Sterling ProMeasure Systems

INSTRUCTION MANUAL

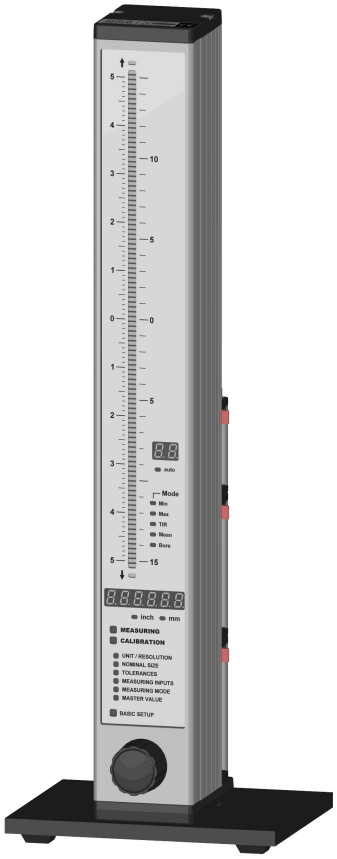
PRO X 200

The Column Gage

Sterling ProMeasure Systems

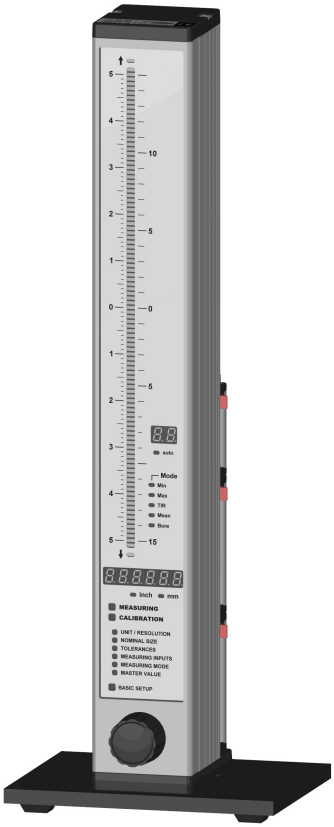
Contents

I. Contact Information



1. Introduction

1.1 General information



The PROX200 electronic column gage is an extremely versatile instrument, allowing the connection of 1 to 8 inductive or incremental probes, pneumatic gage heads, sensors with analog current or voltage outputs and gages with digital interfaces. The extreme flexibility concerning the connection of sensors and gages is achieved due to the modular design and the usage of Bus modules.
The column gage allows manual selection as well as automatic selection of 1 to 8 gages, including static and dynamic measuring programs and the optional classification (grading) of components in up to 30 classes.
Highly sophisticated measuring programs 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 gage number.
The 3-color 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 PROX200 provides solutions for most sophisticated measuring applications, simply by interconnecting several column gages.

1.2 Measuring and display features

- **Static measuring mode**
- **Dynamic measuring modes :** Min, Max, Tir, Mean
  Bore measuring mode with automatic function
- **Multi-gaging measuring modes :** Manual or automatic selection of 1 to 8 gages
- **Measuring range / Resolution :** ± 3.0 mm / 0.1 µm, 0.12 / 0.00001 inches (inductive probes)
  ± 30 mm / 1 µm, 1.2 / 0.0001 inches (inductive probes)
  24 bit (incremental measuring systems)
- **Units :** mm and inches
- **2-digit numeric display :**

Gage number	C1 … C8
Measuring input	P1 … P8
Basic setup menu	L0 … LA

- **Numeric display ranges**

Relative measurements	:	± 9.9999 mm / ±99.999 mm, ±.99999 inches / ±9.9999 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

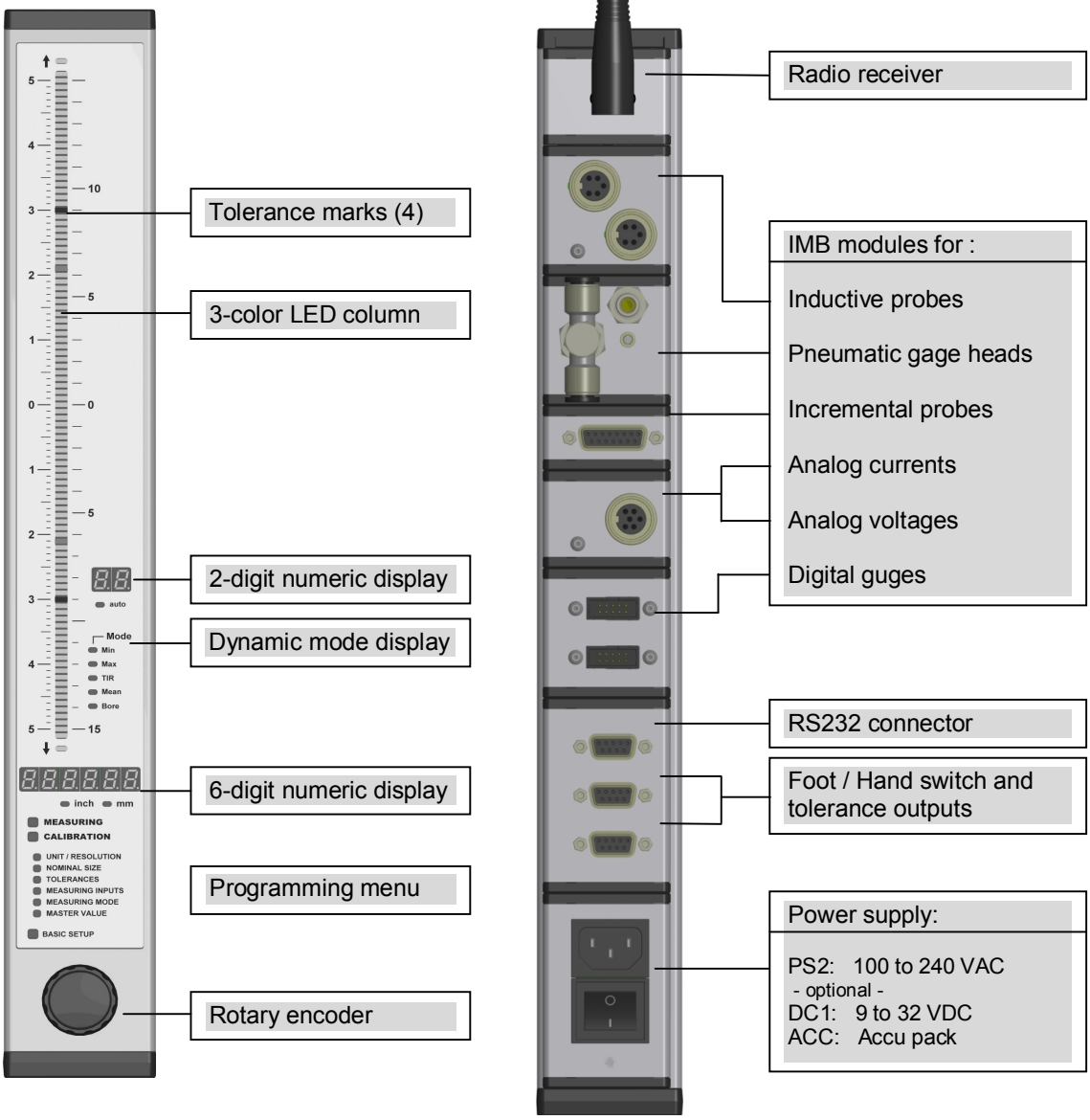
◆ **Column display ranges**

± 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 ″

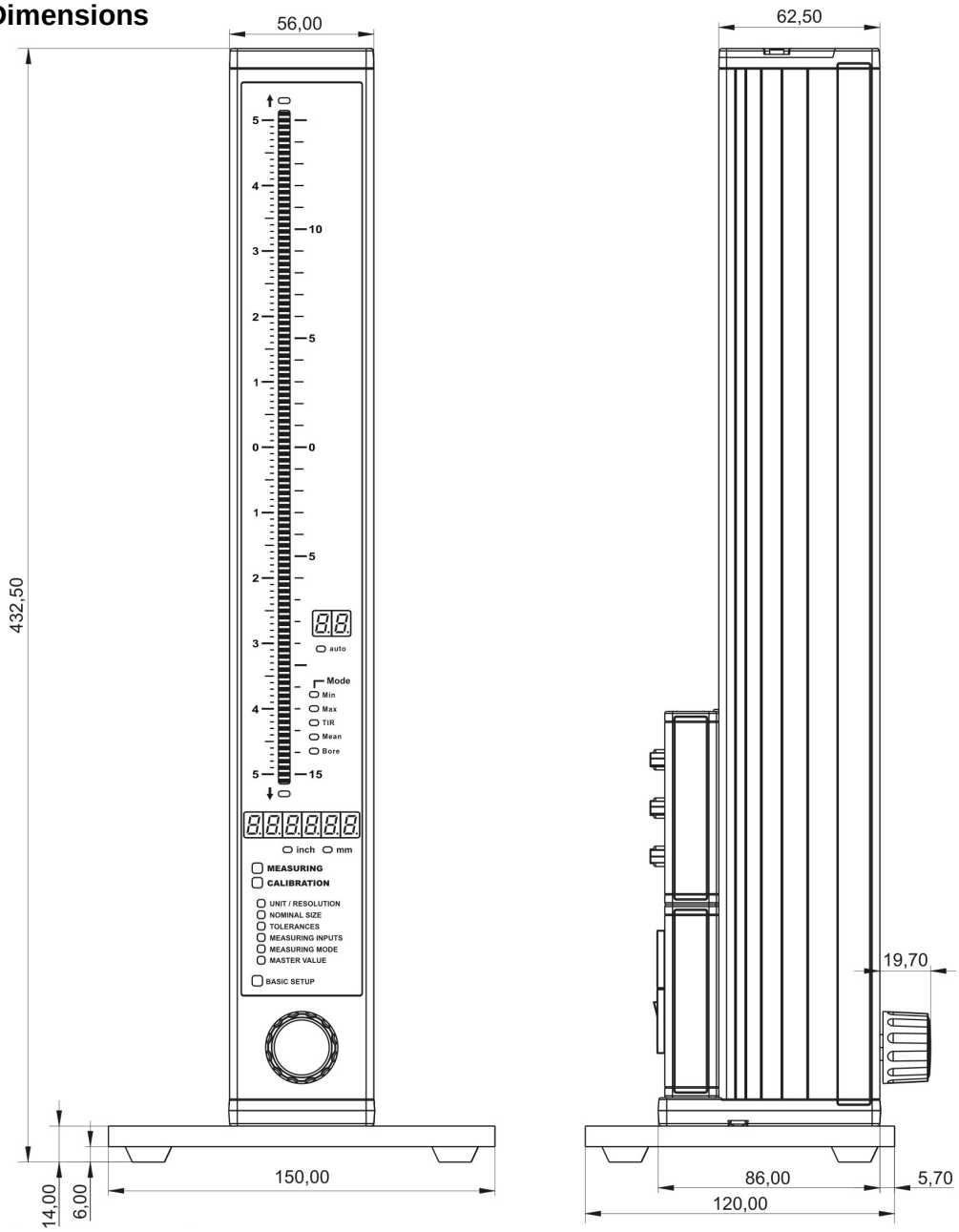
The 3-color column display (red, green, yellow) features an automatic color selection according to the tolerance limits adjusted. A maximum of 4 tolerance limits can be programmed. The tolerance limits are indicated as colored marks on the column display.

*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 gage 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.*

1.3 Front and rear view

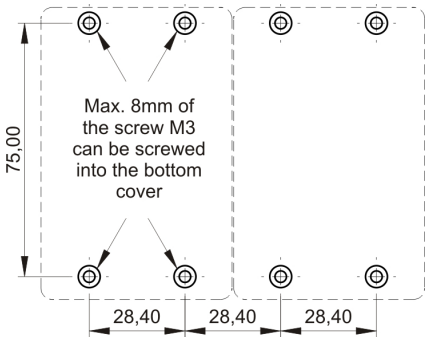


1.4 Dimensions



Picture : Column display with base

1.5 Hole pattern for interconnection



1.6 Technical data

Mechanical characteristics

Case Base	Aluminum anodized, plastic top and bottom parts Aluminum 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)* (*200 incl. base, PS2 and MC1 = 1650g*)

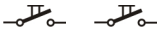
Electrical characteristics

Power supplies: PS2 DC1 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-colors, featuring automatic color 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 µm, ± 4.00000 / 0.00001 inches ± 999.999 mm / 1 µm, ± 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 Bus measuring module	

Bus

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

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 measuring modules

Electromagnetic compatibility (EMC)

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

2. Getting started

2.1 Delivered items

Column gage, base with 4 screws (M3x8) for fixing, instruction manual, programming card, and a 2.0 mm Allen key.
Further accessories, such as Bus 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

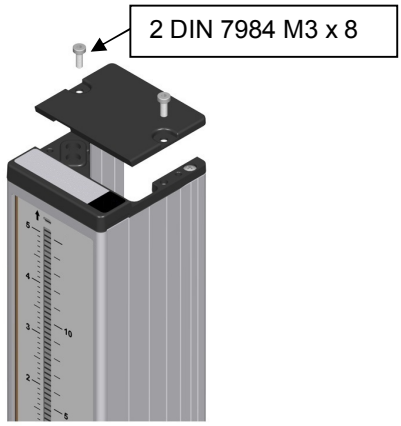
Use the Allen key *(included in shipment)* to screw in the screws of the base and set the column gage on a solid base.

Do not overtighten screws !

2.3 Fitting the modules

The **PROX200** column gage has been developed for use of Bus modules and allows the connection of 1 to 8 probes, air plug gages, sensors and digital measuring instruments. The respective modules of the Bus series can be fitted to the rear panel of the **PROX200** in order to connect probes, sensors and gages.

See Bus Module Overview, chapter 2.12!



2.3.1 Removal of PROX200 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 **PROX200** column gage that comprises Bus modules is configured in a fixed order. If one single **PROX200** is to be configured, the power supply module (No. 1) always has to be fitted first, followed by the measuring controller module (No. 2) and then subsequently (starting with No. 3) the measuring and interface modules in any chosen order. The fitting order of the measuring and interface modules as a result determines the address assignment (**P1** to **P8**) of the connected sensors or measuring instruments. The **PROX200** column gage can read in a maximum of 8 connected sensors or measuring instruments.

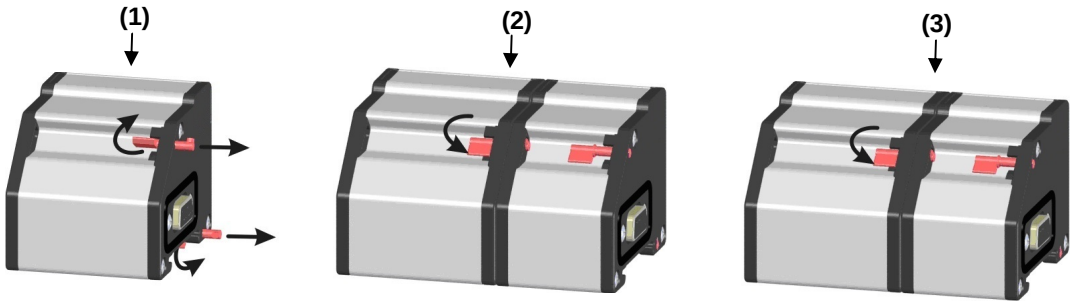
If several **PROX200** are to be connected, the adapter cable (No. 1) has to be fitted first, followed by the power supply module (No. 2), then the measuring controller and subsequently the Bus measuring and interface modules in any chosen order.

One power supply module can supply power to a maximum of 3 **PROX200** column gages in this way. If more than 3 **PROX200** are interconnected, an additional power supply module has to be fitted to the fourth **PROX200** at the latest.

Extension cables can be used to place the particular 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 Bus extension cables must not exceed 1200 m.

2.3.2 Connecting the Bus 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 Bus modules one after the other.

The following table indicates the installation sequence of the Bus modules.
*Position 1 is the bottom position later on, and is screwed to the base of the **PROX200** column gage.*
Important : The bottom Bus module must be equipped with bolts to do so.

Position	Bus module
1	**CAS** *(only if interconnecting several column gages)*
2	**PS2**, *or* ***DC1*** *as an alternative;* ***ACC*** *(power supply modules)*
3	**MC1** *(measuring controller module)*
4	Bus measuring and interface modules
5	Bus terminator *(connector)*

Important :
Should an Bus module already be equipped with bolts *(e.g. **PS2** when using an **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 gage.
*The **"VCC"** LED lights up when the power supply to the column gage 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 Bus extension cables. The Bus design, however, allows adding power supply modules between any Bus gaging and interface modules at will, to compensate voltage drops.*

*The **"RUN"** LED lights up, when the self-test of all Bus modules has finished successfully.*
*The **"RUN"** LED will not light up and will thus signal that the Bus could not be completely checked, if more Bus modules have been fitted than can be addressed by the column gage.*

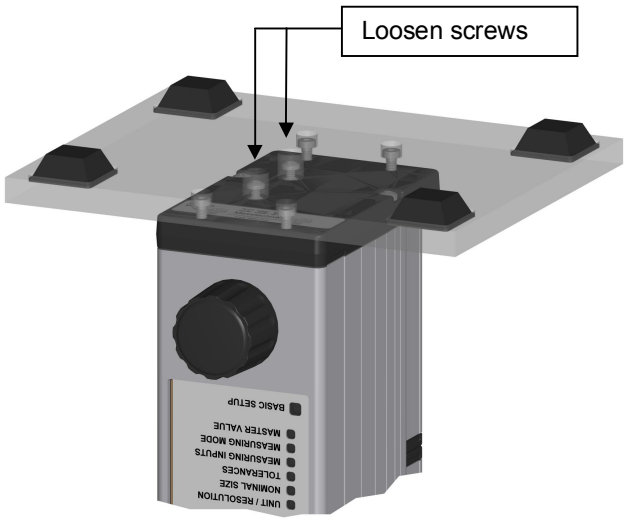
*Note : The **"RUN"** LED will not issue an error message in this case, but instead signals the incomplete self-test of modules that cannot be addressed.*

2.3.4 Fitting Bus modules into the PROX200 column gage

Once the Bus modules have been connected, they are slid into the **PROX200** 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 **PROX200** column and additional modules are to be installed, then all previously fitted modules must be removed first.*

Loosening and removing previously fitted Bus modules:
The Bus modules are screwed to the **PROX200** 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 **PROX200** base. The base does **not need to be removed**. Once both screws have been completely loosened, the Bus 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 **PROX200** column section. Finally the module package is screwed to the column base.

2.3.5 Fitting of PROX200 column cover.

Place the column cover on top of the **PROX200** and fix with two Allen screws (M3 x 8).

Do not overtighten screws !

2.4 Measuring input addresses

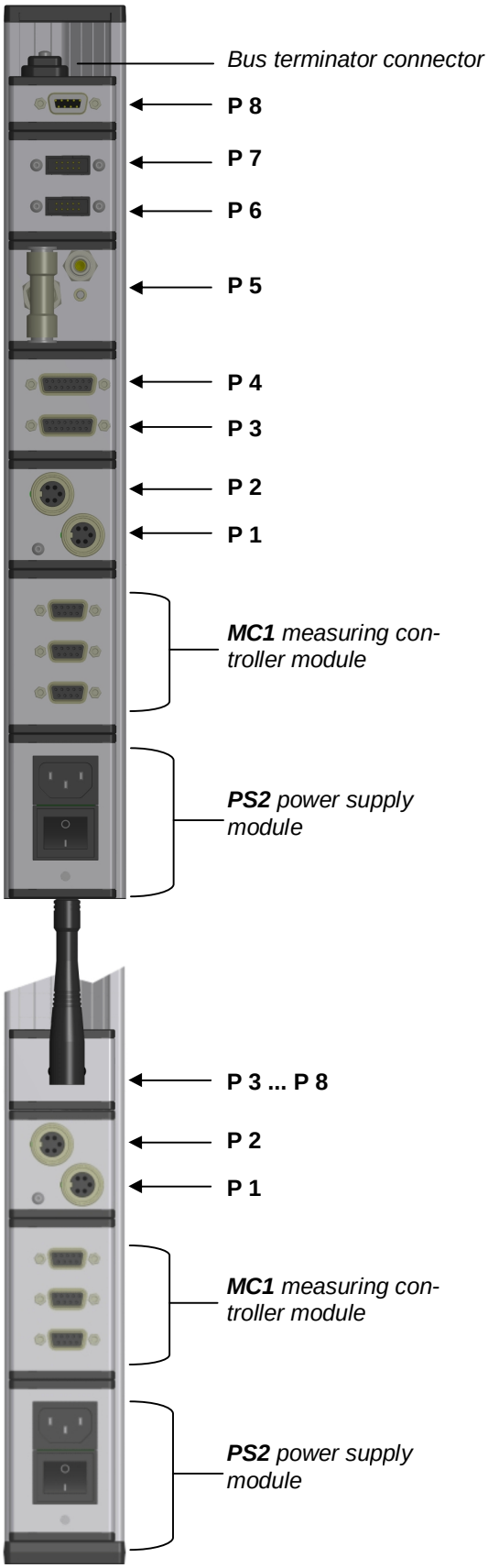
The measuring inputs are referred to as **P1** to **P8** for subsequent programming. The bottom measuring input is always **P1**. It is possible to connect more than 8 measuring inputs, the **PROX200** column gage, however, can only address and read in the first 8 inputs.

Note :
*When connecting further column gages via **CAS** adapter cables, the measuring inputs **(P1** to **P8)** of the first column gage are also available at the subsequent column gages and are referred to as the same addresses. Therefore, there is no complex behavior to pay attention to when programming.*

When connecting several column gages, please take into account the following facts:
A further measuring module in a series of column gages will interrupt the connection to the previous measuring modules, and make available its inputs for the subsequent column gages, including the one it is fitted into.

Note for wireless application :

*The **RF1** modules allow the reception of measurement values from 1…8 **RF** radio modules. Therefore each **RF1** module contains eight channel numbers.*
*Each channel can be assigned to one of the 1...120 addresses of an **RF1** radio module.*
*When you use an **RF1** module together with other IMB-modules in one **PROX200**, then you must install the **RF1** module as the last module of the **PROX200** (upper position). Because the **PROX200** supports only eight channels and the **RF1** has already eight channels, all other IMB-modules behind the **RF1** module are ignored by the **PROX200**.*
*The programming of **RF1** radio modules and the address assignment of the 1…120 **RF1** module addresses to the 1…8 **RF1**.*



2.5 Connecting several column gages

CAS type adapter cables are utilized to connect several column gages.
The adapter cables fulfil two tasks :

1.) Transferring the supply voltage from the first column gage to the next.
*One power supply module can supply power to a maximum of 3 column gages, depending on the connected probes, sensors and measuring instruments. The number of column gages 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 gage are made available for the subsequent column gages.
*The measuring inputs are passed on to the subsequent column gages via the **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 gages will interrupt the connection to the previous measuring modules, and make available its inputs for the subsequent column gages, 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 gages (e.g. for dynamic measuring). See chapter 2.7 for more detailed information.

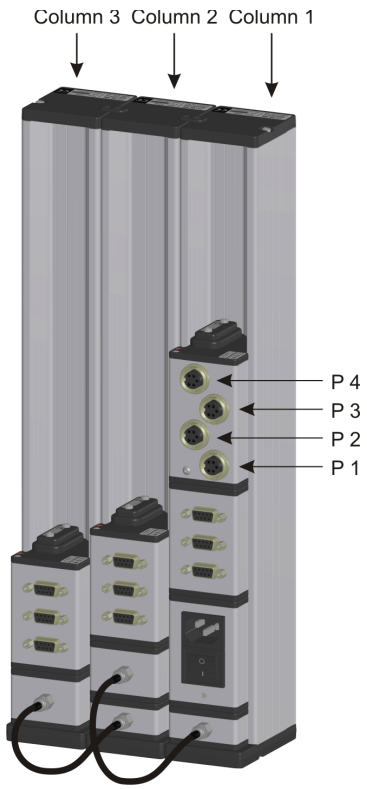
Mechanical connection of column gages :

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

Do not overtighten screws!

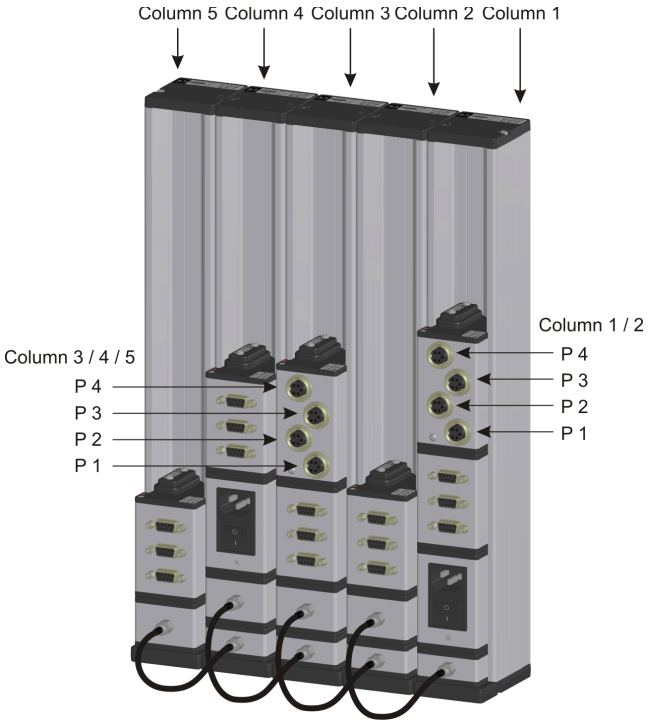
Example 1 : connecting 3 column gages

The three-column gages are linked together via two **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 gage. When using several **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 gage supplies all three column gages with power. The measurement inputs **P1 to P4** are available at all three column gages.



Example 2 : connecting 5 column gages

The five column gages are linked together via four **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 **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 Bus series to supply the column gage with power :

1. **PS2**
   Switched-mode power supply (SMPS) featuring wide range voltage input from 100 to 240 VAC, 45 to 60 Hz

2. **DC1**
   DC to DC converter for input voltage range from 9 to 32 VDC

3. **ACC**
   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.

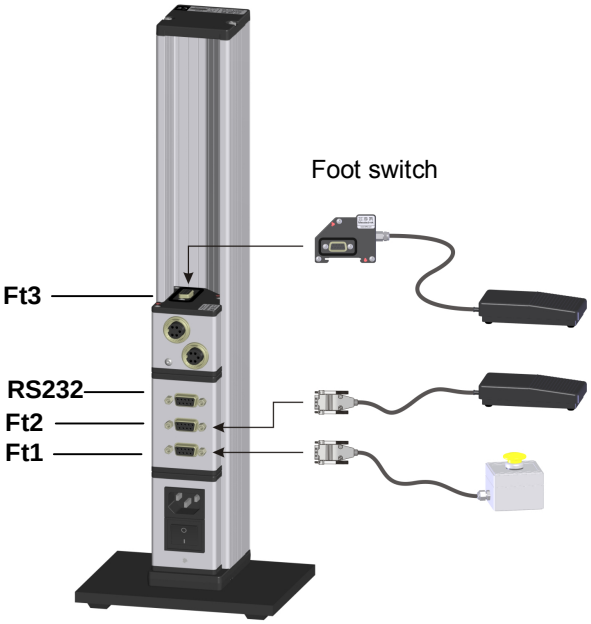
   (Example : PROX200 with 2 inductive probes and a 4000 mAh battery pack can operate for approx. 12 to 15 hours)

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 **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 **MC1** measuring controller. Foot and hand switches can be cascaded in order to synchronize several column gages (e.g. for dynamic measuring) by using a foot or hand switch connected to the **Ft1** or **Ft2** connector. The Y-Adapter can then be used for cascading.
A third foot or hand switch (**Ft3**) can be connected directly to the Bus. An **foot** or **hand switch** is used in order to do so. It provides an Bus connecting part and can be inserted into the Bus at any place behind the **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 .....
Foot switch IP65 .....

Bus foot switch IP32 .....
Bus foot switch IP65 .....

Hand switch IP65.....
Bus hand switch IP65 .....

Important !
Secure all connections by screwing them tight.

2.8 Connecting adapters for tolerance outputs

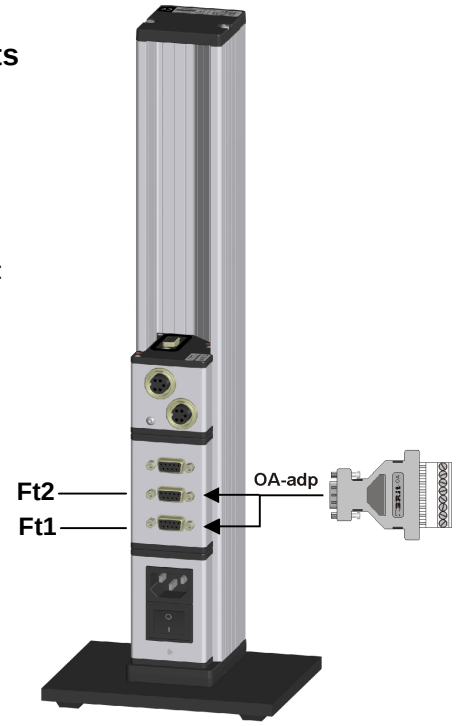
The adapters for the tolerance-controlled outputs are connected at the rear of the column gage to the **Ft1** or **Ft2** Sub-D ports of the **MC1** measuring controller.

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)*

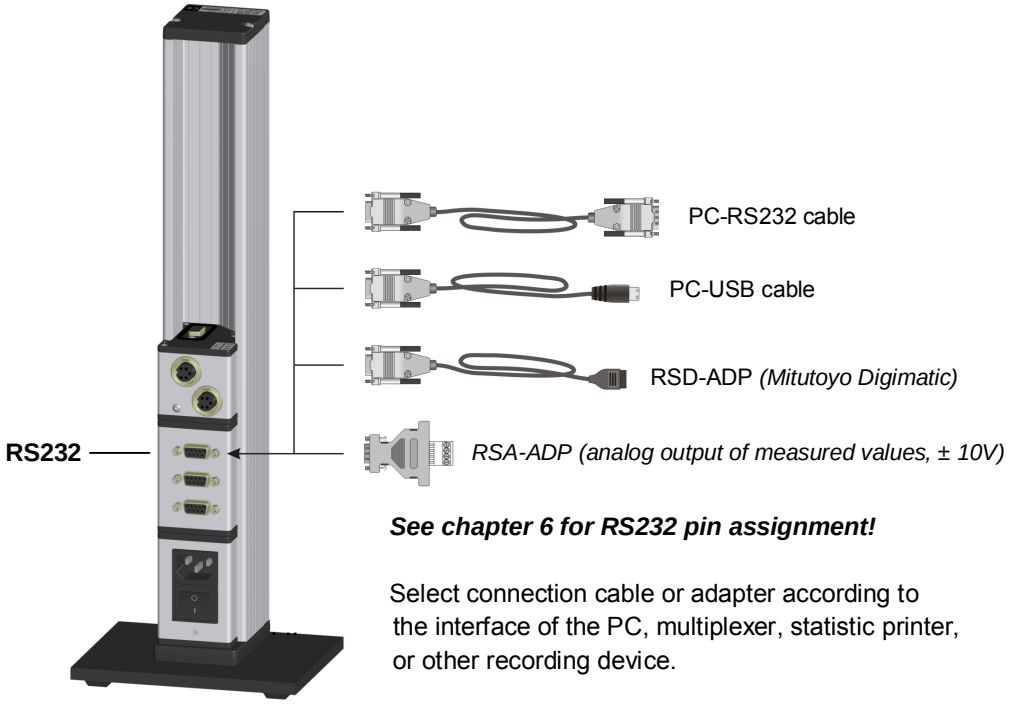
Connection adapter :
High-Side Power-FET

*For adapter pin assignment of **ADP***
see chapter 6; for more information on the adapter.



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 gage via the **RS232** Sub-D port of the **MC1** measuring controller.



See chapter 6 for RS232 pin assignment!

Select connection cable or adapter according to the interface of the PC, multiplexer, statistic printer, or other recording device.

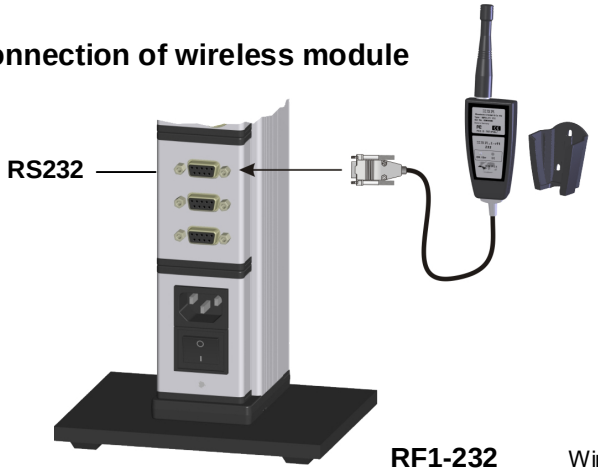
PC-RS232 cable RS232 connection cable for PC COM1 to COM8 interfaces .....

PC-USB cable USB connection cable for PCs incl. driver software for emulation of ..... COM1 to 127 interfaces

RSD Connection cable with interface converter to Mitutoyo Digimatic output ..... *(cable converts RS232 output to DIGIMATIC output)*

RSA adapter with digital / analogue converter to output analog ..... voltages to a terminal block *(adapter converts RS232 output to ±10V analog output)*

2.10 Connection of wireless module

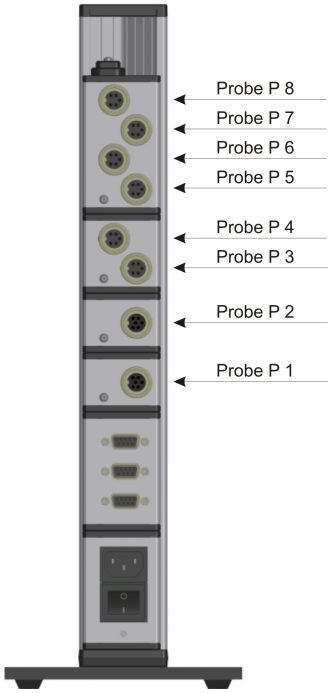


The wireless **FR1-232** module is connected at the rear of the column gage to the **RS232** port. The wireless module enables the wireless transmission of measured values to PCs.

RF1-232 Wireless module for stationary gages with RS232 connector.

2.11 Connection of probes, air plug gages, sensors and measuring instruments

The modular design in conjunction with the **BUS** measuring and interface modules makes it possible to connect virtually any probe, pneumatic gage head, sensor or measuring instrument to the column gage. A maximum of 8 measuring inputs can be handled by the **PROX200**. 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 Bus modules cannot be completely addressed *(see page 10, Information on Bus Terminator)*. The **Bus** 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 **BUS** measuring and interface modules see chapter 2.12.



Example 1 : Connection of inductive probes

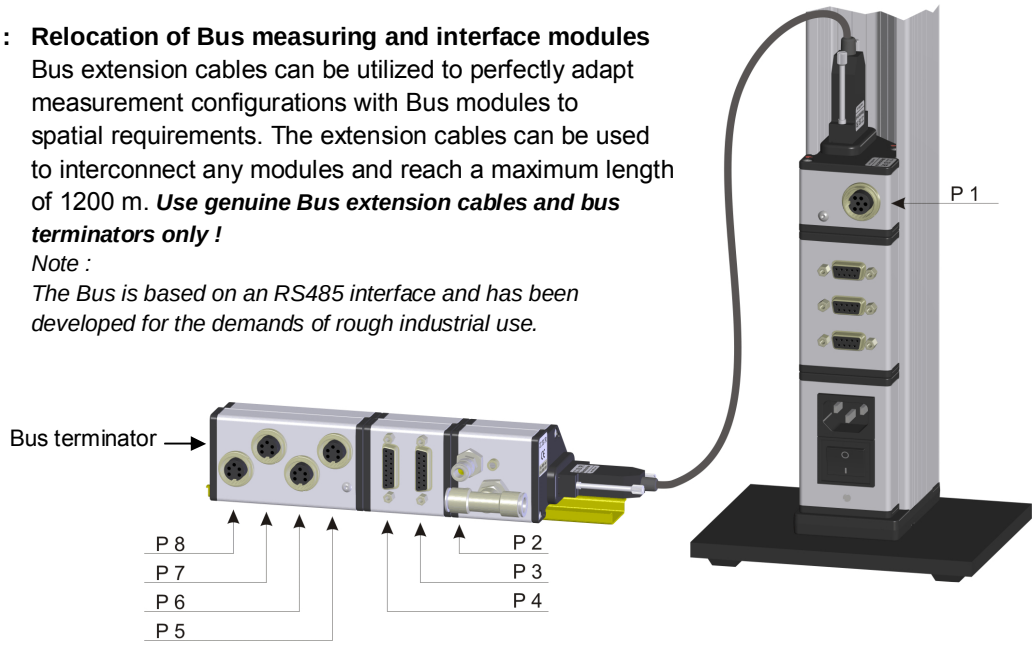
Prior to connecting the probes, check whether the probe types correspond to the type designations listed on the Bus module (**IM1 / 2 / 4 / 8**). Secure the connectors by screwing them tight.

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 Bus measuring and interface modules

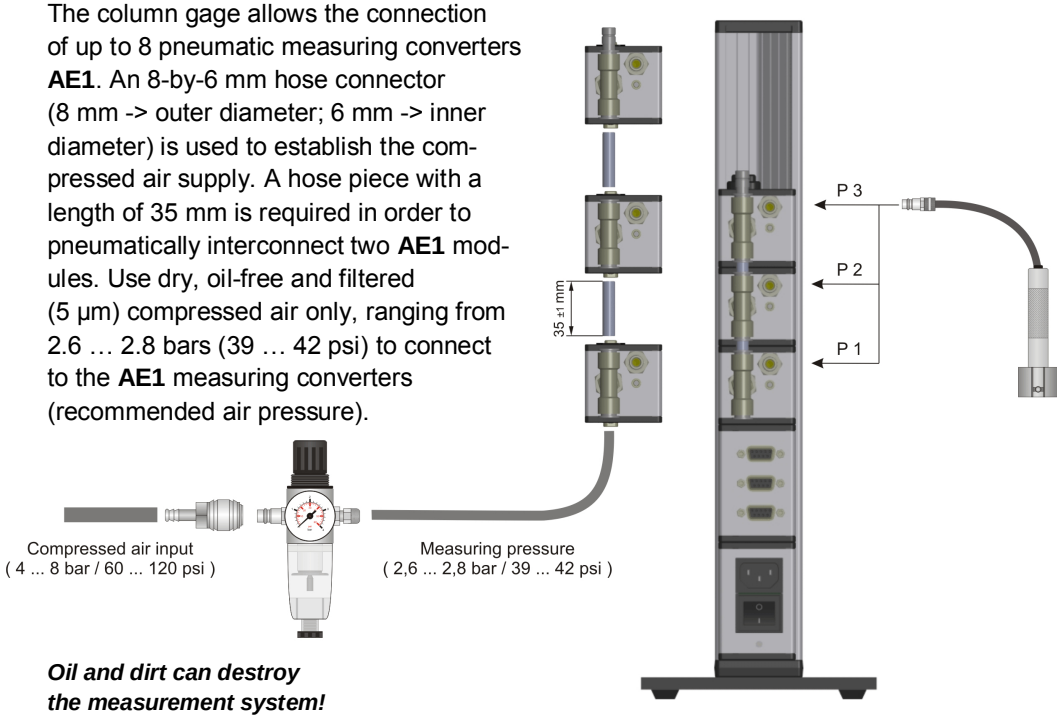
Bus extension cables can be utilized to perfectly adapt measurement configurations with Bus modules to spatial requirements. The extension cables can be used to interconnect any modules and reach a maximum length of 1200 m. ***Use genuine Bus extension cables and bus terminators only !***

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



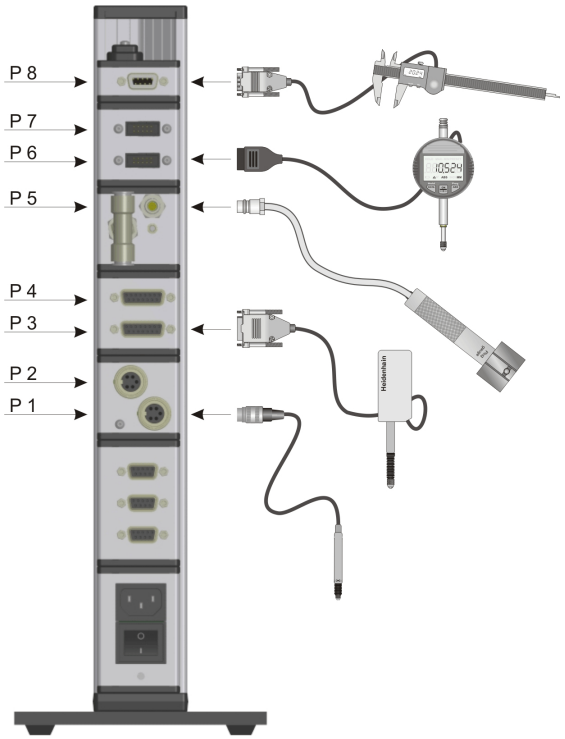
Example 3 : Connection of pneumatic gage heads

The column gage allows the connection of up to 8 pneumatic measuring converters **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 **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 **AE1** measuring converters (recommended air pressure).



Oil and dirt can destroy the measurement system!

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



The example depicts a **PROX200** configuration for connection of 2 inductive probes (**IM2**), 2 incremental probes with 1Vss output (**DM2**), one pneumatic plug gage (**AE1**), 2 Mitutoyo dial gages (**MI2**) and one calliper gage (Sylvac, Tesa, Mahr, etc.) with Opto RS232 output (**SM1**).

2.12 Power on / Self-test

Every time the column gage 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 **PROX200** column gage 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 gage is not active while the self-test is running.

3. Programming the column gage

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 gages **C1** to **C8** in the ***Measuring Mode***.
*The gages (****C1*** *to* ***C8****) are activated in the* ***"BASIC SETUP"*** *menu, section* ***"L0"*** *–* ***Activate / deactivate gages****.*

3.2 Foot and hand switch functions

The column gage 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 gage, 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 gage calSPSation

Basic setup

- **L0.** - Activate / deactivate gages
- **L1.** - Gage 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 calSPSation
- **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 gage.
First-time users of the column gage 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 gage should turn to the following chapter for reference.

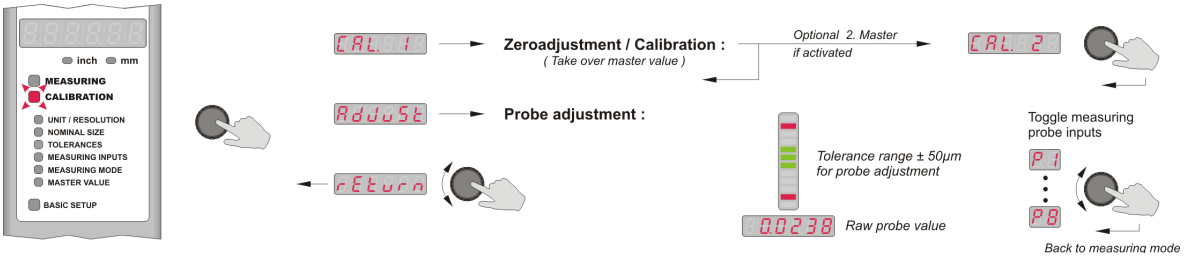
3.4 Description of the calibration mode

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 calSPSation (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 gage head into one of the masters). Push the encoder button to perform an automatic **Zero adjustment** or as the case may be, initiate a **Gage calibration**.

Zero adjustment *(only one master was entered in the* ***MASTER VALUE*** *menu) :*
The master value is adopted as measurement value by the gage, and the column gage returns to the measuring mode.

Gage calibration *(two masters were entered in the* ***MASTER VALUE*** *menu) :*
At the start of the automatic gage 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 gage head into the second master) and confirm by pushing the encoder button.
The column gage then computes the new offset value and the amplification (pneumatic : spread).
The second master value is then adopted as measurement value by the gage and the column gage returns to the measuring mode.

Note : *Zero adjustment or gage calbration 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 gage has been calibrated with 2 masters, the amplification (pneumatic : spread) determined for this gage is permanently stored inside the PROX200. Hence, for measuring operation the PROX200 could be switched to zero adjustment using only 1 master.*

If this gage is later on reprogrammed for a different measuring task using only a one master adjustment, then the amplification stored for this gage must be deleted. The encoder 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 gage must be performed afterwards.*

3.4.2 Probe setup

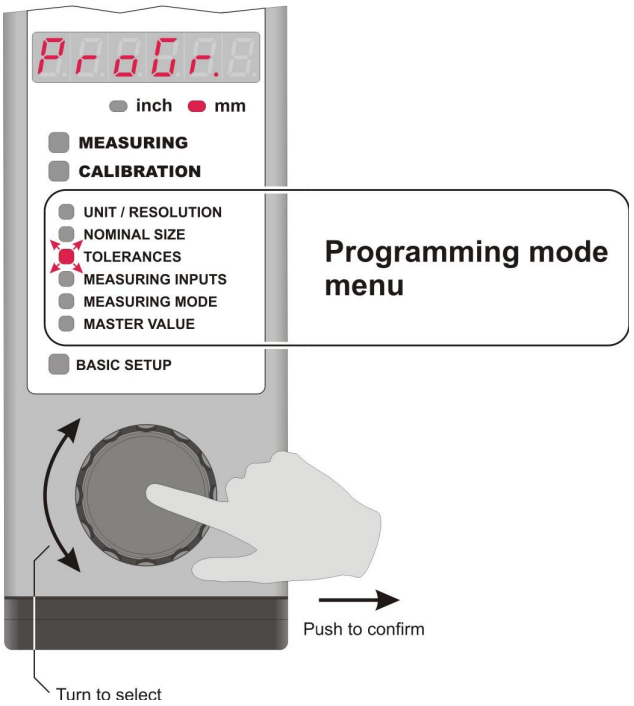
Inductive probes achieve their greatest degree of accuracy within a comparatively small measuring range only. It is therefore extremely important to carefully set up the probes at the electric zero point. On selection of the **AdJuSt** menu, the two-digit numeric display shows the measuring input **P1** 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 diplay 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 gage returns to the measuring mode.

3.4.3 Restrictor adjustment on AE1 pneumatic measuring converters

The AE1 is equipped with a restrictor enabling the adaptation of a wide range of pneumatic gage 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 gage head used for measuring. In case of changing to a gage 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 gage’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 gage 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

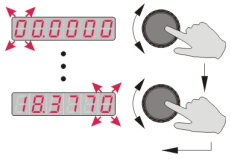
You can select the first menu *(**UNIT / RESOLUTION** - LED flashes)* by pushing the encoder button. The menu allows selecting both the **Unit of Measurement** and the measurement **Resolution**. Turn the encoder to select the unit of measurement, either **"mm"** or **"inch"** and then confirm by pushing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

NOMINAL SIZE



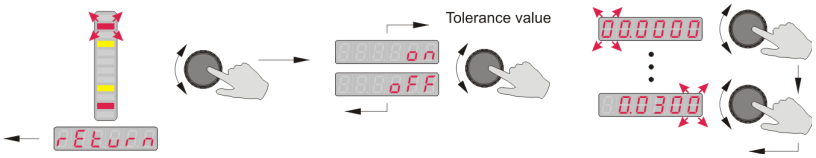
Turn the encoder to select the desired number of the flashing point and then confirm by pushing the encoder button.

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 :

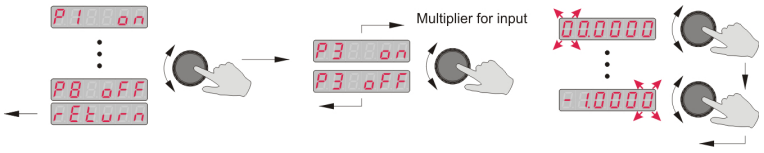
- **+ red** - *upper tolerance limit*
- **+ yellow** - *upper intervention limit*
- **– yellow** - *lower intervention limit*
- **– red** - *lower tolerance limit*

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

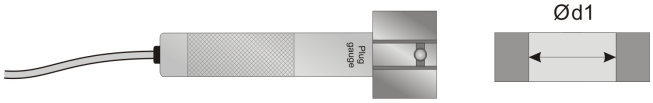
MEASURING INPUTS



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

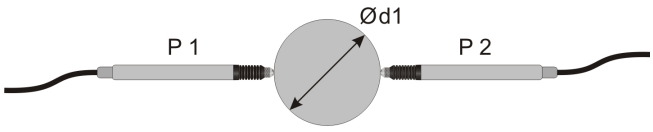
Examples :

a) **Bore gage :** Ø d1 = - P1



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

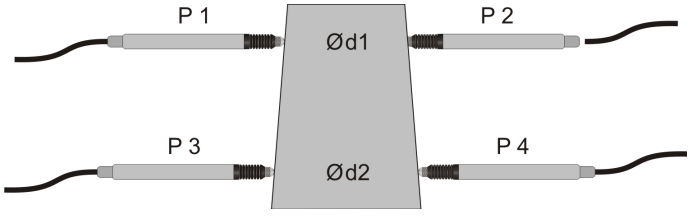
b) **Shaft measurement :** Ø d1 = P1 + P2



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

c) **Taper measurement :** Taper = Ø d2 – Ø d1

Taper = (P3 + P4) - (P1 + P2)
Taper = P3 + P4 - P1 - P2

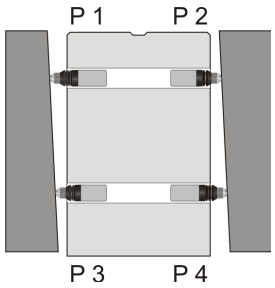


P1	-1.000
P2	-1.000
P3	1.000
P4	1.000
P5	off
P6	off
P7	off
P8	off

d) **Angle measurement :**

$$\text{Angle} = \frac{P1 - P2}{2} - \frac{P3 - P4}{2}$$

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



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 gage will indicate **'Err. 01'** because measurement operation is not possible.*

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

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

MEASURING MODE

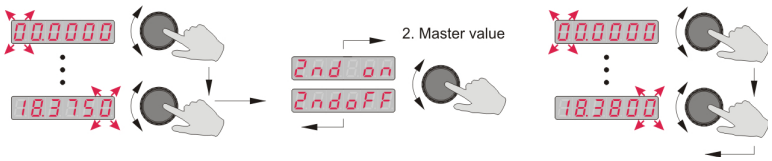
In addition to the static measuring mode, the **PROX200** column gage also has several dynamic measuring modes available. Each of the 8 gages (**C1** to **C8**) can be assigned its own measuring mode without any restriction.

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

MASTER VALUE



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 gage 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 calSPSation 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 gage.

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 gage 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.

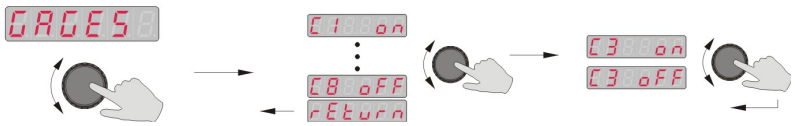
Note : *An offset value is used to set the zero position of the gage in reference to the master when the automatic **Zero Adjustment** is performed.*
*When performing an automatic **Gage Calibration**, not only the offset value (zero position) is set, but also the gain (pneumatic : spread) is adapted 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 gages from **C1** to **C8**. The numeric display will indicate the number of the gage and its current status ***(on / oFF)***.
To change the status of a gage, 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 gages have been switched off (**oFF**), the gage **C1** is automatically switched on again when exiting the programming menu, because measurement operation is not possible without an active gage.*

L1 Gage selection by auto recognition

Aut. on : Automatic gauge selection by auto recognition

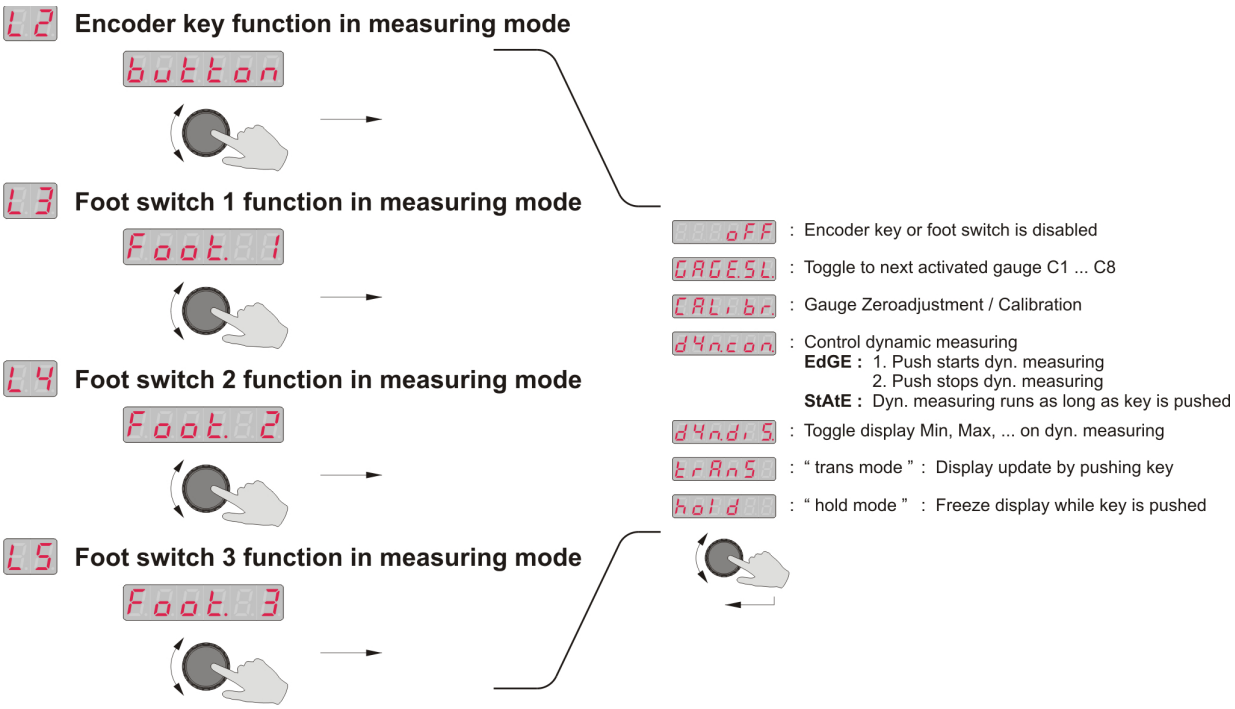
Aut. off : Manual gauge selection with encoder key or foot switch see : [L2 ... L5], GAGE.SL.

Auto.rE. In this menu you can choose either **Manual gage selection** or **Automatic gage 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 gage selection function. Push the encoder button again to confirm the new status.

Note : *If one measuring input **P1** to **P8** is assigned to several gages in the operating mode **Gage selection by auto recognition**, the numeric display of the column gage will indicate **'Err. 08'**.*

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

In the Basic Setup menus **L2** to **L5** controlling of the **PROX200** 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 gage 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 gage calSPSation will be performed on the currently active gage (**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

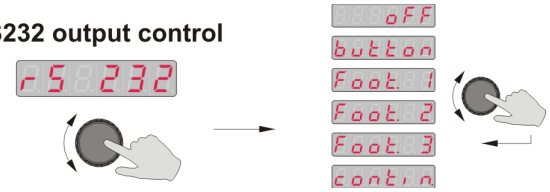
StAtE : The dynamic measurement function runs for as long as the button or switch is activated.

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 gage 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 **PROX200** column gage. 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)**.

L6 RS232 output control



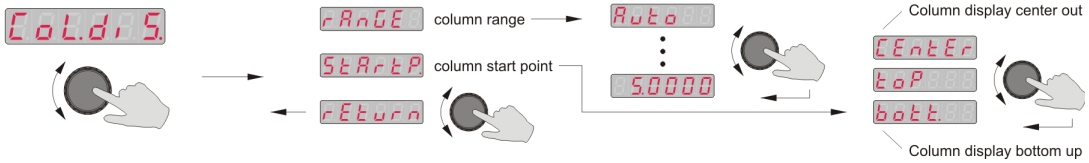
off : Data output off
button : Data output by pushing encoder key
Foot. 1 : Data output by pushing foot switch 1
Foot. 2 : Data output by pushing foot switch 2
Foot. 3 : Data output by pushing foot switch 3
contin. : Data output continuously

RS 232 - The output of measurement values via the serial interface of the column gage 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 **Bus** (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 :
*1.) **Ft1** - Initiates the transfer of data via the RS232 interface and then switches to the next gage (**C1** to **C8**).*
*2.) **Ft1** - Initiates a dynamic measurement. With the second actuation, the measurement is completed and the result is sent to the RS232.*

L7 Column display setup

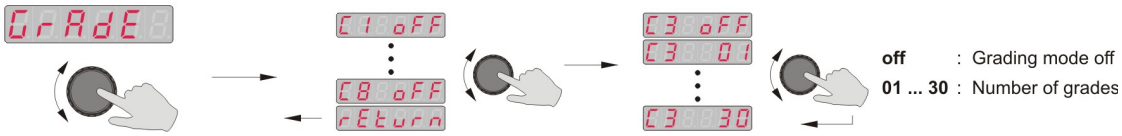


Col.diS. - In this menu the range and the starting point of the column display is set.

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 gage 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 gage (**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.

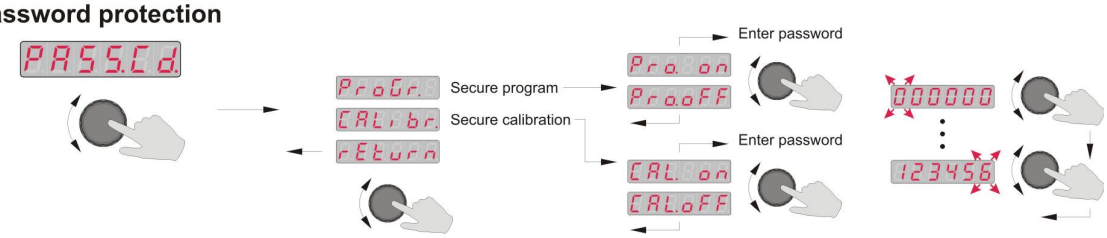
*Note : If no tolerance limits have been specified, the numeric display in the measuring mode indicates " **------** ".*

L9 Timer forced calibration

t.F.-CAL In this menu the timer forced calibration can be activated for each gage (**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 gages are selected for which the timer forced calSPSation shall be activated. The same time interval applies to all selected gages. The column gage automatically switches to the calSPSation 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 calSPSation of the displayed gage can be performed as described at 3.4.1.

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

LA Password protection



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 gage 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.)*

Leave Basic Setup

rEturn

3.7 Restoring factory settings

In order to reset the column gage 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 gage.

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.	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. *(If you have forgotten the password, you can use the default password **200879**.)*
Err. 8	Automatic gage selection is activated. One measuring input has been assigned to several gages. The automatic selection of an active gage is not possible because this input also changes the measured values of various other gages.	There are two ways to eliminate the error : 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 gage 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 reprogram the master values.
Err. 13	Error performing the automatic gage 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 gage calibration. The calibration factor is too large.	The difference between the programmed master values are 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.

Error	Error description	Corrective action
no.dAtA	The PROX200 does not receive any measurement data. Possible causes : 1. No Bus modules have been connected, or an Bus module is defective. 2. Cascading is not possible because the PROX200 with the Bus measuring and interface modules is still turned off.	1. Check Bus modules. 2. Turn on all PROX200s for cascading.
Err. 97	The bootloader version of a connected Bus module is < 1.2.	No correction possible. The connected Bus module is not compatible with the PROX200.
Err. 98	The firmware version of a connected Bus module is < 1.6.	Update Bus module firmware.
Err. 99	Settings were not saved correctly.	Repeat previous action.

4. Working with the column gage

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 gage 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.**
- **If pneumatic gage heads are to be used, perform a restrictor adjustment on each AE1 pneumatic measuring converter.**
- **Perform column gage zero adjustment or calibration.**
  Note : The Bus 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 gage 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 master supplied in order to compensate all offset errors caused by fluctuations in temperature, wear and so on.
- In Case of measuring applications using pneumatic converters (or in case of special applications requiring two masters) an ***automatic Gage calibration*** rather than an ***automatic Zero adjustment*** is performed.
  The automatic gage calibration corrects all offset and gain (spread) errors.
  Switching from the **"automatic Zero adjustment"** to the **"automatic Gage 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 ±150 µm and sets two tolerance marks at ± 50 µm 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 (± 50µm).
6. When all probes have been adjusted properly, push the encoder button to exit the setup mode. The column gage will automatically switch to the measuring mode.

4.4 Restrictor adjustment on 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 gage 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 gage will automatically switch to the measuring mode.
7. ***Perform a gage 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 gage calibration
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 gage 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 gages

- **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 gage and the column gage 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 gage calibration

The automatic gage calibration is activated by programming two masters.

Procedure:

- **Place one of the two masters in the measuring device**
  (or insert the gage 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 gage head into the second master).
- Push the encoder button to confirm the second master.
- Now, the column gage automatically calibrates the currently selected gage. The second master value is adopted as measurement value by the gage and the column gage returns to the measuring mode.

*The automatic gage 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 gage calSPSation can also be triggered by a timer forced mode. This function is programmed in the menu **L9** of the **"BASIC SETUP"**.*

4.7 Multi gaging (C1 … C8)

The **PROX200** column gage allows programming up to 8 independent gages (**C1** to **C8)**.
The unit, resolution, nominal size, tolerance, measuring mode and master values can be programmed for each individual gage. You can switch over to the individual gages (**C1** to **C8)** in the "**MEASURING"** mode by pressing and turning the encoder at the same time, if the function "manual gage selection" is activated. The gage 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 gage 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 gage (**C1** to **C8**) switches over the column automatically to the corresponding gage.

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

End of Document