



Instruction Manual

EMA 200 Digital Pressure Gauge



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Purpose of instruction manual

This instruction manual describes the features of the EMA 200 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.

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.



Translation of the original instructions

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The manufacturer owns the copyright to this instruction manual. This manual contains data, instructions and drawings pertaining to the features and usage of this instrument; copying this manual in part or in full or distributing it to third parties is prohibited.

Table of Contents

1	Safety precautions	4
1.1	Appropriate use	4
1.2	Troubleshooting, maintenance, repairs, disposal	4
1.3	Symbols	5
1.4	Important notes on batteries and rechargeable batteries	6
2	Instrument description.....	7
2.1	Functions.....	7
2.2	Instrument controls	7
3	Start-up	8
3.1	Electrical connections.....	8
3.2	Pneumatic connections	8
4	Operating the instrument.....	9
4.1	Switching the instrument on/off.....	9
4.2	Display modes: measurement, hold, max., min.	9
4.3	Changing pressure units.....	9
4.4	Display and overflow behavior	10
4.5	Zeroing key	10
4.6	Analogue output	10
5	Configuration.....	11
5.1	Setting units of pressure.....	11
5.2	Temperature display.....	11
5.3	Flow-rate display (not available with 200kPa Range).....	11
5.4	Media density (not available with 200kPa Range)	12
5.5	Pitot factor(not available with 200kPa Range)	12
5.6	Setting the scale for the analogue output.....	13
5.7	Analog offset for +/- measurement.....	13
5.8	Attenuation	13
5.9	Auto On/Off	14
5.10	Default settings.....	14
6	Troubleshooting	15
7	Technical data	16
8	Certificate of Conformity.....	18

1 Safety precautions

1.1 Appropriate use

The EMA 200 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 EMA 200 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 EMA 200 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.

1.2 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.

1.3 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.

1.4 Important notes on batteries and rechargeable batteries

According to current international regulations, batteries, rechargeable batteries, and electrical and electronic devices must not be disposed of via household waste.

Optional built-in lithium-ion batteries must be returned together with the device.

Proper Disposal

Please use the return systems provided by retailers or commercial take-back schemes or your local municipal collection points. Check for a suitable collection point in your area.

Depending on the device's features, different instructions apply to the use and disposal of batteries/rechargeable batteries.

The device is equipped with a NiMH battery:

Nominal voltage: 9V

Replacement batteries: 9V block 6LR61 MN1604



DANGER – Fire and explosion hazard!

- Never throw the battery/accumulators into a fire, open, damage, or short-circuit them.
- Do not expose the battery/ accumulators to temperatures below $-10\text{ }^{\circ}\text{C}$ or above $+50\text{ }^{\circ}\text{C}$.
- Non-rechargeable batteries must never be recharged.

Lithium-ion batteries can cause serious injuries in case of short-circuit, overheating, or mechanical damage.



WARNING - Risk of injury!

Improper handling of lithium-ion batteries may cause injuries

- If the device has a built-in battery, only charge it with the supplied or manufacturer-approved charger.
- In case of leakage or deformation, do not touch the battery/accumulator. Rinse immediately with plenty of water if contact with skin or eyes occurs, and seek medical attention.



CAUTION Avoid damage to property!

- Protect against moisture and direct sunlight.
- Unauthorized opening of the device may lead to injury and void the warranty.
- Observe polarity when connecting.



NOTICE

This product does not contain batteries with lead (Pb), cadmium (Cd), or mercury (Hg), in accordance with current EU regulations.

2 Instrument description

2.1 Functions

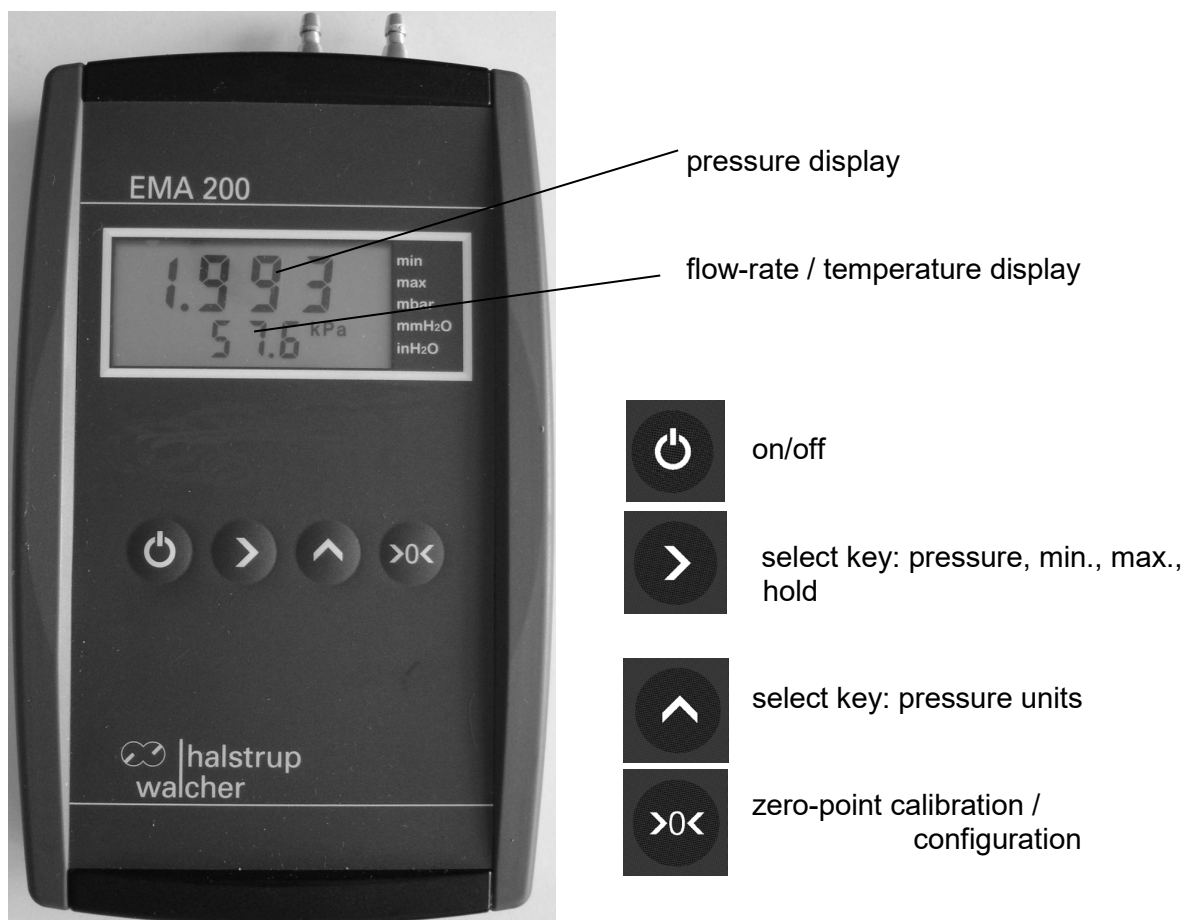
The EMA 200 is a battery-operated, digital pressure gauge for measuring overpressure, vacuum and differential pressure of non-aggressive gases. Operating range is 200 Pa to 200 kPa.

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 200 Pa and 20 kPa. A distance measurement system converts this displacement into an electrical signal. A semiconductor sensor is used for measuring pressures in the area of 200 kPa.

2.2 Instrument controls

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



3 Start-up

3.1 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.

3.2 Pneumatic connections

Connect the EMA 200 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.

4 Operating the instrument

The following sections explain how to operate the instrument correctly.

4.1 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.

4.2 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

4.3 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 table lists the units that are available, whereby the units Pa and kPa depend on the measuring range of the unit in use:

Pressure units	Factor for converting to Pa	Flow rate in	Available at
1 kPa =	1000	m/s	Measuring range 2, 20 and 200 kPa
1 Pa =	1	m/s	Measuring range 200 Pa
1 mbar(hPa) =	100	m/s	All measuring ranges
1 mmH ₂ O =	9,80665	m/s	All measuring ranges
1 inH ₂ O =	249,08891	fpm x 100	All measuring ranges

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.

4.4 Display and overflow behavior

The display unit may vary depending on the measuring range; however, the display and overflow behavior described below is equivalent in all units

Positive range:

If the measuring range is exceeded, an overflow display appears. The display shows a value > 2.000 kPa and the display flashes.

Negative range:

The minus sign is displayed above the middle segment line of the first digit. This limits the display to -1.999 kPa. An overflow display appears immediately at -2.000 kPa.

Hysteresis:

When the measured value decreases, the overflow display does not disappear immediately at -1.999 kPa. The pressure must first decrease further before the measured value is displayed again. The amount of hysteresis is device-specific and not specified.

4.5 Zeroing key

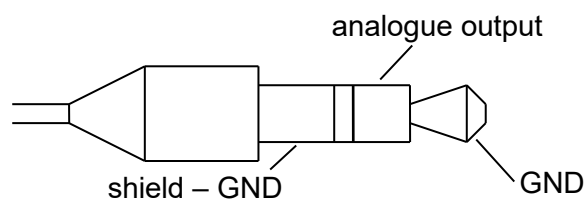
The effects of temperature and positioning of the measurement capsule may cause the zero-point to shift, thereby distorting the measurement result, i.e., causing the instrument to display a measured value even when it is not connected to a source of pressure. Users can recalibrate the zero point by briefly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

It is important that no external pressure is applied to the measuring device at the time of zeroing.

4.6 Analogue output

The EMA 200 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.

For electrical connection, see following assignment:



5 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.

5.1 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.

5.2 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 the 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 temperature or flow rate, but not both at the same time.)

5.3 Flow-rate display (not available with 200kPa Range)



'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 5.6).

5.4 Media density (not available with 200kPa Range)

This configuration parameter is located in the bottom line of the display by the symbol 'ro'. The top line displays the density as it is currently set in g / m^3 . The instrument waits for the user to enter the density of the medium to be measured. You can set values between 0001 and 9999.

The default setting is $1199 \text{ g} / \text{m}^3$.

The keypad buttons perform the following functions:



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



This key increases the selected digit by +1 (0...9→0). There is no overflow to the next higher digit. If the set value exceeds the limits of the setting range, the digit jumps to 0.



Exits the density entry mode and continues on to the pitot factor.

5.5 Pitot factor(not available with 200kPa Range)

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.

The default setting is 1,000 for standard pitot tubes. You can set values between 0,001 and 9,999. The keypad buttons perform the following functions:



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



This key increases the selected digit by +1 (0...9→0). There is no overflow to the next higher digit. If the set value exceeds the limits of the setting range, the digit jumps to 0.



Exits the entry mode for the pitot factor and continues on to the next step: setting the scale of the analogue interface.

5.6 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).



This key increases the selected digit by +1 (0...9→0). There is no overflow to the next higher digit. If the set value exceeds the limits of the setting range, the digit jumps to 0.



Exits this mode and continues on to the next step: setting the analog output.

5.7 Analog offset for +/- measurement

With this menu item you can increase the analogue output voltage by 1.0 V. The amplification of the analogue output is halved. This makes it possible to map negative differential pressures to the analogue output.

The status of this switch is indicated in the upper line with 'On' or 'OFF' and can be changed using the  and  keys. The display shows 'AOF' as the identifier in the bottom line. Press the key  to exit this menu item.

The unit now outputs 2.0 V if the pressure = AnH. 0.0 V are displayed if the pressure corresponds to the value of -AnH.

5.8 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).



This key increases the selected digit by +1 (0...9→0). There is no overflow to the next higher digit. If the set value exceeds the limits of the setting range, the digit jumps to 0.



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

5.9 Auto On/Off

The EMA 200 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 keys are pressed. The wait period is reset to 20 min. every time the user depresses a key 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.

5.10 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.

6 Troubleshooting

Error description	Potential cause	Corrective action
battery symbol active	weak battery	install new battery
battery symbol is blinking	battery nearly empty	the battery should be replaced
display shows 'batt Lo' and switches off	dead battery	install new battery use a 9V IEC 6 LR 61 battery
zero-point calibration cannot be performed	defective pressure measurement capsule	send the instrument to the manufacturer to repair

7 Technical data

linearity	$\pm 0.5\%$ of final full-scale (FS) at $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$
temp.-dependent drift, measurement range	$\pm 0.04\% / ^{\circ}\text{C}$ of FS
temp.-dependent drift, offset	$\pm 0.04\% / ^{\circ}\text{C}$ of FS (for gradual changes in temperature)
long-term amplitude drift	0.5% / year
overload range	• 10 x FS (for ranges ≤ 20 kPa) • 2 x FS (for ranges > 20 kPa)
response time	0.5 seconds
display	• 4-place LCD for pressure resolution: 0.005% of FS for $0 < P < 0.5$ 0.05% for $P > 0.5$ FS 0.005% $0 > P > -0.1$ FS 0.05% $-0.1\% \text{ FS} > P > -\text{FS}$ • 3-place LCD for flow rate
temperature display	• Resolution: 1°C • accuracy: $\pm 1^{\circ}\text{C}$ • measurement range: $0 \dots 60^{\circ}\text{C}$
analogue output	max. output voltage: 3.3 V permissible load: $\geq 2 \text{ k}\Omega$
temperature range	storage temperature $-10 \dots +70^{\circ}\text{C}$ operating temperature range $0 \dots 50^{\circ}\text{C}$
supply voltage	• 9V IEC 6 LR 61 monoblock battery (alkaline-Mn) • battery life, in operation: approx. 120 h • battery life, in standby mode: approx. 2000 h
pressure port	universal tubing ports 3...6 mm inner diameter
housing	• TEKNET TN22-B.29 • units indicated on keypad • four keys
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 key. Each time this happens, the wait period is reset to 20 minutes.

Appendix A:

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

8 Certificate of Conformity



Die Lösung liegt im Detail

EG-Konformitätserklärung im Sinne der
EG- Richtlinie 2014/30/EU, EMV Richtlinie und
2006/95/EG, Niederspannungsrichtlinie

Certificate of Conformity based on the
European Standard 2014/30/EU, and 2006/95/EG

Der Hersteller
The manufacturer

halstrup-walcher GmbH
Stegener Straße 10
79199 Kirchzarten
Deutschland

erklärt, dass die Bauart des Produktes
declares, that the construction of instrument type

Differenzdruck-Messumformer Typ EMA200
Differential Pressure Transformer Type EMA200

entwickelt, konstruiert und gefertigt ist in Übereinstimmung mit den EG – Richtlinien
is developed, designed and manufactured in accordance with the EC Directives.

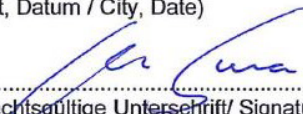
EN 61000-6-2 : 2005
EN 61000-6-4 : 2011
EN 61010-1 : 2011

abgegeben durch / stated by:

Sura, Christian
(Nachname, Vorname / Surname, first name)

Geschäftsführer, Managing Director
(Stellung im Betrieb des Herstellers / Position)

Kirchzarten, 19.10.2016
(Ort, Datum / City, Date)


(Rechtsgültige Unterschrift/ Signature)

Notes:

[illegible]