

# Instruction Manual DM Digital Pressure Gauge



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## 1 Purpose of instruction manual

This instruction manual describes the features of the DM digital pressure gauge and provides guidelines for its use.

Improper use of this instrument or failure to follow these instructions may cause injury or equipment damage. All individuals responsible for operating this instrument must therefore be properly trained and aware of the hazards, and must carefully follow these operating instructions and the safety precautions detailed within. **Contact the manufacturer if you do not understand any part of this instruction manual.**

Handle this manual with care:

- It must be readily available throughout the lifecycle of the instrument.
- It must be provided to any individuals who assume responsibility for operating the instrument at a later date.
- It must include any supplementary materials provided by the manufacturer.

The manufacturer reserves the right to continue developing this instrument model without documenting such development in each individual case. The manufacturer will be happy to determine whether this manual is up-to-date.

## 2 Conformity

This instrument corresponds to the state of the art and meets all legal requirements set forth in EC directives as evidenced by the CE label.



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### **3 Safety precautions**

#### **3.1 Appropriate use**

The DM is a portable, battery-powered digital pressure gauge for measuring positive and negative differential pressures. At the heart of this precision instrument is a pressure measurement capsule containing a membrane spring; the deflection of this spring is then ascertained via an inductive measurement principle. Because it is durable and easy-to-use, the DM lends itself well to maintenance work and customer servicing for heating, air-conditioning and ventilation units, where it can be used for monitoring filters, measuring fireplace drafts and wind pressure, etc. Its precision and reproducibility also make the DM highly suitable for use in laboratory applications.

Always observe the operating requirements particularly the permissible supply voltage indicated on the rating plate and in the "Technical data" section of this manual.

The instrument may only be handled as indicated in this manual. Modifications to the instrument are prohibited. The manufacturer is not liable for damages caused by improper use or failure to follow these instructions. Violations of this type render all warranty claims null and void.

#### **3.2 Troubleshooting, maintenance, repairs, disposal**

The individual responsible for the electrical connections must be notified immediately if the instrument is damaged or if errors occur.

This individual must take the instrument out of service until the error has been corrected and ensure that it cannot be used unintentionally.

This instrument requires no maintenance.

Only the manufacturer may perform repairs that require the housing to be opened.

The electronic components of the instrument contain materials that can be reused. For this reason the instrument must be recycled in accordance with the environmental guidelines of the jurisdiction in question once it has been taken permanently out of service.

### 3.3 Symbols

The symbols given below are used throughout this manual to indicate instances when improper operation could result in the following hazards:



**WARNING!** This warns you of a potential hazard that could lead to bodily injury up to and including death if the corresponding instructions are not followed.



**WARNING:** This warns you of a potential hazard that could lead to significant property damage if corresponding instructions are not followed.



**INFORMATION:** This indicates that the corresponding information is important for operating the instrument properly.

## 4 Instrument description

### 4.1 Functions

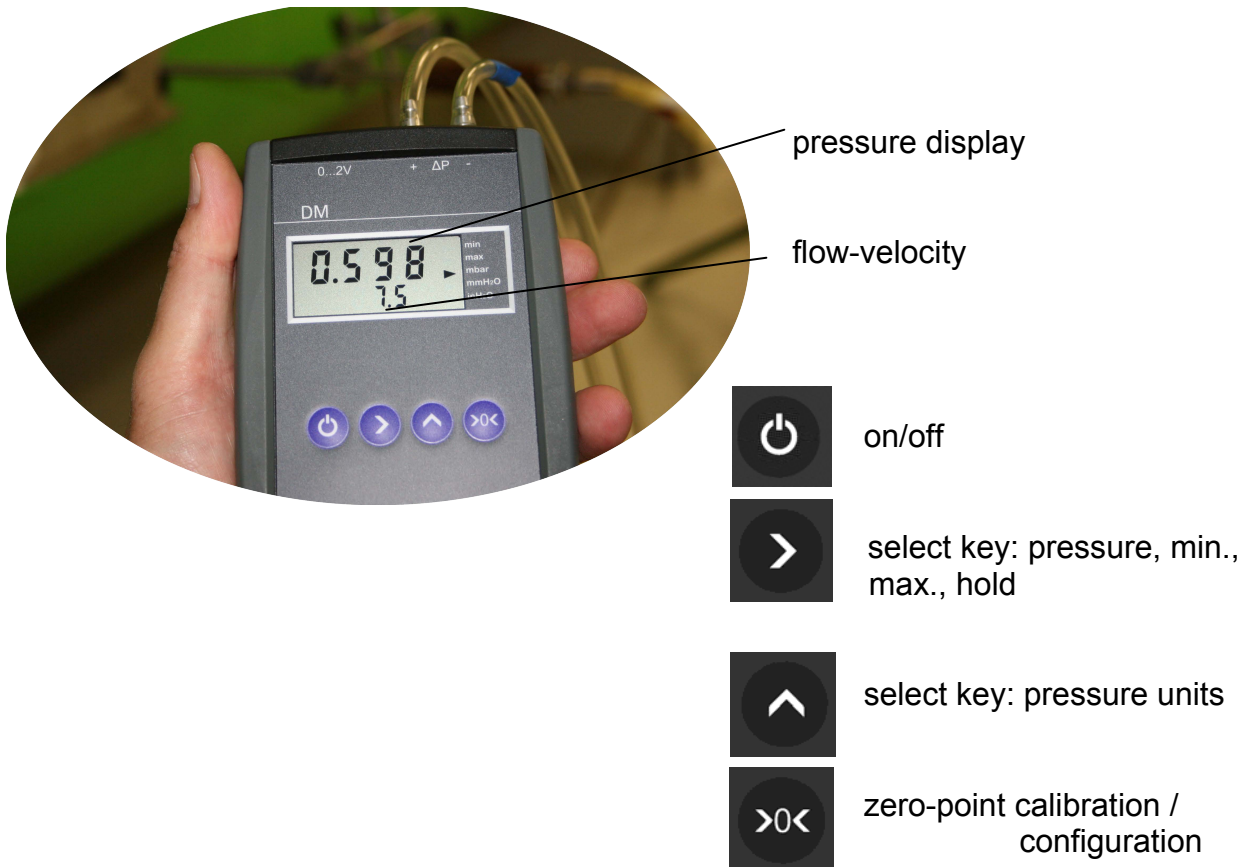
The DM is a battery-operated, digital pressure gauge for measuring overpressure, vacuum and differential pressure of non-aggressive gases. Operating range DM is 2 hPa to 20 hPa.

Because it is robust, easy-to-use and includes an analogue output, this instrument is especially suitable for maintenance, customer service and record-keeping for heating, ventilation and air-conditioning units.

At its heart is a pressure measurement capsule with a beryllium bronze membrane spring, which is displaced by the pressure difference between the two chambers of the measurement capsule. Measurement range is between 2 hPa and 20 hPa. A distance measurement system converts this displacement into an electrical signal. A semiconductor sensor is used for measuring pressures in the area of 20 hPa.

### 4.2 Instrument controls

The instrument control panel consists of a keypad with four buttons.



## 5 Start-up

### 5.1 Electrical connections



**Use only IEC 6 LR 61 batteries.**

Open the battery compartment on the rear of the instrument by sliding off the compartment cover. Plug the batteries in to the battery hook-up, making sure that the battery terminals are properly aligned. Place the battery in the compartment and replace the cover.


### 5.2 Pneumatic connections

Connect the DM to the pressure source at the overpressure port (+) when measuring overpressure, at the vacuum port (-) for measuring vacuum pressure, or at both ports (making certain to connect the + and - ports appropriately) for measuring differential pressure.



## 6 Operating the instrument

The following sections explain how to operate the instrument correctly.

### 6.1 Switching the instrument on/off

Turn the instrument on or off by briefly depressing the  key. The instrument displays its measurement range in mbar for roughly 1 s immediately after it is switched on.


### 6.2 Display modes: measurement, hold, max., min.

The  key allows the user to toggle between the various display modes. Pressing this key once will call up a different display mode. In hold, max and min modes, users can begin a new measurement by briefly depressing the zeroing  key. In the display modes min and max, this will reset the display value, because the actual value will be the new min or max value.

Display mode	Min arrow	Max arrow	Display
normal measurement	off	off	instrument displays current pressure value
hold	on	on	instrument displays pressure value prior to switching modes
max	off	on	instrument displays the largest measured pressure
min	on	off	instrument displays the smallest measured pressure

### 6.3 Changing pressure units

The instrument allows the user to toggle between a number of different units of pressure. Users can change pressure units during normal operation by


depressing the  key. The following units are available:

#### DM:

Pressure units	Factor for converting to Pa	Flow rate in
1 kPa =	1000	m/s
1 Pa =	1	m/s
1 mbar(hPa) =	100	m/s
1 mmH <sub>2</sub> O =	9,80665	m/s
1 inH <sub>2</sub> O =	249,08891	fpm x 100

The instrument will use the new units until it is switched on/off or until the next time the units are changed. The units selected during configuration (see section 7) are always set when the instrument is switched on.

### 6.4 Zeroing key

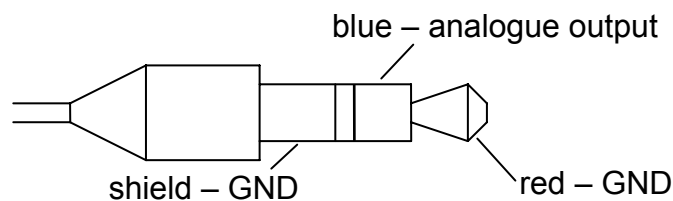
The effects of temperature and positioning of the measurement capsule may cause the zero-point to shift, thereby distorting the measurement result, i.e., causing the instrument to display a measured value even when it is not connected to a source of pressure. Users can recalibrate the zero point by briefly pressing the  key.

It is critical that the instrument not be connected to an external source of pressure when zeroing.




## 6.5 Analogue output




The DM has a 0...2V analogue output, allowing it to read out an output voltage proportional to the pressure. When configuring the instrument, users may set the pressure at which the instrument will read out an output voltage of 2.0V. The output voltage is read out of the instrument via a 3.5 mm jack. The wires of the cable included with the DM correspond to the following assignment:






## 7 Configuration

By adjusting the configuration settings, users can adapt the instrument to their specific application. This menu can be activated by depressing the zero-point key  until '**ConF**' appears in the top line of the display. After the operator releases this key, the instrument launches the first item (setting units of pressure). To exit the configuration menu, simply press the zero-point key again until '**MEAS**' appears in the top line of the display. The new settings are now saved and can be used each time the instrument is switched on.




### 7.1 Setting units of pressure

The symbol '**[P]**' will appear in the bottom line of the display and one of the pressure units will either be displayed or indicated as active by means of an arrow. Users may now set the desired units by pressing the  and  keys. Briefly depressing the  key will exit this mode and the instrument will continue on to the next configuration parameter.

## 7.2 Temperature display




The symbol '°C' is shown in the bottom line of the display and the current status of this switch (on or off) is shown in the top line. Users may change the status by depressing the  and  keys, and may finish entering their settings by pressing the  key. The temperature display will automatically switch off if, during the subsequent step, the flow rate display is activated. (The instrument can only display either temperature or flow rate, but not both.)

## 7.3 Flow-rate display

'SPd' (**SP**eed) will now appear in the bottom line of the display to indicate the function that controls the flow-rate display. The current status of this switch (on or off), shown in the top line, may be altered by pressing the  and  keys. Briefly depressing the  key will exit this mode. If the flow-rate display has been activated, the menu for setting the density of the medium to be measured appears; if not, the next step is to set the scale for the analogue output (section 7.6).

## 7.4 Media density

This configuration parameter is represented in the bottom line of the display by the symbol 'ro'. The top line displays the density as it is currently set and the instrument waits for the user to enter the density of the medium to be measured. The keypad buttons perform the following functions:

-  Selects which digit of the display is to be changed (digit will flash).
-  Increases the selected digit in increments of +1 (0...9→0). If the set next value exceeds the limits of the setting range, it is not added onto the highest digit (no overflow); the digit in question is instead set back to 0.
-  Exits the density entry mode and continues on to the pitot factor.

## 7.5 Pitot factor

This step, represented by the '**Pit**' symbol in the bottom line of the display, allows the user to enter the factor for a pitot tube.



Selects which digit of the display is to be changed (digit will flash).



Increases the selected digit in increments of +1 (0...9→0). If the set value exceeds the limits of the setting range, it is not added onto the next highest digit (no overflow); the digit in question is instead set back to 0.



Exits the entry mode for the pitot factor and continues on to the next step: entering the 2V pressure for the analogue interface.

## 7.6 Setting the scale for the analogue output

This configuration parameter is used for setting the pressure at which the analogue output reads out 2V. Users have the option here of setting the analogue output to any desired final pressure between 20 and 100% of the measurement range. While operators may enter final pressures <20%, doing so will decrease the DA resolution. The bottom line of the display will show the code '**AnH.**'



Selects which digit of the display is to be changed (digit will flash).



Increases the selected digit in increments of +1 (0...9→0) If the set value exceeds the limits of the setting range, it is not added onto the next highest digit (no overflow); the digit in question is instead set back to 0.



Exits this mode and continues on to the next step: entering attenuation.

## 7.7 Attenuation

It may be desirable to determine and display an average value over a specific period if input pressures fluctuate significantly. This parameter allows the user to set the number of measured values to be used to determine an average. Assuming a display rate of 2 measurements per second, this value (1...20) sets an attenuation time between 1 and 10 seconds. The bottom line of the display will show the code '**dAn.**'



Selects which digit of the display is to be changed (digit will flash).



Increases the selected digit in increments of +1 (0...9→0). If the set value exceeds the limits of the setting range, it is not added onto the next highest digit (no overflow); the digit in question is instead set back to 0.



Exits this mode and continues on to the next step: activating the Auto on/off function.

## 7.8 Auto On/Off

The DM has an auto on/off function that can be used to avoid consuming battery power unnecessarily. This feature (which can be toggled on and off) will power down the instrument after 20 minutes if the pressure does not change during this time and no buttons are pressed. The wait period is reset to 20 min. every time the user depresses a button or the pressure fluctuates. The bottom line of the display will show the code '**Aut.**'



Turns this function on or off.



Turns this function on or off.



Exits this mode and continues on to the next step: returning settings to default values.

## 7.9 Default settings

This parameter is used to reset the instrument to its default settings if desired. The bottom line of the display will show the code 'rES.'



Turns this function on (yes) or off (no).



Turns this function on (yes) or off (no).



Exits this mode and returns to measurement mode.

## 8 Troubleshooting

Error description	Potential cause	Corrective action
display does not appear	dead battery	install new battery use a 9V IEC 6 LR 61 battery
instrument returns false values	zero point has shifted  battery is low	adjust zero point (see section 4.4)  'Batt' appears in the display field, i.e., replace battery
zero-point calibration cannot be performed	defective pressure measurement capsule	send the instrument to the manufacturer for repair

## 9 Technical data

linearity:	$\pm 0.5\%$ of FVM at 22°C
temp.-dependent drift, measurement range	$\pm 0.04\%/^{\circ}\text{C}$ of FVM
temp.-dependent drift, offset:	$\pm 0.04\%/^{\circ}\text{C}$ of FVM (for gradual changes in temperature)
overload range	10 x FVM (for ranges $\leq 20$ kPa) 2 x FVM (for ranges $> 20$ kPa and DB3)
response time	0.5s
display: resolution:	<ul style="list-style-type: none"><li>• 4-place LCD for pressure<ul style="list-style-type: none"><li>0.005% of FVM for <math>0 &lt; P &lt; 0.5</math></li><li>0.05% for <math>P &gt; 0.5</math> FVM</li><li>0.005% for <math>0 &gt; P &gt; -0.1</math> FVM</li><li>0.05% for <math>-0.1 \text{ FVM} &gt; P &gt; -\text{FVM}</math></li></ul>(FVM = final value in the meas. range)</li><li>• 3-place LCD for flow rate</li></ul>
temp.measurement:	<ul style="list-style-type: none"><li>• resolution 1°C</li><li>• accuracy: <math>\pm 1^{\circ}\text{C}</math></li><li>• measurement range: 0 ... 60°C</li></ul>
analogue output:	max. output voltage: 3.3V permissible load: $\geq 2\text{k}\Omega$
temperature range:	storage temperature -10 ... +70°C operating temperature range 0 ... 50°C
supply voltage:	<ul style="list-style-type: none"><li>• 9V IEC 6 LR 61 monoblock battery (alkaline-Mn)</li><li>• battery life, in operation: approx. 120 h</li><li>• battery life, in standby mode: approx. 2000 h</li></ul>
pressure port:	universal tubing ports 3...6 mm inner diameter
housing:	<ul style="list-style-type: none"><li>• TEKNET TN22-B.29</li><li>• units indicated on keypad</li><li>• four buttons</li></ul>
operating position:	preferably horizontal; positioning error may be corrected using the "zero-point calibration" key

- weight: approx. 300 g, including battery
- miscellaneous: The automatic off function switches the instrument off after it has been "quiet" for approx. 20 minutes. This "quiet time" is interrupted whenever the pressure changes by more than 2% of the final value or the operator presses a button. Each time this happens, the wait period is reset to 20 minutes.

Appendix A: Parts in contact with measurement medium

- Beryllium bronze CuBe2
- Mu metal (nickel alloy)
- Brass CuZn39Pb3
- Aluminium AlCuMgPb / AlMg3
- Viton(tubing)
- Crastin (PTBP)
- Araldite CY236 / HY988
- Loctite 242e
- Ferrit
- KEL (FPM: fluorinated rubber)
- Vepuran Vu 4457/51
- UHU-Plus endfest 300 binder

### 10 Drawings

