae1 modules to a COM - Port of the PC.
   For the power supply a **IMB-ps2** switching power supply module, a **IMB-dc1** 24V power supply module or a **IMB-acc** battery module is required.
3. **IMB-lan** allows the direct connection of the IMB-ae1 modules to an Ethernet network.
   Power supply please see 2.
4. **IMB-wla** allows the direct connection of the IMB-ae1 modules to a Wireless LAN network.
   Power supply please see 2.
5. **IMB-pb** allows the direct connection of the IMB-ae1 modules to a PLC via Profibus.
   Power supply please see 2.

1.6 Technical data

Mechanical characteristics

Case	Aluminium and plastic sides
Dimension W x H x D / Weight	50 x 49,25 x 62 mm / ca. 210 g

Electrical characteristics

Power supply voltage from IMBus	+5V
Supply current	< 60mA
Interface	IMBus (RS485)

Connectors

Electrical connector	9-pin Sub-D male connector
Air pressure supply connection	Quick connector for PU hose 8/6mm
Air pressure supply of the **AE - FC1**	4 ... 8 bar / 60 ... 120 psi
Air pressure supply of the **IMB-ae1** ***(filtered air < 5µm, free from water and oil)***	2,6 ... 2,8 bar / 39 ... 42 psi ISO 8573-1:2010 [3:3:3]
Outlet of measuring air	Coupling DN2,7
Connection of gauge head	Nipple DN2,7 for PU hose 6/4 mm

Measuring parameters

Measuring principle	Differential pressure measuring with Piezo sensors
Pneumatic measuring range (*depends on the gauge head*)	... ±80 µm / ... ±0,003 INCH

Environmental conditions

Working temperature range	0 ... 45°C
Storage temperature range	-30 ... +80°C
Type of protection	IP 65 (CEI / IEC 529)

Electromagnetic compatibility (EMC)

Electromagnetic compatibility (EMC)	Generation of armful interference according to EN50081-2 Resistance to armful interference according to EN50082-2

2. Getting started

2.1 Delivered items

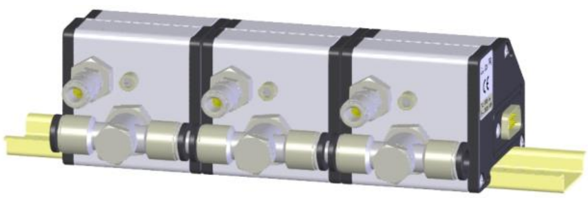
Pneumatic measuring converter IMB-ae1 incl. nipple for hose connector 6/4mm of gauge head, closing plug and instruction manual.
Further accessories like AE-FC1 connection set, etc are listed on the delivery note.
Please check the delivery for completeness and save the packaging for future use.

2.2 Mounting of the measuring converters

At first the IMBus modules have to be connected electrical and mechanical together.
For this push the red levers of the modules out and turn them up. (1)
After this the modules have to be plugged together. (2) To lock the modules together turn the red levers down. (3)

(1) (2) (3)

The measuring converters can be either clicked on mounting rails or put directly on the desk.

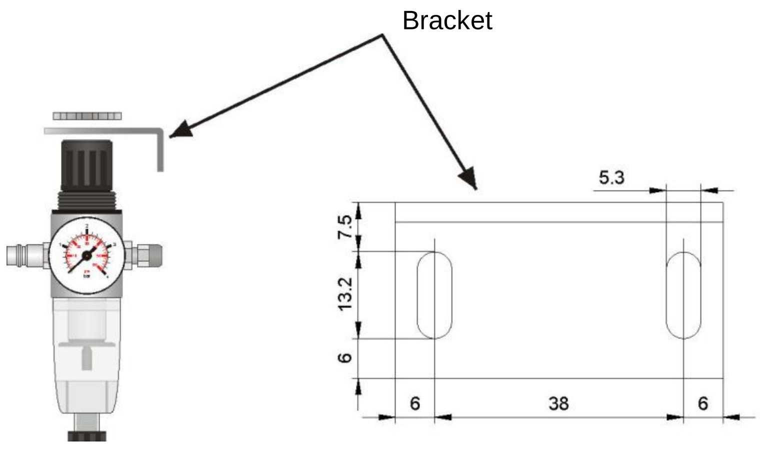


Before plugging several IMB-ae1 modules together, a piece of 35 ±1mm of the 8/6mm PU-hose must be sticked between the pressure air connections (see 2.3.1).

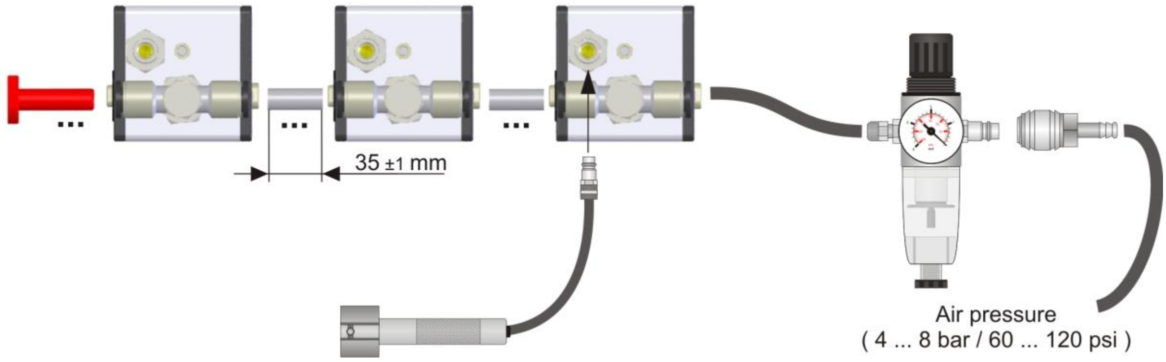
2.3 Mounting the air filter and pressure regulator

To mount the filter and the pressure regulator a mounting kit is supplied together with the ***AE-FC1***. The kit consists of a wall bracket and a nut to fasten the filter / regulator to the bracket.

Attention : For keeping condense water away from the IMB-ae1 measuring converters the air filter and pressure regulator should be mounted below the IMB-ae1 converters.



2.3.1 Connecting to the air pressure supply



Mounting instructions :

1. Cut the PU hose (8/6 mm) for connection of the IMB-ae1 converters to the recommended length shown in the picture.
2. Blow the cut hose piece out so that no dirt particles can reach into the IMB-ae1 measuring converters.
3. Push the hose pieces as shown in the picture into the quick connectors of the IMB-ae1 air inputs.
4. Assemble the IMB-ae1 together as shown under 2.2
5. Cut the remaining PU hose (8/6 mm) to the necessary length to connect the IMB-ae1 converters to the filter / pressure regulator. Mount the pressure regulator below the measuring converter. Push the PU hose into the quick connector and then into the coupling of the outlet from the filter / regulator and secure by nut.
   !!! Tighten nuts only by hand.
6. On the last IMB-ae1 the air supply has to be sealed with the delivered plug.
7. After this the connection to the air pressure supply has to be carried out.
   !!! Check before that the air pressure is in the range of 4 … 8 bar (60 … 120 psi).
   !!! It is only allowed to connect clean (particles < 5µm), oil and water free air pressure.
   The connection is done with a DN7,2 coupling.
   The coupling is the interface to your air pressure supply and allows the connection of pressure hoses with a 9 mm inner diameter.

2.4 Connecting the gauge heads

In order to connect the pneumatic gauge heads the **IMB-ae1** converters are delivered inclusive a DN2,7 nipple suitable for a PU hose 6/4 mm.
The PU hose of the gauge head is pressed onto the nipple and fastened by the nut.
!!! Tighten the nuts only by hand.
Equip all gauge heads with PU hoses and DN2,7 nipples and connect them to the IMB-ae1 converters.

To save compressed air the gauge heads should be parked in a bore (for example in a rejected part) !!!
Connect air pressure supply by mounting the coupling DN7,2 then adjust the pressure regulator to 2,6 … 2,8 bar / 39 … 42 psi.

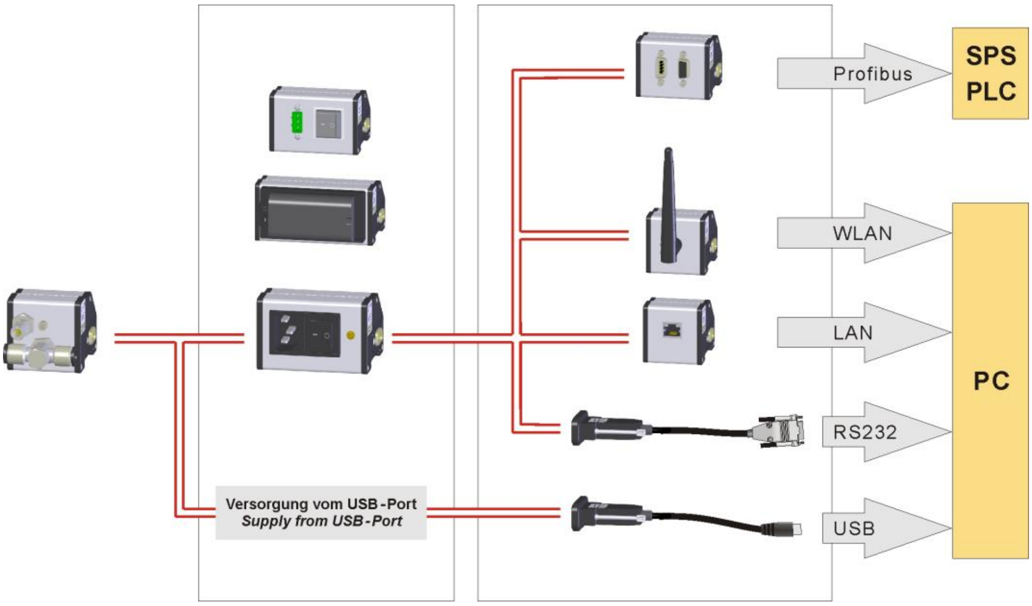
2.5 Electrical Connection

Connection to the PC :

1. **IMB-usb** cable allows the direct connection of the IMB-ae1 modules to an USB - Port of the PC. On smaller applications of up to 5 IMB-ae1 the power supply can occur out of the USB - Port. On applications with more than 5 IMB-ae1 an additional power supply is required (please see 2.).
2. **IMB-232** cable allows the direct connection of the IMB-ae1 modules to a COM - Port of the PC. For the power supply an **IMB-ps2** switching power supply module or an **IMB-dc1** 24V power supply module or an **IMB-acc** battery module is required.
3. **IMB-lan** allows the direct connection of the IMB-ae1 modules to an Ethernet network. Power supply please see 2.
4. **IMB-wla** allows the direct connection of the IMB-ae1 modules to a Wireless LAN network. Power supply please see 2.

Connection to a PLC :

IMB-pb allows the direct connection of the IMBus to a PLC.
For the power supply an **IMB-ps2** switching power supply module or an **IMB-dc1** 24V power supply module or an **IMB-acc** battery module is required.



2.6 Accessories and order information

Name	Description	Article number
IMB-ae1	**Measuring module for connecting 1 pneumatic gauge head**, including quick coupling for gauge head hose 6/4	**F122 081**
AE-FC1	**Pressure regulator with air filter**, quick coupling for hose connection LW9, mounting angle and 2 m hose 8/6	**F330 011**
AE-FF	**Filter unit with centrifugal separator**, sinter filter (5 µm), fine filter (0,01 µm), manual drain valve, quick coupling for hose connection LW9, mounting angle and 2 m hose 8/6	**F330 100**
AE-FP	**Precision pressure regulator with secondary exhaust,** manometer (0 - 4 bar), mounting angle and 2 m hose 8/6	**F330 200**

3. Working with IMB-ae1 measuring converters

3.1 First start-up

- **Mount modules and air filter with pressure regulator.**
- **Connect gauge heads.**
- **Connect air pressure and set pressure regulator to 2,6 … 2,8 bar / 39 … 42 psi.**
- **Connect IMB-ae1 measuring converters to PC.**
  (Detailed information for 1 .. 4 you will find in chapter 2 of this instruction manual.)

- **Installation and configuration of the IMB_Test software.**
- **Restrictor adjustment and calibration of measuring converters.**

3.2 Installation and configuration of the IMB_Test software

Installation from a CD :

1. Insert the CD **IBR Support Software** into your CD-drive.

2. Go to **Start / Run** and enter **<Letter of CD-Drive>: \ IMB_Test \ IMB_Test_Inst**.
   Start the installation by clicking the **OK** - button.

   The installation programme then requests the installation parameters in a few windows.

3. The first window allows the selection of the language desired for the installation procedure.
   Click the **Next>** - button to confirm.

4. The second and third windows display some general information concerning programme installation.
   Click the **Next>** - button to confirm.

5. The fourth window requests the destination directory for the IMB_Test software.
   Click the **Next>** - button to confirm.

6. In the fifth window you can select the folder for **Start / Programmes**.
   Click the **Next>** - button to confirm.

7. The sixth window displays your choice of settings once again for control purposes and can be confirmed by clicking the **Installation** - button.

   Now the installation is executed !!!

8. Close the programme installer by clicking the **Finish** - button, after the installation procedure has been completed successfully. Initial operation of the software can take place directly after completion of the installation procedure. In order to do so, leave the box **"Launch Program File"** checked and click the **Finish** - button.

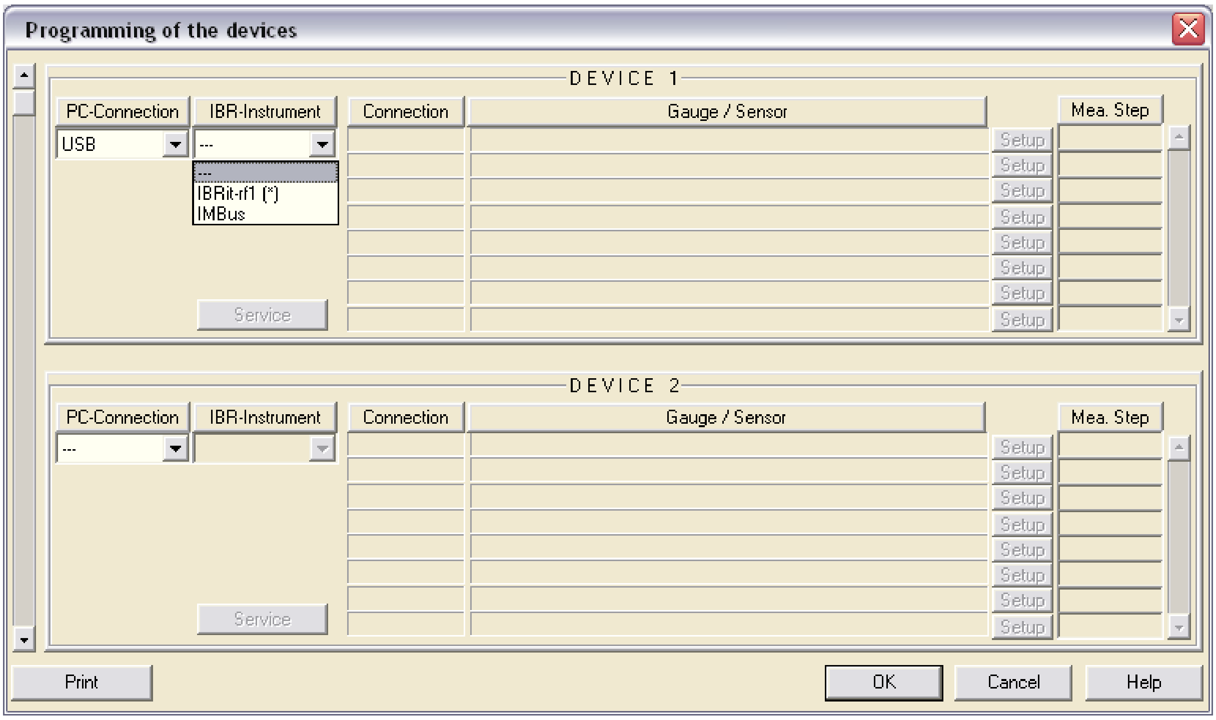
Installation after downloading from website *www.IBRit.com* :

1. Download the file **IMB_Test.zip** from the Homepage ***www.IBRit.com***.
   Go to **Downloads \ Software** in order to do so. Then unzip the file.

2. Start the unzipped installation file **IMB_Test_Inst.exe**.

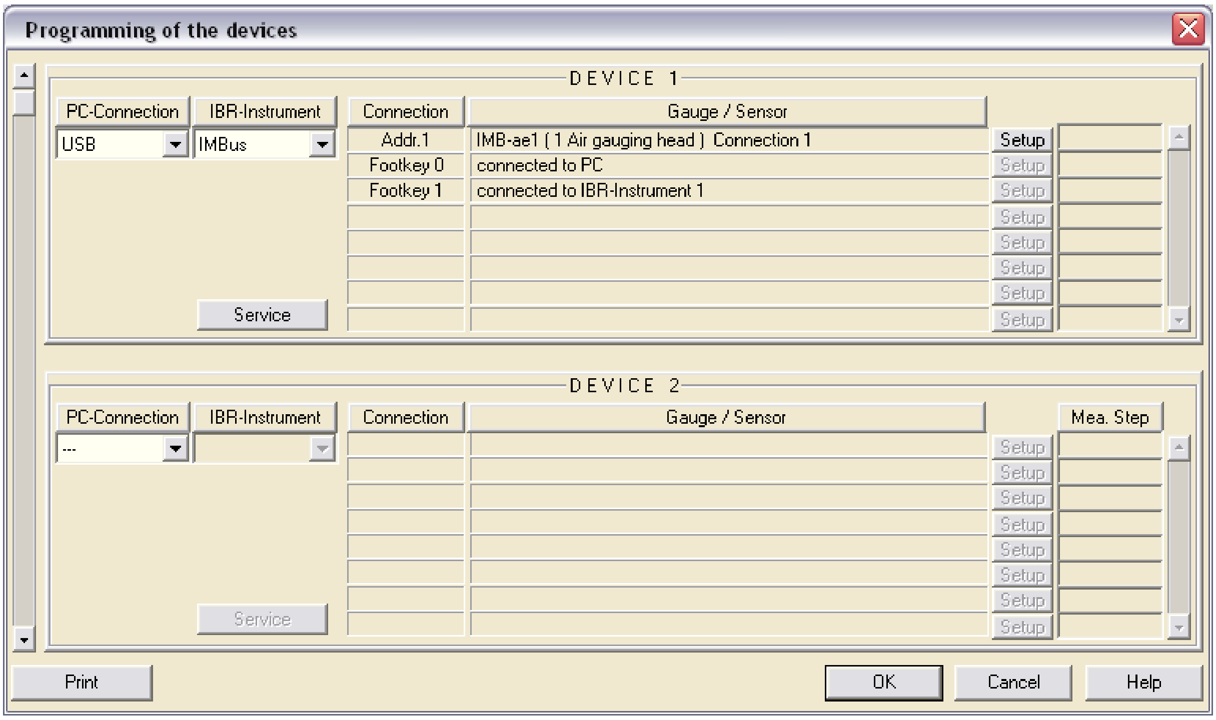
3. Execute the above-described steps 3. to 8. for Installation.

After starting the IMB_Test software you can open the window for selection of the PC-connection (**COM, USB, …**) and the connected IBR-instrument by clicking the **Setup** - button.

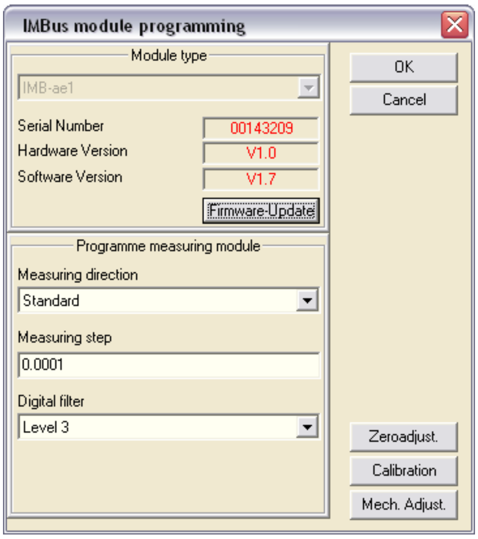


IMBus :

After selecting **IMBus** as setting for the **IBR-Instrument,** the measuring bus is analysed and all connected IMBus modules are displayed.



By means of the **Setup** - buttons for the individual measuring inputs you can select e.g. the resolution, measuring direction, … of the IMB-ae1 modules :

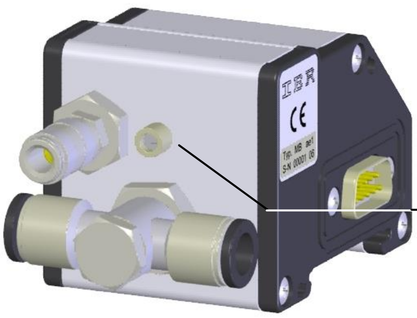


Notes :

- *On outer diameter measurements the negative measuring direction must be selected*
- *On some systems the digital filter must be changed for getting a better measuring value stability (higher filter level) or a higher speed of the IMB-ae1 (lower filter level)*

3.3 Restrictor adjustment on the measuring converter

The IMB-ae1 is equipped with a restrictor enabling the adaptation of a wide range of pneumatic gauge heads and the minimization of linearity errors. The default setting of the restrictor is suitable for gauge heads with jet diameters of 0,8 mm - 1 mm. On gauge heads with smaller or bigger jets and on very small or very big gaps the IMB-ae1 measuring converter can be optimal adapted by the restrictor.
For restrictor adjustment please see the following description.



Restrictor for the adaptation of different gauge heads and minimization of linearity errors

Note : ***Before performing adjustment or calibration, please check that the regulator has 2,6 … 2,8 bar / 39 … 42 psi pressure on its output.***

Restrictor adjustment with 2 masters using a PC :

1. Press the **“Delete Offsets”** and **“Delete calibration”** buttons in the menu **“Adjustment / Calibration”** (see 3.4.). After this the true output signals of the measuring converter are displayed.
2. Adjust the restrictor till the display values of the MIN and MAX Master are laying approximately symmetrically around 0. (that means both have the same absolute value)

   Example : *Display on MAX Master = 0.4573*
   Display on MIN Master = - 0.4600

3. Perform an automatic gauge calibration before beginning measurement operation.
   (Please see chapter 3.4. of this manual)

Restrictor adjustment with 2 masters on B200 / C200 - gauges :

1. Turn the encoder clockwise (CW) to select the ***CALIBRATION*** menu and then push the encoder button to access the menu.
2. Select the ***Adjust*** function by turning the encoder (**“AdJuSt”** flashes) and then push the encoder button to access the function.
3. Turn the encoder to select the measuring input (**P1 … P8**) with the corresponding measuring converter, on which the restrictor adjustment is to be performed. The two-digit numeric display shows the selected measuring input.
4. Insert the pneumatic gauge head into the MIN and MAX Master one after the other. The respective measurement value (“raw value”) is indicated on the six-digit numeric display.
5. Adjust the restrictor till the indicated values of the MIN and MAX Master are laying approximately symmetrically around 0. (that means both have the same absolute value)

   Example : *Display on MAX Master = 0.4573*
   Display on MIN Master = - 0.4600
6. Push the encoder button to exit the setup menu (***Adjust*** function). The B200 / C200 gauge automatically returns to the measuring mode.
7. **Perform a gauge calibration before beginning measurement operation.**
   (Make sure that two master values have been programmed in the gauge – please refer to the B200 / C200 gauge instruction manual for further information)

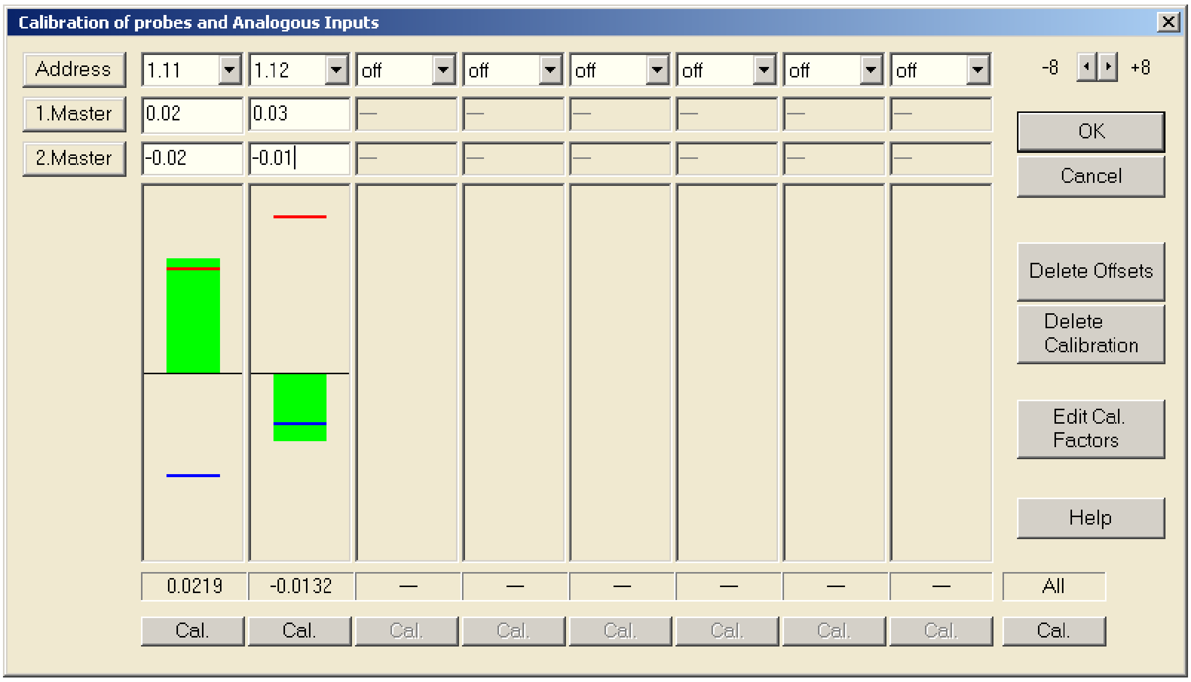
If a third master is available you can optimise linearity as shown below. Take care to perform a restrictor adjustment with 2 masters before you continue.

1. Perform a gauge calibration (when using a B200 / C200 gauge, see instruction manual, chapters 3.4 and 4.6; when using a PC, see chapter 3.4. of this manual).
2. Measure the middle (third) master and compare the measuring value with the master size.
   - *If the measuring value and master size are identical the restrictor is optimal adjusted.*
   - *If the measuring value is different than the master size, the restrictor adjustment has to be changed. For this leave the gauge head inside the master and change the restrictor adjustment till the measuring value is equal to the master size.*
3. After changing the restrictor adjustment, repeat the points 1. and 2. until the difference between the measuring value and the middle master’s size is zero.

Note : Before performing adjustment or calibration, please check that the correct air pressure value is set at the pressure regulator’s output.

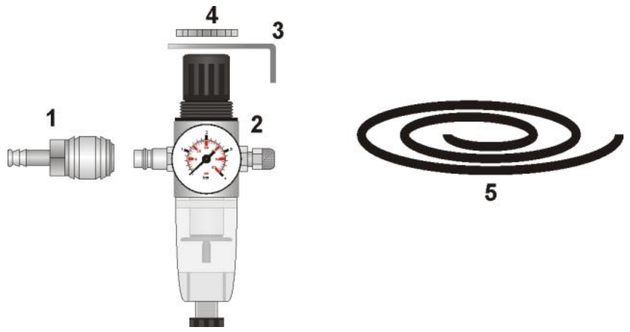
3.4 Automatic gauge calibration

1. Open menu **"Adjustment / Calibration"**
2. Insert password **"scal"**
3. Insert the master values. The master values must be input as relative values to nominal size. Example : On a Min-Master of 29.98 mm and Max-Master of 30.02 mm 0.02 and –0.02 must be inserted as master values.



4. Press the **"Cal"-Button** of the corresponding measuring converter
5. After this the software requests the operator to insert 1.master and then to insert 2. master. After the collection of the 2 measuring values the gain and offset are calculated automatically and stored inside **IMB-ae1**.

4. AE-FC1 connection set (Art. No. F330 011)



1. Nipple of pressure connector for 9mm hose
2. Filter / pressure regulator (0 … 4 bar)
3. Wall bracket
4. Nut
5. PU - hose 8/6 for the air supply of the **IMB-ae1**

5. Maintenance and care

Service	weekly	monthly
Empty filter from condensed water. *Filters with automatic emptying are optional available.*	●	
Check system and hoses for thightness.		●

6. Supervision of the air pressure supply

To supervise the air pressure supply we recommend the use of a pressure switch, which triggers alarm when the pressure gets below the minimum pressure of **4 bar**. A stabile pressure supply is base for good measuring results. It is important to supervise especially by automatic measuring systems the pressure supply.
The supervision of the pressure supply is independent to the IBR - pneumatic and measuring elements.

7. Safety Instructions

The present instrument is state-of-the-art design and complies with the current safety standards. It is nevertheless mandatory to observe the following instructions in order to prevent personal injuries or accidental death of staff members and other persons.

1. All operators must read the present instructions and this manual very carefully **before starting operation.**

2. The instrument may be used only **in errorless technical condition.** Disruptions which may be a danger to operational safety must be removed immediately.

3. The device may be used only as stated in these instructions. The manual must be kept near at hand at the place of operation.

4. Before connecting the device to the power outlet, make sure that the voltage indicated on the label corresponds to the voltage of the local power net. If this is not the case, the device should under no circumstances be connected to the power outlet.

5. The instrument must be connected to the power supply through a properly grounded safety socket. Extension cables, where required, must comply with the VDE safety standards.

6. Any modification and procedures concerning the instrument are permitted only with the prior written consent of **IBR Messtechnik GmbH & Co. KG** and must be carried out by competent staff. Opening the case or tampering with the device without prior permission will lead to the loss of the guarantee and free the producer from all liabilities. Before opening the instrument, make sure to effectively cut the power supply, e.g. by disconnecting the power cable.

7. Before cleaning, disconnect the instrument from the power supply. No liquids should ever be allowed to leak inside the instrument. Strictly avoid the use of cleaners that attack plastic.

8. Replace faulty fuses only with fuses of identical amperage and current characteristics following the instructions given in this manual.

9. Corporate guidelines and safety regulations enforced by the industrial trade associations for the prevention of industrial accidents must be strictly observed. Make sure to consult the safety officer at your company.

10. Do not operate the instrument in an environment containing explosive gases, because an electric spark can cause an explosion.

8. 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.

9. 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, May 26th, 2011

I B R Messtechnik GmbH & Co. KG