

Metrology



INSTRUCTION MANUAL

C200 Column gauge

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Messtechnik GmbH & Co. KG



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1. Introduction

1.1 General information

The C200 column gauge is an electronic gauge allowing the connection of 1 to 8 inductive or incremental probes, pneumatic gauge heads, sensors with analogue current or voltage outputs and gauges with digital interfaces. The extreme flexibility concerning the connection of sensors and gauges is achieved due to the modular design and the usage of IMBus modules.

The column gauge allows manual selection as well as automatic selection of 1 to 8 gauges, including static and dynamic measuring programmes and the optional classification (grading) of components in up to 30 classes.

Highly sophisticated measuring programmes allow a quick and simple calibration using 1 or 2 masters.

Two numeric displays allow indicating absolute measured values, relative deviations or the classification of components as well as the corresponding gauge number.

The 3-colour column display with superimposable tolerance marks gives a quick overview over the tolerance values of the components and is an ideal tool for controlling workpiece characteristics in mass production.

The new Bus system of the C200 provides solutions for most sophisticated measuring applications, simply by interconnecting several column gauges.



1.2 Measuring and display features

- ◆ **Static measuring mode**
- ◆ **Dynamic measuring modes :** Min, Max, Tir, Mean
Bore measuring mode with automatic function
- ◆ **Multi-gauging measuring modes :** Manual or automatic selection of 1 to 8 gauges
- ◆ **Measuring range / Resolution :** $\pm 3.0 \text{ mm} / 0.1 \mu\text{m}$, $0.12 / 0.00001 \text{ inches}$ (inductive probes)
 $\pm 30 \text{ mm} / 1 \mu\text{m}$, $1.2 / 0.0001 \text{ inches}$ (inductive probes)
24 bit (incremental measuring systems)
- ◆ **Units :** mm and inches
- ◆ **2-digit numeric display :**

Gauge number	C1 ... C8
Measuring input	P1 ... P8
Basic setup menu	L0 ... LA
- ◆ **Numeric display ranges**

Relative measurements	: $\pm 9.9999 \text{ mm} / \pm 99.999 \text{ mm}$, $\pm 9.9999 \text{ inches} / \pm 9.9999 \text{ inches}$
Absolute measurements	: 0 to 99.9999 mm / 0 to 999.999 mm, 0 to 9.99999 inches / 0 to 99.9999 inches
Number of grades	: 1...30



◆ Column display ranges

± 5.0000 mm	± 0.50000 "
± 1.5000 mm	± 0.15000 "
± 0.5000 mm	± 0.05000 "
± 0.1500 mm	± 0.01500 "
± 0.0500 mm	± 0.00500 "
± 0.0150 mm	± 0.00150 "
± 0.0050 mm	± 0.00050 "

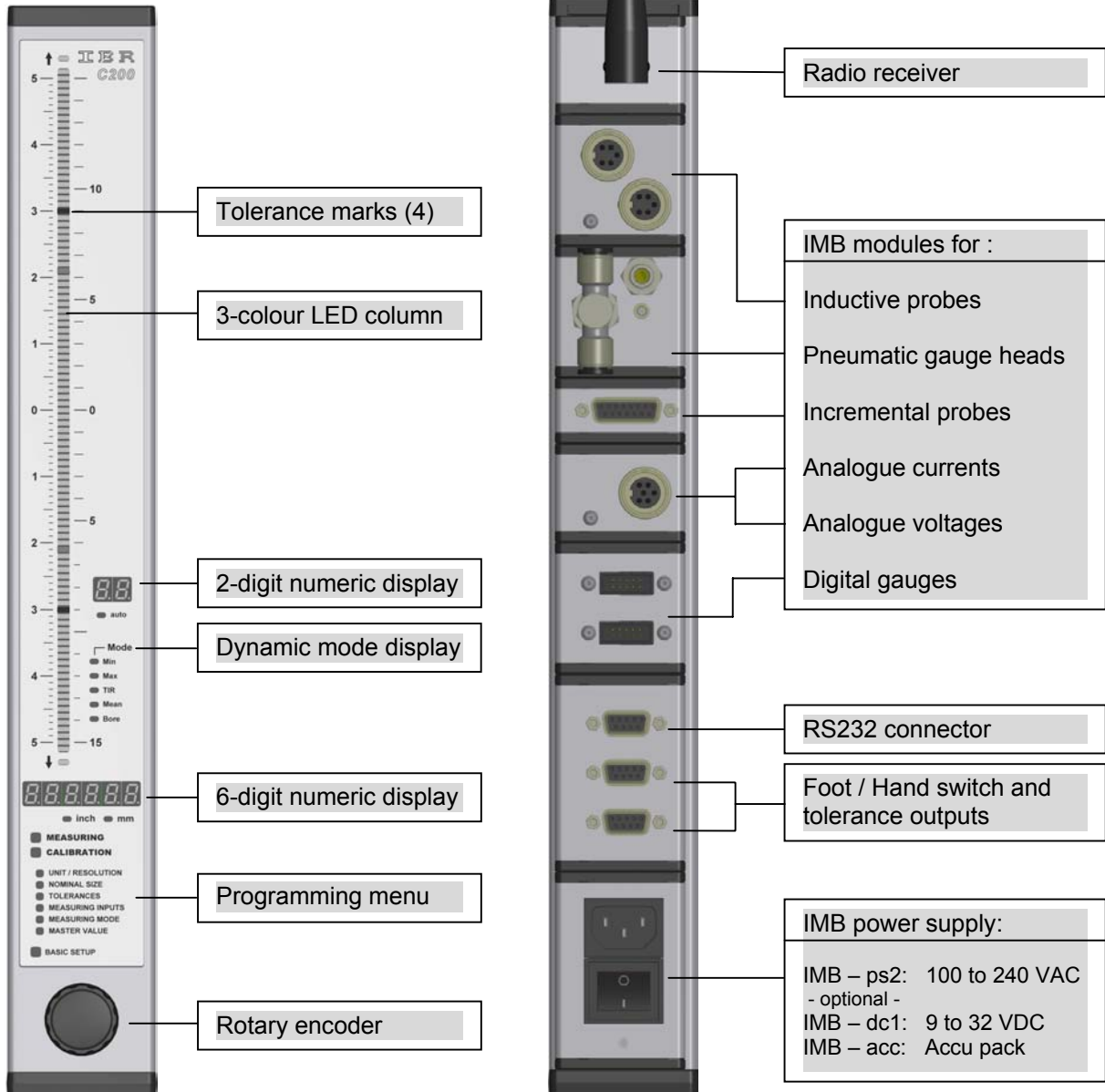
The 3-colour column display (red, green, yellow) features an automatic colour selection according to the tolerance limits adjusted.

A maximum of 4 tolerance limits can be programmed.

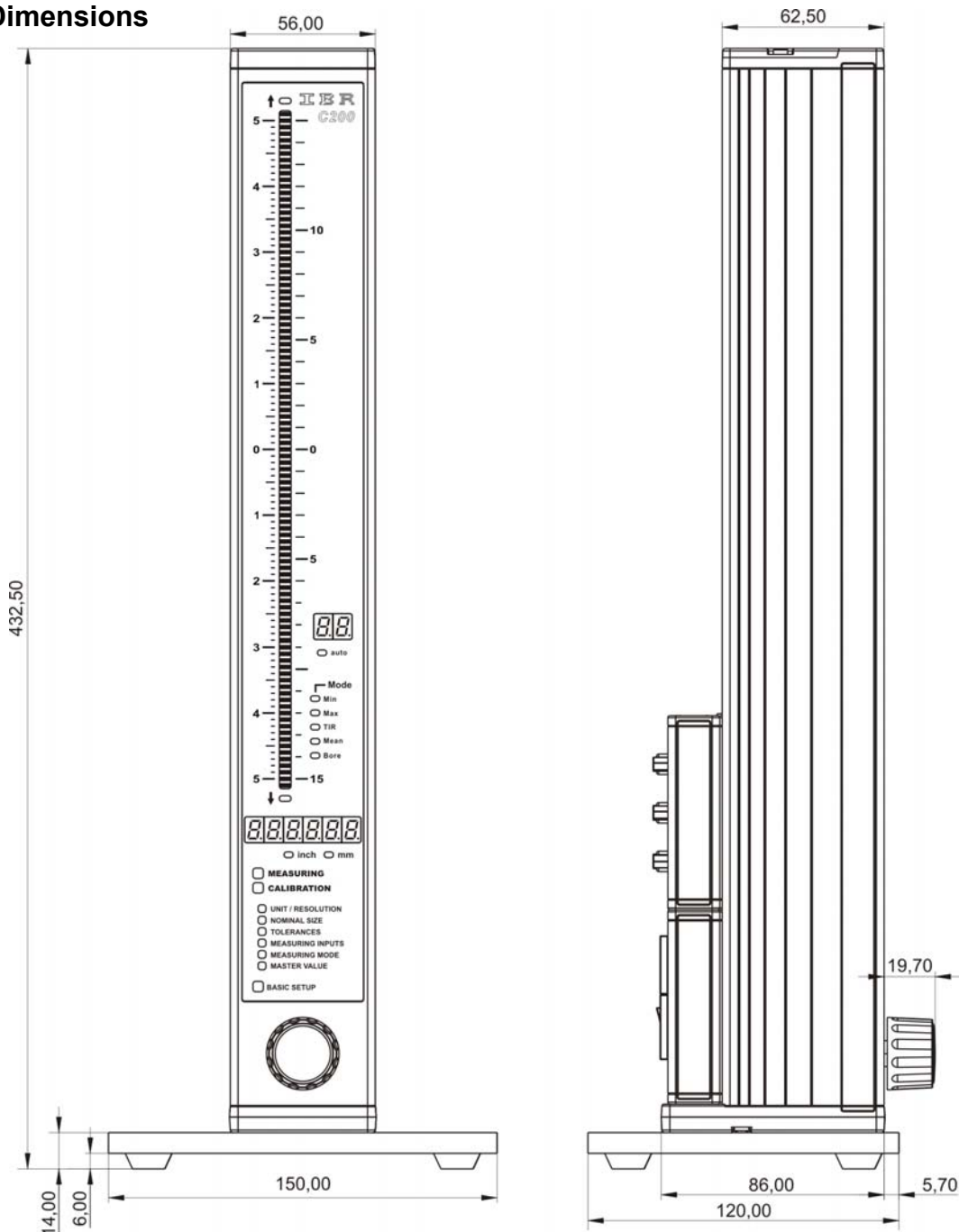
The tolerance limits are indicated as coloured marks on the column display.

The column display range can be set to **AUTO** or to a fixed range in the "BASIC SETUP" menu. In the **AUTO** mode the column gauge automatically selects the optimum column display range, depending on the tolerance limits adjusted. In the measuring mode, the selected column display range is indicated on the numeric display when the Encoder button is pressed longer than 2 seconds. User-defined column display ranges can be programmed using the PC software **C200_PC** (provided by IBR free of charge).

1.3 Front and rear view

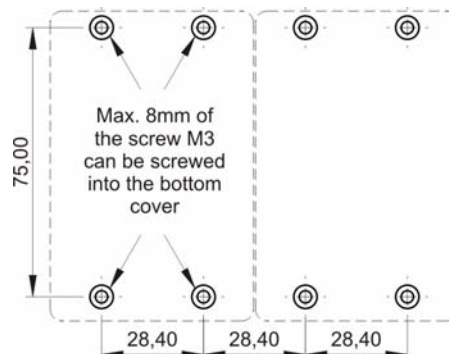


1.4 Dimensions



Picture : Column display with base

1.5 Hole pattern for interconnection





1.6 Technical data

Mechanical characteristics

Case	Aluminium anodised, plastic top and bottom parts
Base	Aluminium powder-coated
Front panel	Acryl glass
Control element	Rotary encoder with pushbutton function (16 detents per rotation)
Dimensions W x H x D / Weight	56 x 418.5 x 86 mm / 1340g (incl. base) (C200 incl. base, IMB-ps2 and IMB-mc1 = 1650g)


Electrical characteristics

Power supplies: IMB – ps2 IMB – dc1 IMB – acc	Primary switched power supply 100 to 240VAC, 45 to 60Hz Power supply featuring DC voltage input from 9 to 32VDC Accumulator module
Max. power consumption	2.5 VA (without measuring modules)

Display

Column display	Scale with 103 plus 2 LEDs for “out-of-range” indication, 3-colours, featuring automatic colour selection and superimposable tolerance marks
Numeric display	6-digit and 2-digit LED displays : 7.62 mm, red
Mode, unit, programming menu indicators	17 LEDs, red

Connections

Interface (RS232)	9-pin SUB-D port, hardware : EIA RS232 standard, data format corresponds to OPTO RS232
2 trigger inputs / tolerance outputs (Ft 1 / Ft 2) 	9-pin SUB-D port, trigger input for external contacts (minimum switch-impulse duration 100 ms) and serial output for OA-adp adapter

Measurement parameters

Measuring range / Resolution	± 99.9999 mm / $0.1 \mu\text{m}$, ± 4.00000 / 0.00001 inches ± 999.999 mm / $1 \mu\text{m}$, ± 40.0000 / 0.0001 inches
Resolution	16 bits (analogue), 24 bits (incremental measuring systems)
Sampling rate	50 measurements per second

For detailed specifications concerning measurement error, linearity, hysteresis and temperature drift please refer to the technical data of the particular IMBus measuring module

Bus

IMBus (IBR Mess Bus)	9-pin SUB-D male (input) / female (output), hardware : EIA RS485 Half Duplex, automatic addressing, max. of 64 clients, max. Bus length 1200 m
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Environmental conditions

Operating temperature range	0 to 50°C
Storage temperature range	-20 to +60°C
Protection class	Front panel IP65 (CEI / IEC 529) Rear panel depending on the IMBus measuring modules

Electromagnetic compatibility (EMC)

Electromagnetic compatibility (EMC)	Interference emission according to EN50081-2 Interference resistance according to EN50082-2
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2. Getting started

2.1 Delivered items

Column gauge, base with 4 screws (M3x8) for fixing, instruction manual, programming card, and a 2.0 mm Allen key.

Further accessories, such as IMBus measuring controllers, power supply modules, measuring modules, foot switches or adapters according to delivery note.

Please check the shipment for completeness and keep the packaging.

2.2 Fitting the base

Use the Allen key (*included in shipment*) to screw in the screws of the base and set the column gauge on a solid base.

!!! Do not overtighten screws !!!



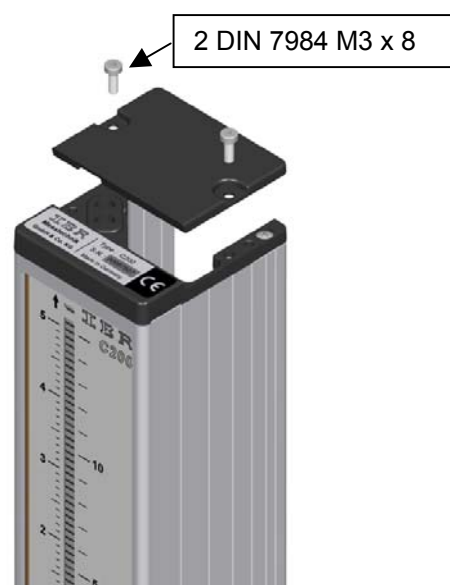
2.3 Fitting the IMBus modules

The **C200** column gauge has been developed for use of IMBus modules and allows the connection of 1 to 8 probes, air plug gauges, sensors and digital measuring instruments. The respective modules of the IMBus series can be fitted to the rear panel of the **C200** in order to connect probes, sensors and gauges.

See IMBus Module Overview, chapter 2.12 !!!

2.3.1 Removal of C200 column cover

Use the Allen key (*included in shipment*) to loosen and remove both retaining screws of the column cover. Then remove the column cover.





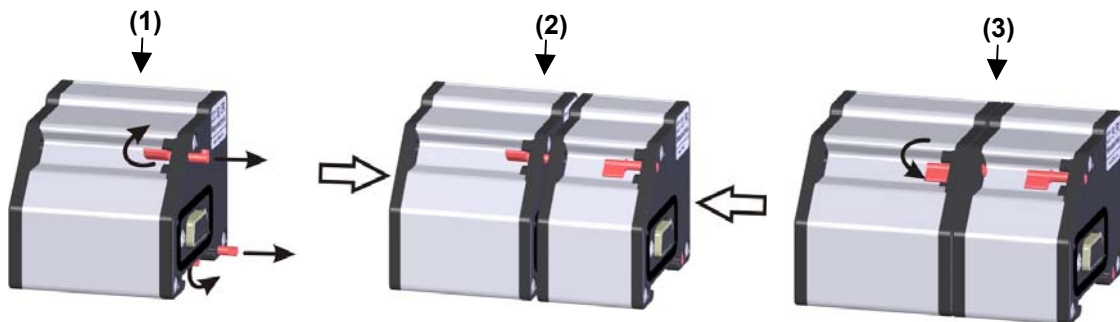
A **C200** column gauge that comprises IMBus modules is configured in a fixed order. If one single **C200** is to be configured, the power supply module (No. 1) always has to be fitted first, followed by the **IMB-mc1** measuring controller module (No. 2) and then subsequently (starting with No. 3) the IMBus measuring and interface modules in any chosen order. The fitting order of the IMBus measuring and interface modules as a result determines the address assignment (**P1** to **P8**) of the connected sensors or measuring instruments. The **C200** column gauge can read in a maximum of 8 connected sensors or measuring instruments. If several **C200** are to be connected, the **IMB-cas** adapter cable (No. 1) has to be fitted first, followed by the power supply module (No. 2), then the **IMB-mc1** measuring controller and subsequently the IMBus measuring and interface modules in any chosen order.

One power supply module can supply power to a maximum of 3 **C200** column gauges in this way. If more than 3 **C200** are interconnected, an additional power supply module has to be fitted to the fourth **C200** at the latest.

Extension cables can be used to place the particular IMBus modules nearby the measuring places, if necessary. Sensitive signal leads from inductive probes, for instance, or long pneumatic hoses for pneumatic measuring configurations can be avoided in this way. The total maximum length of all IMBus extension cables must not exceed 1200 m.

2.3.2 Connecting the IMBus modules

- (1) Push both red levers of the first module against the stop and rotate to the stop (*set up*).
- (2) Connect modules.
- (3) Rotate back both red levers to lock the modules while pressing them together.



Follow steps (1), (2) and (3) to connect the IMBus modules one after the other.

The following table indicates the installation sequence of the IMBus modules.

Position 1 is the bottom position later on, and is screwed to the base of the C200 column gauge.

!!! Important : The bottom IMBus module must be equipped with bolts to do so.

Position	IMBus module
1	IMB-cas (only if interconnecting several column gauges)
2	IMB-ps2 , or IMB-dc1 as an alternative; IMB-acc (power supply modules)
3	IMB-mc1 (measuring controller module)
4	IMBus measuring and interface modules
5	Bus terminator (connector)





Important :

Should an IMBus module already be equipped with bolts (e.g. **IMB-ps2** when using an **IMB-cas** adapter cable), please replace the bolts with 2 cross-recessed screws SH-UNC / 4-40*9.5 (included in shipment) in order to enable connecting of modules.

2.3.3 Fitting of bus terminator

Prior to inserting the modules into the column profile, the bus terminator connector is attached to the vacant port of the last module and screwed to it.

If the last module has not been fitted with bolts to fix the terminator connector, both cross-recessed screws will have to be removed and replaced with bolts.

The bolts are included in the shipment !!!

About the bus terminator :

The purpose of the bus terminator is to terminate the bus lines electrically, to seal the open port, and to provide information on the function and the power supply of the column gauge.

The “VCC” LED lights up when the power supply to the column gauge is secured. The “VCC” LED will be extinguished, if the power supply module has been overloaded due to external consumers, such as digital probes with high current consumption, or as a result of voltage drops due to long IMBus extension cables. The IMBus design, however, allows adding power supply modules between any IMBus gauging and interface modules at will, to compensate voltage drops.

The “RUN” LED lights up, when the self-test of all IMBus modules has finished successfully.

The “RUN” LED will not light up and will thus signal that the IMBus could not be completely checked, if more IMBus modules have been fitted than can be addressed by the column gauge.

Note : *The “RUN” LED will not issue an error message in this case, but instead signals the incomplete self-test of modules that cannot be addressed.*

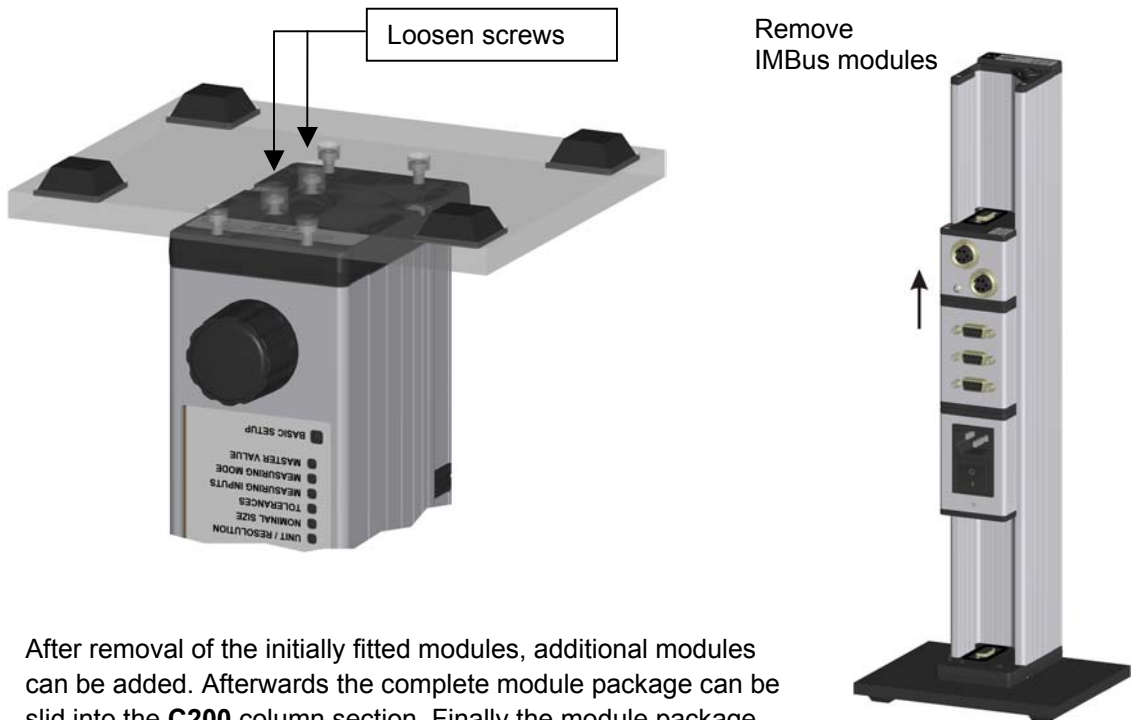
2.3.4 Fitting IMBus modules into the C200 column gauge

Once the IMBus modules have been connected, they are slid into the **C200** column section as a package from the top and are then screwed to the column base using both cross-recessed screws. **!!! Do not overtighten screws !!!**

*If modules have already been fitted into the **C200** column and additional modules are to be installed, then all previously fitted modules must be removed first.*

Loosening and removing previously fitted IMBus modules :

The IMBus modules are screwed to the **C200** base by means of 2 screws. At first both cross-recessed screws must be loosened by using a suitable screwdriver in order to remove the fitted modules. Two lock washers keep the screws in place and they remain in the **C200** base. The base does **not need to be removed**. Once both screws have been completely loosened, the IMBus modules can be slid to the top of the column and removed from it.



After removal of the initially fitted modules, additional modules can be added. Afterwards the complete module package can be slid into the **C200** column section. Finally the module package is screwed to the column base.

2.3.5 Fitting of C200 column cover.

Place the column cover on top of the C200 and fix with two Allen screws (M3 x 8).

!!! Do not overtighten screws !!!



2.4 Measuring input addresses

The measuring inputs are referred to as **P1** to **P8** for subsequent programming. The bottom measuring input is always **P1**. It is possible to connect more than 8 measuring inputs, the **C200** column gauge, however, can only address and read in the first 8 inputs.

Note :

When connecting further column gauges via **IMB-cas** adapter cables, the measuring inputs (**P1** to **P8**) of the first column gauge are also available at the subsequent column gauges and are referred to as the same addresses. Therefore, there is no complex behaviour to pay attention to when programming.

When connecting several column gauges, please take into account the following facts:

A further measuring module in a series of column gauges will interrupt the connection to the previous measuring modules, and make available its inputs for the subsequent column gauges, including the one it is fitted into. See also example 2 on page 14 of this manual.

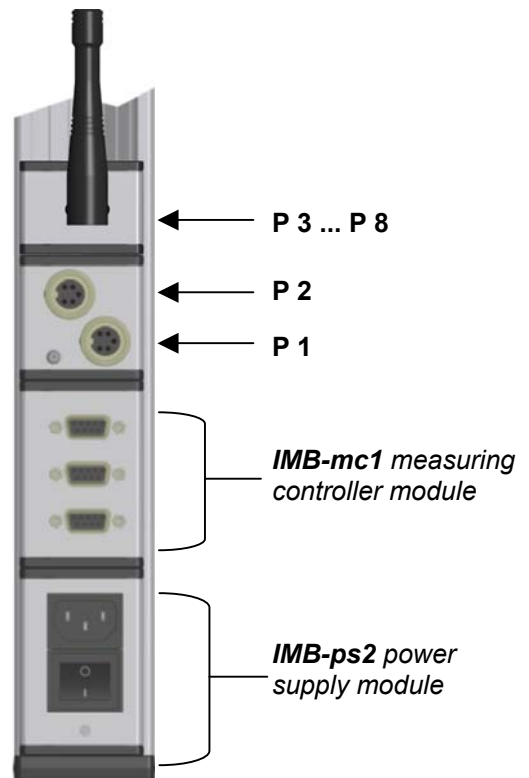
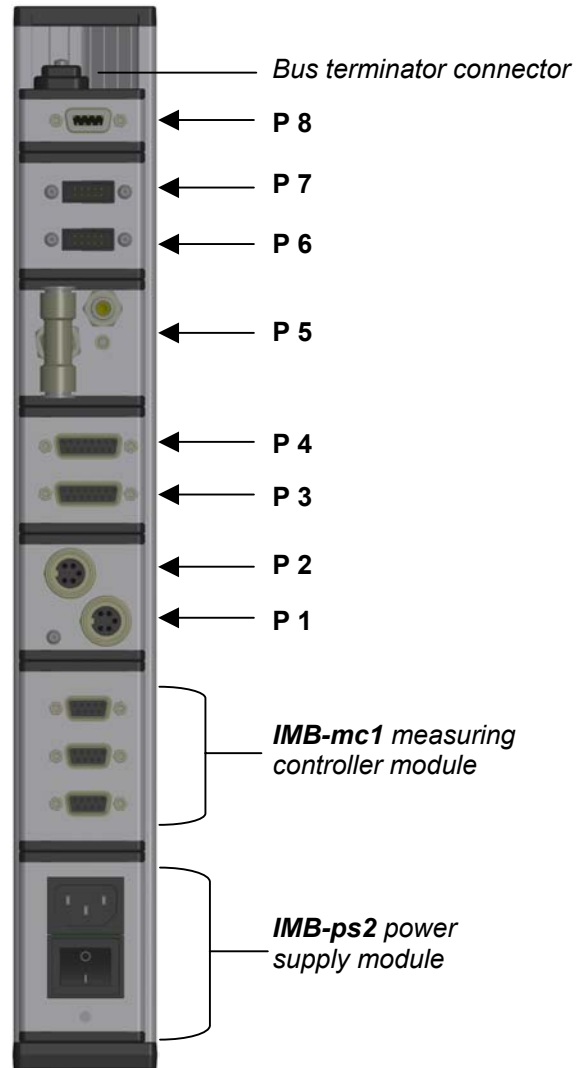
Note for wireless application :

The **IMB-rf1** modules allow the reception of measurement values from 1...8 **IBRit-rf1** radio modules. Therefore each **IMB-rf1** module contains eight channel numbers.

Each channel can be assigned to one of the 1...120 addresses of an **IBRit-rf1** radio module.

When you use an **IMB-rf1** module together with other **IMB**-modules in one **C200**, then you must install the **IMB-rf1** module as the last module of the **C200** (upper position). Because the **C200** supports only eight channels and the **IMB-rf1** has already eight channels, all other **IMB**-modules behind the **IMB-rf1** module are ignored by the **C200**.

The programming of **IBRit-rf1** radio modules and the address assignment of the 1...120 **IBRit-rf1** module addresses to the 1...8 **IMB-rf1** channels can be done by using the PC software **C200_PC** (provided by **IBR** free of charge). The settings are made in the menu "Programming of **IMBus** modules".
(see **IMB-rf1** data sheet)





2.5 Connecting several column gauges

IMB-cas type adapter cables are utilized to connect several column gauges. The adapter cables fulfil two tasks :

1.) Transferring the supply voltage from the first column gauge to the next.

*One power supply module can supply power to a maximum of 3 column gauges, depending on the connected probes, sensors and measuring instruments. The number of column gauges decreases, if the current consumption of the connected measuring instruments exceeds 200 mA. As shown in **Example 2**, power supply modules can be added at will. Each module performs the function of supplying power up to the next power supply module.*

2.) The measuring inputs **P1** to **P8** of the first column gauge are made available for the subsequent column gauges.

*The measuring inputs are passed on to the subsequent column gauges via the **IMB-cas** adapter cables. The data flow direction within the adapter cable is always from the thinner adapter housing towards the thicker adapter housing. A further measuring module in a series of column gauges will interrupt the connection to the previous measuring modules, and make available its inputs for the subsequent column gauges, including the one it is fitted into. See also example 2 on page 14 of this manual.*

Note : Foot and hand switches can be cascaded in order to synchronize several column gauges (e.g. for dynamic measuring). See chapter 2.7 for more detailed information.

Mechanical connection of column gauges :

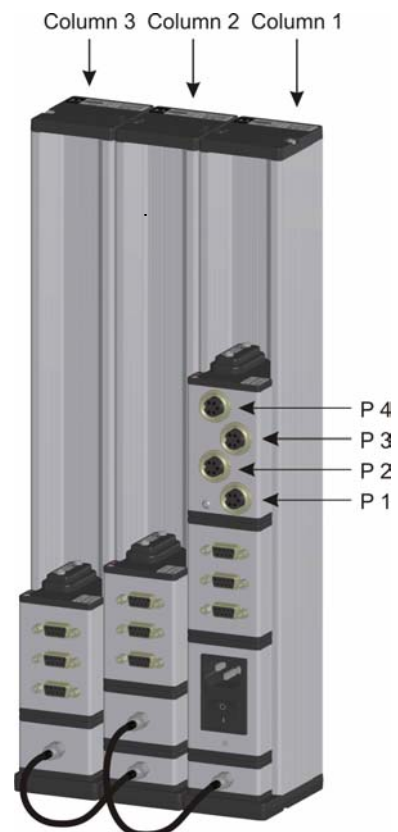


The housing connector underneath the IMBus column cover serves to link together the column gauges. Take the connector out of its storage and screw it together with the column cover.

!!! Do not overtighten screws !!!

Example 1 : connecting 3 column gauges

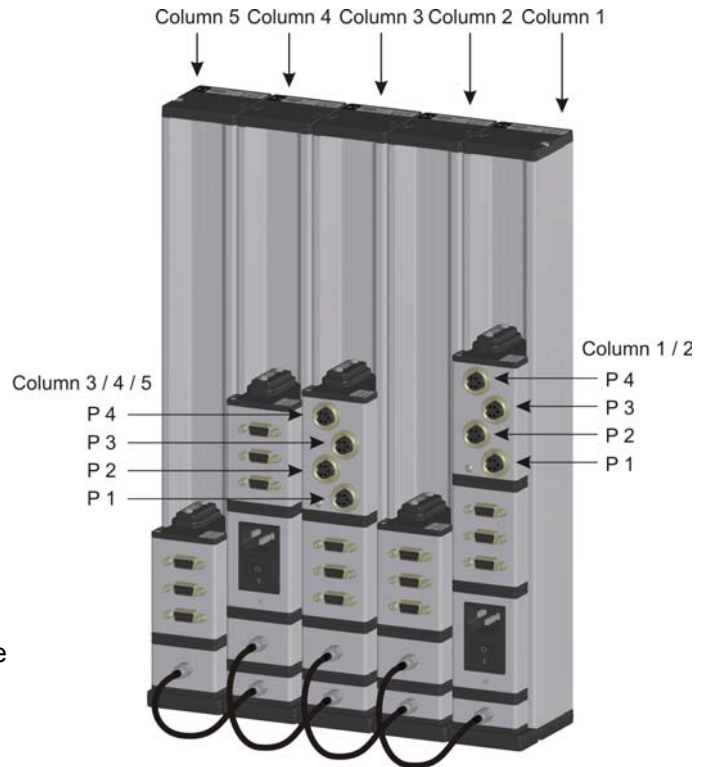
The three-column gauges are linked together via two **IMB-cas** adapter cables. The adapter cables are always fitted in the first position (*bottom slot*), whereat the thinner adapter section is always fitted to the first column gauge. When using several **IMB-cas** adapter cables make sure that the thinner adapter section is fitted in the first position, with the thicker adapter section of the arriving cable directly above it. The power supply module of the first column gauge supplies all three column gauges with power. The measurement inputs **P1** to **P4** are available at all three column gauges.





Example 2 : connecting 5 column gauges

The five column gauges are linked together via four **IMB-cas** adapter cables. The cables are always fitted in the bottom positions, as shown in the illustration. The measurement inputs are passed on from the thinner adapter section towards the thicker adapter section. When using several **IMB-cas** adapter cables make sure that the thinner adapter section is fitted in the first position, with the thicker adapter section of the arriving cable directly above it. The power supply module of column 1 supplies columns 1, 2 and 3 with power. The power supply module of column 4 interrupts the further power supply from column 1 and supplies columns 4 and 5 with power. The measuring module in column 1 makes available the measurement inputs (**P1 to P4**) for columns 1 and 2. The measuring module in column 3 interrupts the connection to the measurement inputs from column 1 and makes available its own measurement inputs at columns 3, 4 and 5.



2.6 Power supply connection

There are three modules available from the IMBus series to supply the column gauge with power :

1. **IMB-ps2 : (Part No. F121 020)**
Switched-mode power supply (SMPS) featuring wide range voltage input from 100 to 240 VAC, 45 to 60 Hz
2. **IMB-dc1 : (Part No. F121 040)**
DC to DC converter for input voltage range from 9 to 32 VDC
3. **IMB-acc : (Part No. F121 030)**
Rechargeable battery (accu-pack) module for battery-operated systems. The module allows quick battery replacement. Rechargeable batteries with capacities of 1850 / 4000 and 5500 mAh are available.

(Example : C200 with 2 inductive probes and a 4000 mAh battery pack can operate for approx. 12 to 15 hours)

First read the sticker information on the fitted power supply module and then check whether the module is suitable for your mains voltage respectively DC voltage. Use the enclosed power cable to connect the **IMB-ps2** to the mains outlet.

Important !!! Insert device plug into grounded outlet only



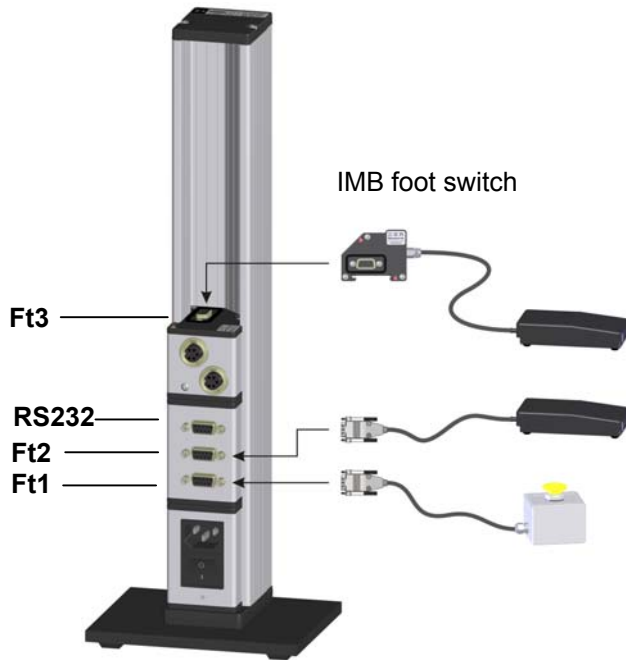


2.7 Connecting a foot or hand switch

The foot or hand switches are connected to the Sub-D ports **Ft1** and **Ft2** of the **IMB-mc1** measuring controller. Foot and hand switches can be cascaded in order to synchronize several column gauges (e.g. for dynamic measuring) by using a foot or hand switch connected to the **Ft1** or **Ft2** connector. The Y-Adapter (Part No. F121 190) can then be used for cascading.

A third foot or hand switch (**Ft3**) can be connected directly to the IMBus. An **IMB foot or hand switch** is used in order to do so. It provides an IMBus connecting part and can be inserted into the IMBus at any place behind the **IMB-mc1** (see illustration below).

The functions of the foot or hand switches can be configured in the “BASIC SETUP” menu (L3 -L5).



Types of foot or hand switches :	Part No.
Foot switch IP32	F121 110
Foot switch IP65	F121 120
IMBus foot switch IP32	F121 130
IMBus foot switch IP65	F121 140
Hand switch IP65.....	F121 150
IMBus hand switch IP65	F121 160

Important !!!
Secure all connections by screwing them tight.

Plug-in connector pin assignments :
see chapter 6

2.8 Connecting adapters for tolerance outputs

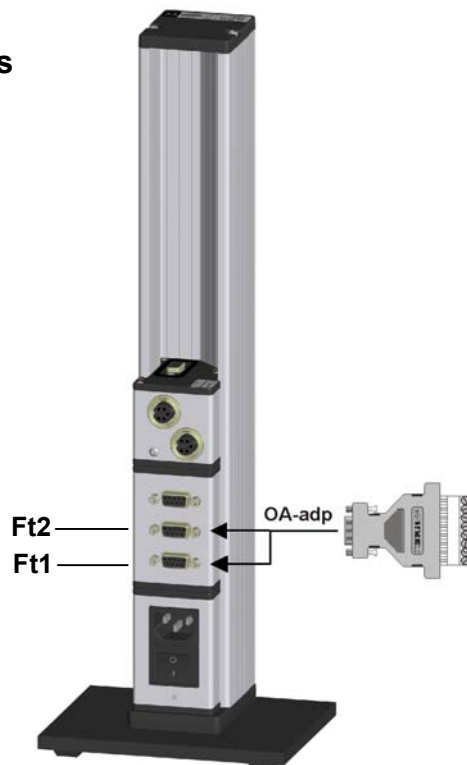
The adapters for the tolerance-controlled outputs are connected at the rear of the column gauge to the **Ft1** or **Ft2** Sub-D ports of the **IMB-mc1** measuring controller.

A total of 5 tolerance-controlled outputs are available:

1. Upper tolerance limit (red) exceeded
2. Upper intervention limit (yellow) exceeded
3. Measured value OK
4. Below lower intervention limit (yellow)
5. Below lower tolerance limit (red)

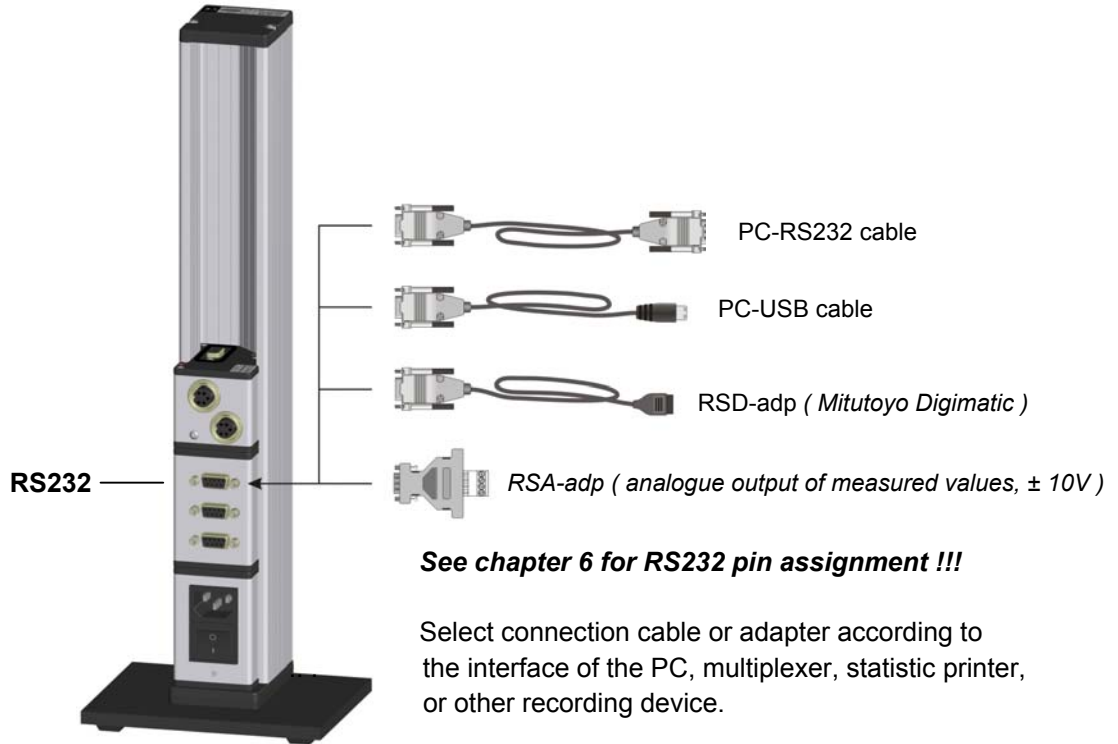
Connection adapter :	Part No.
High-Side Power-FET OA-adp	F603 010

For adapter pin assignment of **OA-adp**
see chapter 6; for more information on the adapter
see Data Sheet, Doc. D2MF603 010.



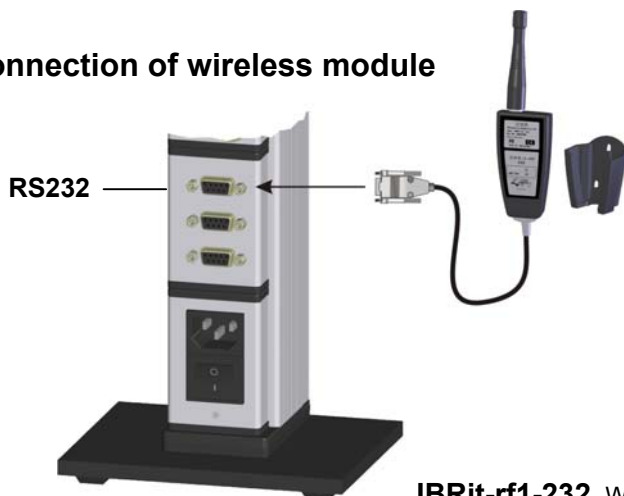
2.9 Connecting a PC, multiplexer or statistic printer

A PC (COM 1... 8, USB), a multiplexer or a statistic printer can be connected at the rear panel of the column gauge via the **RS232** Sub-D port of the **IMB-mc1** measuring controller.



PC-RS232 cable	RS232 connection cable for PC COM1 to COM8 interfaces	F601 003
PC-USB cable	USB connection cable for PCs incl. driver software for emulation of COM1 to 127 interfaces	F601 021
RSD-adp	Connection cable with interface converter to Mitutoyo Digimatic output (cable converts RS232 output to DIGIMATIC output)	F601 030
RSA-adp	adapter with digital / analogue converter to output analogue voltages to a terminal block (adapter converts RS232 output to ±10V analogue output)	F601 031

2.10 Connection of wireless module

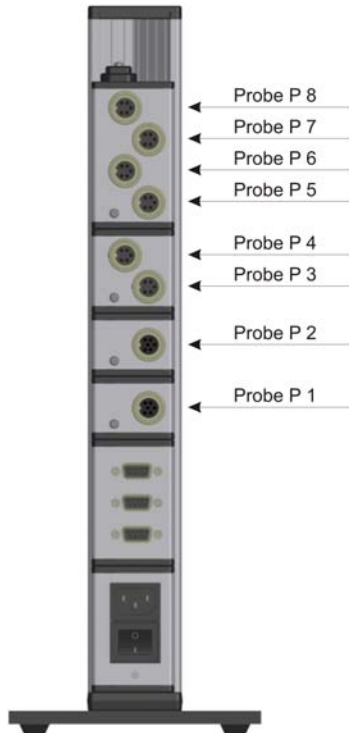


The wireless **IBRit-rf1-232** module is connected at the rear of the column gauge to the **RS232** port. The wireless module enables the wireless transmission of measured values to PCs.
For more information go to : www.IBRit.com (IBRit-rf1 series)

IBRit-rf1-232	Wireless module for stationary gauges with RS232 connector	F604 008
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2.11 Connection of probes, air plug gauges, sensors and measuring instruments

The modular design in conjunction with the **IMBus** measuring and interface modules makes it possible to connect virtually any probe, pneumatic gauge head, sensor or measuring instrument to the column gauge. A maximum of 8 measuring inputs can be handled by the **C200**. It is possible to connect more than 8 inputs, however, the additional inputs are ignored. The **RUN** LED on the bus terminator connector does not light up, if the surplus IMBus modules cannot be completely addressed (see page 10, *Information on Bus Terminator*). The **IMBus** measuring and interface modules can be combined in any order and allow the simultaneous connection of different types of sensors (inductive, digital, pneumatic, etc.). For an overview of **IMBus** measuring and interface modules see chapter 2.12.



Example 1 : Connection of inductive probes

Prior to connecting the probes, check whether the probe types correspond to the type designations listed on the IMBus module (**IMB-im1 / 2 / 4 / 8**). Secure the connectors by screwing them tight.

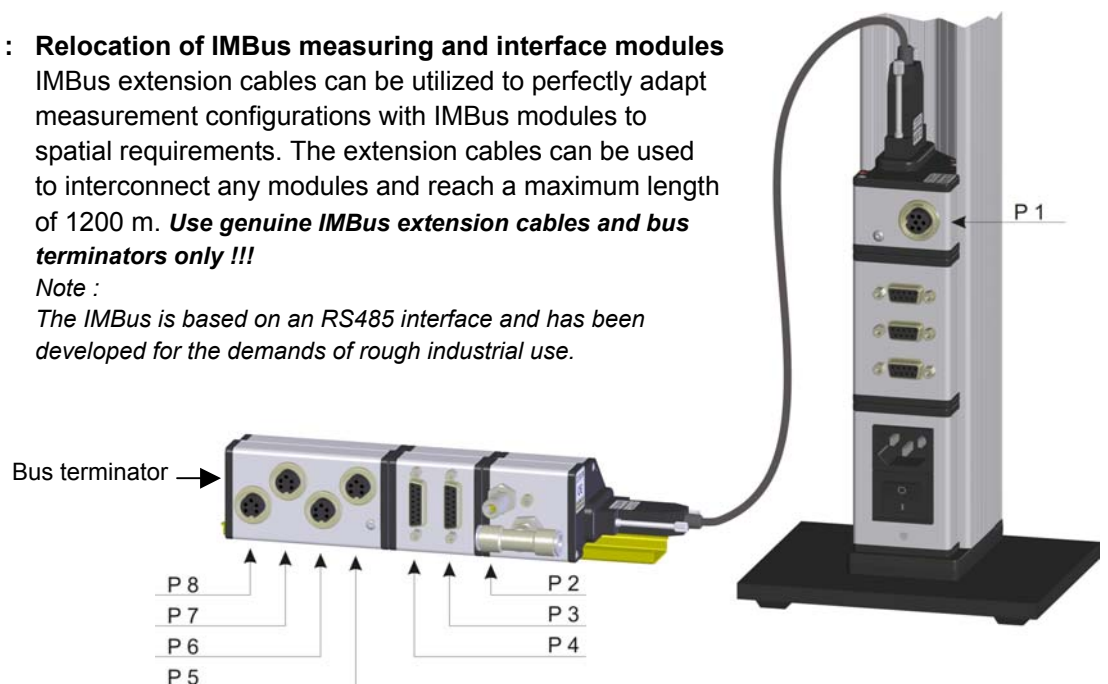


Important !!! *Reliable measurements can only be guaranteed, if the connections have been screwed tight, so that the contact to the probe shielding is good.*

Example 2 : Relocation of IMBus measuring and interface modules

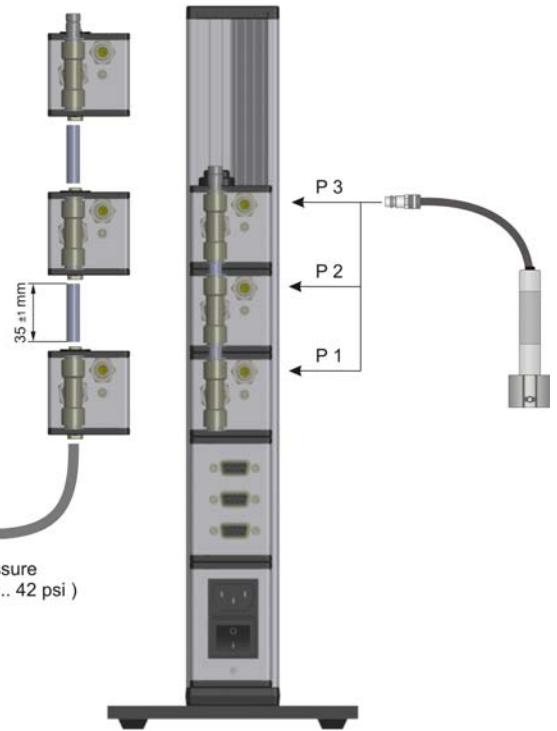
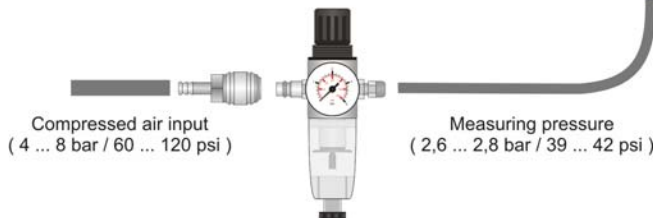
IMBus extension cables can be utilized to perfectly adapt measurement configurations with IMBus modules to spatial requirements. The extension cables can be used to interconnect any modules and reach a maximum length of 1200 m. **Use genuine IMBus extension cables and bus terminators only !!!**

Note :
The IMBus is based on an RS485 interface and has been developed for the demands of rough industrial use.



Example 3 : Connection of pneumatic gauge heads

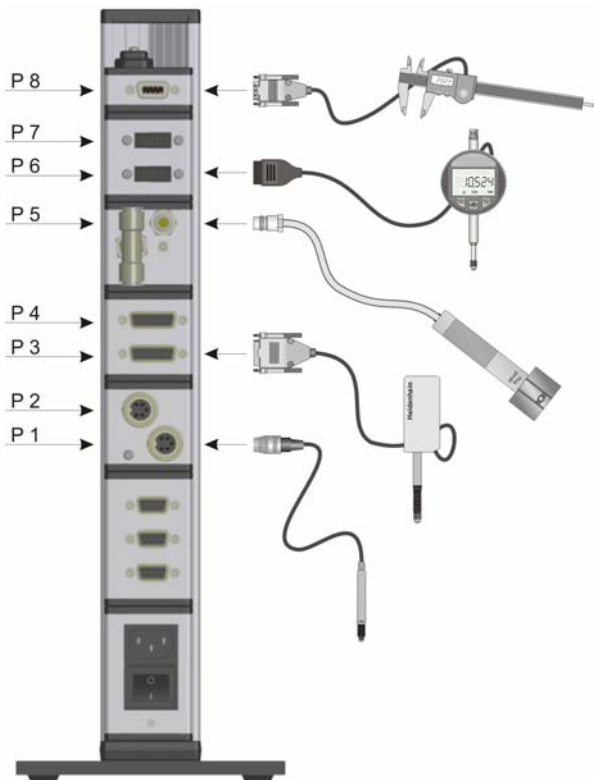
The column gauge allows the connection of up to 8 pneumatic measuring converters **IMB-ae1**. An 8-by-6 mm hose connector (8 mm -> outer diameter; 6 mm -> inner diameter) is used to establish the compressed air supply. A hose piece with a length of 35 mm is required in order to pneumatically interconnect two **IMB-ae1** modules. Use dry, oil-free and filtered (5 µm) compressed air only, ranging from 2.6 ... 2.8 bars (39 ... 42 psi) to connect to the **IMB-ae1** measuring converters (recommended air pressure).



Oil and dirt can destroy the measurement system !!!

For more information see **IMB-ae1 Manual, Doc. D2MF122 081**










Example 4 : Connection of different probes, gauges, sensors and measuring instruments



The example depicts a **C200** configuration for connection of 2 inductive probes (**IMB-im2**), 2 incremental probes with 1Vss output (**IMB-dm2**), one pneumatic plug gauge (**IMB-ae1**), 2 Mitutoyo dial gauges (**IMB-mi2**) and one calliper gauge (Sylvac, Tesa, Mahr, etc.) with Opto RS232 output (**IMB-sm1**).

2.12 IMBus modules at a glance

The modules shown below provide an overview of IMBus measuring and interface modules that can be connected to the **C200** column gauge.

<p>IMB-im1 [F122 061] Measuring module for the connection of im2 [F122 062] 1, 2, 4 or 8 inductive probes im4 [F122 064] im8 [F122 068]</p>	
<p>IMB-dm1 [F122 071] Measuring module for the connection of dm2 [F122 072] 1, 2 or 4 incremental measuring systems dm4 [F122 074] (1Vpp / 11µA - Interface)</p>	
<p>IMB-tc1 [F122 111] Measuring module for the connection of tc2 [F122 112] 1, 2 or 4 incremental measuring systems tc4 [F122 114] (TTL - Interface)</p>	
<p>IMB-ae1 [F122 081] Measuring module for the connection of one pneumatic gauge head [F330 011] AE-FC1 Connection set with filter and regulator</p>	
<p>IMB-ai1 [F122 041] Measuring module with 1, 2, 4 or 8 ai2 [F122 042] analogue inputs (± 10V) ai4 [F122 044] ai8 [F122 048]</p>	
<p>IMB-mi2 [F122 022] Interface module for the connection of mi4 [F122 024] 2, 4 or 8 measuring gauges with mi8 [F122 028] Mitutoyo Digimatic interface</p>	
<p>IMB-sm1 [F122 011] Interface module for the connection of sm2 [F122 012] 1, 2 or 4 measuring gauges with sm4 [F122 014] serial interface</p>	
<p>IMB-pm1 [F122 031] Universal parallel interface module for the pm2 [F122 032] connection of 1, 2 or 4 measuring gauges pm4 [F122 034] with parallel interface [F335 001] IBRit - ts1 Temperatur sensor for components</p>	
<p>IMB-rf1 [F122 121] Radio receiver for IBRit - rf1 radio modules</p>	

!!! For more information see **IMBus series** !!!

2.13 Power on / Self-test

Every time the column gauge is switched on, a self-test will automatically be performed in order to check all system components. If an error is detected during the self-test, the numeric display will indicate an error message.

If the display remains dark, after the **C200** column gauge was switched on, check both, the **VCC** and **RUN** LEDs on the bus terminator connector.

Both LEDs must be lit !!!

VCC - LED is lit if the supplied voltage is within allowed tolerance values.

RUN - LED is lit if the internal self-test for all modules has finished successfully.

See chapter 2.3.3 for more information

A display test routine runs subsequently, during which all display elements are switched on, one after the other. This enables the user to check the function of the display elements. Once the column test has been completed, information on the release of the software is shown on the six-digit numeric display.

Note : The RS232 interface of the column gauge is not active while the self-test is running.



3. Programming the column gauge

The rotary encoder on the front panel is used to make all settings and carry out any programming. During programming the user is guided through the individual menus, step by step, and prompted by the LED and numeric displays. The programming procedure follows a logic structure and becomes self-explanatory after studying it briefly.

Abbreviations used :

- Encoder** : Rotary encoder with pushbutton function
- CW** : Turn rotary encoder clockwise
- CCW** : Turn rotary encoder counterclockwise

3.1 Encoder functions

Turning the encoder By turning the encoder clockwise (CW) in the **Measuring Mode**, you can switch to the **Calibration Mode** or the **Programming Mode**.

In the **Calibration or Programming Mode**, the flashing value or function can be altered by turning the encoder.

CW - increases the value or moves to the next function.

CCW - reduces the value or returns to previous function.

Pushing the encoder By pushing the encoder button in the **Measuring Mode**, the function selected in the Basic Setup is executed.

Programming is carried out in the "BASIC SETUP" menu, section "L2" - Encoder key function in measuring mode.

Push the encoder button in the **Calibration or Programming Mode** to accept the programmed value or the flashing setting respectively.

Push and hold for > 2 sec. The six-digit numeric display indicates the column display range in the **Measuring Mode**.

The programmed value of the corresponding, flashing menu LED is displayed for 1 second in the **Programming Mode**.

This is only valid for the values of "NOMINAL SIZE" and "MASTER VALUE".

Pushing and turning Switches to and from the activated gauges **C1** to **C8** in the **Measuring Mode**.

The gauges (C1 to C8) are activated in the "BASIC SETUP" menu, section "L0" - Activate / deactivate gauges.

3.2 Foot and hand switch functions

The column gauge allows connecting up to 3 foot or hand switches. The functions of the particular switches can be assigned in the **"BASIC SETUP"** menu, sections **L3** to **L5**.





3.3 Quick programming guide for programmers in a hurry

Menu selection and programming

1. Turn the encoder clockwise (CW) to switch to the programming mode.
Turn the encoder counterclockwise (CCW) to exit the programming mode.
2. The respective display element that can be changed flashes in the programming mode.
3. Turn the encoder to alter the flashing display element. (CW → +1 or go to the next function; CCW → -1 or go to the previous function).
4. Push the encoder button to accept or confirm a flashing setting.

Menu overview

Entry of...	Entry or selection...
Calibration mode	→ Perform zero adjustment or calibration Menu for mechanical adjustment of probes
Unit / Resolution	→ mm (0.0001 / 0.001) / inches (0.00001 / 0.0001)
Programming of the column display	
Nominal size	→ Zero point of column display
Tolerances	→ Tolerance values 1 to 4 as relative deviations from nominal size
Measuring inputs	→ Activation of measurement inputs for the selected gauge, Coefficients and linking of measurement inputs P1 to P8
Measuring mode	→ Static measurement Dynamic measurement (Min, Max, TIR, Mean, Bore)
Master value	→ Standard value for zero adjustment Standard values for gauge calibration



Programming of the column display



Basic setup

- L0.** - Activate / deactivate gauges
- L1.** - Gauge selection by auto recognition (on / oFF)
- L2.** - Encoder button function in measuring mode
- L3.** - Foot / hand switch **Ft1** function in measuring mode
- L4.** - Foot / hand switch **Ft2** function in measuring mode
- L5.** - Function of IMB foot / hand switch in measuring mode
- L6.** - RS232 output control
- L7.** - Column display setup (column range, column starting point)
- L8.** - Setting the grading mode (classification)
- L9.** - Timer forced calibration
- LA.** - Setting password protection

For quick help during programming use the programming reference card !!!

The card provides useful information and is a valuable source of information for daily work with the column gauge.

First-time users of the column gauge should carefully read the instructions given in the following chapter, which provides detailed information on the individual programming steps.

Users with basic knowledge of the column gauge should turn to the following chapter for reference.





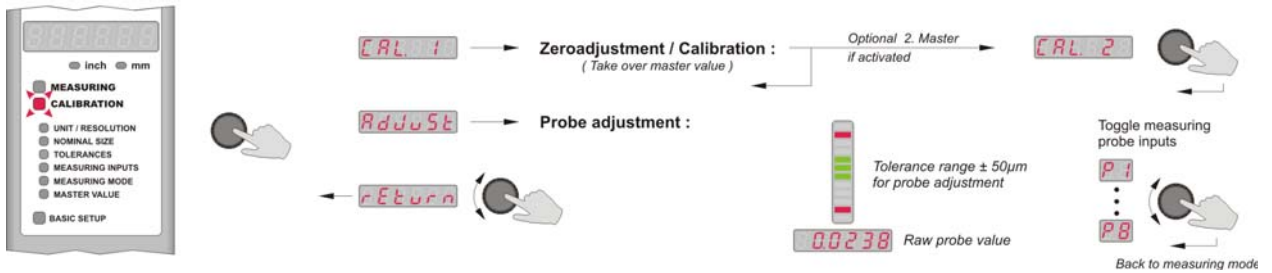
3.4 Description of the calibration mode

Turn the encoder clockwise (CW) to select the **CALIBRATION** menu and then push the encoder button to access the menu.

Three functions are available in the calibration mode :

1. Zero adjustment (one master, **CAL.1** flashes) or calibration (two masters, **CAL.1 / CAL.2** flashes)
2. Mechanical probe setup (**AdJuSt** flashes)
3. Exit menu (**rEtUrn** flashes)

Turn the encoder to select the desired function and then push the encoder button to access the function.



3.4.1 Zero adjustment / Calibration :

If the **CALIBRATION** menu has been selected, the display will alternately change from **CAL. 1** to the currently measured value. Now, place the master or one of the masters in the measuring device (or insert the gauge head into one of the masters). Push the encoder button to perform an automatic **Zero adjustment** or as the case may be, initiate a **Gauge calibration**.

Zero adjustment (only one master was entered in the **MASTER VALUE** menu) :

The master value is adopted as measurement value by the gauge, and the column gauge returns to the measuring mode.

Gauge calibration (two masters were entered in the **MASTER VALUE** menu) :

At the start of the automatic gauge calibration, the first master value was measured, and the numeric display alternately indicates **CAL. 2** and the measured value.

Now, place the second master in the measuring device (or insert the gauge head into the second master) and confirm by pushing the encoder button.

The column gauge then computes the new offset value and the amplification (pneumatic : spread).

The second master value is then adopted as measurement value by the gauge and the column gauge returns to the measuring mode.

Note : Zero adjustment or gauge calibration can also be triggered by a timer forced mode. This function is programmed in the "BASIC SETUP" menu, submenu "L9 - Timer forced calibration" and is described in chapter 3.6.

Attention : Once a gauge has been calibrated with 2 masters, the amplification (pneumatic : spread) determined for this gauge is permanently stored inside the C200. Hence, for measuring operation the C200 could be switched to zero adjustment using only 1 master.

If this gauge is later on reprogrammed for a different measuring task using only a one master adjustment, then the amplification stored for this gauge must be deleted. The ecoder button is held pressed for at least 5 seconds during zero adjustment (as described above, the display will alternately change from **CAL. 1** to the currently measured value) in order to do so. All offset and amplification data is then deleted. A zero adjustment of the gauge must be performed afterwards.





3.4.2 Probe setup

Inductive probes achieve their greatest degree of accuracy within a comparatively small measuring range only. It is therefore extremely important to carefully set up the probes at the electric zero point. On selection of the **AdJuSt** menu, the two-digit numeric display shows the measuring input **P1** and the six-digit numeric display indicates the “raw value” of the probe connected to measuring input 1. The column display tolerance limits have automatically been set to 50µm. The first inductive probe can now be set up. Place a component or a master in the measuring device to do so. Adjust the probe in its holding fixture until the column display turns green. Turn the encoder to activate all measuring inputs (**P1** to **P8**) one after the other and to set up all inductive probes. Push the encoder button to exit the setup menu. The column gauge returns to the measuring mode.

3.4.3 Restrictor adjustment on IMB-ae1 pneumatic measuring converters

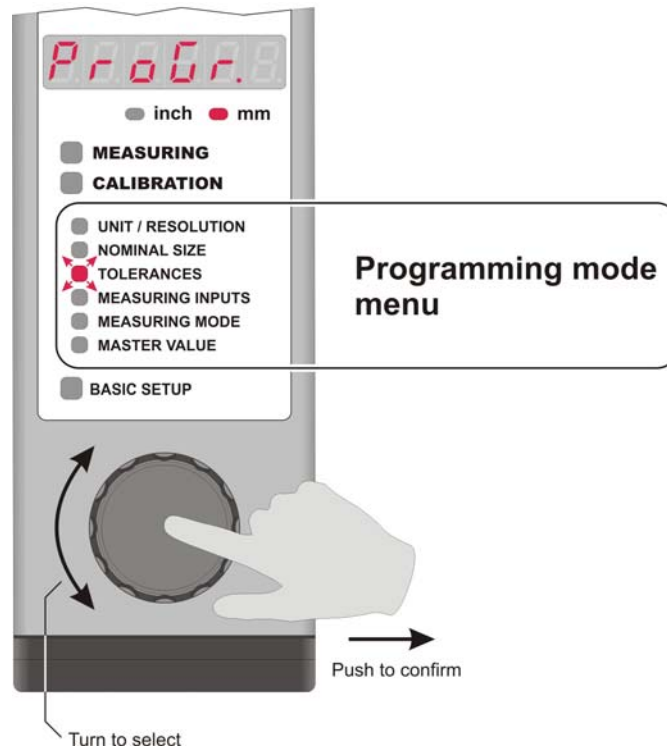
The IMB-ae1 is equipped with a restrictor enabling the adaptation of a wide range of pneumatic gauge heads and the minimization of linearity errors. The restrictor adjustment must be performed only once and allows the best possible adaptation to the airflow of the pneumatic gauge head used for measuring. In case of changing to a gauge head of a different manufacturer, the optimal adaptation can be restored by performing a renewed adjustment of the restrictor. The adjustment is done by means of the column gauge’s setup menu. On selection of the **AdJuSt** menu, the two-digit numeric display shows the measuring input **P1** and the six-digit numeric display indicates the “raw value” of measuring input 1. The restrictor of the first pneumatic measuring converter can now be adjusted. For optimum adjustment the procedure with two masters is recommended. In case of highest requirements concerning measurement linearity the adjustment can be performed with three masters. Both adjustment procedures are described in chapter 4.4 of this instruction manual. Turn the encoder to activate all measuring inputs (**P1** to **P8**) one after the other and to adjust the restrictors of all pneumatic measuring converters. Push the encoder button to exit the setup menu. The column gauge returns to the measuring mode.





3.5 Description of the programming mode

Turn the encoder clockwise (CW) to switch from the **Measuring Mode** to the **Programming Mode**.
 - The six-digit numeric display indicates 'ProGr.'.



Programming menus :

UNIT / RESOLUTION



You can select the first menu (**UNIT / RESOLUTION** - LED flashes) by pushing the encoder button. The menu allows selecting both the **Unit of Measurement** and the measurement **Resolution**. Turn the encoder to select the unit of measurement, either “mm” or “inch” and then confirm by pushing the encoder button. Afterwards turn the encoder to select the measurement resolution and confirm by pushing the encoder button.

The **UNIT / RESOLUTION** - Led is flashing again now.
 Turn the encoder :

- CW - to go to the **NOMINAL SIZE** menu item
- CCW - to return to the measuring mode **MEASURING**

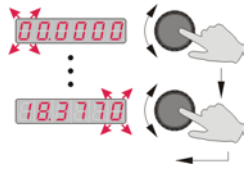
Note :

When changing the unit or the resolution, the programmed numeric values, such as master values, nominal sizes and tolerances are not automatically changed by the column gauge.





NOMINAL SIZE



Turn the encoder to select the desired number of the flashing point and then confirm by pushing the encoder button.

The nominal value determines the value at which the zero point (*no deviation*) is indicated on the column display. If the nominal value for a component is for instance 20 mm, the column will indicate a deviation of 0.1 mm with a component of 20.1 mm.

If you just want to check and not change the nominal size, turn the encoder to select the **NOMINAL SIZE** menu (*LED flashes*) and then push and hold the encoder for more than 2 seconds. The display will briefly indicate the nominal size value without starting the menu.

Note : The nominal size value is used for zero positioning of the column display only and does not influence the numeric display.

TOLERANCES



In this menu you can programme up to 4 tolerance limits to indicate the relative deviation from the nominal size.

The first step in programming is to select one tolerance mark. The column display therefore superimposes the 4 tolerance marks :

- + **red** - upper tolerance limit
- + **yellow** - upper intervention limit
- **yellow** - lower intervention limit
- **red** - lower tolerance limit

The corresponding, active tolerance mark flashes. Turn the encoder to switch from one tolerance mark to another. The numeric display will indicate the respective state (OFF) or the tolerance value set for the flashing tolerance mark.

Push the encoder button to start the programming procedure for the respective tolerance mark.

Switch the tolerance mark ON or OFF via **on/oFF** on the numeric display by turning the encoder. If the tolerance mark has been activated, the **relative deviation** to the nominal size can now be entered.

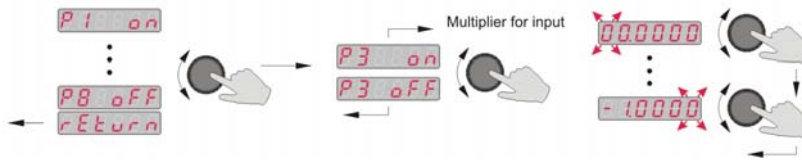
See the following table for information on the possible range of values for tolerance settings :

Unit	Resolution	Min. value	Max. value
mm	0,001	-59,999	59,999
mm	0,0001	-5,9999	5,9999
inch	0,0001	-5,9999	5,9999
inch	0,00001	-0,59999	0,59999





MEASURING INPUTS



The **MEASURING INPUTS** menu enables assigning the measuring inputs (**P1** to **P8**) to the currently selected gauge (**C1...C8**).

The 8 inputs can be linked in any order (e.g.: $P1+P2$, $P1-P2$, $P1+P2 - P3+P4$, etc.).

Every measuring input can be multiplied by a “device coefficient” (multiplier) ranging from 0.001 to 59.999. Enter **1** as the multiplying factor, if the input is to be added without correction; enter **-1**, if the input is to be subtracted without correction.

Examples :

a) **Bore gauge :**

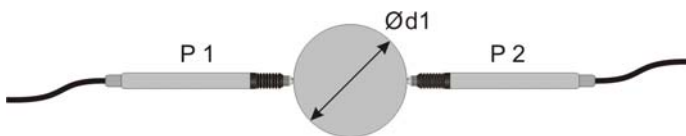
$$\text{Ø d1} = - P1$$



P1	-1.000
P2	off
P3	off
P4	off
P5	off
P6	off
P7	off
P8	off

b) **Shaft measurement :**

$$\text{Ø d1} = P1 + P2$$



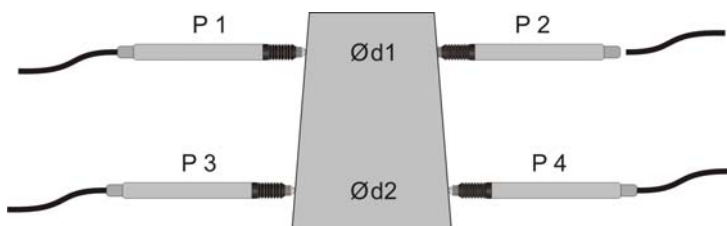
P1	1.000
P2	1.000
P3	off
P4	off
P5	off
P6	off
P7	off
P8	off

c) **Taper measurement :**

$$\text{Taper} = \text{Ø d2} - \text{Ø d1}$$

$$\text{Taper} = (P3 + P4) - (P1 + P2)$$

$$\text{Taper} = P3 + P4 - P1 - P2$$



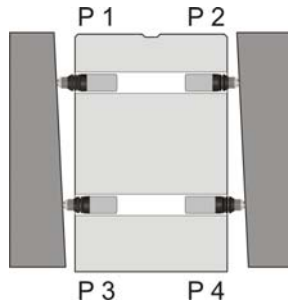
P1	-1.000
P2	-1.000
P3	1.000
P4	1.000
P5	off
P6	off
P7	off
P8	off





d) **Angle measurement :**
$$\text{Angle} = \frac{P1 - P2}{2} - \frac{P3 - P4}{2}$$

$$\text{Angle} = 0.5 \cdot P1 - 0.5 \cdot P2 - 0.5 \cdot P3 + 0.5 \cdot P4$$

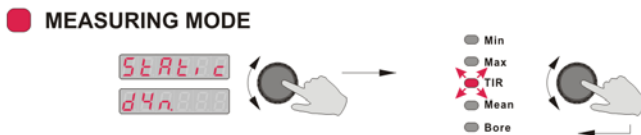


P1	0.5
P2	- 0.5
P3	- 0.5
P4	0.5
P5	off
P6	off
P7	off
P8	off

Note : If all measuring inputs are switched off, the numeric display of the column gauge will indicate 'Err. 01' because measurement operation is not possible.

*If the same measuring input is assigned to several gauges in the operating mode **Gauge selection by auto recognition**, the numeric display of the column gauge will indicate 'Err. 08'.*

If a measurement value would change for a measuring input that is assigned several times, the measurement values for several gauges would change at the same time, and an automatic gauge selection would consequently not be possible.



In addition to the static measuring mode, the **C200** column gauge also has several dynamic measuring modes available. Each of the 8 gauges (**C1** to **C8**) can be assigned its own measuring mode without any restriction.

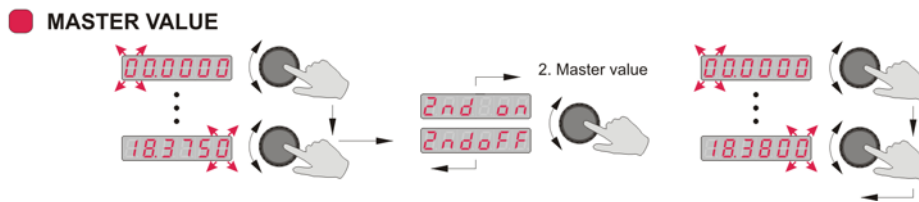
Turn the encoder to select the **MEASURING MODE** and then push the encoder button to access the menu. In the display "**StAtic**" will flash. Turn the encoder to switch from the static to the dynamic measuring modes (*flashing display: "dyn"*) and vice versa.

After selecting the required measuring mode (**static / dynamic**), push the encoder button to confirm the selected mode.

In the dynamic measuring mode, you can select the particular mode by turning the encoder. Then push the encoder button to confirm the selected mode.

- Min** → Minimum
- Max** → Maximum
- TIR** → Max - Min
- Mean** → (Max + Min) / 2
- Bore** → Special bore mode. Zero adjustment is performed in this mode by applying the most recent dynamic measurement result





Turn the encoder to select the desired number of the flashing point and then confirm by pushing the encoder button.

- The first master value is programmed -

The numeric display now flashes and indicates “**2nd on**” or “**2nd off**”. Turn the encoder to select whether a zero adjustment (*requires one master only, “2nd off”*) or a gauge calibration with two masters (“**2nd on**”), is to be programmed. With “**2nd on**”, the second master will then have to be entered.

Note :

The automatic zero adjustment prerequisites the previous entry of a master (*standard measure value*). During automatic zero adjustment, (*select calibration mode; place master in the measuring device and confirm Cal. 1 by pushing the encoder button*) the master value is adopted as measurement value by the gauge.

The master value is programmed at zero if relative measurements are to be taken (*indicates the deviation from the nominal value*). In this case, the master value should equal the nominal value.

The automatic gauge calibration can be performed as an option to the automatic zero adjustment function, if pneumatic sensors are being used. Two masters will have to be programmed in order to do so. If the same value is programmed for both masters, the numeric display will briefly indicate ‘**Error**’ and the menu of the second master will be started again automatically.

Note : *An offset value is used to set the zero position of the gauge in reference to the master when the automatic **Zero Adjustment** is performed. When performing an automatic **Gauge Calibration**, not only the offset value (zero position) is set, but also the gain (pneumatic : spread) is adapted automatically.*

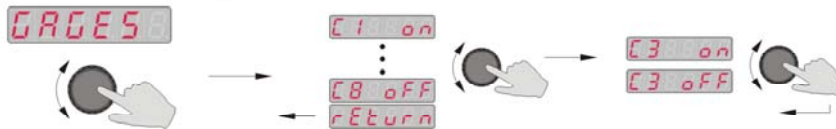


3.6 Basic setup

The Basic Setup menu comprises all basic device settings which are usually only programmed during the initial operation.

*The basic factory setting is identified by an * in the individual menus.*

L0 Activate / deactivate gages



GAGES Push the encoder button to select the menu. Turn the encoder to browse through the individual gauges from **C1** to **C8**. The numeric display will indicate the number of the gauge and its current status (**on** / **OFF**).

To change the status of a gauge, push the encoder button and then turn the encoder to select the new status. Push the encoder button again to confirm the new status.

Note : If all gauges have been switched off (**OFF**), the gauge **C1** is automatically switched on again when exiting the programming menu, because measurement operation is not possible without an active gauge.

L1 Gage selection by auto recognition



Aut. on : Automatic gauge selection by auto recognition
Aut. off : Manual gauge selection with encoder key or foot switch
 see : [L2 ... L5], GAGE.SL.

Auto.rE. In this menu you can choose either **Manual gauge selection** or **Automatic gauge selection by auto recognition**.

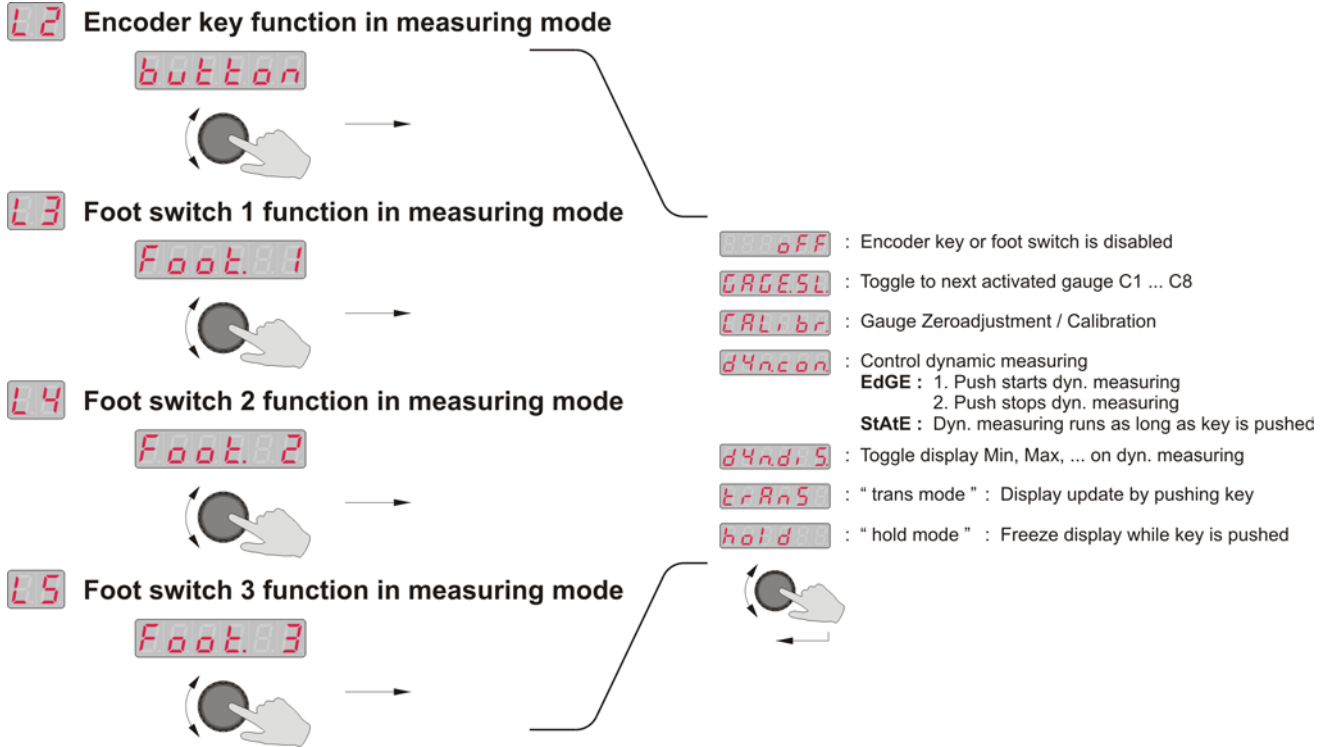
Push the encoder button to select the menu. The numeric display indicates **Aut.oFF** / **on**. Turn the encoder to activate (**on**) or deactivate (**OFF**) the automatic gauge selection function. Push the encoder button again to confirm the new status.

Note : If one measuring input **P1** to **P8** is assigned to several gauges in the operating mode **Gauge selection by auto recognition**, the numeric display of the column gauge will indicate 'Err. 08'.
 If a measurement value would change for a measuring input that is assigned several times, the measurement values for several gauges would change at the same time, and an automatic gauge selection would consequently not be possible.





In the Basic Setup menus **L2** to **L5** controlling of the **C200** via the encoder button and the foot or hand switch connections **Ft1**, **Ft2** as well as the IMB foot switch **Ft3** is set. The encoder button and each one of the 3 foot or hand switch connections can be assigned any function from the list.



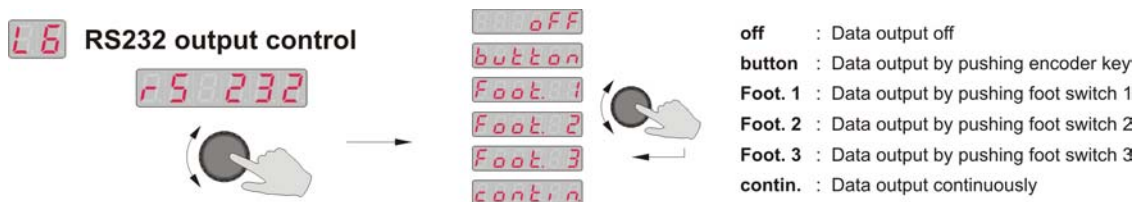
Description of the different functions :

- oFF *** - No function assigned to the encoder button or the respective foot or hand switch.
- GAGESL.** - If this function has been assigned to a particular button or switch, and if that button or switch is then activated in the measuring mode, you will automatically switch to the next activated gauge from **C1** to **C8**.
- CALibr.** - If this function has been assigned to a particular button or switch, and if that button or switch is then activated in the measuring mode, an automatic zero adjustment or an automatic gauge calibration will be performed on the currently active gauge (**C1** to **C8**).
- dYn.con.** - If this function has been assigned to a particular button or switch, and if that button or switch is then activated in the measuring mode, the dynamic measurement function can be controlled.
 There are two control options :
EdGe : 1. Actuation starts the dynamic measurement function
 2. Actuation stops the dynamic measurement function
StAtE : The dynamic measurement function runs for as long as the button or switch is activated.
- dYn.diS.** - If this function has been assigned to a particular button or switch, and if that button or switch is activated in the measuring mode, you will switch between the dynamic modes (**Min**, **Max**, **TIR**, etc.) with display of the measured values. The currently active gauge however, must have been programmed for a dynamic measurement mode. This function enables viewing the four results for the **Min**, **Max**, **TIR**, and **Mean Value** of the component after a dynamic measurement has been taken.





- trAnS** - The activation of the **trAnS** mode freeze-frames the numeric and column display of the **C200** column gauge. Every time a programmed input (**Encoder button, Ft1, Ft2, Ft3**) is actuated, the currently measured value will be displayed.
- hold** - The activation of the **hold** mode effects that the display is freeze-framed while the programmed input is actuated (**Encoder button, Ft1, Ft2, Ft3**).



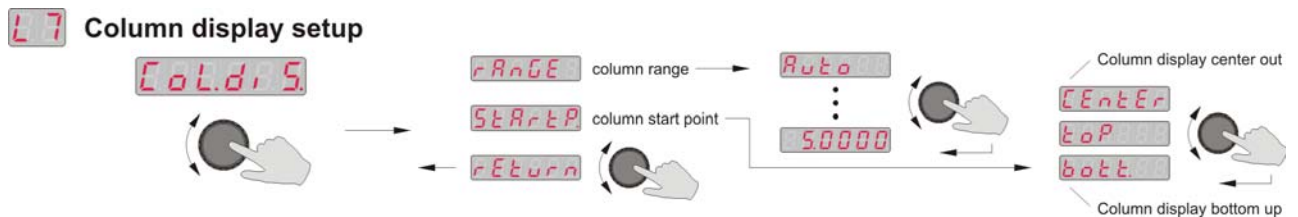
- rS 232** - The output of measurement values via the serial interface of the column gauge is programmed in this menu.

Assignment : **Button** = Encoder button
Foot. 1 = Foot or hand switch input **Ft1** (Sub-D port of IMB-mc1 module)
Foot. 2 = Foot or hand switch input **Ft2** (Sub-D port of IMB-mc1 module)
Foot. 3 = Foot or hand switch input via **IMBus** (Sub-D port)

Note : A dual function assignment for the foot or hand switch inputs **Ft1, Ft2** and **Ft3** is possible.

Examples of dual function assignments :

- Ft1** - Initiates the transfer of data via the RS232 interface and then switches to the next gauge (**C1** to **C8**).
- Ft1** - Initiates a dynamic measurement. With the second actuation, the measurement is completed and the result is sent to the RS232.



- Col.diS.** - In this menu the range and the starting point of the column display is set.

rAnGE - **mm** Auto* / 0.0050 / 0.0150 / 0.0500 / 0.1500 / 0.5000 / 1.5000 / 5.0000
inches Auto* / 0.00050 / 0.00150 / 0.00500 / 0.01500 / 0.05000 / 0.15000 / 0.50000

Note : In the **Auto** mode the column gauge automatically selects the column display range according to the tolerance limits programmed.

StArtP. - **CentEr** Column display starts at the centre and moves upwards or downwards
toP Column display moves from the top to the bottom
bott. Column display moves from the bottom to the top





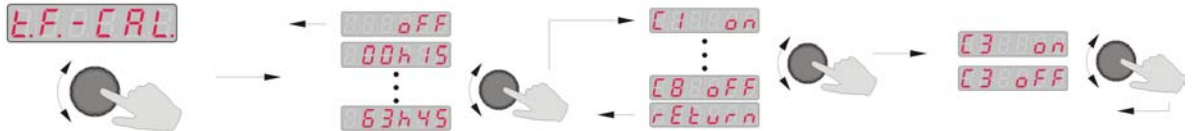
L8 Grading mode



GrAdE The grading mode can be activated or deactivated independently for each gauge (**C1** to **C8**) in this menu. The number of grading groups (classes) can be set from **1** to **30** and determines in how many, equal fields (*linear pitch*) the tolerance range is split.

Note : If no tolerance limits have been specified, the numeric display in the measuring mode indicates “ ----- ”.

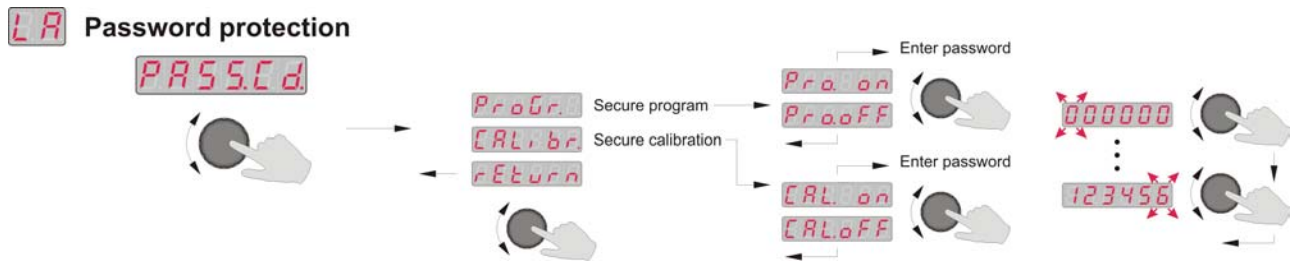
L9 Timer forced calibration



t.F.-CAL In this menu the timer forced calibration can be activated for each gauge (**C1** to **C8**). At first the time interval is set to a value from 15 minutes up to 63 hours and 45 minutes (in 15 minute steps). Then those gauges are selected for which the timer forced calibration shall be activated. The same time interval applies to all selected gauges. The column gauge automatically switches to the calibration mode, as soon as the time interval has elapsed. The **Calibration** - LED flashes and the measuring mode is locked. After pushing the encoder button, a calibration of the displayed gauge can be performed as described at 3.4.1.

Note : If the timer forced calibration has been activated for several gauges, then those gauges that were not selected for display on the column gauge as the time interval elapsed, must be calibrated as soon as they are selected for display.





PASS.Cd. For the protection of calibration and / or programming data, password protection can be activated in this menu. The numeric display will prompt the assignment of a six-digit password for password protection of calibration or programming data.

Note : If the calibration menu or the programming menu is selected later on, the column gauge prompts the entry of the six-digit password. (If you have forgotten one or both passwords, use the master password **200879** to access the required menu.)



3.7 Restoring factory settings

In order to reset the column gauge to the factory settings, push and hold the encoder button for approx. 5 seconds on the menu item **BASIC SETUP** (**BASIC SETUP** LED flashes) until the numeric display flashes and indicates "rSt oFF".

1. Turn the encoder to select "rSt. on".
2. If the encoder button is pushed with "rSt. on", resetting is confirmed and executed.
3. If the encoder button is pushed with "rSt. oFF", resetting is aborted.





3.8 Error messages / Corrective actions

The numeric display indicates **Operating and Programming Errors** caused by the user as well as **System Errors** of the column gauge.

3.8.1 Operating and programming errors

Err. xx : error message (Err), error number (xx)

Error	Error description	Corrective action
Err. 1	All measuring inputs are switched off in the probe interconnection or one of the measuring inputs is defective.	<ol style="list-style-type: none"> 1. Select MEASURING INPUTS and check to make sure that at least one measuring input is activated. 2. Select CALIBRATION and then AdJuSt and check the individual measuring inputs.
Err. 2	The wrong password was entered.	Enter the correct password. <i>(If you have forgotten the password, you can use the default password 200879.)</i>
Err. 8	Automatic gauge selection is activated. One measuring input has been assigned to several gauges. The automatic selection of an active gauge is not possible because this input also changes the measured values of various other gauges.	There are two ways to eliminate the error : <ol style="list-style-type: none"> 1. Select BASIC SETUP – L1 menu and set Aut.oFF. 2. Select MEASURING INPUTS and deactivate the input that was assigned repeatedly.
Err. 10	For automatic gauge calibration, the same master was placed in the measuring device twice.	Repeat the calibration procedure using two different masters.
Err. 11	The discrepancy between the two masters is too large. (discrepancy > 6.5 mm)	Repeat the calibration procedure using two masters that are not that different.
Err. 12	The discrepancy between the two programmed master values is too large. (discrepancy > 6.5 mm)	Select the menu MASTER VALUE and reprogramme the master values.
Err. 13	Error performing the automatic gauge calibration. The calibration factor is too small.	The difference between the programmed master values is much smaller than the difference between the measured master values. Repeat the calibration procedure and check the master values programmed in the MASTER VALUE menu.
Err. 14	Error performing the automatic gauge calibration. The calibration factor is too large.	The difference between the programmed master values is much larger than the difference between the measured master values. Repeat the calibration procedure and check the master values programmed in the MASTER VALUE menu.





3.8.2 System errors

System errors are displayed in the event of hardware problems. These error messages assist our service department in analysing the problem. Switch off the device and then switch it on again. If the error message recurs, please contact the **IBR service department**.

Error	Error description	Corrective action
no.dAtA	The C200 does not receive any measurement data. Possible causes : 1. No IMBus modules have been connected, or an IMBus module is defective. 2. Cascading is not possible because the C200 with the IMBus measuring and interface modules is still turned off.	1. Check IMBus modules. 2. Turn on all C200s for cascading.
Err. 97	The bootloader version of a connected IMBus module is < 1.2.	No correction possible. The connected IMBus module is not compatible with the C200.
Err. 98	The firmware version of a connected IMBus module is < 1.6.	Update IMBus module firmware.
Err. 99	Settings were not saved correctly.	Repeat previous action.





4. Working with the column gauge

4.1 Initial operation

- ◆ **Start by fitting the base and connecting the accessories (probes, foot switches, etc.).**
Follow the instructions given in chapter 2 of this manual.
- ◆ **Then programme the column gauge for your application.**
Follow the instructions given in chapter 3 of this manual.
Use the manual or the programming card in order to go through all settings.
- ◆ **Now use the master or a component to mechanically setup the probes in the holding fixture of the measuring device.** See chapter 4.3
- ◆ **If pneumatic gauge heads are to be used, perform a restrictor adjustment on each IMB-ae1 pneumatic measuring converter.** See chapter 4.4
- ◆ **Perform column gauge zero adjustment or calibration.** See chapter 4.5 and 4.6
Note : The IMBus modules have been calibrated at the factory for the specified type of probe. Recalibration by the user will only be necessary under exceptional circumstances, e.g. when using uncalibrated probes or extension cables.
- ◆ **The column gauge is now ready for measurement operation.**

4.2 Measuring operation

- Prior to starting measuring operation you should always perform an **automatic Zero adjustment** using the masterpiece supplied in order to compensate all offset errors caused by fluctuations in temperature, wear and so on. See chapter 4.5.
- In Case of measuring applications using pneumatic converters (or in case of special applications requiring two masters) an **automatic Gauge calibration** rather than an **automatic Zero adjustment** is performed. See chapter 4.6.
The automatic gauge calibration corrects all offset and gain (spread) errors.
Switching from the “**automatic Zero adjustment**” to the “**automatic Gauge calibration**” is carried out by programming a second master in the **MASTER VALUE** programming menu.

4.3 Mechanical setup of inductive probes

Inductive probes achieve their greatest degree of accuracy within a comparatively small measuring range only. For this reason it is very important to setup the probes with great care.

1. Use the encoder to select the “**CALIBRATION**” menu.
The calibration menu is password protected, if the numeric display indicates “PASS.Cd.”.
(See **BASIC SETUP “LA – PASS.Cd.”**)
2. Use the encoder to select and start the “**AdJuSt**” function.
3. The column display automatically changes to a display range of $\pm 150 \mu\text{m}$ and sets two tolerance marks at $\pm 50 \mu\text{m}$ for guidance.
4. Turn the encoder to browse through the “raw values” of the different measuring inputs from **P1** to **P8**.
5. Adjust the probe placed on a component or the master to its electric zero point. The probe has been adjusted with sufficient accuracy if the displayed value is located in the green area ($\pm 50 \mu\text{m}$).
6. When all probes have been adjusted properly, push the encoder button to exit the setup mode. The column gauge will automatically switch to the measuring mode.





4.4 Restrictor adjustment on IMB-ae1 moduls

Restrictor adjustment with 2 masters :

1. Use the encoder to select the "**CALIBRATION**" menu.
The calibration menu is password protected, if the numeric display indicates "PASS.Cd."
(See **BASIC SETUP "LA – PASS.Cd."**)
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 column gauge will automatically switch to the measuring mode.
7. **Perform a gauge calibration before beginning measurement operation.**
(Please refer to chapters 3.4 and 4.6 of this 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 (see chapters 3.4 and 4.6 of this instruction 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.*



4.5 Automatic zero adjustment of gauges

- **Place the master in the measuring device**
- Use the encoder to select and start the **“CALIBRATION”** menu.
*The calibration menu is password protected, if the numeric display indicates **“PASS.Cd.”** (See **BASIC SETUP “LA – PASS.Cd.”**)*
- The numeric display alternately indicates **“CAL. 1”** and the currently **measured value**.
- Push the encoder button to execute the automatic zero adjustment. The master value is adopted as measurement value by the gauge and the column gauge returns to the measuring mode.

*The automatic zero adjustment can also be executed in the measuring mode by actuating the encoder button, foot or hand switch, or an external contact. The **“BASIC SETUP”** (menus **L2 ... L5**) must be programmed accordingly in order to allow this option. The automatic zero adjustment can also be triggered by a timer forced mode. This function is programmed in the menu **L9** of the **“BASIC SETUP”**.*

4.6 Automatic gauge calibration

The automatic gauge calibration is activated by programming two masters.

Procedure :

- **Place one of the two masters in the measuring device (or insert the gauge head into one of the masters).**
- Use the encoder to select and start the **“CALIBRATION”** menu.
*The calibration menu is password protected, if the numeric display indicates **“PASS.Cd.”** (See **BASIC SETUP “LA – PASS.Cd.”**)*
- The numeric display alternately indicates **“CAL. 1”** and the currently **measured value**.
- Push the encoder button to confirm the first master.
- The numeric display alternately indicates **“CAL. 2”** and the currently **measured value**.
- Place the second master in the measuring device (or insert the gauge head into the second master).
- Push the encoder button to confirm the second master.
- Now, the column gauge automatically calibrates the currently selected gauge. The second master value is adopted as measurement value by the gauge and the column gauge returns to the measuring mode.

*The automatic gauge calibration can also be executed in the measuring mode by actuating the encoder button, foot or hand switch, or an external contact. The **“BASIC SETUP”** (menus **L2 ... L5**) must be programmed accordingly in order to allow this option. The automatic gauge calibration can also be triggered by a timer forced mode. This function is programmed in the menu **L9** of the **“BASIC SETUP”**.*

4.7 Multi gauging (C1 ... C8)

The **C200** column gauge allows programming up to 8 independent gauges (**C1 to C8**).

The unit, resolution, nominal size, tolerance, measuring mode and master values can be programmed for each individual gauge. You can switch over to the individual gauges (**C1 to C8**) in the **“MEASURING”** mode by pressing and turning the encoder at the same time, if the function “manual gauge selection” is activated. The gauge selection can also be performed in the measuring mode by actuating the encoder button, foot or hand switch, or an external contact. The **“BASIC SETUP”** (menus **L2 ... L5**) must be programmed accordingly in order to allow this option.

The gauge selection (**C1 to C8**) is performed automatically, if **“Aut. on”** was set in the **“BASIC SETUP”** menu (**“L1 – Auto.rE.”**). A change in the measured value of a gauge (**C1 to C8**) switches over the column automatically to the corresponding gauge.

Note : This operating mode is preferred mainly for applications with several bore gauges.

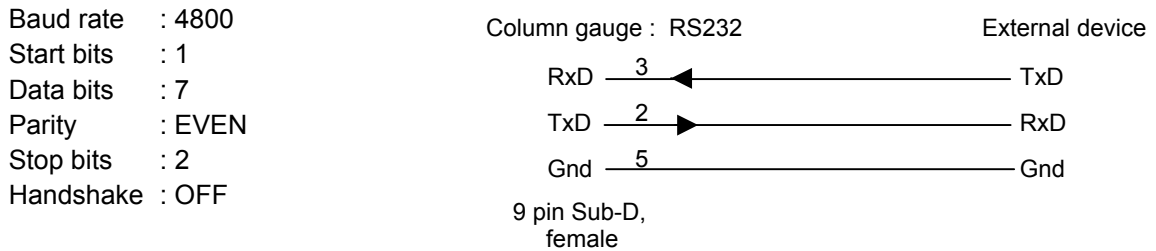




5. The RS232 interface

The column gauge is equipped with an RS232 interface to support the output of measurement data to computers, multiplexers, statistic printers and so on. The “**RS232**” connector is located on the **IMB-mc1** at the rear of the column gauge. Transmission and data formats are according to **Opto RS232**.

5.1 Transmission format and wiring



5.2 Data format

The data format has a fixed length of 10 digits including the end character <cr> = ASCII 13. The measured value always starts with a sign (+/-) followed by leading zeroes. The decimal point is shifted according to the unit and the resolution chosen.

Unit	Resolution	Data format
mm	0.0001 mm	“± 012.3456 <cr>”
mm	0.001 mm	“± 0123.456 <cr>”
inch	0.00001 inch	“± 01.23456 <cr>”
inch	0.0001 inch	“± 012.3456 <cr>”
Meas. values outside of measuring range		“OV <cr>”

5.3 Table of commands

Command	Function
"? <cr>"	Request current measured value displayed on numeric display
"1 ... 8 <cr>"	Selection of gauge C1 ... C8
"I <cr>"	Request type of device / version: " C200 V1.0 <cr> "
"S <cr>"	Start / Stop dynamic measurement
"Z <cr>"	Executes zero adjustment
<i>Note : This command cannot be used to execute a gauge calibration with two masters</i>	
"A <cr>"	Simulates the actuation of foot / hand switch at Ft1 port
"B <cr>"	Simulates the actuation of foot / hand switch at Ft2 port
"C <cr>"	Simulates the actuation of foot / hand switch connected to the IMBus
"T <cr>"	Status request of foot / hand switch inputs as well as encoder button : e.g. " 0 1 0 0 <cr> " ('0' = not actuated; '1' = actuated)
	<ul style="list-style-type: none"> — Status of foot / hand switch connected to the IMBus — Status of foot / hand switch at Ft2 port — Status of foot / hand switch at Ft1 port — Status of encoder button

*Note : The commands are only executed, if the menu **MEASURING** has been selected. All characters set in inverted commas (e.g. "? <cr>") are transmitted in ASCII format.*





5.4 Requesting measurement values

The column gauge supports requesting measurement values by using the request-string “?” via the Opto RS232 interface. (bi-directional Opto - RS232)

Example : Computer program (DOS, BASIC)

110 OPEN “COM1,4800,E,7,2” FOR RANDOM AS #1	... Open COM interface
120 PRINT#1, “?” +CHR\$(13)	... Request measurement value
130 INPUT #1,A\$... Read measurement value
140 PRINT A\$... Display measurement value
150 CLOSE #1	... Close COM interface

5.5 Transmission of measurement values

The **BASIC SETUP** menu - L6 allows 2 different settings for the transmission of measurement values.

1. The transmission of measurement values can be triggered by actuating the encoder button or the foot or hand switch.
2. Continuous transmission of measurement values from the column gauge.
See chapter 3.6 [L6]

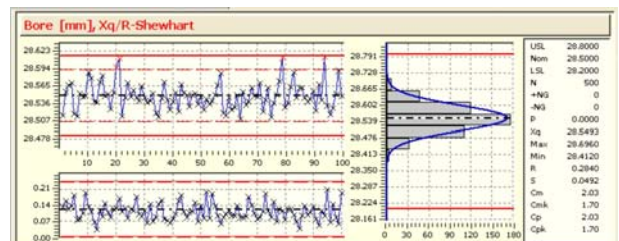
5.6 Importing measurement values into Windows applications

The **IBR_Device Driver Kit = IBR_DDK.DLL** is available to programmers for importing measurement data into 32-bit Windows applications. Examples for C++, Delphi and Visual Basic are included. The **IBR_DDK.DLL** offers an API interface as well as a COM interface (ActiveX) and can be downloaded free of charge from our website : www.IBRit.com.

- Features of the IBR_DDK.DLL :**
- ◆ Parallel operation of up to 8 interfaces (COM or USB)
 - ◆ Universal interface to all IBR interface and measuring devices
 - ◆ Examples for VB, VC++ and Delphi

5.7 Importing measurement values into MS EXCEL

IBREXDLL enables reading measurement data in MS-Excel and assigning that data freely to the cells of any Excel workbook. The measurement data can come from any IBR interface and measuring devices. The collected data can later be analysed statistically by control charts, histograms and so on.

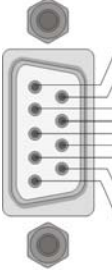




6. Connector pin assignments

6.1 IMB-mc1 measuring controller connectors

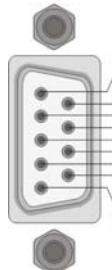
RS232



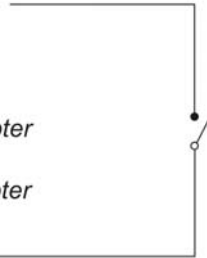
1 - n.c.	
6 - DTR (Output)	<i>In conformance with EIA RS232 Standard</i>
2 - TxD (Output)	<i>In conformance with EIA RS232 Standard</i>
7 - n.c.	
3 - RxD (Input)	<i>In conformance with EIA RS232 Standard</i>
8 - RTS (Output)	<i>In conformance with EIA RS232 Standard</i>
4 - DSR (Input)	<i>In conformance with EIA RS232 Standard</i>
9 - VCC (+5V, I _{max} = 100mA)	Available for external supply
5 - GND (Ground)	

Sub - D - Connector 9 pin , female

Ft 1 and Ft 2



1 - Foot / hand switch (Input Internal Pull Up - Resistor 1kΩ an +3,3V)	
6 - n.c.	
2 - n.c.	
7 - n.c.	
3 - CLK (Output)	<i>Control signal for OA-adp - Adapter</i>
8 - n.c.	
4 - DATA (Output)	<i>Control signal for OA-adp - Adapter</i>
9 - VCC (+5V, I _{max} = 100mA)	Available for external supply
5 - GND (Ground)	

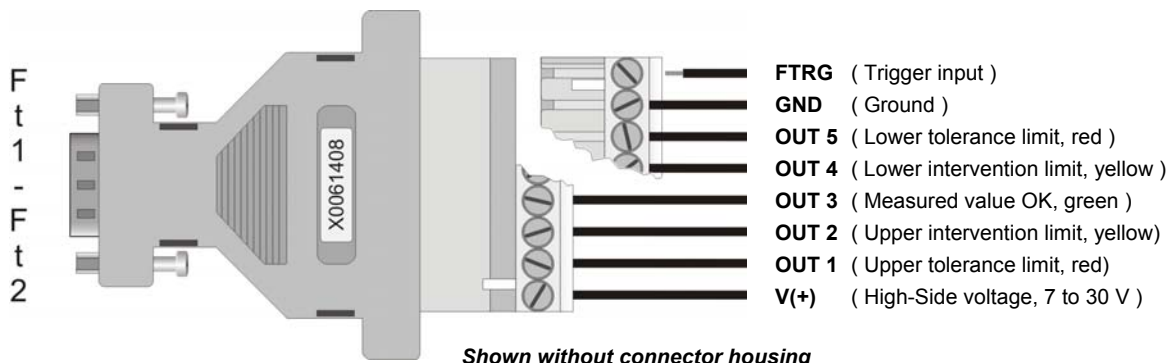


Sub - D - Connector 9 pin , female



6.2 Terminal blocks of the accessories

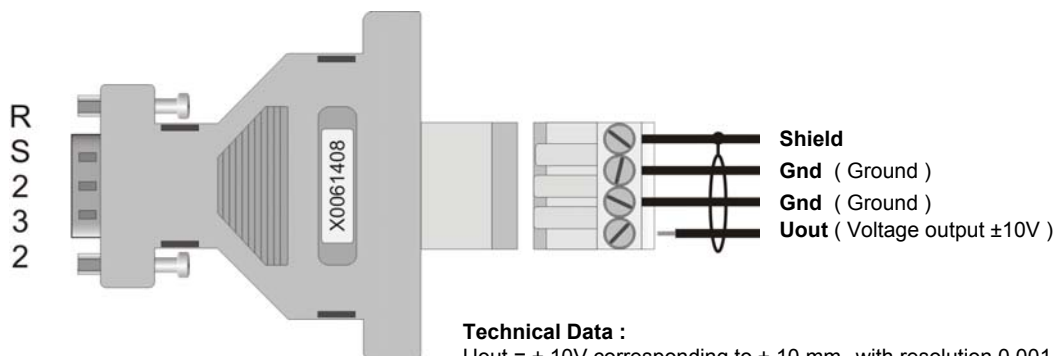
Adapter : OA-adp



Technical Data :

Isolation voltage : 3250 V
 Allowed voltage range (V(+), FTRG) : 7 to 30 V DC
 Maximum allowed output current (OUT 1-5) : 700 mA (Continuous current for each output)
 Input resistance of the Trigger input (FTRG) : > 3 kΩ

Adapter : RSA-adp



Technical Data :

Uout = ± 10V corresponding to ± 10 mm with resolution 0,001 mm
 Uout = ± 10V corresponding to ± 1.0 mm with resolution 0,0001 mm
 Uout = ± 10V corresponding to ± 1.0 inch with resolution 0,0001 inch
 Uout = ± 10V corresponding to ± 0.1 inch with resolution 0,00001 inch

Max. allowed output current = ± 0.1mA



7. Accessories and ordering information

Designation	Part Number
C200 Column gauge without measuring module Column gauge - basic module with 3-colour column display (103+2 Seg.), digital measured value display, base, programming card and manual	F232 001
IMB-mc1 Measuring controller for IMBus display modules with RS232 interface, trigger and switch connections	F240 001
IMBus power supply modules	
IMB-ps2 Switched-mode power supply with wide range voltage input 100 - 240 VAC	F121 020
IMB-dc1 DC to DC converter for input voltage range from 9 - 32 VDC	F121 040
IMB-acc Rechargeable battery module, incl. battery F220 110 for portable operation	F121 030
Universal battery charger for rechargeable Lithium ion batteries (VW-VBD1E) Rechargeable Lithium ion batteries	F220 102
	Series type NP-F930, 950 (7.2V / 1850mAh) F220 110 Series type NP-F930, 950 (7.2V / 4000mAh) F220 111 Series type NP-F930, 950 (7.2V / 5500mAh) F220 112
IMBus measuring and interface modules	
IMB-im1 Measuring module to connect 1 inductive probe (Tesa HB & compatibles)	F122 061
IMB-im2 Measuring module to connect 2 inductive probes (Tesa HB & compatibles)	F122 062
	IMB-im1/2 adjustment and calibration for other types of inductive probes F122 063
IMB-im4 Measuring module to connect 4 inductive probes (Tesa HB & compatibles)	F122 064
IMB-im8 Measuring module to connect 8 inductive probes (Tesa HB & compatibles)	F122 068
	IMB-im4/8 adjustment and calibration for other types of inductive probes F122 069
IMB-dm1 Measuring module to connect 1 incremental measuring system (1Vpp)	F122 071
IMB-dm2 Measuring module to connect 2 incremental measuring systems (1Vpp)	F122 072
IMB-dm4 Measuring module to connect 4 incremental measuring systems (1Vpp)	F122 074
	Converter cable, 11µA / 1Vpp with coupling for 9-pin circular plug with F160 010 1 m long cable and 15-pin Sub-D connector
	Adapter, IK220 / IMB-dm 15/15-pin F160 011
	Universal converter cable, analogue 0°/90° to 1 Vpp, fitted with F160 012 1 m long cable and 15-pin Sub-D connector
IMB-tc1 Measuring module to connect 1 incremental measuring system (TTL-RS422) .	F122 111
IMB-tc2 Measuring module to connect 2 incremental measuring systems (TTL-RS422)	F122 112
IMB-tc4 Measuring module to connect 4 incremental measuring systems (TTL-RS422)	F122 114
	Universal converter cable, TTL 0°/90° to TTL-RS422, fitted with F160 015 1 m long cable and 15-pin Sub-D connector





Designation		Part Number
IMB-ae1	Measuring module to connect 1 pneumatic gauge head, hose connector (4/6 mm) for gauge head	F122 081
AE-FC1	Pressure regulator with filter, quick-release fastener for hose connection LW9, mounting bracket and 2 m long compressed-air hose 8/6	F330 011
AE-FF	Filter unit with centrifugal separator, sintered filter element (5 µm), Micro filter (0.01 µm), manual drain valve, quick-release fastener for hose connection LW9, bracket and 2 m long compressed-air hose 8/6	F330 100
AE-FP	Precision pressure regulator with secondary ventilation, pressure gauge (0 - 4 bars), Bracket and 2 m long compressed-air hose 8/6	F330 200
IMB-ai1	Measuring module with 1 analogue input (± 10V, ± 20 mA)	F122 041
IMB-ai2	Measuring module with 2 analogue inputs (± 10V, ± 20 mA)	F122 042
IMB-ai4	Measuring module with 4 analogue inputs (± 10V, ± 20 mA)	F122 044
IMB-ai8	Measuring module with 8 analogue inputs (± 10V, ± 20 mA)	F122 048
	Universal measuring converter with cable and voltage output..... for IMB-ai modules	F122 043
	Sensor-specific measuring amplifier setting and calibration	F122 049
IMB-mi2	Interface module for 2 measuring devices with Mitutoyo Digimatic output	F122 022
IMB-mi4	Interface module for 4 measuring devices with Mitutoyo Digimatic output	F122 024
IMB-mi8	Interface module for 8 measuring devices with Mitutoyo Digimatic output	F122 028
IMB-sm1	Interface module with 1 universal, serial interface (RS232)	F122 011
IMB-sm2	Interface module with 2 universal, serial interfaces (RS232)	F122 012
IMB-sm4	Interface module with 4 universal, serial interfaces (RS232)	F122 014
IMB-pm1	Interface module with 1 universal, parallel interface	F122 031
IMB-pm2	Interface module with 2 universal, parallel interfaces	F122 032
IMB-pm4	Interface module with 4 universal, parallel interfaces	F122 034
	Customer-specific initialisation, IMB-pm1 / -pm2 / -pm4 / -sm1 / -sm2 / -sm4 .. for each measuring device driver	F700 020
	Development of customer-specific measuring device driver and initialisation in IMB-pm1 / -pm2 / -pm4 / -sm1 / -sm2 / -sm4 (group 1)	F700 030
	Development of customer-specific measuring device driver and initialisation in IMB-pm1 / -pm2 / -pm4 / -sm1 / -sm2 / -sm4 (group 2)	F700 040
	Customer-specific development of a special measuring device driver and initialisation in IMB-pm1 / -pm2 / -pm4 / -sm1 / -sm2 / -sm4	F700 050
IMB-rf1	IMBus radio module for wireless data collection from external gauges and sensors	F122 121





Designation		Part Number
Accessories		
IMB-cas	Adapter for C200 column gauge cascading	F241 010
PC-RS232 cable	RS232 cable to connect to COM interfaces	F601 003
PC-USB cable	Cable to connect to USB ports, incl. driver software	F601 021
	for COM port emulation	
IBRit-rf1-232	Radio module for wireless data transmission from C200 gauges to a PC	F604 008
RSD-adp	RS232 cable with converter for Mitutoyo Digimatic interface	F601 030
RSA-adp	RS232 adapter with terminal block for analogue output voltages	F601 031
IMB-tco	Adapter for integration of C200 column gauges in IMBus systems	F241 020
OA-adp	High-Side Power-FET adapter with terminal block	F603 010
Foot switch	Foot switch, standard	F121 110
	Foot switch, heavy metal design, IP65	F121 120
	IMBus foot switch, standard	F121 130
	IMBus foot switch, heavy metal design, IP65	F121 140
Hand switch	Hand switch, standard IP65	F121 150
	IMBus hand switch, IP65	F121 160
IBR_DDK.DLL	Device driver to load measurement data into 32 bit Windows applications	F710 010
IBREXDLL	Programme to import data from IBR interface and measuring devices into	F710 001
	MS EXCEL	





8. Safety instructions

The instrument has been designed and manufactured according to the state of the art and approved technical safety regulations. 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 **prior to starting operation**.
2. The instrument may be used only **in proper operational** condition. Malfunctions or errors that may potentially impair the operational safety must be eliminated immediately.
3. The instrument is to be used only for its intended purpose and according to the Instruction Manual. The Instruction Manual is to be kept near the place of operation and ready for use.
4. Prior to connecting the instrument to the power outlet, make sure that the voltage indicated on the label corresponds to the voltage of the local mains. 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, if required, must comply with VDE safety standards.
6. Any modification to or change in procedures concerning the instrument is permitted only with the prior written consent of IBR Messtechnik GmbH & Co. KG and must be carried out by trained staff. Unauthorised opening of the instrument or tampering with the device shall void the guarantee and exempt the manufacturer from any liability. Before opening the instrument, make sure to effectively cut the power supply, e.g. by disconnecting the power cable.
7. Disconnect the instrument from the mains prior to cleaning. Never let any liquids penetrate the inside of the instrument. Do not use cleaners that dissolve 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.

We reserve the right to change the design and technical data contained in our documentation without notifying our customers. IBR is not obliged to notify buyers of product changes.

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9. 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.

Furthermore, we certify that the measuring equipment used to check this product refers to national master standards. The traceability of measuring values is guaranteed by our Quality Assurance System.

10. Guarantee

The quality of this instrument is guaranteed for a period of 12 months from the date of delivery. This guarantee covers all material and manufacturing defects.

Our liability is limited to product repair services or, should we deem it necessary, replacing or crediting the goods.

This guarantee does not include the batteries or damage due to:

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

We are not to be held liable for any subsequent damage caused by, directly or indirectly, the instrument or its use.

Notice : If you are 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, August 29th, 2011

I B R Messtechnik GmbH & Co. KG