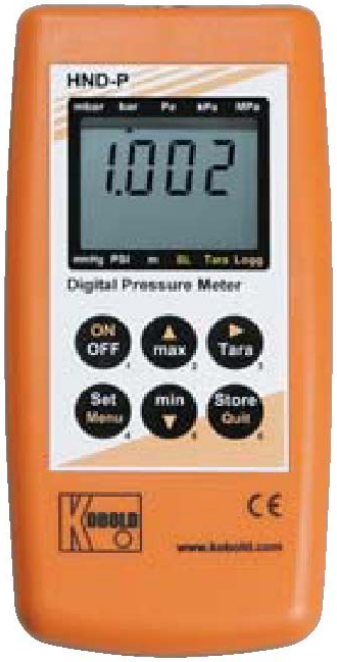
# Operating Instructions

# for

# Handheld Pressure Measuring Devices with External Pressure Sensors

## Model: HND-P105



# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

## 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

## 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Handheld Pressure Measuring Devices with External Pressure Sensors model: HND-P105
- Operating Instructions

## 4. Regulation Use

Any use of the Manual Pressure Measuring Devices with External and Integrated Pressure Sensors, model: HND-P105, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The KOBOLD manual pressure measuring devices HND-P105 are highly precise, compact pressure measuring devices that can be used universally. In conjunction with the appropriate external pressure sensors, precise measurement results over the entire measuring range can be achieved.
Various pressure sensors are available for a multitude of measuring tasks and special applications. The respective measurement task determines which combination is selected. Naturally, these first-rate KOBOLD-measuring units can display more than just pressure. All devices in this series allow for minimum/maximum value memory, hold function, automatic self-shut-off, or zero point offset entry for all connected pressure sensors.

# 6. Electrical Connection

## 6.1 Mains Operation With Power Supply

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$.**
**Do not apply overvoltage!! Cheap 12 V-power supplies often have excessive no-load voltage.**
**We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002.**
**Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.**

### 6.1.1 Connecting/Changing Sensors

Do not use unsuitable sensors. Connecting other devices/sensors as specificated may cause a damage to the instrument and device/sensor! Switch off device before changing the sensor.
Connect sensor before switching on the device, otherwise the sensor may not be detected correctly. When connecting the sensor the connector may not lock correctly. In such case take the plug not at the casing but at the buckling protection at the end of the plug. If plug is entered correctly, it will slide in smoothly. To disconnect sensor do not pull at the cable but at the plug (to open locking mechanism).

# 7. Operation / Configuration / Adjustments

## 7.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

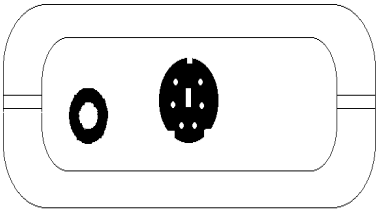
1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under *9 Technical Information*.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting. Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

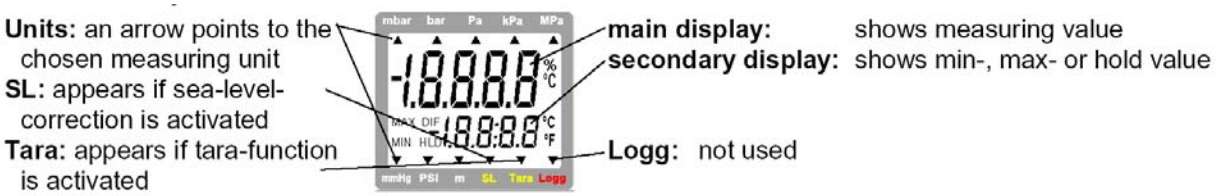
   In case of doubt, please return device to manufacturer for repair or maintenance.

## 7.2 Connections



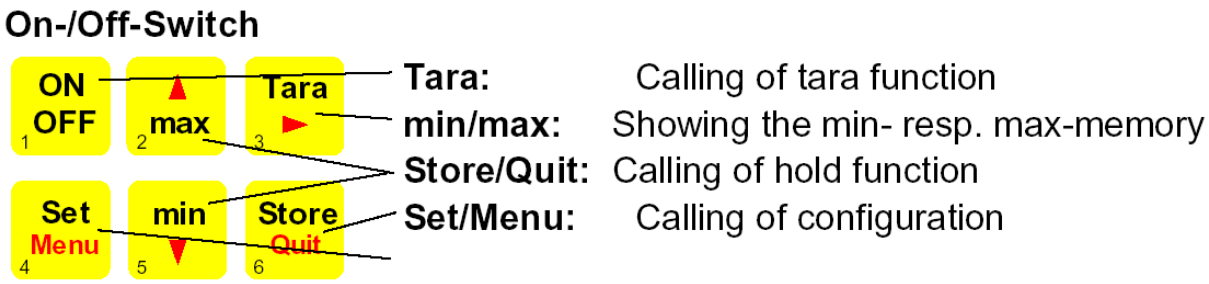
1. **Interface:** Connect to optically isolated interface adapter (accessory: GRS 3100, GRS 3105, USB 3100 or USB 3100N)
2. **Connections** for **pressure sensors** of the HND-PS-family
3. The **mains socket** is located at the left side of the instrument

## 7.3 Display




## 7.4 Basic Operation

When switching on the device displayed “Corr”, if a sensor with activated offset or scale correction is connected.




**Tare Function:** By pressing `Tara`(key 3) the displays will be set to 0. All measuring from then on will be displayed relatively to the set tare values. When the tare function is activated, the arrow “Tara” appears in the display. To deactivate tare function press `Tara`for >2 seconds. ***Please note: Activating/deactivating tara clears the max-&min-memories.***

**Max Memory:** Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max memory press key ´max´ for >2 seconds.

**Min Memory:** Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min memory press key ´min´ for >2 seconds.

**Hold Function:** By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it.

**Zero-Point Adjustment:** If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press key 3 for approx. 5 seconds. (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration menu). Please note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits!
To recall the manufacturer`s calibration press button 3 for approx. 15 seconds.
*Note: If a zero-point adjustment was carried out, this will be signalled by the short displaying of "Corr" when switching on the device.*

## 7.5 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu.
Pressing key ***Menu*** jumps between the parameters.
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

### 7.5.1 Unit: Choice Of The Display Unit


Choose the desired display unit, the referring unit is displayed by means of a functional arrow in the display. The selection is permanently stored in the sensor, therefore after reconnecting the sensor the unit will instantly reappear. The choice depends on the used sensor.

### 7.5.2 Sea Level Correction For Absolute Pressure Sensors

The device displays the absolute pressure measured at the sensor. This is not necessarily the same like the values given by weather stations! The weather stations' values are pressure at sea level. Usually the sensor is placed above sea level and therefore, if the value at sea level (zero) is to be measured, the pressure loss resulting from the actual level above zero has to be considered!


- To correct activate the „Sea-Level-Function":
  Select „on" in the menu „SL" with ▲ (key 2) or ▼ (key 5).


- Jump to the next parameter „Alti" by pressing ***Menu*** (key 4).
  Then enter the altitude above sea level of the sensor's location in meters and leave the configuration by pressing ***Quit*** (key 6)

If the sea level correction is active this will be shown by the functional arrow „SL" in the display, the device now displays the absolute pressure at sea level (zero).

### 7.5.3 P.oFF: Auto Power Off Time


The device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power off time. The power off time can be set to values between 1 and 120 min. It can be completely deactivated by setting the parameter to ‚P.oFF = oFF“.

### 7.5.4 Adr: Base Address of Interface


Up to 10 devices of the HND- handheld-family can be connected to a serial interface at once (depending on interface converter, e.g. HND-P...: 5 devices). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

### 7.5.5 OFFS: Adjusting Sensor Zero Displacement

A zero displacement can be carried out for the measured value:

**value displayed = value measured - offset**

Standard setting: ´off´= 0.0, i.e. no zero displacement will be carried out. Together with the scale correction (see below) this factor is mainly used to compensate for sensor deviations. Input is in the display unit.

### 7.5.6 SCAL: Adjusting Sensor Scale

The scale of the measuring can be influenced by this setting (factor is in %):

**displayed value = measured value*(1+Scal/100)**

Standard setting: ´off´= 0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

## 7.6 Measuring Of Water Level – Display Unit [m]

**(only for devices with ‚m‘ printed below the display)**

When using a suitable waterproof pressure sensor the unit [m] for meters of water can be set in the menu “Unit“. 10 m of water are roughly 1 bar over pressure. Measurings can be made e.g. like described below :

- With abs. pressure sensor (SL oFF!): Press ‚Tara‘ when sensor is at ambient air and then bring sensor to the depth to be measured. The display shows now the depth in [m].
- With rel pressure sensor: bring tube connection for lower press. in contact to ambient air by means of a tube (no water contact!) and bring the sensor with its open press. connection for higher pressure to water depth to be measured (display and is compensated for pressure changes in ambient air).

## 7.7 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificied for its accuracy, it is the best solution to return it with the referring sensors to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

## 7.8 Pressure Connection To The Sensors

The device is designed to be connected to the sensors of the HND-PS...-series without a new calibration being necessary. Therefore a great variety of replaceable sensors of e.g. –1.999...2.500 mbar relative up to 0...400.0 bar absolute pressure can be connected to the device *(p.r.t. chapter 10.1 Pressure sensors)*

### 7.8.1 Relative Pressure Sensors

- **For measurements of over- or under pressure:**
  Connect plastic tube with internal dia of 4 mm to pressure port "B". Port "A" will not be used!
  Pressure sensors HND-PS01, -PS02 and –P03 allow for measurements of under pressure up to the entire over pressure measuring range by re-plugging the tube to pressure port "A". Please note that all values are displayed as positive values. No minus sign will be shown. (Example for HND-PS02: For tube connection "B" the measuring range covers -19.99 to 25.00 mbar. If you replug to port "A" under pressure measurements down to -25.00 mbar could be carried out with the display showing the value 25.00 (no minus sign).
- **For measurements of pressure differences:**
  Connect both plastic tubes with an internal dia of 4 mm to pressure port "B" and "A"; make sure to apply higher pressure to port "B".

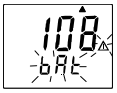
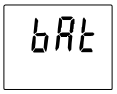
### 7.8.2 Absolute pressure sensors:

Connect plastic tube with an internal dia of 4 mm to pressure port "A". (Port "B" is not used.)

### 7.8.3 Stainless steel pressure sensors:

For measurements of over-, under- or absolute pressure screw sensor to G1/4" pressure terminal or plug plastic tube to a suitable adapter.

## 7.9 Error And System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
|  | No sensor connected | Switch off device and connect sensor |
| | Connected sensor or device defective | If second sensor available, check if device is ok. Return defective device/sensor to manufacturer for repair |
| or ***Err.9*** | Measured value far out of allowable range | Check: pressure not within sensor range? |
| No display or confused characters, device does not react on keypress | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| ***Err.1*** | Measured value above allowable range | Check: pressure not within sensor range? -> measuring value to high! |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | Check: pressure not within sensor range? -> measuring value to low! |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.3*** | Display range overflow | Check: value above 19999->to high to be displayed |
| ***Err.4*** | Display range underflow | Check: display below -19999 (Tara?)-> to low! |
| ***Err.11*** | Value could not be calculated | Choose different unit |
| | Calculation overflow happened | Choose different unit |
| ***Err.7*** | System error | Return to manufacturer for repair |
| ***----*** | Sensor not present/recognised | Connect suitable sensor |
| | Could not calculate value | |

### 7.10 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031 or HND-Z032) the device can be connected to a computer for data transfer. To avoid transmission errors, there are several security checks implemented e.g. CRC.
The following standard software packages are available:

- **BUS-EBS9M**: 9-channel software to display the measuring values

**Note: The measuring display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Code | Name/Function | Code | Name/Function |
|---|---|---|---|
| 0 | Read measurement value | 200 | Read min display range |
| 3 | Read system state | 201 | Read max display range |
| 6 | Read min value | 202 | Read display range - unit |
| 7 | Read max value | 204 | Read display range – decimal point |
| 12 | Read ID number | 208 | Read # of channels |
| 176 | Read min measuring range | 214 | Read Scale adjustment |
| 177 | Read max measuring range | 216 | Read Offset adjustment |
| 178 | Read measuring range unit | 222 | Read power off time (Conf.-P.oFF) |
| 179 | Read measuring range decimal point | 223 | Set power off time (Conf-P.oFF) |
| 180 | Read kind of measuring of sensor | 240 | Reset |
| 199 | Read kind of measuring of display | 254 | Program version |

# 8. Maintenance

## 8.1 Battery Operation

If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up. The battery has to be taken out, when storing device above 50 °C.

**Please note: We recommend to take out battery if device is not used for a longer period of time!**

# 9. Technical Information

| | |
|---|---|
| **Measuring ranges:** | |
| Display range: | -19999 ... +19999 digit, depending on connected sensor |
| Resolution: | depending on connected sensor |
| Pressure units: | mbar, bar, kPa, MPa, mmHg, PSI, $mH_2O$ |
| Accuracy: (typ.) | ± 0,1 % F.S. (at nominal temperature) |
| Measuring rate: | 4 meas./sec |
| Nominal temperature: | 25 °C |
| **Sensor:** | All sensors of the HND-PS-series without calibration can be connected. |
| Connection: | Mini-DIN-Socket with locking mechanism<br>The sensor will automatically be detected, the measurement range settings are set referring to sensor data |
| **Additional Functions:** | |
| Power-Off-Function: | Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated. |
| **Display:** | 2 four-digit LCDs (12.4mm high and 7mm high) for measuring values, and for min/max memories, hold function, etc. As well as additional functional arrows. |
| **Pushbuttons:** | 6 membrane keys |
| **Interface:** | Serial interface (3.5 mm jack) can be connected to HND-Z031 or HND-Z032 to RS232 or USB interface of a PC via electrically isolated interface adapter. |
| **Power supply:** | 9 V-battery, type: IEC 6F22<br>(included in the scope of delivery)<br>As well as additional d.c. connector (diameter of internal pin 1.9 mm) for external 10.5-12V direct voltage supply. (suitable power supply: GNG10/3000) |
| Power consumption: | <1.6 mA |
| Low battery warning: | `bAt` |
| **Housing:** | impact-resistant ABS, membrane keyboard, transparent panel, Front side IP65 |
| Dimensions: | 142 x 71 x 26 mm (LxWxD) |
| Weight: | approx.150 g |
| Working temperature: | -25...+50 °C |
| Allowable rel. humidity: | 0...95%RH (not condensing) |
| Storage temperature: | -25...+70 °C |

# 10. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P105** | 1 x pressure sensor input, standard |

## 10.1 Pressure sensors for HND-P105

| Measuring range | Accuracy | Resolution | Overload | Working-Temperature | Connection | Order-no. |
|---|---|---|---|---|---|---|
| 1.999...2.500 mbar | ±0.2 % f.s. / ±1.0 % f.s.* | 0.001 mbar | max. 200 mbar | 0...+50 °C | Nylon spigot for hose 6 x1 mm  | HND-PS01** |
| 19.99...25 mbar | ±0.2 % f.s. /±0.5 % f.s.* | 0.01 mbar | max. 300 mbar | | | HND-PS02** |
| 199.9...350.0 mbar | ±0.2 % f.s. /±0.4 % f.s.* | 0.1 mbar | max. 1 bar | | | HND-PS03** |
| 1000...2000 mbar | | 1 mbar | max. 4 bar | | | HND-PS04** |
| -1...10 bar | | 10 mbar | max. 10.34 bar | | | HND-PS05** |
| 0...1300 mbar abs. | | 1 mbar | max. 4 bar abs. | | | HND-PS06** |
| 0...2000 mbar abs. | | | | | | HND-PS07** |
| 0...7.00 bar abs. | | 10 mbar | max. 10 bar abs. | | | HND-PS08** |
| 0...350.0 mbar rel. | | 0.1 mbar | max. 1.4 bar | 0...+70 °C | G ¼ male, stainless steel  | HND-PS09 |
| 0...1000 mbar abs. | | 1 mbar | max. 4 bar abs. | | | HND-PS10 |
| 0...3500 mbar abs. | | | max. 14 bar abs. | | | HND-PS11 |
| 0...3500 mbar rel. | | | max. 14 bar rel. | | | HND-PS12 |
| 0...7000 mbar abs. | | | max. 28 bar abs. | | | HND-PS13 |
| 0...35.00 bar abs. | | 10 mbar | max. 140 bar abs. | | | HND-PS14 |
| 0...70.00 bar abs. | | 0.1 bar | max. 280 bar abs. | | | HND-PS15 |
| 0...160.0 bar abs. | | | max. 600 bar abs | | | HND-PS16 |
| 0...250.0 bar abs. | | | | | | HND-PS17 |
| 0...400.0 bar abs. | | | | | | HND-PS18 |
| 0...1000 mbar abs | ±0,2% ME / ±0,4% ME* | 1 mbar | max. 5 bar abs | 0...+70°C | G ½ male  | HND-PA20 |
| 0...2500 mbar abs | | | max. 10 bar abs | | | HND-PA21 |
| 0...4000 mbar abs | | | max. 17 bar abs | | | HND-PA22 |
| 0...6000 mbar abs | | | max. 35 bar abs | | | HND-PA23 |

* in the range from 0 to +50 °C

** Pressure sensors HND-PS01 up to HND-PS08 are only suitable for air and non corrosive/non ionizing gases and liquid.

## 10.2 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10.5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose 6.4 on hose 6.4 |
| **HND-Z082** | Hose clamp for hose 6.4 |
| **HND-Z088** | Adapter made of brass for G ½ internal threads on hose 6.4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

* Please pay attention to instrument dimensions

More accessories on request

# 11. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Handheld Pressure Measuring Devices with External Pressure Sensors**
**Model: HND-P105**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 8. Mai 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Hand-held Pressure Measuring Devices with Integrated Pressure Sensors

## Model: HND-P121

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Hand-held Pressure Measuring Devices with Integrated Pressure Sensors model: HND-P121
- Operating Instructions

# 4. Regulation Use

Any use of the hand--held Pressure Measuring Devices with Integrated Pressure Sensors, model: HND-P121, which exceeds the manufacturer’s specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The highly precise KOBOLD manual pressure measuring devices HND-P121 are measuring devices with integrated pressure sensors. They have two pressure measurement inputs on the top of the housing, which are connected to the measuring points by means of stable metal connections and plastic hoses that are available as accessories. Numerous measuring ranges in the overpressure and underpressure range are available for various measurement tasks, such as differential pressure measurement. In addition to pressure display, these first-rate, compact, universally applicable measuring units offer additional functions such as minimum/maximum value memory, a hold function, tare function, automatic self-shut-off, or zero point offset. The devices with an expanded spectrum of functions also have a logger function, a peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

# 6. General

## 6.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under chapter *13. Technical Information*.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
   Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

   In case of doubt, please return device to manufacturer for repair or maintenance.

## 6.2 Maintenance

- **Battery Operation**

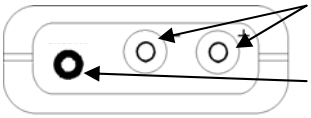
If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.

**Note: We recommend to take out the battery if device is not used for a longer period of time!**

- **Mains Operation With Power Supply**

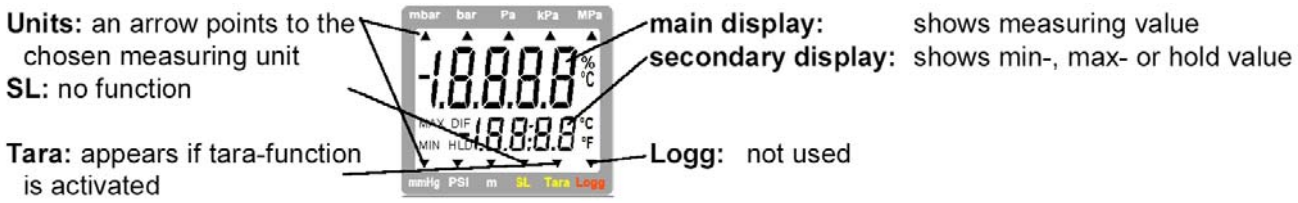
**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!! Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002.**
**Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.**

## 6.3 Connections



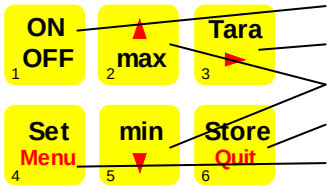
Connection for pressure tubes:
„+“ = higher pressure, „-“ = lower pressure
Interface: Connection for el. isolated interface adapter (p.r.t. chapter *12 The Serial Interface*)
The mains adapter socket is located at the left side of the device.

### 6.4 Display




# 7. Operation

When **switching on** the device and a zero point adjustment was carried out it shows shortly „nuLL Corr“.




**On-/Off-Switch**
**Tara:** Calling of tara function, zero point adjustment
**min/max:** Showing the min- resp. max-memory in sec. display
**Store/Quit:** Calling of hold function
**Set/Menu:** Calling of configuration

**Max Memory:** Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max memory press key ´max´ for >2 seconds.

**Min Memory:** Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min memory press key ´min´ for >2 seconds.

**Hold Function:** By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it.

**Tare Function:** By pressing ´Tara´ (key 3) the display will be set to 0. All measurings from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds.

**Please Note: Activating/deactivating tara clears the max- & min-memories.**

**Zero-Point Adjustment:** If there is no pressure applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press key 3 for approx. 5 seconds (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration menu).

Please note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits! To recall the manufacturer's calibration press button 3 for approx. 15 seconds. Note: If a zero-point adjustment was carried out, this will be signalled by the short displaying of "Corr" when switching on the device.

# 8. Configuration of the Device

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu.
Pressing key ***Menu*** jumps between the parameters.
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

## 8.1 Unit: Coice Of The Display Unit


Choose the desired display unit, the referring unit is displayed by means of a functional arrow in the display. The selection is permanently stored in the device, therefore after power on the unit will instantly reappear. The choice depends on the used sensor.
The unit [m] =m$H_2O$ is just supported by devices with [m] printed below the display!

## 8.2 P.oFF: Auto Power Off Time


The device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power off time. The power off time can be set to values between 1 and 120 min. It can be completely deactivated by setting the parameter to ‚P.oFF = oFF".

## 8.3 Adr: Base Address of Interface


Up to 10 devices of the HND-P… handheld-family can be connected to a serial interface at once. To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

### 8.4 OFFS: Adjusting Sensor zero Displacement

A zero displacement can be carried out for the measured value:

**value displayed = value measured – offset**

Standard setting: ‘off’= 0.0°, i.e. no zero displacement will be carried out. Together with the scale correction (see below) this factor is mainly used to compensate for senor deviations. Input is in the display unit.

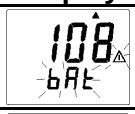
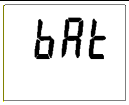
### 8.5 SCAL: Adjusting Sensor Scale

The scale of the measuring can be influenced by this setting (factor is in %):

**displayed value = measured value*(1+Scal/100)**

Standard setting: ‘off’= 0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

## 9. Error and System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
| **No display or confused characters, device does not react on keypress** | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| ***Err.1*** | Measured value above allowable range | Check: pressure above 25 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | Check: pressure below -1mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.4*** | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| ***Err.9*** | Measured value far out of allowable range | Check: pressure not within sensor range? |
| ***Err.7*** | System error | Return to manufacturer for repair |

# 10. Pressure Connection to the Sensors

- **For measurements of over pressure (-1.00 mbar...25.00 mbar):**
  Connect plastic tube with internal diameter of 4 mm to pressure port "+". Port "-" will not be used!
- **For measurements of under pressure (-25.00 mbar...0.00 mbar):**
  Plug the tube to pressure port "-". The measuring range covers then -25.00 to 0.00 mbar.

**Note: All values are displayed now as positive values. No minus sign will be shown.**

Example: it is possible to measure under pressure down to -25.00 mbar, the display shows then the value 25.00 (no minus sign).

- **For measurements of pressure differences:**
  Connect both plastic tubes with an internal diameter of 4 mm to pressure port "+" and "-"; make sure to apply higher pressure to port "+".

# 11. Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certified for its accuracy, it is the best solution to return it with the referring sensors to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

# 12. The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031) the device can be connected to a computer for data transfer. To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:

- **BUS-SW9M**: 9-channel software to display the measuring values

**Note: The measuring and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

**Supported functions:**

| Code | Name/Function | Code | Name/Function |
|---|---|---|---|
| 0 | Read measurement value | 200 | Read min display range |
| 3 | Read system state | 201 | Read max display range |
| 6 | Read min memory | 202 | Read display range - unit |
| 7 | Read max memory | 204 | Read display range – decimal point |
| 12 | Read ID number | 208 | Read # of channels |
| 174 | Clear min memory | 214 | Read scale adjustment [%] |
| 175 | Clear max memory | 216 | Read offset adjustment |
| 176 | Read min measuring range | 222 | Read power off time (Conf-P.oFF) |
| 177 | Read max measuring range | 223 | Set power off time (Conf-P.oFF) |
| 178 | Read measuring range – measuring unit | 240 | Reset |
| 179 | Read measuring range – decimal point | 254 | Program version |
| 180 | Read kind of measuring of sensor | | |
| 199 | Read kind of measuring of display | | |

# 13. Technical Information

| | |
|---|---|
| Measuring range: | -1.00 to 25.00 mbar rel. |
| Accuracy: | ±0.3 % f.s.<br>(Hysteresis and linearity)<br>±0.4 % f.s.<br>(in the range o f 0-50 °C) |
| Resolution: | 0.01 mbar (1Pa) |
| Units: | mbar, bar, Pa, kPa, mmHg, PSI,<br>$mH_2O$ (display “m”)<br>(switchable) |
| Overload: | max. 10000 Pa (max. 100 mbar) |
| Measurement input: | by means of two metal hose stems |
| **Sensor:** | **piezo-resistive relative pressure sensor, for air or non-corrosive and non-ionising gases and liquids, not for water!** |
| Display: | 2 x 4- digit LCDs |
| Operating temp.: | 0 to +50 °C |
| Storage temp.: | -20 to +70 °C |
| Storage humidity: | 0 to 95 % r.H. (non-condensing) |
| Output: | serial interface<br>(via 3,5mm jack, to RS232,<br>or USB optional) |
| Power supply: | 9 V-monobloc battery<br>(included in the scope of delivery),<br>external 10.5-12 $V_{DC}$ via jack |
| Power consumption: | approx. 0,6 mA (HND-P121...) |
| Material: | housing made of impact-resistant ABS plastic |
| Degree of protection: | IP65, front side |
| Dimensions: | 142 x 71 x 26 mm (L x W x D) |
| Weight: | approx. 165 g |

**Scope of functions:**
**Minimum/maximum value memory**
**Hold function**: »freezing« of the current value
**Automatic-off function**: 1...120 min (can be deactivated)
**Zero point adjustment** via keyboard possible
**Tare function**: display, minimum/maximum values are set to zero
**Battery change notification**

# 14. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P121** | 2 measuring inputs, standard |

## 14.1 Accessories for HND-P

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10.5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose 6/4 on hose 6/4 |
| **HND-Z082** | Hose clamp for hose 6/4 |
| **HND-Z088** | Adapter made of brass for G 1/2 internal threads on hose 6/4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

Additional accessories on request.

*Observe instrument dimensions.

# 15. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Pressure Measuring Devices with Integrated Pressure Sensors**
**model: HND-P121**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 8. May 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Hand held Pressure Measuring Devices with Integrated Pressure Sensors

## Model:

**HND-P121** **HND-P123**

**HND-P126** **HND-P127**

**HND-P129**


# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Hand held Pressure Measuring Devices with Integrated Pressure Sensors Model: HND-P121/-P123/-P126/-P127/-P129
- Operating Instructions

# 4. Regulation Use

Any use of the device which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

Nearly all measuring tasks for the determination of pressure can be performed with the HND-P series KOBOLD hand-held pressure measuring devices. Various housing designs make it possible to find the right housing with the appropriate characteristic for every application. In addition to the large selection of external pressure sensors up to max. 400 bar absolute, measuring devices with integrated sensors in the millibar range are also available.

# 6. Electrical Connection

## 6.1 Mains Operation with Power Supply

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!! Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002.**

**Prior to connecting the power supply to the mains makes sure that the operating voltage stated at the power supply is identical to the mains voltage.**

# 7. Operation / Configuration / Adjustments

## 7.1 General

### 7.1.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

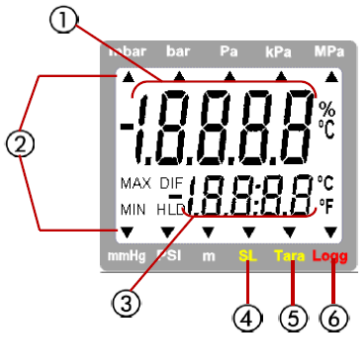
1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under *9 Technical Information*.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting. Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

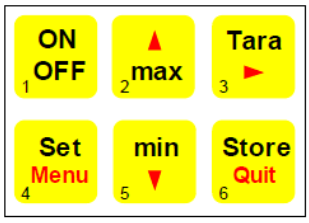
In case of doubt, please return device to manufacturer for repair or maintenance.

### 7.1.2 Display




| | |
|---|---|
| 1 | **Main display:** shows actual value |
| 2 | Arrow points to the chosen measuring **unit** |
| 3 | **Secondary display:** shows min./max. or hold value |
| 4 | **SL:** appears if sea-level-correction is activated *(only HND-P129)* |
| 5 | **Tara:** appears if tara-function is activated |
| 6 | *Not used* |

### 7.1.3 Basic Operation

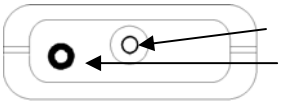



| | | |
|---|---|---|
| ON OFF | **On / Off** | |
| max + min | **min/max when taking measurement:** | |
| | press short: | shows the min./max. value |
| | press again: | hides min./max. value |
| | press 2 sec.: | clears particular value |
| Tara | **Tara, zero-point adjustment:** | |
| | press short: | display will be set to 0<br>The following measuring will be relatively displayed to the set tara value |
| | press 2 sec.: | deactivates tara-function |
| | press 5 sec.: | Zero-Point Adjustment[1)] |
| Set Menu | **Set/Menu**: | |
| | press short: | invokes configuration menu |
| Store Quit | **Store/Quit**: | |
| | press short: | hold-function, the last measuring value will be held in the secondary display. |
| | press again: | hides the value |

**Please Note: Activating/deactivating tara clears the max- & min-memories.**

[1)] Zero-Point Adjustment: If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press button 3 for approx. 5 seconds (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration menu).
To recall the manufacturer's calibration press button 3 for approx. 15 seconds.

### 7.1.4 Connections



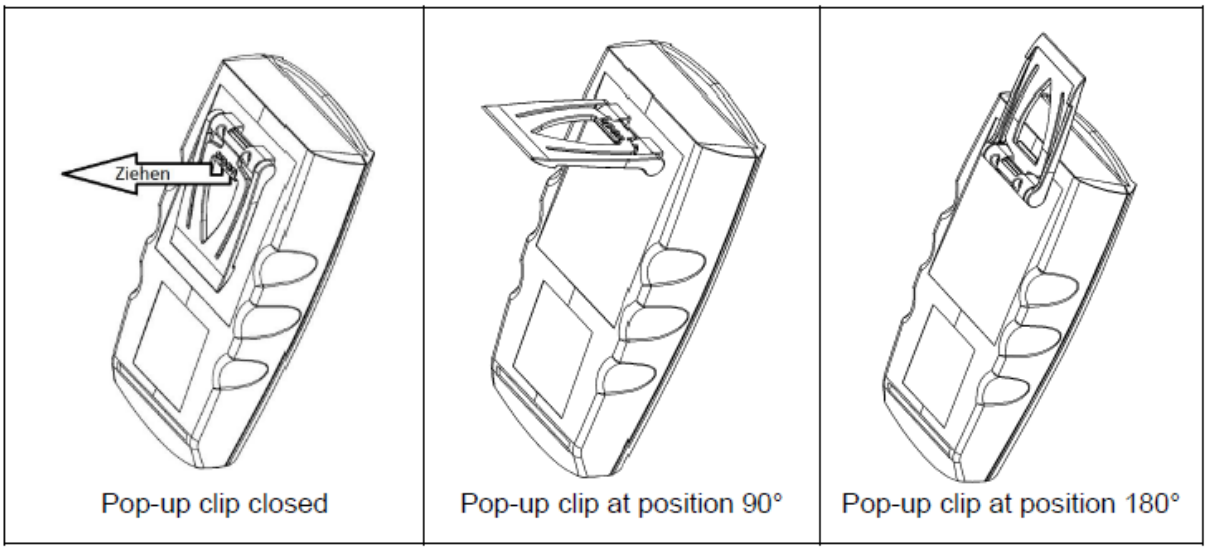
Connection for pressure tube
Interface: Connection for el. isolated interface adapter (p.r.t. chapter *7.5 The Serial Interface*)

The mains adapter socket is located at the left side of the device.

## 7.2 Pop-up clip

**Handling:**

- Pull at label “open” in order to swing open the pop-up clip.

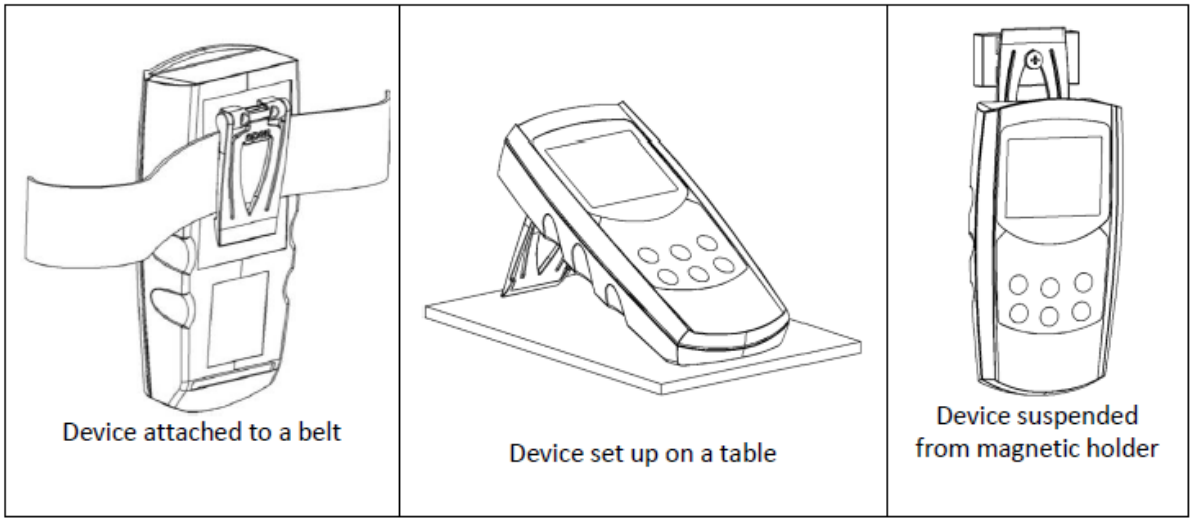



Pop-up clip closed | Pop-up clip at position 90° | Pop-up clip at position 180°

- Pull at label “open” again to swing open the pop-up clip further.

**Function:**

- The device with a closed pop-up clip can be plainly laid onto a table or attached to a belt, etc.
- The device with pop-up clip at position 90° can be set up on a table, etc.
- The device with pop-up clip at position 180° can be suspended from a screw or the magnetic holder.



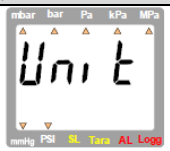
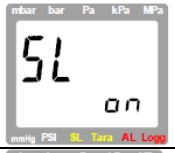
Device attached to a belt | Device set up on a table | Device suspended from magnetic holder

## 7.3 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificated for its accuracy, it is the best solution to return it with the referring sensors to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

## 7.4 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu.
Pressing key ***Menu*** jumps between the parameters.
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

| Parameter | Value | Description |
|---|---|---|
| ‚Menu' | ▲ or▼ | |
|  | mbar, bar, … | **Unit**: Unit of display |
|  | oFF/on | **Sea-Level**: Sea level correction: on or off (only available at HND-P129) |
|  | -2000 … 9999 | **Altitude**: Input of altitude above sea level [m], only if SL=on (only available at HND-P129) |
|  | 1…120 | **Auto Power-Off** time in minutes |
| | oFF | Auto Power-Off deactivated |
|  | 0,1, 11…91 | Base **adress** of interface |
| OFFS | ***refer to list below*** | The **offset of sensor** will be displaced by this value to compensate for deviations in the probe or in the measuring device. |
| | oFF | Zero displacement inactive (=0.00) |
| SCAL | -2.000 … 2.000 | The measuring **scale of sensor** will be changed by this factor [%] to compensate deviations of temperature probe or measuring device. |
| | oFF | Scale correction factor inactive (=0.000) |

| Device type | adjustable offset |
|---|---|
| HND-P121 | -5.00…5.00 mbar |
| HND-P123 | -50.0…50.0 mbar |
| HND-P127 | -50.0…50.0 mbar |
| HND-P126 | -500…500 mbar |
| HND-P129 | -500…500 mbar |

### 7.4.1 Sea Level Correction for Absolute Pressure Sensors (HND-P129)

The device displays the absolute pressure measured at the sensor. This is not necessarily the same like the values given by weather stations! The weather stations‘ values are pressure at sea level. Usually the sensor is placed above sea level and therefore, if the value at sea level (zero) is to be measured, the pressure loss resulting from the actual level above zero has to be considered! To correct the measuring display activate the “Sea-Level-Function” (SL, p.r.t. chapter 7.4).
If the sea level correction is active this will be shown by the functional arrow „SL“ in the display, the device now displays the absolute pressure at sea level (zero).

### 7.4.2 Power off Time

The device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power off time.
It can be completely deactivated by setting the parameter to ‚P.oFF = oFF“.

## 7.5 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter HND-Z031, HND-Z032 (accessories) the device can be connected to a computer for data transfer.
To avoid transmission errors, there are several security checks implemented e.g. CRC.
The following standard software packages are available:

**BUS-S20M**: 20-channel software to display the measuring values

**Note: The measuring and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Code | Name/Function | Code | Name/Function |
|---|---|---|---|
| 0 | Read measurement value | 200 | Read min display range |
| 3 | Read system state | 201 | Read max display range |
| 6 | Read min memory | 202 | Read display range - unit |
| 7 | Read max memory | 204 | Read display range – decimal point |
| 12 | Read ID number | 208 | Read # of channels |
| 32 | Read configuration flag BitCorrectToSealevel:32 | 214 | Read scale adjustment [%] |
| | | 216 | Read offset adjustment |
| 160 | Set configuration flag (see above) | 220 | Read altitude (only abs. press sensors) |
| 174 | Clear min memory | 221 | Set altitude (only abs. press sensors) |
| 175 | Clear max memory | 222 | Read power off time (Conf-P.oFF) |
| 176 | Read min measuring range | 223 | Set power off time (Conf-P.oFF) |
| 177 | Read max measuring range | 240 | Reset |
| 178 | Read measuring range – measuring unit | 254 | Program version |
| 179 | Read measuring range – decimal point | | |
| 180 | Read kind of measuring of sensor | | |
| 199 | Read kind of measuring of display | | |

## 7.6 Zero Displacement Sensor ('OFFS')

A zero displacement can be carried out for the measured value:

**value displayed = value measured - offset**

Standard setting: 'off' = 0.0°, i.e. no zero displacement will be carried out. Together with the scale correction (see below) this factor is mainly used to compensate for sensor deviations. Input is in the display unit.

## 7.7 Scale Correction Sensor ('SCAL')

The scale of the measuring can be influenced by this setting (factor is in %):

**displayed value = measured value * (1+Scal/100)**

Standard setting: 'off' =0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

## 7.8 Pressure Connection

2 (or 1) universal pressure connector for 6 x 1 mm (4 mm tube inner diameter) or 8 x 1 mm (6 mm tube inner diameter) plastic tubes.

### 7.8.1 Device type with absolute pressure (HND-P129)

Connect plastic tube to pressure port.

### 7.8.2 Device type with relative pressure

- For measurements of overpressure (refer to summary):
  Connect plastic tube to pressure port "+". Port "-" will not be used!

- For measurements of underpressure (refer to summary):
  Plug the tube to pressure port "-". The measuring range covers then up to max. overpressure range

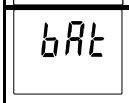
**Note: All values are displayed now as positive values. No minus sign will be shown. Example: it is possible to measure under pressure down to -25.00 mbar, the display shows then the value 25.00 (no minus sign).**

- For measurements of pressure differences:
  Connect both plastic tubes to pressure port "+" and "-"; make sure to apply higher pressure to port "+".

Measure ranges:

| Device type | Over- or underpressure | underpressure |
|---|---|---|
| HND-P121 | -1.00…25.00 mbar | -25.00…0.00 mbar |
| HND-P123 | -10.0…350.0 mbar | -350.0…0.0 mbar |
| HND-P127 | -10.0…420.0 mbar | -420.0…0.0 mbar |
| HND-P126 | -100…2000 mbar | -2000…0 mbar |

### 7.9 Error and System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
| ***No display or confused characters, device does not react on keypress*** | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| ***Err.1*** | Measured value above allowable range | Check: pressure above 1300 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | -> measuring value to low |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.4*** | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| ***Err.9*** | Measured value far out of allowable range | Check: pressure not within sensor range? |
| ***Err.7*** | System error | Return to manufacturer for repair |

# 8. Maintenance

## 8.1 Battery Operation

If ´bAt´ is shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.

**Please note: We recommend taking out battery if device is not used for a longer period of time!**

# 9. Technical Information

**HND-P121:**

| | |
|---|---|
| Measuring range: | -1.00...25.00 mbar |
| Accuracy: | ±0.3 % F.S.<br>(hysteresis and linearity)<br>±0.4 % F.S.<br>(temperature dependency 0...50 °C) |
| Resolution: | 1 Pa (0.01 mbar) |
| Pressure units: | mbar, bar, Pa, kPa, MPa, mmHg, PSI, m $H_2O$<br>(display “m”) |
| Overload: | max. 100 mbar |

**HND-P123:**

| | |
|---|---|
| Measuring range: | -10.0...350.0 mbar |
| Accuracy: | ±0.2 % F.S.<br>(hysteresis and linearity)<br>±0.4 % F.S.<br>(temperature dependency 0...50 °C) |
| Resolution: | 0.01 mbar |
| Pressure units: | mbar, bar, kPa, MPa, mmHg, PSI, m $H_2O$<br>(display “m”) |
| Overload: | max. 1 bar |

**HND-P127:**

| | |
|---|---|
| Measuring range: | -10.0...420.0 mbar |
| Accuracy: | ±0.1 % F.S.<br>(hysteresis and linearity)<br>±0.4 % F.S.<br>(temperature dependency 0...50 °C) |
| Resolution: | 0.1 mbar |
| Pressure units: | mbar, bar, kPa, MPa, mmHg, PSI, m $H_2O$<br>(display “m”) |
| Overload: | max. 1 bar |

**HND-P126:**

| | |
|---|---|
| Measuring range: | -100...2000 mbar |
| Accuracy: | ±0.2 % F.S.<br>(hysteresis and linearity)<br>±0.4 % F.S.<br>(temperature dependency 0...50 °C) |
| Resolution: | 0.1 mbar |
| Pressure units: | mbar, bar, kPa, MPa, mmHg, PSI, m $H_2O$<br>(display “m”) |
| Overload: | max. 4 bar |

**HND-P129:**

| | |
|---|---|
| Measuring range: | 0...1300 mbar abs. |
| Accuracy: | ±0.2 % F.S.<br>(hysteresis and linearity)<br>±0.4 % F.S.<br>(temperature dependency 0...50 °C) |
| Resolution: | 1 Pa (0.01 mbar) |
| Pressure units: | mbar, bar, Pa, kPa, MPa, mmHg, PSI, m $H_2O$<br>(display “m”) |
| Overload: | max. 4 bar abs. |
| | |
| Measuring input: | by means of a metal-hose stems |
| Sensor: | **piezo-resistive absolute pressure sensor, for air or non-corrosive and non-ionising gases and liquids, not for water!** |
| Display: | 2 x 4 ½ digit LC-displays |
| Operating temperature: | 0…+50 °C |
| Storage temperature: | -20…+70 °C |
| Relative humidity: | 0...95 % r.H. (non-condensing) |
| Output: | serial interface<br>(via 3.5 mm jack, transformer on RS232 or USB optional) |
| Power supply: | 9V-monobloc battery<br>(included in the scope of delivery),<br>extern 10.5...12 $V_{DC}$ via jack |
| Current consumption: | ~0.6 mA |
| Materials: | housing made of impact-resistant ABS plastic |
| Protection: | IP 65, front side |
| Dimensions: | 142 x 71 x 26 mm (L x W x D) |
| Weight: | approx. 165g |

**Scope of functions:**

- **Min-/Max-value memory**
- **Hold function:** »freezing« of the current value
- **Automatic-off function:** 1...120 min (can be deactivated)
- **Zero point adjustment** via keyboard possible
- **Tare function:** Display, minimum/maximum values are set to zero
- **Battery change notification**

# 10. Order Codes

| Order-No. | Housing design |
|---|---|
| **HND-P121** | 2 measuring inputs, standard |
| **HND-P123** | 2 measuring inputs, standard |
| **HND-P126** | 2 measuring inputs, standard |
| **HND-P127** | 2 measuring inputs, greater sensor accuracy, standard |
| **HND-P129** | 1x pressure sensor input, standard |

## 10.1 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10.5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **BUS-S20M** | Software for recording measuring data on a PC for 20 modules, for devices of the HND-series without logging function |
| **HND-Z081** | Double nozzle for hose 6/4 on hose 6/4 |
| **HND-Z082** | Hose clamp for hose 6/4 |
| **HND-Z083** | Adapter made of brass for G 1/4 internal threads on hose 6/4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

* observe instrument dimensions

Additional accessories on request

# 11. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Hand held Pressure Measuring Devices with Integrated Pressure Sensors**
**Model: HND-P121/-P123/-P126/P127/-P129**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 22. Juli 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Hand-held Measuring Devices with Integrated Pressure Sensors

## Model: HND-P123

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Hand-held Measuring Devices with Integrated Pressure Sensors
  model: HND-P123
- Operating Instructions

# 4. Regulation Use

Any use of the Hand-held Measuring Devices with Integrated Pressure Sensors, model: HND-P123, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The highly precise KOBOLD manual pressure measuring devices HND-P123 are measuring devices with integrated pressure sensors. They have two pressure measurement inputs on the top of the housing, which are connected to the measuring points by means of stable metal connections and plastic hoses that are available as accessories. Numerous measuring ranges in the overpressure and underpressure range are available for various measurement tasks, such as differential pressure measurement. In addition to pressure display, these first-rate, compact, universally applicable measuring units offer additional functions such as minimum/maximum value memory, a hold function, tare function, automatic self-shut-off, or zero point offset. The devices with an expanded spectrum of functions also have a logger function, a peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

# 6. Electrical Connection

## 6.1 Mains Operation with Power Supply

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!!**
**Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002.**

Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.

# 7. Operation / Configuration / Adjustments

## 7.1 General

### 7.1.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under *9 Technical Information*.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

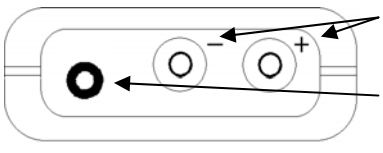
5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.

Operator safety may be a risk if:

- there is visible damage to the device
- the device is not working as specified
- the device has been stored under unsuitable conditions for a longer period of time.

In case of doubt, please return device to manufacturer for repair or maintenance.

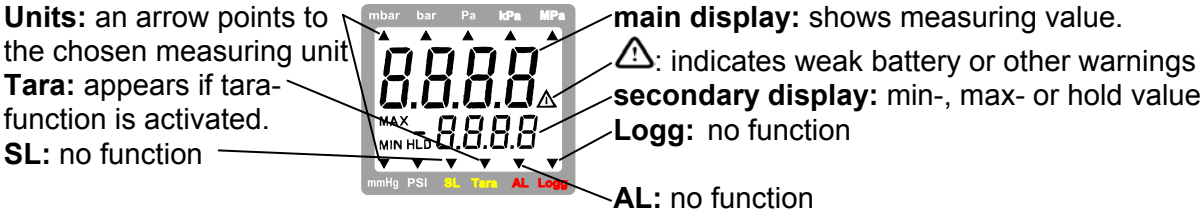
### 7.1.2 Connections



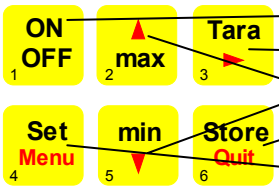

Connection for pressure tubes: „+“ = higher pressure, „-“ = lower pressure
Interface: Connection for el. isolated interface adapter (see. chapter *7.6 The Serial Interface*)

The mains adapter socket is located at the left side of the device.

### 7.1.3 Display




When switching on the device and a zero point adjustment was carried out it shows shortly „nuLL Corr“.




**On-/Off-Switch**

**Tara:** Calling of tara function, zero point adjustment

**min/max:** Showing the min- resp. max-memory in sec. display

**Store/Quit:** Calling of hold function

**Set/Menu:** Calling of configuration

**Max Memory:** Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max memory press key ´max´ for >2 seconds.

**Min Memory:** Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min memory press key ´min´ for >2 seconds.

**Hold Function:** By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it.

**Tare Function:** By pressing ´Tara´ (key 3) the display will be set to 0. All measurings from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds.

**Please Note: Activating/deactivating tara clears the max- & min-memories.**

**Zero-Point Adjustment:** If there is no pressure applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press key 3 for 5 seconds. (Please note: A zero-point adjustment can only be carried out if the difference between the value on display and the value calibrated on site is less than 2 %! E.g. for the measuring range of –10.0 ..+350.0 mbar, =>zero-point adjustment up to 7.0 mbar possible). To recall the manufacturer`s calibration press button 3 for approx. 7 seconds.

**Note: If a zero-point adjustment was carried out, this will be signalled by the short displaying of „NuLL Corr“ when switching on the device.**

## 7.2 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu.
Pressing key ***Menu*** jumps between the parameters.
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

### 7.2.1 Unit: Coice Of The Display Unit


Choose the desired display unit, the refering unit is displayed by means of a functional arrow in the display. The selection is permanently stored in the device, therefore after power on the unit will instantly reapear. The choice depends on the used sensor.
The unit [m] =m$H_2O$ is just supported by devices with [m] printed below the display

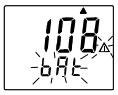
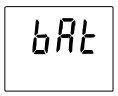
### 7.2.2 P.oFF: Auto Power Off Time


The device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power off time. The power off time can be set to values between 1 and 120 min. It can be completely deactivated by setting the paramter to ‚P.oFF = oFF“.

### 7.2.3 Adr: Base Address of Interface


Up to 10 devices of the HND- handheld-family can be connected to a serial interface at once. To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

## 7.3 Error And System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
| **No display or confused characters, device does not react on keypress** | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| *Err.1* | Measured value above allowable range | Check: pressure above 350 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| *Err.2* | Measured value below allowable range | Check: pressure below -10 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| *Err.4* | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| *Err.9* | Measured value far out of allowable range | Check: pressure not within sensor range? |
| *Err.7* | System error | Return to manufacturer for repair |

## 7.4 Pressure Connection To The Sensors

- **For measurements of over pressure (-10.0 mbar...350.0 mbar):**

Connect plastic tube with internal dia of 4 mm to pressure port "+". Port "-" will not be used!

- **For measurements of under pressure (-350.0 mbar...0.0 mbar):**

Plug the tube to pressure port "-". The measuring range covers then -350.0 to 0.0 mbar.

**Note: All values are displayed now as positive values. No minus sign will be shown.**

Example: it is possible to messure under pressure down to -350.0 mbar, the display shows then the value 350.0 (no minus sign).

- **For measurements of pressure differences:**

Connect both plastic tubes with an internal dia of 4 mm to pressure port "+" and "-"; make sure to apply higher pressure to port "+".

## 7.5 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificied for its accuracy, it is the best solution to return it with the refering sensors to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

## 7.6 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031 or HND-Z032) the device can be connected to a computer for data transfer. With the HND-Z032 up to 5 devices of the HND- series can be connected to one interface (see also manual of HND-Z031 orHND-Z032)
To avoid transmission errors, there are several security checks implemented e.g. CRC.
The following standard software packages are available:
**BUS-SW9M**: 9-channel software to display the measuring values

**Note: The measuring and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Code | Name/Function | Code | Name/Function |
|---|---|---|---|
| 0 | Read measurement value | 194 | Set display unit |
| 3 | Read system state | 199 | Read kind of measuring of display |
| 6 | Read min memory | 200 | Read min display range |
| 7 | Read max memory | 201 | Read max display range |
| 12 | Read ID number | 202 | Read display range - unit |
| 174 | Clear min memory | 204 | Read display range – decimal point |
| 175 | Clear max memory | 208 | Read # of channels |
| 176 | Read min measuring range | 222 | Read power off time (Conf-P.oFF) |
| 177 | Read max measuring range | 223 | Set power off time (Conf-P.oFF) |
| 178 | Read measuring range – measuring unit | 240 | Reset |
| 179 | Read measuring range – decimal point | 254 | Program version |
| 180 | Read kind of measuring of sensor | | |

# 8. Maintenance

## 8.1 Battery Operation

If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.

**Please note: We recommend to take out battery if device is not used for a longer period of time!**

# 9. Technical Information

| | |
|---|---|
| Measuring range: | -10.0 to 350.0 mbar<br>(-350.0...+350.0 mbar) |
| Accuracy: | ±0.2 % F.S.<br>(Hysteresis and l inearity)<br>±0.4 % F.S.<br>(in the range of 0-50 °C) |
| Resolution: | 0.1 mbar |
| Units: | mbar, bar, kPa, MPa, PSI, mmHg, m<br>(switchable) |
| Overload: | max. 1 bar |
| Measurement input: | by means of two metal hose stems |
| **Sensor:** | **piezo-resistive relative pressure sensor, for air or non-corrosive and non-ionising gases and liquids, not for water!** |
| Display: | 2 x 4- digit LC-displays |
| Operating temp.: | 0 to +50 °C |
| Storage temp.: | -20 to +70 °C |
| Storage humidity: | 0 to 95 % r.H. (non-condensing) |
| Output: | serial interface<br>(via 3-pin jack, transformer on RS232 or USB optional) |
| Power supply: | 9 V-monobloc battery<br>(included in the scope of delivery),<br>extern 10,5-12 $V_{DC}$ via jack |

| | |
|---|---|
| Current consumpt.: | < 1 mA (HND-P121...),<br>max. 3 mA (HND-P231...) |
| Material: | housing made of impact-resistant ABS plastic |
| Degree of protect.: | IP65, front |
| Dimensions: | 142 x 71 x 26 mm (HxWxD) |
| Weight: | approx. 160 g |

**Scope of functions:**
**Minimum/maximum value memory**
**Hold function**: »freezing« of the current value
**Automatic-off function**: 1...120 min (can be deactivated)
**Zero point adjustment** via keyboard possible
**Tare function**:
display, minimum/maximum values are set to zero
**Battery change notification**

# 10. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P123** | 2 measuring inputs, standard |

## 10.1 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10,5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose 6/4 on hose 6/4 |
| **HND-Z082** | Hose clamp for hose 6/4 |
| **HND-Z083** | Adapter made of brass for G ¼ internal threads on hose 6/4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

Additional accessories on request

# 11. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Hand-held Measuring Devices with Integrated Pressure Sensors**
**model: HND-P123**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326+A1+A2** | Electromagnetic Compatibility Directive |

Also the following EEC guidelines are fulfilled:

| | |
|---|---|
| **93/68/EWG, 2004/108/EG** | Electromagnetic Compatibility Directive |
| **73/23/EWG, 93/68/EWG** | Low Voltage Directive |

Hofheim, 01. April 2006

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Hand-held Pressure Measuring Devices with Integrated Pressure Sensors

## Model: HND-P126

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Hand-held Pressure Measuring Devices with Integrated Pressure Sensors
  Model: HND-P126
- Operating Instructions

# 4. Regulation Use

Any use of the Hand-held Pressure Measuring Devices with Integrated Pressure Sensors, model: HND-P126, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The highly precise KOBOLD manual pressure measuring devices HND-P126 are measuring devices with integrated pressure sensors. They have two pressure measurement inputs on the top of the housing, which are connected to the measuring points by means of stable metal connections and plastic hoses that are available as accessories. Numerous measuring ranges in the overpressure and underpressure range are available for various measurement tasks, such as differential pressure measurement. In addition to pressure display, these first-rate, compact, universally applicable measuring units offer additional functions such as minimum/maximum value memory, a hold function, tare function, automatic self-shut-off, or zero point offset. The devices with an expanded spectrum of functions also have a logger function, a peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

# 6. Electrical Connection

## 6.1 Mains Operation With Power Supply

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!! Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002.**

Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.

# 7. Operation / Configuration / Adjustments

## 7.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

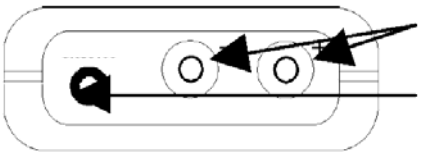
1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under Technical Information.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting. Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

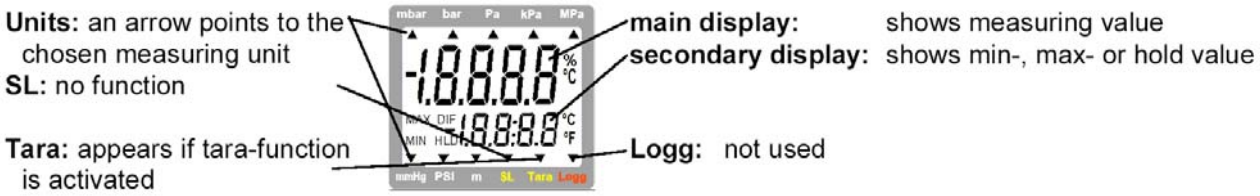
In case of doubt, please return device to manufacturer for repair or maintenance.

## 7.2 Connections



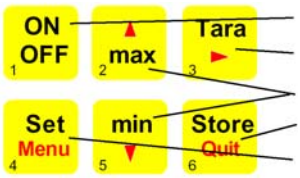
Connection for pressure tubes: „+" = higher pressure, „-" = lower pressure Interface: Connection for el. isolated interface adapter (p.r.t. chapter *7.9 The Serial Interface*) The mains adapter socket is located at the left side of the device.

## 7.3 Display




## 7.4 Basic Operation

When switching on the device and a zero point adjustment was carried out it shows shortly „nuLL Corr“.




**On-/Off-Switch**
**Tara:** Calling of tara function, zero point adjustment
**min/max:** Showing the min- resp. max-memory in sec. display
**Store/Quit:** Calling of hold function
**Set/Menu:** Calling of configuration

**Max Memory:** Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max memory press key ´max´ for >2 seconds.

**Min Memory:** Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min memory press key ´min´ for >2 seconds.

**Hold Function:** By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it.

**Tare Function:** By pressing ´Tara´ (key 3) the display will be set to 0. All measurings from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds.

**Please Note: Activating/deactivating tara clears the max- & min-memories.**

**Zero-Point Adjustment:** If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press key 3 for approx. 5 seconds. (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration menu). Please note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits! To recall the manufacturer`s calibration press button 3 for approx. 15 seconds. Note: If a zero-point adjustment was carried out, this will be signaled by the short displaying of “Corr” when switching on the device.

## 7.5 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu. Pressing key ***Menu*** jumps between the parameters.
The parameters can be changed with ▲ (key 2) or ▼ (key 5). ***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

### 7.5.1 Unit: Coice Of The Display Unit


Choose the desired display unit, the refering unit is displayed by means of a functional arrow in the display. The selection is permanently stored in the device, therefore after power on the unit will instantly reapear. The choice depends on the used sensor.
The unit [m] =m$H_2O$ is just supported by devices with [m] printed below the display!

### 7.5.2 P.oFF: Auto Power Off Time


The device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power off time.
The power off time can be set to values between 1 and 120 min. It can be completely deactivated by setting the paramter to ‚P.oFF = oFF“.

### 7.5.3 Adr: Base Address of Interface


Up to 10 devices of the HND-P handheld-family can be connected to a serial interface at once (depending on interface converter). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

### 7.5.4 OFFS: Adjusting Sensor Zero Displacement

A zero displacement can be carried out of the measured value:

**value displayed = value measured – offset**

Standard setting: ‘off’ = 0.0°, i.e. no zero displacement will be carried out. Together with the scale correction (see below) this factor is mainly used to compensate for sensor deviations. Input is in the display unit.

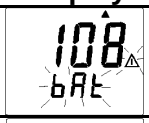
### 7.5.5 SCAL: Adjusting Sensor Scale

The scale of the measuring can be influenced by this setting (factor is in %):

**displayed value = measured value*(1+Scal/100)**

Standard setting: ‘off’=0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

## 7.6 Error And System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
| ***No display or confused characters, device does not react on keypress*** | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| ***Err.1*** | Measured value above allowable range | Check: pressure above 2000 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | Check: pressure below -100 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.4*** | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| ***Err.9*** | Measured value far out of allowable range | Check: pressure not within sensor range? |
| ***Err.7*** | System error | Return to manufacturer for repair |

## 7.7 Pressure Connection To The Sensors

- **For measurements of over pressure (-100 mbar...2000 mbar):**

Connect plastic tube with internal dia of 4 mm to pressure port "+". Port "-" will not be used!

- **For measurements of under pressure (-2000 mbar...0 mbar):**

Plug the tube to pressure port "-". The measuring range covers then -2000 to 0 mbar.

**Note: All values are displayed now as positive values. No minus sign will be shown.**

Example: it is possible to meassure under pressure down to –2000 mbar, the display shows then the value 2000 (no minus sign).

- **For measurements of pressure differences:**

Connect both plastic tubes with an internal dia of 4 mm to pressure port "+" and "-"; make sure to apply higher pressure to port "+".

## 7.8 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificied for its accuracy, it is the best solution to return it with the refering sensors to the manufacturer. Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

## 7.9 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031) the device can be connected to a computer for data transfer. To avoid transmission errors, there are several security checks implemented e.g. CRC.
The following standard software packages are available:
**BUS-SW9M**: 9-channel software to display the measuring values

**Note: The measuring and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Code | Name/Function | Code | Name/Function |
|---|---|---|---|
| 0 | Read measurement value | 200 | Read min display range |
| 3 | Read system state | 201 | Read max display range |
| 6 | Read min memory | 202 | Read display range - unit |
| 7 | Read max memory | 204 | Read display range – decimal point |
| 12 | Read ID number | 208 | Read # of channels |
| 174 | Clear min memory | 214 | Read scale adjustment [%] |
| 175 | Clear max memory | 216 | Read offset adjustment |
| 176 | Read min measuring range | 222 | Read power off time (Conf-P.oFF) |
| 177 | Read max measuring range | 223 | Set power off time (Conf-P.oFF) |
| 178 | Read measuring range – measuring unit | 240 | Reset |
| 179 | Read measuring range – decimal point | 254 | Program version |
| 180 | Read kind of measuring of sensor | | |
| 199 | Read kind of measuring of display | | |

# 8. Maintenance

## 8.1 Battery Operation

If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.

**Please note: We recommend to take out battery if device is not used for a longer period of time!**

# 9. Technical Information

| | |
|---|---|
| Measuring range: | -100 to 2000 mbar |
| Accuracy: | ±0.2 % F.S. (Hysteresis and l inearity)<br>±0.4 % F.S. (in the range of 0-50 °C) |
| Resolution: | 1 mbar |
| Units: | mbar, bar, kPa, MPa, PSI, mmHg,<br>$mH_2O$ (display “m”)<br>(switchable) |
| Overload: | max. 4 bar rel. |
| Connection: | 2 metal pressure ports for connection to 6x1mm tubes at the top of device (4mm inner tube ø) |
| **Sensor:** | **piezo-resistive relative pressure sensor, for air or non-corrosive and non-ionising gases and liquids, not for water!** |
| Display: | 2 x 4- digit LCDs |
| Operating temp.: | 0 to +50 °C |
| Storage temp.: | -20 to +70 °C |
| Storage humidity: | 0 to 95 % r.H. (non-condensing) |
| Output: | serial interface<br>(via 3,5mm jack, to RS232<br>or USB optional) |
| Power supply: | 9 V-monobloc battery<br>(included in the scope of delivery),<br>extern 10.5-12 $V_{DC}$ via jack |
| Power consumpt.: | approx. 0,6 mA |
| Material: | housing made of impact-resistant ABS plastic |
| Degree of protect.: | IP65, front side |
| Dimensions: | 142 x 71 x 26 mm (LxWxD) |
| Weight: | approx. 165 g |

**Scope of functions:**

Minimum/maximum value memory
Hold function: »freezing« of the current value
Automatic-off function: 1...120 min (can be deactivated)
Zero point adjustment via keyboard possible
Tare function:
display, minimum/maximum values are set to zero
Battery change notification

# 10. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P126** | 2 measuring inputs, standard |

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10.5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose 6/4 on hose 6/4 |
| **HND-Z082** | Hose clamp for hose 6/4 |
| **HND-Z088** | Adapter made of brass for G 1/2 internal threads on hose 6/4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

*observe instrument dimensions

Additional accessories on request.

# 11. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Manual Pressure Measuring Devices with External and Integrated Pressure Sensors Model:HND-P126**

to which this declaration relates is in conformity with the standards noted below:

**EN61326-1:2006** Electrical equipment for measurement, control and laboratory use. EMC requirements

Also the following EC guidelines are fulfilled:

**2004/108/EG** Electromagnetic Compatibility Directive

**2006/95/EC** Low Voltage Directive

Hofheim, 8. May 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Hand-held Pressure Measuring Devices with Integrated Pressure Sensors

## Model: HND-P127

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Hand-held Pressure Measuring Devices with integrated Pressure Sensors model: HND-P-127
- Operating Instructions

# 4. Regulation Use

Any use of the Hand-held Pressure Measuring Devices with integrated Pressure Sensors, model: HND-P127, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The highly precise KOBOLD hand-held pressure measuring devices HND-P127 are measuring devices with integrated pressure sensors. They have two pressure measurement inputs on the top of the housing, which are connected to the measuring points by means of stable metal connections and plastic hoses that are available as accessories. Numerous measuring ranges in the overpressure and underpressure range are available for various measurement tasks, such as differential pressure measurement. In addition to pressure display, these first-rate, compact, universally applicable measuring units offer additional functions such as minimum/maximum value memory, a hold function, tare function, automatic self-shut-off, or zero point offset. The devices with an expanded spectrum of functions also have a logger function, a peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

# 6. Electrical Connection

## 6.1 Mains Operation with Power Supply

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply over-voltage !! Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002. Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage**

# 7. Operation

## 7.1 General

### 7.1.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

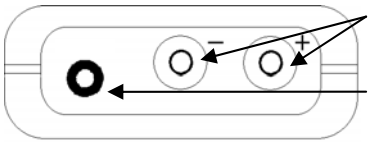
1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under 9. Technical Information.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
   Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

   In case of doubt, please return device to manufacturer for repair or maintenance.

### 7.1.2 Connections

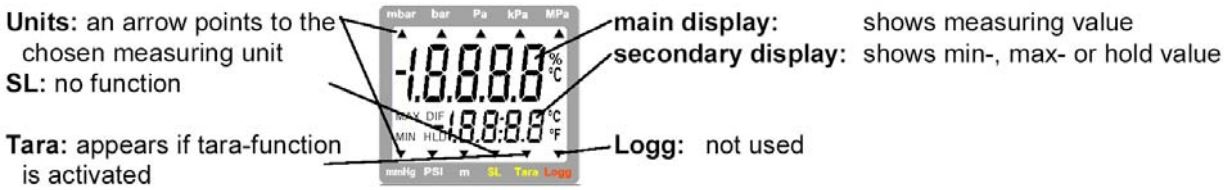



Connection for pressure tubes: „+" = higher pressure, „-" = lower pressure

Interface: Connection for el. isolated interface adapter (p.r.t. chapter *7.6 The Serial Interface*)

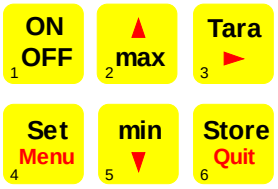
The mains adapter socket is located at the left side of the device

### 7.1.3 Display



### 7.1.4 Operating

When **switching on** the device and a zero point adjustment was carried out it shows shortly „nuLL Corr“.




**On-/Off-Switch**
**Tara:** Calling of tara function, zero point adjustment
**min/max:** Showing the min- resp. max-memory in sec. display
**Store/Quit:** Calling of hold function
**Set/Menu:** Calling of configuration

**Max Memory:** Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max-memory press key ´max´ for >2 seconds.

**Min Memory:** Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min-memory press key ´min´ for >2 seconds.

**Hold Function:** By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it.

**Tare Function:** By pressing ´Tara´ (key 3) the display will be set to 0. All measurements from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds.

**Note: Activating/deactivating tara clears the max- & min-memories.**

**Zero-Point Adjustment:** If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press button 3 for approx. 5 seconds (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration-menu).
*Please note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits!*
*To recall the manufacturer`s calibration press button 3 for approx. 15 seconds.*
*Note: If a zero-point adjustment was carried out, this will be signalled by the short displaying of “Corr” when switching the device.*

## 7.2 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu.
Pressing key ***Menu*** jumps between the parameters.
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

### 7.2.1 Unit: Choice Of The Display Unit


Choose the desired display unit, the referring unit is displayed by means of a functional arrow in the display. The selection is permanently stored in the device, therefore after power on the unit will instantly reappear. The choice depends on the used sensor.
The unit [m] =m$H_2O$ is just supported by devices with [m] printed below the display!

### 7.2.2 P.oFF: Auto Power Off Time


The device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power off time.
The power off time can be set to values between 1 and 120 min. It can be completely deactivated by setting the parameter to ‚P.oFF = oFF“.

### 7.2.3 Adr: Base Address of Interface


Up to 10 devices of the HND- handheld-family can be connected to a serial interface at once (depending on interface converter, e.g. HND-Z031: 5 devices). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

### 7.2.4 OFFS: Adjusting Sensor Zero Displacement

A zero displacement can be carried out for the measured value:

**value displayed = value measured – offset**

Standard setting: ´off´= 0.0°, i.e. no zero displacement will be carried out. Together with the scale correction (see below) this factor is mainly used to compensate for sensor deviations. Input is in the display unit.

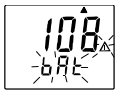
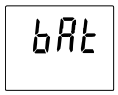
### 7.2.5 SCAL: Adjusting Sensor Scale

The scale of the measuring can be influenced by this setting (factor is in %):

**displayed value = measured value*(1+Scal/100)**

Standard setting: ´off´= 0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

## 7.3 Error and System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
| ***No display or confused characters, device does not react on keypress*** | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| ***Err.1*** | Measured value above allowable range | Check: pressure above 420 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | Check: pressure below -10 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.4*** | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| ***Err.9*** | Measured value far out of allowable range | Check: pressure not within sensor range? |
| ***Err.7*** | System error | Return to manufacturer for repair |

## 7.4 Pressure Connection to the Sensors

- **For measurements of over pressure (-10.0 mbar...420.0 mbar):**
  Connect plastic tube with internal diameter of 4 mm to pressure port "+".
  Port "-" will not be used!
- **For measurements of under pressure (-420.0 mbar...0.0 mbar):**
  Plug the tube to pressure port "-". The measuring range covers then -420.0 to 0.0 mbar.

**Note: All values are displayed now as positive values. No minus sign will be shown.**

Example: It is possible to measure under pressure down to -420.0 mbar, the display shows then the value 420.0 (no minus sign).

- **For measurements of pressure differences:**
  Connect both plastic tubes with an internal diameter of 4 mm to pressure port "+" and "-"; make sure to apply higher pressure to port "+".

## 7.5 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certified for its accuracy, it is the best solution to return it with the referring sensors to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

## 7.6 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031) the device can be connected to a computer for data transfer. To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:

- **BUS-SW9M**: 9-channel software to display the measuring values

**Note: The measuring and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Code | Name/Function | Code | Name/Function |
|---|---|---|---|
| 0 | Read measurement value | 199 | Read kind of measuring of display |
| 3 | Read system state | 200 | Read min display range |
| 6 | Read min memory | 201 | Read max display range |
| 7 | Read max memory | 202 | Read display range - unit |
| 12 | Read ID number | 204 | Read display range – decimal point |
| 174 | Clear min memory | 208 | Read # of channels |
| 175 | Clear max memory | 214 | Read scale adjustment [%] |
| 176 | Read min measuring range | 216 | Read offset adjustment |
| 177 | Read max measuring range | 222 | Read power off time (Conf-P.oFF) |
| 178 | Read measuring range – measuring unit | 223 | Set power off time (Conf-P.oFF) |
| 179 | Read measuring range – decimal point | 240 | Reset |
| 180 | Read kind of measuring of sensor | 254 | Program version |
| 194 | Set display unit | | |

# 8. Maintenance

## 8.1 Battery Operation

If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.

**Note: We recommend to take out the battery if device is not used for a longer period of time!**

# 9. Technical Information

| | |
|---|---|
| **Measuring ranges:** | |
| Display range: | -10.0 to 420.0 mbar rel. |
| Overload: | max. 1 bar |
| Resolution: | 0.1 mbar |
| Pressure units: | mbar, bar, kPa, MPa, PSI, mmHg, $mH_2O$ (display “m”) (switchable) |
| Accuracy: | ±0.1 % f.s. (Hysteresis and linearity) ±0.4 % f.s. (in the range of 0-50 °C) |
| Measuring rate: | 4 meas./sec |
| Nominal temperature: | 25°C |
| **Sensor:** | **piezo-resistive relative pressure sensor, for air or non-corrosive and non-ionising gases and liquids, not for water!** |
| Connection: | 2 metal pressure ports for connection to 6x1mm tubes at the top of device (4mm inner tube ø) |
| **Power-Off-Function:** | Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated. |
| **Display:** | 2 four digit LCDs |
| **Pushbuttons:** | 6 membrane keys |
| **Interface:** | Serial interface (3,5mm jack) can be connected to RS232 or USB interface of a PC via electrically isolated interface adapter (see accessories). |
| **Power supply:** | 9 V battery (included in the scope of delivery), external 10.5-12 $V_{DC}$ via jack  |
| Power consumption: | approx. 0,6mA |
| Low battery warning: | ´bAt´ |
| **Housing:** | impact-resistant ABS, membrane keyboard, transparent panel, Front side IP65 |
| Weight: | approx. 165g |
| Working temperature: | -20...+50 °C |
| Allowable rel. humidity: | 0...95% RH (not condensing) |
| Storage temperature: | -20...+70°C |

**Scope of functions:**

**Minimum/maximum value memory**

**Hold function**: »memorising« of the current value

**Tare function**:

display, minimum/maximum values are set to zero

**Battery change notification**

# 10. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P127** | 2 measuring inputs, greater sensor accuracy, standard |

## 10.1 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10.5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose 6/4 on hose 6/4 |
| **HND-Z082** | Hose clamp for hose 6/4 |
| **HND-Z088** | Adapter made of brass for G 1/2 internal threads on hose 6/4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

*Observe instrument dimensions

# 11. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Manual Pressure Measuring Devices with External and Integrated Pressure Sensors Model: HND.P127**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 8. May 2014

H. Peters
General Manager

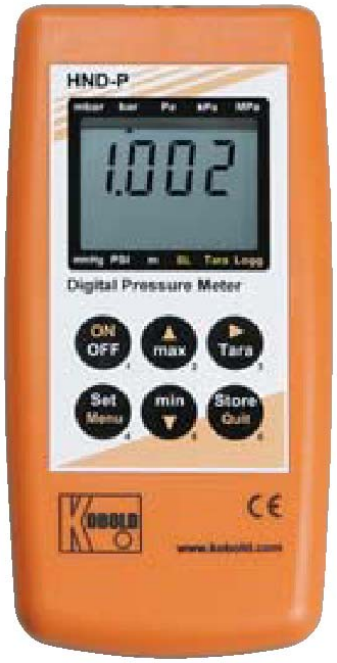
M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Hand-held Pressure Measuring Devices for External Pressure Sensors

## Model: HND-P210



# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Hand-held Pressure Measuring Devices for External Pressure Sensors
  Model: HND-P210
- Operating Instructions

# 4. Regulation Use

Any use of the Manual Pressure Measuring Devices with External Pressure Sensors, model: HND-P210, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The KOBOLD manual pressure measuring devices HND-P210 are highly precise, compact pressure measuring devices that can be used universally. In conjunction with the appropriate external pressure sensors, precise measurement results over the entire measuring range can be achieved.
Various pressure sensors are available for a multitude of measuring tasks and special applications. The respective measurement task determines which combination is selected. Naturally, these first-rate KOBOLD-measuring units can display more than just pressure. All devices in this series allow for minimum/maximum value memory, hold function, automatic self-shut-off, or zero point offset entry for all connected pressure sensors, for example. The HND-P210 types also have a logger function, a peak value memory, or a minimum/maximum alarm.

# 6. Electrical Connection

**Mains Operation With Power Supply**

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!! Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002.**

Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.

**Connecting/Changing Sensors**
Do not use insuitable sensors. Connecting other devices/sensors as specificated may cause a damage to the instrument and device/sensor! Switch off device before changing the sensor. Connect sensor before switching on the device, otherwise the sensor may not be detected correctly. When connecting the sensor the connector may not lock correctly. In such case take the plug not at the casing but at the buckling protection at the end of the plug. If plug is entered correctly, it will slide in smoothly. To disconnect sensor do not pull at the cable but at the plug (to open locking mechanism).

# 7. Operation

## 7.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated see chapter *10 Technical Information*.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

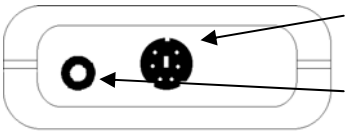
**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting. Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

In case of doubt, please return device to manufacturer for repair or maintenance.

# 8. Start of Operation

## 8.1 Connections

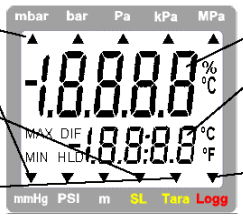


Connection for pressure sensors of the HND-P-family

Interface: Connection for el. isolated interface adapter (see chapter *8.7 The Serial Interface*)
The mains adapter socket is located at the left side of the device.

## 8.2 Display

**Units:** an arrow points to the chosen measuring unit
**SL:** appears if sea-level-correction is activated
**Tara:** appears if tara-function is activated

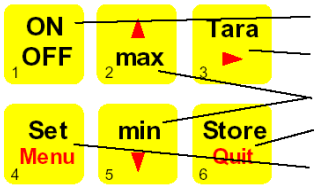



**main display:** shows measuring value
**secondary display:** shows min-, max- or hold value

**Logg:** appears, if a logger function is chosen

## 8.3 Basic Operation

**When switching on** the device and the logger function is not off the time of the integrated clock will shortly be displayed. Furthermore the kind of measuring is displayed (Slo/Fast/P.det, p.r.t 2.1) and “Corr”, if a Sensor with activated offset or scale correction is connected.
**After changing the battery** the clock-setting menu is activated automatically (‚CLOC‘). Check the clock and adjust, if necessary (see chapter 8.4 *Configuration*).




**On-/Off-Switch**
**Tara:** Calling of tara function
**min/max:** Showing the min- resp. max-memory
**Store/Quit:** Calling of hold function resp. calling of logger functions
**Set/Menu:** Calling of configuration

**Tare Function:** By pressing ´Tara´ (key 3) the display will be set to 0. All measurings from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds.

**Please Note: Activating/deactivating tara clears the max- & min-memories.**

**Max Memory:** Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides them. To clear the max memory press key ´max´ for >2 seconds.

**Min Memory:** Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides them. To clear the min memory press key ´min´ for >2 seconds.

**Hold Function:** By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it. (only when logger = ‚off').

**Zero-Point Adjustment:** If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out.

To carry out the adjustment press button 3 for approx. 5 seconds. (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration menu).

*Note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits!*

To recall the manufacturer`s calibration press button 3 for approx. 15 seconds.

**Note: If a zero-point adjustment was carried out, this will be signalled by the short displaying of „Corr“ when switching on the device.**

## 8.4 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu (main display: „SEt“).

Pressing key ***Menu*** changes between the menus, pressing ▸ (key 3) jumps to the referring parameters, which can be selected with key ▸ (key 3).

The parameters can be changed with ▲ (key 2) or ▼ (key 5).

Pressing ***Menu*** again jumps back to the main configuration menu and saves the settings.

***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

| Menu | Param. | Values | Meaning | |
|---|---|---|---|---|
| ‚Menu' | ▸ | ▲ or ▼ | | |
| **SEt ConF** | **Set Configuration: Generic Configurations** | | | |
| | **Unit** | mbar,bar.. | **Unit**: Unit of display | * |
| | **SL** | oFF/on | **Sea level correction**: on or off | * |
| | **Alti** | -2000..9999 | **Altitude**: Input of altitude above sea level [m] (only if SL on) | * |
| | **rAtE** | | **Rate**: Measuring rate (p.r.t. chapter *8.4.1)* | * |
| | | Slo | **Slow** measuring rate (4 Hz filtered, low power consumption) | * |
| | | FASt | **Fast** measuring rate, filtered (>1000 Hz) | * |
| | | P.dEt | **Peak detection**: fast measuring rate, unfiltered (>1000 Hz) | * |
| | **t.AVG** | 1-120 | Averaging period in seconds, used by the averaging function | |
| | | oFF | Averaging function deactivated | |
| | **P.oFF** | 1-120 | **Auto Power Off** time in minutes | |
| | | oFF | Auto Power Off deactivated | |
| | **Out** | oFF | Function of the output: No output function, lowest power consumption | |
| | | Ser | Output is serial interface | |
| | | dAC | Output is analogue output 0...1 V | |
| | **Adr.** | 01,11..91 | Base **address** of interface (if Out = SEr) | |
| | **dAC.0** | eg. -5.00.. 5.00 mbar | Enter desired value which the analogue output potential should be 0 V (if Out = dAC) | |
| | **dAC.1** | eg. -5.00.. 5.00 mbar | Enter desired value at which the analogue output potential should be 1 V (if Out = dAC) | |
| **Set CAL** | **Set Calibration: Adjustment of Sensor** | | | |
| | **OFFS** | Sensordep., e.g. -5.00..5.00 mbar | The **offset of sensor** will be displaced by this value to compensate for deviations in the probe or in the measuring device. | |
| | | OFF | Zero | |
| | **SCAL** | -2.000... 2.000 | The measuring **scale of sensor** will be changed by this factor [%] to compensate deviations of temperature probe or measuring device. | |
| | | OFF | Scale correction factor inactive (=0.000) | |
| **SEt AL.** | **Set Alarm: Settings Of Alarm Function** | | | |
| | **AL.** | On | **Alarm** on, with horn-sound | |
| | | no.So | Alarm on, without horn-sound | |
| | | oFF | no alarm function | |
| | **AL.Lo** | Sensor-Min ... AL.Hi | Min alarm rail (not when AL. oFF, Sensor-Min is the lower display range of connected sensor) | |
| | **AL.Hi** | AL.Lo ... Sensor-Max | Max alarm rail (not when AL. oFF, Sensor-Max is the upper display range of connected sensor) | |
| **SEt LoGG** | **Set Logger: Configuration Of Logger Function** | | | * |
| | **Func** | CYCL | **Cyclic**: logger function ‚cyclic logger' | * |
| | | Stor | **Store**: logger function ‚individual value logger' | * |
| | | oFF | no logger function | * |
| | **CYCL** | 1..3600 | Cycle time of cyclic logger [seconds] | * |
| | **Lo.Po** | on/oFF | **Low-power logger** with very low power consumption only for cyclic logger and slow measuring rate) | * |
| **SEt** | **Set Clock: Setting Of Real Time Clock** | | | |

| | | | | |
|---|---|---|---|---|
| **CLOC** | **CLOC** | HH:MM | **Clock**: Setting of time hours:minutes | |
| | **dAtE** | TT.MM | **Date**: day.month | |
| | **YEAr** | YYYY | **Year** | |

**Note: If the logger memory contains data already, the menues/parameters marked with (*) can not be invoked! If these should be altered the logger memory has to be cleared before! (key 6, see chapter *8.6 Operation Of Logger*)**

### 8.4.1 Different Kinds of Measuring: “rAtE-Slo, -P.dEt, -FASt”

Three different kinds of measuring pressure are supported. Two of them (P.dEt and FASt) are working with high measuring frequency of more than 1000 measurings per second.

#### 8.4.1.1 rAtE-Slo: Standard Measuring

Measuring rate 4Hz, averaging and filter functions are active.
Application: Measuring of slowly changing or static pressures, eg. measuring of leakproofness, atmospheric pressure...
Highest accuracy, high noise immunity (EMI and unstable measuring signals), low power consumption.

#### 8.4.1.2 rAtE-P.dEt: Peak detection

Measuring rate >1000Hz, the value is displayed unfiltered.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of <1ms. The cyclic logger function records the arithmetic mean value, the highest and the lowest peak of the referring time interval.
Attention: higher power consumption, measuring is sensitive to noise (EMI,..)

#### 8.4.1.3 rAtE-FASt: Fast filtered measuring

Measuring rate >1000Hz, the value is filtered slightly (higher noise immunity than P.dEt., small peaks will be filtered out), apart from that identical behaviour like P.dEt.

### 8.4.2 Averaging Function

The averaging function concerns the display values (LCD and interface). It is completely independent from the averaging of the logger function, please don’t mix them up!
The averaging integrates the measuring values during a selectable period of time and then calculates the average display value. It is independent from the selected kind of measuring (slow, fast, peak detect). As long as not enough values are collected (selected averaging time) to calculate a average value, the upper display shows “----“, the lower display a ‘countdown‘.
During an active low-power-logging procedure the averring is always deactivated
Function of min/max-value memory during averaging:

- If averaging is activated and slow measuring is selected (rAtE-Slo), the min-/max-value memory refers to the average display value.

- If averaging is activated and fast measuring is selected (rAtE-FASt or P.dEt) , the min-/max-value memory refers to the internal measured values (fast peaks can be detected).

### 8.4.3 Power Off Time

If there won't be pressed any key and no interface communication takes place for the time of the power off time setting (P.Off), the device will be switched off automatically to save battery power.
If P.oFF = oFF then the automatic switch off is deactivated.

### 8.4.4 Address

Up to 10 devices of the HND-P- handheld-family can be connected to a serial interface at once (depending on interface converter). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on. See also chapter *8.7 The Serial Interface*.

### 8.4.5 Alarm

There are three possible settings: Alarm off (AL. oFF), on with horn sound (AL. on), on without sound (AL. no.So).
Following conditions will display an alarm, when the function is activated (on or no.So):

- Value is below lower (AL. Lo) or above upper alarm rail (AL.Hi).
- Sensor error (Sens Erro)
- Low battery (bAt)
- Fe 7: System error (always with sound)

In case of an alarm and when polling the interface the prio-flag is set in the returned interface message.

### 8.4.6 Real Time Clock

The real time clock is used for the logger function: Recorded values are also containing the point of time, when they were measured. Please check the settings when necessary.
If the battery was replaced the refering menu ‚CLOC' will automatically be started.

## 8.5 Measuring Of Water Level – Display Unit [m]

**(only for devices with ‚m' printed below the display)**
When using a suitable waterproof pressure sensor the unit [m] for meters of water can be set in the menu "Unit". 10 m of water are roughly 1 bar over pressure. Measurings can be made e.g. like described below :

- With abs. pressure sensor (SL oFF!): Press ‚Tara' when sensor is at ambient air and then bring sensor to the depth to be measured. The display shows now the depth in [m].
- With rel pressure sensor: bring tube connection for lower press. in contact to ambient air by means of a tube (no water contact!) and bring the sensor with its open press. connection for higher pressure to water depth to be measured (display and is compensated for pressure changes in ambient air).

## 8.6 Operation Of Logger

The device supports two different logger functions:

**„Func-Stor":** each time when „store" (key 6) is pressed a measurement will be recorded.

**„Func-CYCL":** measurements will automatically be recorded each interval, which was set in the logger menu ‚CYCL' until the logger will be stopped or the logger memory is full. The recording is started by pressing „Store" 2 seconds.

The logger records 3 measurement results each time:
current or mean value (depending on logger setting, see below), min peak and max peak of sensor
**Min and max peak** are the minimum resp. the maximum of the measured values since the last recording. Using them allows f.e. analysis of fluctuating pressures. For the evaluation of the data the software HND-Z034 has to be used. The software also allows easy configuration and starting of the logger. When the logger is activated (Func Stor or Func CYCL) the hold function is no more available, the key 6 is solely used for the operation of the logger functions.

### 8.6.1 „Func-Stor": Storing Single Measurements

Each time when „store" (key 6) is pressed a measurement and its time stamp will be recorded.
The recorded data can be viewed either in the display (when calling the configuration an additional menu „REAd LoGG" is displayed, see below) or by means of the interface and a PC with HND-Z034-software.

***Please note:*** *For the Func-Stor-logging function it is not allowed to change the pressure sensor after values are stored, otherwise invalid data could be read out. For the read out of the logger the sensor has to be kept connected!*

Max. number of measurings: 99
A measuring contains: - current measuring value at the time of recording
- min peak, max peak since the last recording
- max peak since the last recording

- time and date of the recording

After each recording „St. XX“ will be displayed for a short time. XX represents the number of the recording.

**If logger memory contains recordings already:**
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

If the logger memory is full, the display will show: 


**Viewing Recorded Measurings**
Within the „LoGG Stor“ function the measurings can be viewed directly in the display not only by means of a computer (like at „Func CYCL“): press 2 seconds „Set“ (key 4): The first menu displayed now is „rEAd LoGG“ (read logger data). After pressing ▶ (key 3) the measurement recorded last will be displayed, changing between the different values referring to the measurement also is done by pressing ▶.
Changing the measurement is done by pressing the keys ▲ or ▼.

### 8.6.2 „Func-CYCL“: Automatic Recording With Selectable Logger-Cycle-Time

The Logger-Cycle-Time is settable (p.r.t. Configuration). For example „CYCL“ = 60: A measuring is recorded after each 60 seconds.
When the slow measurement "rAtE-Slo" is chosen, additionally a low power function is available: „Lo.Po“.
If „Lo.Po“ is on, the device only will take a measurement at the point of time of the recording. In between the recordings the measuring shut’s down. This decreases the power consumption enormously and therefore is recommended e.g. for long time recordings where no mains adapter is available.

Max. number of measurings: 10000
Cycle time: 1...3600 seconds (=1h), selectable in the configuration

A measuring contains:

- rAtE SLo: - current measuring value at the time of recording
  - min peak, max peak since the last recording
- rAtE FASt,P.dEt - arithmetic mean value since the last recording
  - min peak, max peak since the last recording

**Starting a recording:**
By pressing "Store" (key 6) for 2 seconds the recording will be initiated. After that the display shows ‘St.XXXX‘ for a short time whenever a measuring is recorded. XXXX is the number of the measuring 1..10000.

If the logger memory is full, the display will show: 

The recording automatically will be stopped.

If Low-Power-Logger-Function „Lo.Po = on“ the device switches itself off as soon as the memory gets filled.

**Stopping the recording manually:**
By pressing "Store" (key 6) the recording can be stopped manually. Then the following choice appears:

Stop the recording

Do not stop the recording

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

**Note: If you try to switch off the instrument in the cyclic recording operation You will be asked once again if the recording is to be stopped. The device can only be switched off after the recording has been stopped! The Auto-Power-Off-function is deactivated during recording!**

**Clear Recordings:**
By pressing „Store“ (key 6) for 2 seconds the logger operation will be called.

The display will show 

By pressing the keys ▲ (key 2) or ▼ (key 5) the display will change to 

.

When “Store” is pressed, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording sequence

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

## 8.7 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031/-032) the device can be connected to a computer for data transfer. To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:

- **HND-Z034**: Operation and read out of logger function, data display in diagrams and tables
- **BUS-SW9M**: 9-channel software to display the measuring values

**The device has 3 channels:**

1: current measuring value (base address)
2: min peak (see chapter *8.6 Operation Of Logger*)
3: max peak ( see chapter *8.6 Operation Of Logger*)

**Note: The measuring-/ alarm- and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Channel | | Code | Name/Function | Channel | | Code | Name/Function |
|---|---|---|---|---|---|---|---|
| 1 | 2, 3 | | | 1 | 2, 3 | | |
| x | x | 0 | Read measurement value | x | | 208 | Read # of channels |
| x | x | 3 | Read system state | x | | 222 | Read power off time (Conf-P.oFF) |
| x | | 12 | Read ID number | x | | 223 | Set power off time (Conf-P.oFF) |
| x | | 22 | Read min alarm rail (AL. - AL.Lo) | x | x | 224 | Logger: Read data of CYCL- Logger |
| x | | 23 | Read max alarm rail (AL. - AL.Hi) | x | | 225 | Logger: Read cycle time (LoGG - CYCL) |
| x | | 32 | Read configuration flag BitAlarmOn:1; BitAlarmSound:3; BitLoggerOn:50; BitCyclicLogger:51; BitLowPowerLogger:52 | x | | 226 | Logger: set cycle time (LoGG - CYCL) |
| x | | 160 | Set configuration flag (refer to 32) | x | | 227 | Logger: start recording |
| x | x | 176 | Read min measuring range | x | | 228 | Logger: Read # of recordings made |
| x | x | 177 | Read max measuring range | x | | 229 | Logger: Read state |
| x | x | 178 | Read measuring range – measuring unit | x | | 231 | Logger: Read stop time |
| x | x | 179 | Read measuring range – decimal point | x | | 233 | Read real time clock (CLOC) |
| x | x | 180 | Read kind of measuring of sensor | x | | 234 | Set real time clock (CLOC) |
| | | | | x | | 236 | Read logger memory size |
| x | x | 199 | Read kind of measuring of display | x | | 237 | Read logger filecount |
| x | x | 200 | Read min display range | x | | 238 | Read logger filepointer |
| x | x | 201 | Read max display range | x | | 239 | Read logger file info |
| x | x | 202 | Read display range - unit | x | | 240 | Reset |
| x | x | 204 | Read display range – decimal point | x | | 254 | Program version |
| | | | | x | | 260 | Logger: read data of STOR Logger |
| | | | | x | x | 263 | Read logger channel info |

## 8.8 Pressure Connection To The Sensors

The device is designed to be connected to the sensors of the HND-PS...-series without a new calibration being necessary. Therefore a great variety of replaceable sensors of e.g. –1.999...2.500 mbar relative up to 0...400.0 bar absolute pressure can be connected to the device (p.r.t. chapter 11 order codes)

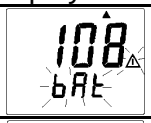
**Relative Pressure Sensors**

- **For measurements of over- or under pressure:**
  Connect plastic tube with internal dia of 4 mm to pressure port "B". Port "A" will not be used! Pressure sensors HND-PS01/-PS02/-PS03 allow for measurements of under pressure up to the entire over pressure measuring range by re-plugging the tube to pressure port "A". Please note that all values are displayed as positive values. No minus sign will be shown. (Example for HND-PS02: For tube connection "B" the measuring range covers -19.99 to 25.00 mbar. If you replug to port "A" under pressure measurements down to -25.00 mbar could be carried out with the display showing the value 25.00 (no minus sign).
- **For measurements of pressure differences:**
  Connect both plastic tubes with an internal dia of 4 mm to pressure port "B" and "A"; make sure to apply higher pressure to port "B".

**Absolute pressure sensors:**
Connect plastic tube with an internal dia of 4 mm to pressure port "A". (Port "B" is not used.)

**Stainless steel pressure sensors:**
For measurements of over-, under- or absolute pressure screw sensor to G1/4" pressure terminal or plug plastic tube to a suitable adapter.

## 8.9 Error And System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
|  ***or Err.9*** | No sensor connected | Switch off device and connect sensor |
| | Connected sensor or device defective | If second sensor available, check if device is ok. Return defective device/sensor to manufacturer for repair |
| | Value extremely out of measuring range | Check: pressure not within sensor range? |
| No display or confused characters, device does not react on keypress | Battery empty | |
| | Mains operation: wrong | |
| | | |
| | | |
| ***Err.1*** | Measured value above allowable range | Check: pressure not within sensor range?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | Check: pressure not within sensor range?<br>-> measuring value to low |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.3*** | Display range overflow | Check: value above 19999->to high to be displayed |
| ***Err.4*** | Display range underflow | Check: value below -19999 (Tara?) ->to low! |
| ***Err.11*** | Value could not be calculated | Choose different unit |
| | Calculation overflow happened | Choose different unit |
| ***Err.7*** | System error | Return to manufacturer for repair |
| ***----*** | Sensor not present/recognised | Reconnect sensor, during logging: stop the logger and restart it |
| | Could not calculate value | Suitable sensor/unit combination necessary |

## 8.10 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificated for its accuracy, it is the best solution to return it with the referring sensors to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

# 9. Maintenance

## 9.1 Battery Operation

If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.
The battery has to be taken out, when storing device above 50 °C.

**Please note: We recommend to take out battery if device is not used for a longer period of time!**

# 10. Technical Information

| | |
|---|---|
| **Measuring ranges:** | |
| Display range: | max. -19999…19999 digit, depending on connected sensor |
| Resolution: | depending on connected sensor |
| Pressure units: | mbar, bar, kPa, MPa, mmHg, PSI, $mH_2O$<br>Selectable depending on connected sensor |
| Accuracy: (typ.) | ± 0.1 % F.S. (at nominal temperature)<br>(FASt and P.dET: ±0,5%FS) |
| Measuring rate: | slow: 4 meas./sec (ConF-Rate=slow)<br>fast: >1000 meas./sec<br>(ConF-Rate=FASt and P.dEt) |
| Nominal temperature: | 25 °C |
| **Sensor:** | All sensors of the HND-Ps…-series without recalibration can be connected |
| Connection: | Mini-DIN-Socket with locking mechanism<br>The sensor will automatically be detected, the measurement range settings are set referring to sensor data |
| **Additional functions:** | |
| Power-Off-Function: | Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated. |
| Min/Max-Alarm: | The measuring values can be monitored constantly for the min. and max. rails set<br>Alarming is done by integrated horn, display and interface |
| Real time clock: | Integrated clock with date and year |
| **Logger:** | 2 Functions: individual value logger (“Func-Stor”) |

| | |
|---|---|
| | and cyclic logger (“Func-CYCL”) |
| Memory: | Stor: 99 data sets; CYCL: 10000 data sets |
| Cycle time CYCL: | 1…3600 seconds (=1h) |
| **Display:** | 2 four digit LCDs (12.4mm high and 7mm high) for measuring values, and for min/max memories, hold function, etc. as well as additional functional arrows. |
| **Pushbuttons:** | 6 membrane keys |
| **Interface:** | Serial interface (3.5mm jack) can be connected to RS232 or USB interface of a PC via electrically isolated interface adapter HND-Z031,or HND-Z032 (see accessories) |
| **Power supply:** | 9V battery, type: IEC 6F22 (included in scope of supply) as well as additional d.c. connector (diameter of internal pin 1.9mm) for external 10.5-12V direct voltage supply. |
| Power consumption: | Slow measuring rate: <1.6mA<br>Fast measuring rate: <7.0mA<br>Low-Power-Logger: <0.3mA (for cycle time >30s, without interface communication active and no alarm horn sounding) up to 0.8mA (at cycle time 1s) |
| **Housing:** | impact-resistant ABS, membrane keyboard, transparent panel, Front side IP 65 |
| Dimensions: | 142x71x26mm (LxWxD) |
| Working conditions: | -25…+50°C, 0…95%RH (non-condensing) |
| Storage temperature: | -25…+70°C |
| **EMC:** | The device corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (2004/108/EG)<br>Additional fault: <1% |

**Scope of functions**
**Minimum/maximum value memory**
**Hold function:** »freezing« of the current value
**Automatic-off function:** 1...120 min (can be deactivated)
**Zero point adjustment** for connected sensor
**Tare function:**
display-, minimum/maximum values are set to zero

# 11. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P210** | 1 x pressure sensor input with additional functions |

## 11.1 Pressure sensors

| Measuring range | Accuracy | Resolution | Overload | Working temperature | Connection | Order-no. |
|---|---|---|---|---|---|---|
| -1,999...2,500 mbar | ±0,2% ME / ±1,0% ME* | 0,001 mbar | max. 200 mbar | 0...+50 °C | Nylon-spigot for hose 6 x 1 mm  | HND-PS01** |
| -19,99...25 mbar | ±0,2% ME/±0,5% ME* | 0,01 mbar | max. 300 mbar | | | HND-PS02** |
| -199,9...350,0 mbar | ±0,2% ME/±0,4% ME* | 0,1 mbar | max. 1 bar | | | HND-PS03** |
| -1000...2000 mbar | | 1 mbar | max. 4 bar | | | HND-PS04** |
| -1...10 bar | | 10 mbar | max. 10,34 bar | | | HND-PS05** |
| 0...1300 mbar abs. | | 1 mbar | max. 4 bar abs. | | | HND-PS06** |
| 0...2000 mbar abs. | | | | | | HND-PS07** |
| 0...7,00 bar abs. | | 10 mbar | max. 10 bar abs. | | | HND-PS08** |
| 0...400,0 mbar rel. | | 0,1 mbar | max. 2 bar rel. | 0...+70 °C | External threads G ½ Edelstahl  | HND-PS19 |
| 0...1000 mbar rel. | | 1 mbar | max. 5 bar rel. | | | HND-PS20 |
| 0...2500 mbar rel. | | | max. 10 bar rel. | | | HND-PS21 |
| 0...4000 mbar rel. | | | max. 17 bar rel. | | | HND-PS22 |
| 0...6000 mbar rel.. | | | max. 35 bar rel. | | | HND-PS23 |
| 0...10 bar rel. | | 10 mbar | | | | HND-PS24 |
| 0...25 bar rel. | | | max. 50 bar rel. | | | HND-PS25 |
| 0...40,0 bar rel. | | | max. 80 bar rel. | | | HND-PS26 |
| 0...60 bar rel. | | | max. 120 bar rel. | | | HND-PS27 |
| 0...100 bar rel. | | 0,1 bar | max. 200 bar rel. | | | HND-PS28 |
| 0...160 bar rel. | | | max. 320 bar rel. | | | HND-PS29 |
| 0...250 bar rel. | | | max. 500 bar rel. | | | HND-PS30 |
| 0...400 bar rel. | | 10 mbar | max. 800 bar rel. | | | HND-PS31 |
| 0...600 bar rel. | | 0,1 bar | max. 1200 bar rel. | | | HND-PS32 |
| 0...1000 bar rel. | | 1 bar | max. 1500 bar rel. | | | HND-PS33 |
| 0...1000 mbar abs | ±0,2% ME / ±0,4% ME* | 1 mbar | max. 5 bar abs | 0...+70°C | External threads G ½  | HND-PA20 |
| 0...2500 mbar abs | | | max. 10 bar abs | | | HND-PA21 |
| 0...4000 mbar abs | | | max. 17 bar abs | | | HND-PA22 |
| 0...6000 mbar abs | | | max. 35 bar abs | | | HND-PA23 |

* in the range from 0 to +50 °C

** Pressure sensors HND-PS01 up to HND-PS08 are only suitable for air and non-corrosive/non-ionizing gases and liquids.

## 11.2 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10.5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose 6.4 on hose 6.4 |
| **HND-Z082** | Hose clamp for hose 6.4 |
| **HND-Z088** | Adapter made of brass for G 1.4 internal threads on hose 6.4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

*Pay attention to instrument dimensions

Additional accessories on request

# 12. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Hand-held Pressure Measuring Devices with External Pressure Sensors**
**Model: HND-P210**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 8. Mai 2014

H. Peters
General Manager

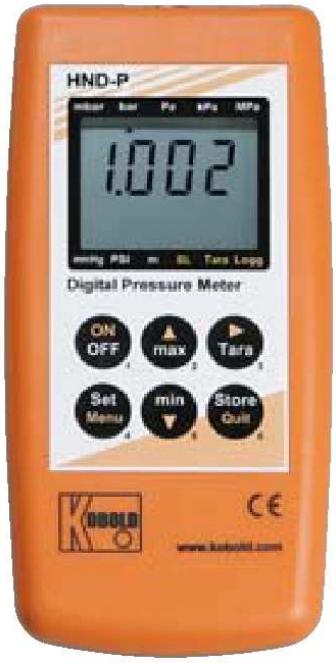
M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Manual Pressure Measuring Devices with External and Integrated Pressure Sensors

## Model: HND-P215



# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfill the EG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Manual Pressure Measuring Devices with External and Integrated Pressure Sensors model: HND-P215
- Operating Instructions

# 4. Regulation Use

Any use of the Manual Pressure Measuring Devices with External and Integrated Pressure Sensors, model: HND-P215, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The KOBOLD manual pressure measuring devices HND-P215 are highly precise, compact pressure measuring devices that can be used universally. In conjunction with the appropriate external pressure sensors, precise measurement results over the entire measuring range can be achieved.
Various pressure sensors are available for a multitude of measuring tasks and special applications. The respective measurement task determines which combination is selected. Naturally, these first-rate KOBOLD-measuring units can display more than just pressure. All devices in this series allow for minimum/maximum value memory, hold function, automatic self-shut-off, or zero point offset entry for all connected pressure sensors, for example. The HND-P215 type also has a logger function, a peak value memory, or a minimum/maximum alarm. A special characteristic of the type HND-P215 is the possibility of connecting two external pressure sensors.

# 6. Electrical Connection

## 6.1 Mains Operation with Power Supply

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!! Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002. Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.**

# 7. Operation / Configuration / Adjustments

## 7.1 General

### 7.1.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under *10 Technical Information*.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. When connecting the device to other devices the connection has to be designed most thoroughly as internal connections in third-party devices (e.g. connection GND with protective earth) may lead to undesired voltage potentials that can lead to malfunctions or destroying of the device and the connected devices.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

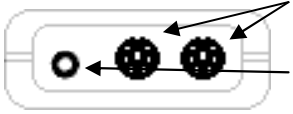
5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.

Operator safety may be a risk if:

- there is visible damage to the device
- the device is not working as specified
- the device has been stored under unsuitable conditions for a longer period of time.

In case of doubt, please return device to manufacturer for repair or maintenance.

## 7.2 Connections



Connections for **pressure sensors** of the HND-PS-family (p.r.t. chapter 8)

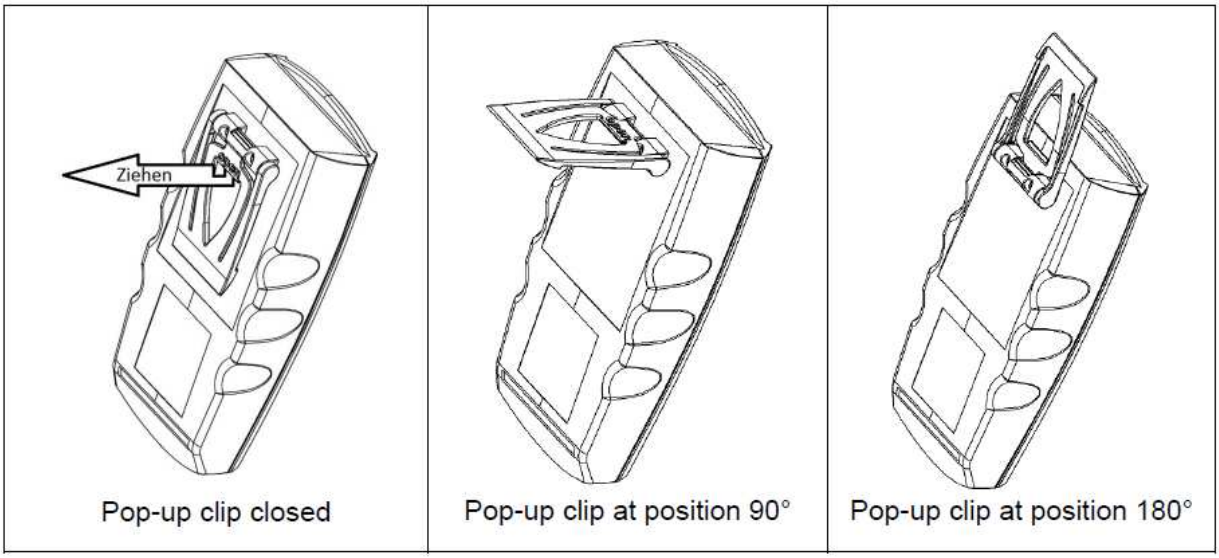
**Interface**: Connection for el. isolated interface adapter (p.r.t. chapter *8.1 The Serial Interface*)

The mains adapter socket is located at the left side of the device.

## 7.3 Pop-up clip

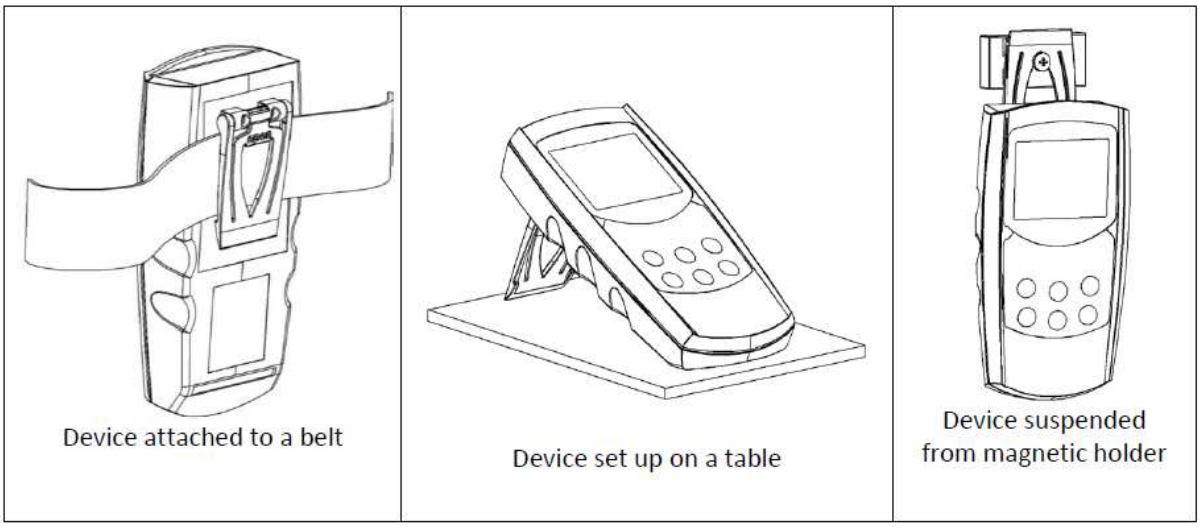
**Handling:**

- Pull at label “open” in order to swing open the pop-up clip.
- Pull at label “open” again to swing open the pop-up clip further.

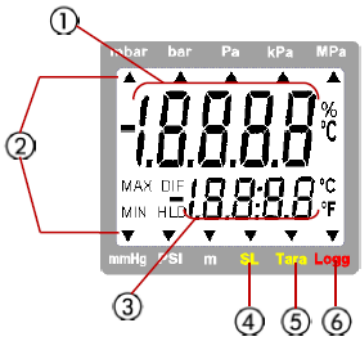



**Function:**

- The device with a closed pop-up clip can be plainly laid onto a table or attached to a belt, etc.
- The device with pop-up clip at position 90° can be set up on a table, etc.
- The device with pop-up clip at position 180° can be suspended from a screw or the magnetic holder.



## 7.4 Display




| | |
|---|---|
| 1 | **Main display:** measuring value of **sensor 1** |
| 2 | Arrow points to the chosen measuring **unit** |
| 3 | **Secondary display:** measuring value of **sensor 2** or **difference sensor 1 – sensor 2** |
| 4 | **SL:** appears if sea-level-correction is activated |
| 5 | **Tara:** appears if tara-function is activated |
| 6 | **Logg:** appears if logger function is chosen, flashes while logger is running |

## 7.5 Basic Operation


| | | |
|---|---|---|
| ON OFF | **On / Off** | |
| max + min | **min/max bei Messung:** | |
| | press short: | shows the min./max. value |
| | press again: | hides min./max. value |
| | press 2 sec.: | clears particular value |
| Tara | **Tara, zero-point adjustment:** | |
| | press short: | display will be set to 0<br>The following measuring will be relatively displayed to the set tara value |
| | press 2 sec.: | deactivates tara-function |
| | press 5 sec.: | Zero-Point Adjustment[1)] |
| Set Menu | **Set/Menu:** | |
| | press short: | Choose secondary display: **Sensor 2** or **difference sensor 1 – sensor 2** or calling of configuration |
| Store Quit | **Store/Quit:** | |
| | press short: | hold-function, the last measuring value will be held in the secondary display. |
| | press again: | hides the value |
| | at active logger: | invokes logger functions |

***Please Note: Activating/deactivating tara clears the max- & min-memories.***

[1)] **Zero-Point Adjustment:** If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press button 3 for approx. 5 seconds (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor
(referring configuration menu).

To recall the manufacturer's calibration press button 3 for approx. 15 seconds. *Please note: - A zero-point adjustment can only be carried out if the difference between the values on display is less than 500 digits!*
*- If a zero point adjustment was carried out the display shows "Corr" after a restart .*

## 7.6 Operation

Connect sensor, turn on device via 

key.

After segment test  the device displays some configuration:
If the logger function is not off the time of the integrated clock will shortly be displayed.
If a zero point adjustment was carried out the display shows shortly „nuLL Corr".
After changing the battery the clock-setting menu is activated automatically (‚CLOC'). Check the clock and adjust, if necessary (p.r.t. chapter 7.7). After that the device is ready for measuring.

## 7.7 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will activate the configuration menu (main display: „SEt").
Pressing key ***Menu*** changes between the menus, pressing ▸ (key 3) jumps to the referring parameters, which can be selected with key ▸ (key 3).
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
Pressing ***Menu*** again jumps back to the main configuration menu and saves the settings.
***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

| Menu | Parameter | Values | Meaning | |
|---|---|---|---|---|
| KEY Menu | KEY ▸ | KEY ▲ or ▼ | | |
| **SEt ConF** | **Set Configuration: Generic Configurations** | | | |
| | **Unit** | mbar,bar.. | Unit: Unit of display (given by sensor 1 when using 2 sensors) | *,** |
| | **SL** | oFF/on | Sea level correction: on or off (only for Sensor 1) | *,** |
| | **Alti** | -2000..9999 | Altitude above sea level [m] (only for Sensor1 and if SL ) | *,** |
| | **rAtE** | | Rate: Measuring rate (p.r.t. chapter *7.7.1)* | * |
| | | Slo | Slow measuring rate (4 Hz filtered, low power consumption) | * |
| | | FASt | Fast measuring rate, filtered (>1000Hz) | * |
| | | P.dEt | Peak detection: fast measuring rate, unfiltered (>1000Hz) | * |
| | **t.AVG** | 1-120 | Averaging period in seconds, used by the averaging function | |
| | | oFF | Averaging function deactivated | |
| | **P.oFF** | 1-120 | Auto Power Off time in minutes | |
| | | oFF | Auto Power Off deactivated | |
| | **Out** | oFF | Function of the output: No output function, lowest power consumption | |
| | | Ser | Output is serial interface | |
| | | dAC | Output is analogue output 0…1 V | |

| Menu | Parameter | Values | Meaning | |
|---|---|---|---|---|
| KEY Menu | KEY ▸ | KEY ▲ or ▼ | | |
| **SEt ConF** | **Set Configuration: Generic Configurations** | | | |
| | **Adr.** | 01,11..91 | Base address of interface (if Out=Ser) | |
| | **dAC.** | CH1, CH2, or CH DIF | Choice of the input to be the source for the analogue output (if Out=dAC) | |
| | **dAC.0** | eg. -5.00..5.00 mbar | Enter desired value at which the analogue output potential should be 0 V (if Out=dAC) | |
| | **dAC.1** | eg. -5.00…5.00 mbar | Enter desired value at which the analogue output potential should be 1 V (if Out=dAC) | |
| **SEt CAL** | **Set Calibration: Adjustment of Sensors** | | | |
| | **OFS.1** | Sensordep., e.g. -5.00…5.00 mbar | The **offset of sensor 1** will be displaced by this value to compensate for deviations in the probe or in the measuring device. | |
| | | OFF | Zero displacement is inactive (=0.0°) | |
| | SCL.1 | -2.000…2.000 | The measuring **scale of sensor 1** will be changed by this factor [%] to compensate deviations of temperature probe or measuring device. | |
| | | OFF | Scale correction factor inactive (=0.000) | |
| | **OFS.2** | Sensordep., e.g. -5.00…5.00 mbar | The **offset of sensor 2** will be displaced by this value to compensate for deviations in the probe or in the measuring device. | |
| | | oFF | Zero displacement inactive (=0.0°) | |
| | **SCL.2** | -2.000…2.000 | The measuring **scale of sensor 2** will be changed by this factor [%] to compensate deviations of temperature probe or measuring device. | |
| | | oFF | Scale correction factor inactive (=0.000) | |
| **SEt AL.** | **Set Alarm: Settings Of Alarm Function** | | | |
| | **AL. 1** | On | **Alarm sensor 1** on, with buzzer sound | |
| | | no.So | Alarm sensor 1 on, without buzzer sound | |
| | | oFF | no alarm function for sensor 1 | |
| | **AL.Lo/AL.1** | Sensor1-Min... AL.1-Hi | Min alarm rail Sensor 1 (not when AL.1 oFF)<br>Sensor1-Min is the lower display range of sensor 1 | |
| | **AL.Hi/AL.1** | AL.1-Lo... Sensor1-Max | Max alarm rail Sensor 1 (not when AL.1 oFF)<br>Sensor1-Max is the upper display range of sensor 1 | |
| | **AL. 2** | On | **Alarm sensor 2** on, with buzzer sound | |
| | | no.So | Alarm sensor 2 on, without buzzer sound | |
| | | oFF | no alarm function for sensor 2 | |
| | **AL.Lo/AL.2** | Sensor2-Min...AL.2-Hi | Min alarm rail Sensor 2 (not when AL.2 oFF)<br>Sensor2-Min is the lower display range of sensor 2 | |
| | **AL.Hi/AL.2** | AL.2-Lo... Sensor2-Max | Max alarm rail Sensor 2 (not when AL.2 oFF)<br>Sensor2-Max is the upper display range of sensor 2 | |
| | **AL.DIF** | On | **Alarm sensor difference** on, with buzzer sound | |
| | | no.So | Alarm sensor difference on, without buzzer sound | |
| | | oFF | no alarm function for sensor difference | |
| | **AL.Lo DIF** | -19999..AL.DIF-Hi | Min alarm rail of difference (not when AL.DIF oFF) | |
| | **AL.Hi DIF** | AL.DIF-Lo..19999 | Max alarm rail of difference (not when AL.DIF oFF) | |
| **SEt LoGG** | **Set Logger: Configuration Of Logger Function** | | | * |
| | **Func** | CYCL | **Cyclic**: logger function ‚cyclic logger' | * |
| | | Stor | **Store**: logger function ‚individual value logger' | * |
| | | oFF | no logger function | * |
| | **CYCL** | 1..3600 | Cycle time of cyclic logger [seconds] | * |
| | **Lo.Po** | on/oFF | **Low-power logger** with very low power consumption (only for cyclic logger and slow measuring rate) | * |
| **SEt CLOC** | **Set Clock: Setting Of Real Time Clock** | | | |
| | **CLOC** | HH:MM | **Clock**: Setting of time hours:minutes | |
| | **dAtE** | TT.MM | **Date**: day.month | |
| | **YEAr** | YYYY | **Year** | |

***(*) This menu can only be invoked if the logger memory contains no data! If parameter should be changed the logger memory has to be cleared before! (key 6, p.r.t. 7.8 Operation Of Logger)***

***(**) This menu can only be invoked if a referring sensor is connected to connection 1. When using a second referring sensor at connection 2 then changes are taken over.***

*Note: When using the logger function some settings in the menu may not be accessible (*). If this settings should be changed, the logger has to be stopped before, eventually the logger data has to be cleared. (p.r.t. chapter 7.8)*

### 7.7.1 Different Kinds Of Measuring: „rAtE-Slo, -P.dEt, -FASt“

Three different kinds of measuring pressure are supported. Two of them (P.dEt and FASt) are working with high measuring frequency of more than 1000 measurings per second.

#### 7.7.1.1 rAtE-Slo: Standard Measuring

Measuring rate 4 Hz, averaging and filter functions are active.
Application: Measuring of slowly changing or static pressures, e.g. measuring of leakproofness, athmospheric pressure... Highest accuracy, high noise immunity (EMI and unstable measuring signals), low power consumption.

#### 7.7.1.2 rAtE-P.dEt: Peak detection

Measuring rate >1000 Hz, the value is displayed unfiltered.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of < 1 ms. The cyclic logger function records the arithmetic mean value, the highest and the lowest peak of the refering time interval. Attention: higher power consumption, measuring is sensitive to noise (EMI,..).

#### 7.7.1.3 rAtE-FASt: Fast filtered measuring

Measuring rate >1000 Hz, the value is filtered slighlty (higher noise immunity than P.dEt, small peaks will be filtered out), apart from that identical behaviour like P.dEt.

### 7.7.2 Measuring Of Water Level – Display Unit [m]

When using suitable waterproof pressure sensors the unit [m] for meters of water can be set in the menu “Unit“. 10 m of water are roughly 1 bar over pressure. Measurings can be made e.g. like described below :

- With one abs. pressure sensor (SL oFF!): Press ‚Tara‘ when sensor is at ambient air and then bring sensor to the depth to be measured. The display shows now the depth in [m].
- With two abs. pressure sensors (SL oFF!): Sensor 2 at ambient air (does not have to be waterproof), waterproof sensor 1 at water depth to be measured. Don’t press ‚Tara‘, the depth can already read from the DIF-display and is compensated for pressure changes in ambient air.
- With one rel pressure sensor: bring tube connection for lower press. in contact to ambient air by means of a tube (no water contact!) and bring the sensor with its open press. connection for higher pressure to water depth to be measured (display and is compensated for pressure changes in ambient air).

### 7.7.3 Sea Level Correction For Absolute Pressure Sensors

The device displays the absolute pressure. This is not necessarily the same like the values given by weather stations! The weather stations‘ values are giving the pressure at sea level. Usually the sensor is placed above sea level and therefore, if the value at sea level (zero) is to be measured, the pressure loss resulting from the actual level above sea level has to be considered! To correct the measuring display activate the „Sea-Level-Function“ (SL, p.r.t. chapter *7.7 Configuration*, setting is only possible, if the abs. pressure sensor is connected to sensor socket 1). Then enter the altitude above sea level of the sensor‘s location in meters (Alti, p.r.t. chapter 7.*7 Configuration*). When activated, the display shows the SL-arrow and the device displays the pressure value at sea level.

**Please note: When two absolute pressure sensors are connected, the sea level function for both is corresponding to the setting of sensor 1**

### 7.7.4 Averaging Function

The averaging function concerns the display values (LCD and interface). It is completely independent from the averaging of the logger function, please don’t mix them up!
The averaging integrates the measuring values during a selectable period of time and then calculates the average display value. It is independent from the selected kind of measuring (slow, fast, peak detect).
As long as not enough values are collected (selected averaging time) to calculate a average value, the upper display shows “----“, the lower display a ‘countdown‘.
During an active low-power-logging procedure the averring is always deactivated
Function of min/max-value memory during averaging:
- If averaging is activated and slow measuring is selected (rAtE-Slo), the min-/max-value memory refers to the average display value.
- If averaging is activated and fast measuring is selected (rAtE-FASt or P.dEt) , the min-/max-value memory refers to the internal measured values (fast peaks can be detected). (>1000 Hz)

### 7.7.5 Power Off Time

If there won’t be pressed any key and no interface communication takes place for the time of the power off time setting (P.Off), the device will be switched off automatically to save battery power. If P.oFF = oFF then the automatic switch off is deactivated.

### 7.7.6 Alarm

3 possible settings per channel: Alarm off (AL.oFF), on with horn sound (AL.on), on without horn (AL.no.So). Following conditions will display an alarm, when the function is activated (on or no.So):

- Value is below lower (AL. Lo) or above upper alarm rail (AL.Hi).
- Sensor error (Sens Erro)
- Low battery (bAt)
- Fe 7: System error (always with sound)

In case of an alarm and when polling the interface the prio-flag is set in the returned interface message.

If the horn sound of one channel will be switched on/off (on or no.So), then this horn sound setting will automatically be copied to the other activated channels.

### 7.7.7 Real Time Clock

The real time clock is used for the logger function: Recorded values are also containing the point of time, when they were measured. Please check the settings when necessary.
If the battery was replaced the referring menu ‚CLOC' will automatically be started.

## 7.8 Operation Of Logger

The device supports two different logger functions:

**„Func-Stor":** each time when „store" (key 6) is pressed a measurement will be recorded.

**„Func-CYCL":** measurements will automatically be recorded each interval, which was set in the logger menu ‚CYCL' until the logger will be stopped or the logger memory is full. The recording is started by pressing „Store" 2 seconds.

The logger records 3 measurement results each time:

- current or mean value (depending on logger setting, see below), min peak and max peak of sensor 1
- current or mean value (depending on logger setting, see below), min peak and max peak of sensor 2
- current or mean value (dep. on logger setting), min peak and max peak of sensor 1 - sensor 2

**Min and max peak** are the minimum resp. the maximum of the measured values since the last recording. Using them allows f.e. analysis of fluctuating pressures. For the evaluation of the data the software HND-Z034 has to be used. The software also allows easy configuration and starting of the logger. When the logger is activated (Func Stor or Func CYCL) the hold function is no more available, the key 6 is solely used for the operation of the logger functions.

**Please note: When reading out loggerdata either the sensor connected during logging or no sensor should be connected. Otherwise the measuring unit of the data may be corrupted.**

### 7.8.1 „Func-Stor": Storing Single Measurements

Each time when „store" (key 6) is pressed a measurement and its time stamp will be recorded. The recorded data can be viewed either in the display (when calling the configuration an additional menu „REAd LoGG" is displayed, see below) or by means of the interface and a PC with HND-Z034-software.
Max. number of measurings: 99
A measuring contains: - sensor 1, current measuring value at the time of recording
- sensor 1, min peak since the last recording
- sensor 1, max peak since the last recording
- sensor 2, current measuring value at the time of recording
- sensor 2, min peak since the last recording

- sensor 2, max peak since the last recording
- difference sensor 1 - sensor 2, current measuring value at time of recording
- difference sensor 1 - sensor 2, min peak since the last recording
- difference sensor 1 - sensor 2, max peak since the last recording
- time and date of the recording

After each recording „St. XX“ will be displayed for a short time. XX represents the number of the recording.

**If logger memory contains recordings already:**

When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

If the logger memory is full, the display will show: 


**Viewing Recorded Measurings**

Within the „LoGG Stor“ function the measurings can be viewed directly in the display not only by means of a computer (like at „Func CYCL“): press 2 seconds „Set“ (key 4): The first menu displayed now is „rEAd LoGG“ (read logger data). After pressing ▶ (key 3) the measurement recorded last will be displayed, changing between the different values refering to the measurement also is done by pressing ▶.

Changing the measurement is done by pressing the keys ▲ or ▼.

### 7.8.2 „Func-CYCL“: Automatic Recording With Selectable Logger-Cycle-Time

The Logger-Cycle-Time is setable (p.r.t. *7.7 Configuration*). For example „CYCL“ = 60: A measuring is recorded after each 60 seconds.

When the slow measurement "rAtE-Slo" is chosen, additionaly a low power function is available: „Lo.Po“.

If „Lo.Po“ is on, the device only will take a measurement at the point of time of the recording. In between the recordings the measuring shut’s down. This decreases the power consumption enormously and therefore is recommended e.g. for long time recordings where no mains adapter is available.

Max. number of measurings: 4000

Cycle time: 1...3600 seconds (=1h), selectable in the configuration

A measuring contains:

- slow measuring rate (rAtE Slo):
  - sensor 1, current measuring value at the time of recording
  - sensor 1, min peak, max peak since the last recording
  - sensor 2, current measuring value at the time of recording
  - sensor 2, min peak, max peak since the last recording
  - difference sensor 1 – sensor 2, current measuring value at time of recording
  - difference sensor 1 – sensor 2, min peak, max peak since the last recording

fast measuring rates (rAtE FASt,P.dEt):
- sensor 1, arithmetic mean value since the last recording
- sensor 1 min peak, max peak since the last recording
- sensor 2, arithmetic mean value since the last recording
- sensor 2 min peak, max peak since the last recording
- difference sensor 1 – sensor 2, arithmetic mean value since the last recording
- difference sensor 1 – sensor 2, min peak, max peak since the last recording

**Starting a recording:**
By pressing "Store" (key 6) for 2 seconds the recording will be initiated. After that the display shows ‘St.XXXX‘ for a short time whenever a measuring is recorded. XXXX is the number of the measuring 1..4000.

If the logger memory is full, the display will show: 

The recording automatically will be stopped.
If Low-Power-Logger-Function „Lo.Po = on“ the device switches itself off as soon as the memory gets filled.

**Stopping the recording manually:**
By pressing "Store" (key 6) the recording can be stopped manually. Then the following choice appears:

Stop the recording

Do not stop the recording

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

**Note: If you try to switch off the instrument in the cyclic recording operation you will be asked once again if the recording is to be stopped. The device can only be switched off after the recording has been stopped! The Auto-Power-Off-function is deactivated during recording!**

**Clear Recordings:**
When „Store“ is pressed for 2 seconds, the logger operation will be called:

The display wil show: 

By pressing the keys ▲ (key 2) or ▼ (key 5) the display will change to 


When „Store“ is pressed, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording sequence

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

# 8. Output

The output can be used as serial interface (HND-Z031 or HND-Z032 interface adapters) or as analog output (0-1V).
If none of both is needed, we suggest to switch the output off, because battery life then is extended.

## 8.1 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031) the device can be connected to a computer for data transfer. To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:

- **HND-Z034**: Operation and read out of logger function, data display in diagrams and tables
- **BUS-S20M**: 20-channel software to display the measuring values

**The device has 9 channels:**

- Channel 1: sensor 1 current measuring value (base address)
- Channel 2: sensor 1 min peak (p.r.t. *7.8 Operation Of Logger*)
- Channel 3: sensor 1 max peak (p.r.t. *7.8 Operation Of Logger*)
- Channel 4: sensor 2 current measuring value (base address)
- Channel 5: sensor 2 min peak (p.r.t. *7.8 Operation Of Logger*)
- Channel 6: sensor 2 max peak (p.r.t. *7.8 Operation Of Logger*)
- Channel 7: difference sensor 1 – sensor 2 current measuring value (base address)
- Channel 8: difference sensor 1 – sensor 2 min peak (p.r.t. chapter *7.8 Operation Of Logger*)
- Channel 9: difference sensor 1 – sensor 2 sensor 1 max peak (p.r.t. chapter *7.8* Operation Of Logger)

**Note: The measuring-/ alarm- and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

**Supported functions:**

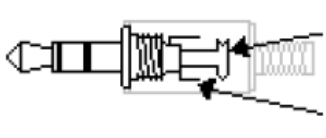
| Channel | | | Code | Name/Function | Channel | | | Code | Name/Function |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4, 7 | 2,3,5 6,8,9 | | | 1 | 4, 7 | 2,3,5 6,8,9 | | |
| x | x | x | 0 | Read measurement value | x | | | 208 | Read # of channels |
| x | x | x | 3 | Read system state | x | | | 222 | Read power off time (Conf-P.oFF) |
| x | | | 12 | Read ID number | x | | | 223 | Set power off time (Conf-P.oFF) |
| x | | | 22 | Read min alarm rail (AL. - AL.Lo) | x | x | x | 224 | Logger: Read data of CYCL- Logger |
| x | | | 23 | Read max alarm rail (AL. - AL.Hi) | x | | | 225 | Logger: Read cycle time (LoGG - CYCL) |
| x | | | 32 | Read configuration flag BitPeakDetection:33; BitFastFiltered:34; BitLoggerOn:50; BitCyclicLogger:51; BitLowPowerLogger:52 | x | | | 226 | Logger: set cycle time (LoGG - CYCL) |
| | | | | | x | | | 227 | Logger: start recording |
| | | | | | x | | | 228 | Logger: Read # of recordings made |
| | | | | | x | | | 229 | Logger: Read state |
| | | | | | x | | | 231 | Logger: Read stop time |
| x | | | 160 | Set configuration flag (refer to 32) | x | | | 233 | Read real time clock (CLOC) |
| x | x | x | 176 | Read min measuring range | x | | | 234 | Set real time clock (CLOC) |
| x | x | x | 177 | Read max measuring range | x | | | 236 | Read logger memory size |
| x | x | x | 178 | Read measuring range unit | x | | | 237 | Read logger filecount |
| x | x | x | 179 | Read measuring range decimal point | x | | | 238 | Read logger filepointer |
| x | x | x | 180 | Read kind of measuring of sensor | x | | | 239 | Read logger file info |
| | | | | | x | | | 240 | Reset |
| x | x | x | 199 | Read kind of measuring of display | x | | | 254 | Program version |
| x | x | x | 200 | Read min display range | x | | | 260 | Logger: read data of STOR Logger |
| x | x | x | 201 | Read max display range | x | x | x | 263 | Read logger channel info |
| x | x | x | 202 | Read display range - unit | | | | | |
| x | x | x | 204 | Read display range – decimal point | | | | | |

## 8.2 Analogue Output – Scaling with DAC.0 and DAC.1

Note: Analogue output cannot be used during logger recordings

With the DAC.0 and DAC.1 values the output can be rapidly scaled to your efforts.
Keep in mind not to connect low-resistive loads to the output, otherwise the output value will be wrong and battery life is decreased. Loads above ca 10kOhm are uncritical.
If the display exceeds the value set by DAC.1, then the device will apply 1V to the output
If the display falls below the value set by DAC.0, then the device will apply 0V to the output
In case of an error (Err.1, Err.2, no sensor, etc.) the device will apply slightly above 1V to the output.

plug wiring:




Attention!
the 3rd contact has to be left floating!
Only stereo plugs are allowed!

## 8.3 Instrument Adjustment

### 8.3.1 Zero Displacement Sensor 1 ('OFS.1') and Sensor 2 ('OFS.2')

A zero displacement can be carried out for the measured value:
value displayed = value measured - offset
Standard setting: 'off' = 0.0°, i.e. no zero displacement will be carried out. Together with the scale correction (see below) this factor is mainly used to compensate for sensor deviations. Input is in the display unit.

### 8.3.2 Scale Correction Sensor 1 ('SCL.1') and Sensor 2 ('SCL.2')

The scale of the measuring can be influenced by this setting (factor is in %):
displayed value = measured value * (1+Scal/100)
Standard setting: 'off' =0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

## 8.4 Pressure Connection to the Sensors

The device is designed to be connected to the sensors of the HND-PS...-series without a new calibration being necessary. Therefore a great variety of replaceable sensors of e.g. –1.999...2.500 mbar relative up to 0...1000 bar absolute pressure can be connected to the device.

## 8.5 Relative Pressure Sensors (Types: HND-PS01…-PS05, HND-PS09)

- **For measurements of over- or under pressure:**

Connect plastic tube with internal dia of 4 mm to pressure port "B". Port "A" is not used!

- **For measurements of under pressure:** (with higher negative measuring range)

Connect plastic tube with internal dia of 4 mm to pressure port "B". Port "A" will not be used!
Pressure sensors HND-PS01, HND-PS02 and HND-PS03 allow for measurements of under pressure up to the entire over pressure measuring range by re-plugging the tube to pressure port "A". Please note that all values are displayed as positive values. No minus sign will be shown. (Example for HND-PS02: For tube connection "B" the measuring range covers -19.99 to 25.00 mbar. If you replug to port "A" under pressure measurements down to -25.00 mbar could be carried out with the display showing the value 25.00 (no minus sign).

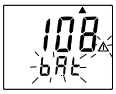
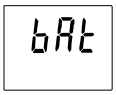
***Note: All values are displayed now as positive values. No minus sign will be shown. Example: it is possible to measure under pressure down to -25.00 mbar, the display shows then the value 25.00 (no minus sign).***

**For measurements of differential pressure:**
Connect both plastic tubes with an internal dia of 4 mm to pressure port "B" and "A"; make sure to apply higher pressure to port "B".

**Stainless steel pressure sensors: (types: HND-PS01…-PS30)**
For measurements of over-, under- or absolute pressure screw sensor to G1/4" pressure terminal or plug plastic tube to a suitable adapter.

**Measurements of differential pressure with two sensors**
By means of the calculation sensor 1 – sensor 2 (DIF) press. differences of any sensor combinations can be measured.

## 8.6 Error and System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
|  or **Err.9** | No sensor connected | Switch off device and connect sensor |
| | Connected sensor or device defective | If 2nd sensor available, check if device is ok. Return defective device/sensor to manufacturer for repair |
| | Value extremely out of measuring range | Check: pressure not within sensor range? |
| No display or confused characters, device does not react on keypress | Battery empty | Replace battery |
| | Mains operation: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| **Err.1** | Measured value above allowable range | Check: pressure not within sensor range? -> measuring value to high! |
| | Sensor defective | Return to manufacturer for repair |
| **Err.2** | Measured value below allowable range | Check: pressure not within sensor range? -> measuring value to low! |
| | Sensor defective | Return to manufacturer for repair |
| **Err.3** | Display range overflow | Check: value above 19999 -> to high to be displayed! |
| **Err.4** | Display range underflow | Check: value below 19999 (Tara?) -> to low! |
| **Er.11** | Value could not be calculated | Choose different unit |
| | Calculation overflow happened | Choose different unit |
| **Err.7** | System error | Return to manufacturer for repair |
| **----** | Sensor not present/recognized | Reconnect sensor, During logging: stop the logger and restart it |
| | Could not calculate value | Suitable sensor/unit combination necessary |

### 8.7 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificated for its accuracy, it is the best solution to return it with the referring sensors to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

## 9. Maintenance

### 9.1 Battery Operation

If ´bAt´ is shown in the lower display the battery has been used up and needs to be replaced. However, the device will operate correctly for a certain time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.

**Please note: The battery has to be taken out, when storing device above 50 °C. We recommend taking out battery if device is not used for a longer period of time! After recommissioning the real time clock has to be set again.**

# 10. Technical Information

| | |
|---|---|
| Measurement input: | for pressure sensor HND-PS |
| Measuring range: | depending upon the pressure sensor |
| Accuracy: | ± 0.1 % F.S. ± 1 Digit<br>(at nominal temperature 25 °C) |
| Resolution: | depending upon the sensor |
| Display range: | -19999 ... +19999 |
| Operating temperat.: | -25 to +50 °C |
| Storage temperat.: | -25 to +70 °C |
| Storage humidity: | 0 to 95% r.H. (non-condensing) |
| Probe connection: | 6-pin shielded Mini-DIN plug,<br>autom. sensor recognition, and measuring range adjustment |
| Output: | 3.5mm audio plug, stereo |
| Output function: | selectable as serial interface or analog output |
| Interface: | Serial interface (3.5mm jack) can be connected to USB or RS232 interface of a PC via electrically isolated interface adapter,<br>HND-Z031 or HND-Z032 (see accessories) |
| Analog output: | 0…1 Volt, freely scaleable (resolution 12 bit) |
| Power supply: | 9V battery, type IEC 6F22<br>(included in scope of delivery)<br>as well as additional d.c. connector<br>(diameter of internal pin 1.9mm) for external<br>10.5-12 V direct voltage supply.  <br>(suitable power supply: HND-Z002) |
| Power consumption: | Slow measuring rate: <1.8 mA<br>Fast measuring rate: <7.0 mA<br>Low-Power-Logger: <0.3 mA (for cycle time >30s, without interface communication active and no alarm horn sounding) up to 0.8 mA (at cycle time 1s) |
| Low battery warning: | ‘bat’ |
| Working conditions: | -20…+50 °C, 0…95% RH (not condensing) |
| Storage temperature: | -20…+70 °C |
| Housing: | impact-resistance ABS, membrane keyboard, transparent panel, Front side IP65 |
| Dimensions: | 142x71x26 mm (LxWxD) |
| Weight: | approx. 170 g |

# 11. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P…** | 2 x pressure sensor inputs with additional functions (see techn. data) |

## 11.1 Pressure sensors

| Measuring range | Accuracy | Resolution | Overload | Working-Temperature | Connection | Order-no. |
|---|---|---|---|---|---|---|
| 1.999...2.500 mbar | ±0.2 % EW / ±1.0 % EW* | 0.001 mbar | max. 200 mbar | 0...+50 °C | Nylon spigot for hose 6 x1 mm  | HND-PS01** |
| 19.99...25 mbar | ±0.2 % EW/±0.5 % EW* | 0.01 mbar | max. 300 mbar | | | HND-PS02** |
| 199.9...350.0 mbar | ±0.2 % EW/±0.4 % EW* | 0.1 mbar | max. 1 bar | | | HND-PS03** |
| 1000...2000 mbar | | 1 mbar | max. 4 bar | | | HND-PS04** |
| -1...10 bar | | 10 mbar | max. 10.34 bar | | | HND-PS05** |
| 0...1300 mbar abs. | | 1 mbar | max. 4 bar abs. | | | HND-PS06** |
| 0...2000 mbar abs. | | | | | | HND-PS07** |
| 0...7.00 bar abs. | | 10 mbar | max. 10 bar abs. | | | HND-PS08** |
| 0...350.0 mbar rel. | | 0.1 mbar | max. 1.4 bar | 0...+70 °C | External threads G ¼, stainless steel  | HND-PS09 |
| 0...1000 mbar abs. | | 1 mbar | max. 4 bar abs. | | | HND-PS10 |
| 0...3500 mbar abs. | | | max. 14 bar abs. | | | HND-PS11 |
| 0...3500 mbar rel. | | | max. 14 bar rel. | | | HND-PS12 |
| 0...7000 mbar abs. | | | max. 28 bar abs. | | | HND-PS13 |
| 0...35.00 bar abs. | | 10 mbar | max. 140 bar abs. | | | HND-PS14 |
| 0...70.00 bar abs. | | 0.1 bar | max. 280 bar abs. | | | HND-PS15 |
| 0...160.0 bar abs. | | | max. 600 bar abs | | | HND-PS16 |
| 0...250.0 bar abs. | | | | | | HND-PS17 |
| 0...400.0 bar abs. | | | | | | HND-PS18 |
| 0...400 mbar rel. | | 0.1 mbar | max. 2 bar rel. | 0...+70 °C | G ½ male thread  | HND-PS19 |
| 0...1000 mbar rel. | | 1 mbar | max. 5 bar rel. | | | HND-PS20 |
| 0...2500 mbar rel. | | | max. 10 bar rel. | | | HND-PS21 |
| 0...4000 mbar rel. | | | max. 17 bar rel. | | | HND-PS22 |
| 0...6000 mbar rel. | | | max. 35 bar rel. | | | HND-PS23 |
| 0...10 bar rel. | | 10 mbar | | | | HND-PS24 |
| 0...250 bar rel. | | | max. 50 bar rel. | | | HND-PS25 |
| 0...40.0 bar rel. | | | max.80 bar rel. | | | HND-PS26 |
| 0...60 bar rel. | | | max. 120 bar rel. | | | HND-PS27 |
| 0...100 bar rel. | | 0.1 bar | max. 200 bar rel. | | | HND-PS28 |
| 0...160 bar rel. | | | max. 320 bar rel. | | | HND-PS29 |
| 0...250 bar rel. | | | max. 500 bar rel. | | | HND-PS30 |
| 0...400 bar rel. | | 10 mbar | max. 800 bar rel. | | | HND-PS31 |
| 0...600 bar rel. | | 0.1 bar | max. 1200 bar rel. | | | HND-PS32 |
| 0...1000 bar rel. | | 1 bar | max. 1500 bar rel. | | | HND-PS33 |

* in the range from 0 to +50 °C

** Pressure sensors HND-PS01 up to HND-PS08 are only suitable for air and non corrosive/non ionizing gases and liquids, not for water.

## 11.2 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10,5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose $^{6}/_{4}$ on hose $^{6}/_{4}$ |
| **HND-Z082** | Hose clamp for hose $^{6}/_{4}$ |
| **HND-Z083** | Adapter made of brass for G ¼ internal threads on hose $^{6}/_{4}$ |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

* observe instrument dimensions

Additional accessories on request

# 12. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Manual Pressure Measuring Devices with External and Integrated Pressure Sensors model: HND-P215**

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 29. July 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Hand-Held Pressure Measuring Devices with Integrated Pressure Sensors

## Model: HND-P231

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Hand-held Pressure Measuring Device with Integrated Pressure Sensors model: HND-P231
- Operating Instructions

# 4. Regulation Use

Any use of the Hand-held Pressure Measuring Device with Integrated Pressure Sensors, model: HND-P231, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The highly precise KOBOLD manual pressure measuring devices HND-P231 are measuring devices with integrated pressure sensors. They have two pressure measurement inputs on the top of the housing, which are connected to the measuring points by means of stable metal connections and plastic hoses that are available as accessories. Numerous measuring ranges in the overpressure and underpressure range are available for various measurement tasks, such as differential pressure measurement. In addition to pressure display, these first-rate, compact, universally applicable measuring units offer additional functions such as minimum/maximum value memory, a hold function, tare function, automatic self-shut-off, or zero point offset. The devices
with an expanded spectrum of functions also have a logger function, a peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

# 6. Electrical Connection

## 6.1 General

### 6.1.1 Mains Operation With Power Supply

**Attention: When using a power supply please note that operating voltage has to be 10.5 to 12 V DC. Do not apply overvoltage!! Cheap 12V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply GNG10/3000. Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.**

# 7. Operation

## 7.1 General

### 7.1.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

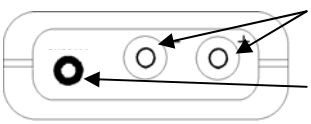
1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under chapter 9 Technical Information.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
   Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

   In case of doubt, please return device to manufacturer for repair or maintenance.

### 7.1.2 Connections



Connection for pressure tubes:
„+" = higher pressure, „-" = lower pressure
Interface: Connection for el. isolated interface adapter (p.r.t. chapter 7.4 The Serial Interface)
The mains adapter socket is located at the left side of the device.

### 7.1.3 Display

**Einheiten:** ein Pfeil zeigt auf die gewählte Messeinheit
**SL:** ohne Funktion

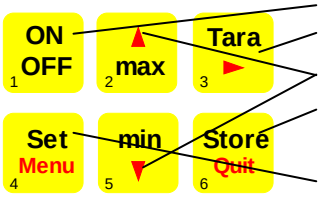
**Tara:** signalisiert, ob Tara-Funktion aktiviert ist.


**Hauptanzeige:** zeigt den aktuellen Messwert an
**Nebenanzeige:** zeigt u.a. Min-, Max- oder Hold-werte an.

**Logg:** erscheint falls Loggerfunktion ausgewählt wurde und blinkt bei laufendem Logger

### 7.1.4 Basic Operation

**When switching on** the device and the logger function is not off the time of the integrated clock will shortly be displayed. If a **zero point adjustment** was carried out the display shows shortly „nuLL Corr".
**After changing the battery** the clock-setting menu is activated automatically (‚CLOC'). Check the clock and adjust, if necessary (p.r.t. chapter *7.2 Configuration*).




**On-/Off-Switch**
**Tara:** Calling of tara function, zero point adjustment
**min/max:** Showing the min- resp. max-memory in sec. display
**Store/Quit:** Calling of hold function resp. calling of logger functions (p.r.t. ch. *7.3 Operation Of Logger*)
**Set/Menu:** Calling of configuration

**Max Memory:** Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max memory press key ´max´ for >2 seconds.

**Min Memory:** Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min memory press key ´min´ for >2 seconds.

**Hold Function:** By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it. (only when logger = ‚off').

**Tare Function:** By pressing ´Tara´ (key 3) the display will be set to 0. All measurings from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds.

**Please Note: Activating/deactivating tara clears the max- & min-memories.**

**Zero-Point Adjustment:** If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press button 3 for approx. 5 seconds (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration menu).
*Please note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits!*
To recall the manufacturer`s calibration press button 3 for approx. 15 seconds.

## 7.2 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu (main display: „SEt“).
Pressing key ***Menu*** changes between the menues, pressing ▸ (key 3) jumps to the refering parameters, which can be selected with key ▸ (key 3).
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
Pressing ***Menu*** again jumps back to the main configuration menu and saves the settings.
***Quit*** (key 6) finishes the configuration and returns to standard meas. operation.

| **Menu** | **PARAM.** | **Values** | **Meaning** | C_log | C_dat | Stor |
|---|---|---|---|---|---|---|
| ‚Menu‘ | ▸ | ▲ or ▼ | | | | |
| **SEt ConF** | **Set Configuration: Generic Configurations** | | | | | |
| | **Unit** | mbar,bar.. | Unit: Unit of display | * | | * |
| | **rAtE** | | **Rate**: Measuring rate (p.r.t. chapter *7.2.1 Different Kinds Of Measuring: „rAtE-Slo, -P.dEt, -FASt“*) | * | | * |
| | | Slo | **Slow** measuring rate (4 Hz filtered, low power consumption) | * | | * |
| | | FASt | **Fast** measuring rate, filtered (>100 Hz) | * | | * |
| | | P.dEt | **Peak detection**: fast measuring rate, unfiltered (>100 Hz) | * | | * |
| | **t.AVG** | 1-120 | Averaging period in seconds, used by the averaging function | * | | * |
| | | oFF | Averaging function deactivated | * | | * |
| | **P.oFF** | 1-120 | **Auto Power Off** time in minutes | | | |
| | | oFF | Auto Power Off deactivated | | | |
| | **Out** | oFF | Function oft he output: No output function, lowest power consumption | | | |
| | | SEr | Output is serial interface | | | |
| | | dAC | Output is analogue output 0…1V | | | |
| | **Adr.** | 01,11..91 | Base **address** of interface | | | |
| | **dAC.0** | -1.00… 25.00 mbar | Enter desired value at which the analogue output potential should be 0V (if Out=dAC) | | | |
| | **dAC.1** | -1.00… 25.00 mbar | Enter desired value at which the analogue output potential should be 1V (if Out=dAC) | | | |
| **Set CAL** | **Set Calibration: Adjustment of Sensor** | | | * | | |
| | **OFFS** | -5.00… 5.00 mbar | The offset of sensor will be displaced by this value to compensate for deviations in the probe or in measuring device. | * | | |
| | | oFF | Zero displacement inactive (=0.00) | * | | |
| | **SCAL** | -2.000… 2.000 | The measuring scale of sensor will be changed by this factor [%] to compensate deviations of temperature probe or measuring device | * | | |
| | | oFF | Scale correction factor inactive (=0.000) | * | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Set AL.** | **Set Alarm: Settings Of Alarm Function** | | | | | |
| | **AL.** | On | **Alarm** on, with horn-sound | | | |
| | | no.So | Alarm on, without horn-sound | | | |
| | | oFF | Alarm deactivated | | | |
| | **AL.Lo** | -10 mbar ... AL.Hi | Min alarm rail (not when AL. oFF, Sensor-Min is the lower display range of connected sensor) | | | |
| | **AL.Hi** | AL.Lo ... 350 mbar | Max alarm rail (not when AL. oFF, Sensor-Max is the upper display range of connected sensor) | | | |
| **SEt LoGG** | **Set Logger: Configuration Of Logger Function** | | | * | | * |
| | **Func** | CYCL | **Cyclic**: logger function ‚cyclic logger' | * | * | * |
| | | Stor | **Store**: logger function ‚individual value logger' | * | * | * |
| | | oFF | no logger function | * | * | * |
| | **CYCL** | 1..3600 | Cycle time of cyclic logger [seconds] | * | | * |
| | **Lo.Po** | on/oFF | **Low-power logger** with very low power consumption (only for cyclic logger and slow measuring rate) | * | | * |
| **SEt CLOC** | **Set Clock: Setting Of Real Time Clock** | | | | | |
| | **CLOC** | HH:MM | **Clock**: Setting of time hours:minutes | | | |
| | **dAtE** | TT.MM | **Date**: day.month | | | |
| | **YEAr** | YYYY | **Year** | | | |

**Note: If the logger memory contains data already, the menues/parameters marked with (*) can not be invoked! If these should be altered the logger memory has to be cleared before! (key 6, p.r.t. chapter 7.3 Operation Of Logger)**

### 7.2.1 Different Kinds Of Measuring: „rAtE-Slo, -P.dEt, -FASt"

Three different kinds of measuring pressure are supported. Two of them are working with high measuring frequency of more than 1000 measurings per second. If one of them was chosen in the configuration (see above), this will be displayed in the secondary display: „P.dEt" or „FASt".

#### 7.2.1.1 rAtE-Slo: Standard Measuring

Measuring rate 4 Hz, averaging and filter functions are active.
Application: Measuring of slowly changing or static pressures, e.g. measuring of leakproofness, athmospheric pressure...
Highest accuracy, high noise immunity (EMI and unstable measuring signals), low power consumption.

#### 7.2.1.2 rAtE-P.dEt: Peak detection

Measuring rate >1000 Hz, the value is displayed unfiltered.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of < 1 ms. The cyclic logger function records the arithmetic mean value, the highest and the lowest peak of the refering time interval.
Attention: higher power consumption, measuring is sensitive to noise (EMI,..).

#### 7.2.1.3 rAtE-FASt: Fast filtered measuring

Measuring rate >1000 Hz, the value is filtered slighlty (higher noise immunity than P.dEt, small peaks will be filtered out), apart from that identical behaviour like P.dEt.

### 7.2.2 Averaging Function

The averaging function concerns the display values (LCD and interface). It is completely independent from the averaging of the logger function, please don't mix them up!
The averaging integrates the measuring values during a selectable period of time and then calulates the average display value. It is independent from the selected kind of measuring (slow, fast, peak detect) .
As long as not enough values are collected (selected avereaging time) to calculate a average value, the upper display shows "----", the lower display a 'countdown'.
During an active low-power-logging procedure the avering is always deactivated
Function of min/max-value memory during averaging:

- If averaging is activated and slow measuring is selected (rAtE-Slo), the min-/max-value memory refers to the average display value.
- If averaging is activated and fast measuring is selected (rAtE-FASt or P.dEt) , the min-/max-value memory refers to the internal measured values (fast peaks can be detected).

### 7.2.3 Zero Displacement Sensor (`OFFS`)

A zero displacement can be carried out for the measured value:

**value displayed = value measured – offset**

Standard setting: `off`= 0.0, i.e. no zero displacement will be carried out.
Together with the scale correction (see below) this factor is mainly used to compensate for sensor deviations. Input is in the display unit.

### 7.2.4 Scale Correction Sensor (`SCAL`)

The scale of the measuring can be influenced by this setting (factor is in %):

**value displayed = measured value *(1+Scal/100)**

Standard setting: `off`= 0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

### 7.2.5 Power Off Time

If there won't be pressed any key and no interface communication takes place for the time of the power off time setting (P.Off), the device will be switched off automatically to save battery power.
If P.oFF = oFF then the automatic switch off is deactivated.

### 7.2.6 Output

The output can be used as serial interface (for HND-Z032, HND-Z031 interface adapters) or as analogue output.

#### 7.2.6.1 Interface-Base Address

Up to 10 devices of the HND-P...-handheld-family can be connected to a serial interface at once. To get access ti each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

#### 7.2.6.2 Analogue Output-Scaling with DAC.0 and DAC.1

***Note: Analogue output can not be used during logger recordings***

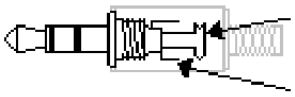
With the DAC.0 and DAC.1 values the output can be rapidly scaled to Your efforts. Keep in mind not to connect low-resistive loads to the output, otherwise the output value will be wrong and battery life is decreased. Loads above ca 10kOhm are uncritical.

If the display exceeds the value set by DAC.1, then the device will apply 1V to the output.

If the display falls below the value set by DAC.0, the the device will apply 0V to the output.

In case of an error (Err.1, Err.2, no sensor, etc.) the device will aplly slightly above 1V to the output.

**plug wiring:**




**Attention!**
The 3rd contact hast to be left floating!
Only stereo plugs are allowed!

### 7.2.7 Address

Up to 10 devices of the HND-handheld-family can be connected to a serial interface at once (depending on interface converter, e.g. HND-Z032: 5 devices). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on. See also chapter 7.4 The Serial Interface.

### 7.2.8 Alarm

There are three possible settings: Alarm off (AL. oFF), on with horn sound (AL. on), on without horn sound (AL. no.So).

Following conditions will display an alarm, when the function is activated (on or no.So):

- Value is below lower (AL. Lo) or above upper alarm rail (AL.Hi).
- Sensor error (Sens Erro)
- Low battery (bAt)
- Fe 7: System error (always with sound)

In case of an alarm and when polling the interface the prio-flag is set in the returned interface message.

### 7.2.9 Real Time Clock

The real time clock is used for the logger function: Recorded values are also containing the point of time, when they were measured. Please check the settings when necessary.
If the battery was replaced the referring menu ‚CLOC' will automatically be started.

## 7.3 Operation Of Logger

The device supports two different logger functions:

**„Func-Stor":** each time when „store" (key 6) is pressed a measurement will be recorded.

**„Func-CYCL":** measurements will automatically be recorded each interval, which was set in the logger menu ‚CYCL' until the logger will be stopped or the logger memory is full. The recording is started by pressing „Store" 2 seconds.

The logger records 3 measurement results each time:
current or mean value (depending on logger setting, see below), min peak and max peak.
**Min and max peak** are the minimum resp. the maximum of the measured values since the last recording.
Using them allows f.e. analysis of fluctuating pressures.
For the evaluation of the data the software HND-Z034 has to be used. The software also allows easy configuration and starting of the logger.
When the logger is activated (Func Stor or Func CYCL) the hold function is no more available, the key 6 is solely used for the operation of the logger functions.

### 7.3.1 Func-Stor": Storing Single Measurements

Each time when „store" (key 6) is pressed a measurement and its time stamp will be recorded.
The recorded data can be viewed either in the display (when calling the configuration an additional menu „REAd LoGG" is displayed, see below) or by means of the interface and a PC with HND-Z034-software.

Max. number of measurings 99

A measuring contains:
- current measuring value at the time of recording
- min peak, max peak since the last recording
- time and date of the recording

After each recording „St. XX" will be displayed for a short time. XX represents the number of the recording.

**If logger memory contains recordings already:**
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

If the logger memory is full, the display will show: 


**Viewing Recorded Measurings**
Within the „LoGG Stor“ function the measurings can be viewed directly in the display not only by means of a computer (like at „Func CYCL“): press 2 seconds „Set“ (key 4): The first menu displayed now is „rEAd LoGG“ (read logger data). After pressing ▶ (key 3) the measurement recorded last will be displayed, changing between the different values refering to the measurement also is done by pressing ▶.
Changing the measurement is done by pressing the keys ▲ or ▼.

### 7.3.2 „Func-CYCL“: Automatic Recording With Selectable Logger-Cycle-Time

The Logger-Cycle-Time is setable (p.r.t. *7.2 Configuration*). For example „CYCL“ = 60: A measuring is recorded after each 60 seconds.
When the slow measurement "rAtE-Slo" is chosen, additionally a low power function is available: „Lo.Po“.
If „Lo.Po“ is on, the device only will take a measurement at the point of time of the recording. In between the recordings the measuring shut’s down. This decreases the power consumption enormously and therefore is recommended e.g. for long time recordings where no mains adapter is available.

Max. number of measurings: 10000

| | |
|---|---|
| Cycle time: configuration | 1...3600 seconds (=1 h), selectable in the |
| A measuring contains: | |
| rAtE SLo: | - current measuring value at the time of recording<br>- min peak, max peak since the last recording |
| rAtE FASt,P.dEt | - arithmetic mean value since the last recording<br>- min peak, max peak since the last recording |

**Starting a recording:**
By pressing "Store" (key 6) for 2 seconds the recording will be initiated. After that the display shows ‘St.XXXX‘ for a short time whenever a measuring is recorded. XXXX is the number of the measuring 1..10000.

If the logger memory is full, the display will show: 

The recording

If Low-Power-Logger-Function „Lo.Po = on“ the device switches itself off as soon as the memory gets filled.

**Stopping the recording manually:**
By pressing "Store" (key 6) the recording can be stopped manually. Then the following choice appears:

Stop the recording

Do not stop the recording

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

**Note: If you try to switch off the instrument in the cyclic recording operation You will be asked once again if the recording is to be stopped.**
**The device can only be switched off after the recording has been stopped!**
**The Auto-Power-Off-function is deactivated during recording!**

**Clear Recordings:**
By pressing “Store“ (key 6) for 2 seconds the logger operation will be called:

The display will show: 

By pressing the keys ▲ (key 2) or ▼ (key 5) the display will change to 

.
When “Store” is pressed, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording sequence

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

## 7.4 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031) the device can be connected to a computer for data transfer. To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:

- **HND-Z034**: Operation and read out of logger function, data display in diagrams and tables
- **BUS-SW9M**: 9-channel software to display the measuring values

**The device has 3 channels:**

- Channel 1: current measuring value (base address)
- Channel 2: min peak (p.r.t. chapter 7.3 Operation Of Logger)
- Channel 3: max peak (p.r.t. chapter 7.3 Operation Of Logger)

**Note: The measuring-/ alarm- and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Channel | | | Code | Name/Function | Channel | | | Code | Name/Function |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | | | 1 | 2 | 3 | | |
| x | x | x | 0 | Read measurement value | x | x | x | 200 | Read min display range |
| x | x | x | 3 | Read system state | x | x | x | 201 | Read max display range |
| x | | | 6 | Read min memory | x | x | x | 202 | Read display range - unit |
| x | | | 7 | Read max memory | x | x | x | 204 | Read display range – decimal point |
| x | x | x | 12 | Read ID number | x | | | 208 | Read # of channels |
| x | | | 22 | Read min alarm rail (AL. - AL.Lo) | x | | | 214 | Read scale adjustment [%] |
| x | | | 23 | Read max alarm rail (AL. - AL.Hi) | x | | | 216 | Read offset adjustment |
| x | | | 32 | Read configuration flag BitAlarmOn:1; BitAlarmSound:3; BitPeakDetection:33; BitFastFiltered:34; BitLoggerOn:50; BitCyclicLogger:51; BitLowPowerLogger:52 | x | | | 222 | Read power off time (Conf-P.oFF) |
| | | | | | x | | | 223 | Set power off time (Conf-P.oFF) |
| | | | | | x | x | x | 224 | Logger: Read data of CYCL-Logger |
| | | | | | x | | | 225 | Logger: Read cycle time (LoGG - CYCL) |
| | | | | | x | | | 226 | Logger: set cycle time (LoGG - CYCL) |
| x | | | 102 | Set min alarm rail (AL. - AL.Lo) | x | | | 227 | Logger: start recording |
| x | | | 103 | Set max alarm rail (AL. - AL.Hi) | x | | | 228 | Logger: Read # of recordings made |
| x | | | 160 | Set configuration flag (refer to 32) | x | | | 229 | Logger: Read state |
| x | | | 174 | Clear min memory | x | | | 231 | Logger: Read stop time |
| x | | | 175 | Clear max memory | x | | | 233 | Read real time clock (CLOC) |
| x | x | x | 176 | Read min measuring range | x | | | 234 | Set real time clock (CLOC) |
| x | x | x | 177 | Read max measuring range | x | | | 236 | Read logger memory size |
| x | x | x | 178 | Read measuring range – measuring unit | x | | | 240 | Reset |
| x | x | x | 179 | Read measuring range – decimal point | x | | | 254 | Program version |
| x | x | x | 180 | Read kind of measuring of sensor | x | | | 260 | Logger: read data of STOR Logger |
| x | x | x | 199 | Read kind of measuring of display | | | | | |

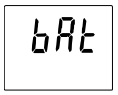
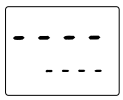
## 7.5 Pressure Connection To The Sensors

- **For measurements of over pressure (-1.00 mbar...25.00 mbar):**
  Connect plastic tube with internal dia of 4 mm to pressure port "+". Port "-" will not be used!
- **For measurements of under pressure (-25.00 mbar...0.00 mbar):**
  Plug the tube to pressure port "-". The measuring range covers then -350.0 to 0.0 mbar.

  **Note: All values are displayed now as positive values. No minus sign will be shown.**

  Example: it is possible to messure under pressure down to -25.0 mbar, the display shows then the value 25.00 (no minus sign).
- **For measurements of pressure differences:**
  Connect both plastic tubes with an internal dia of 4 mm to pressure port "+" and "-"; make sure to apply higher pressure to port "+".

## 7.6 Error And System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
|  | Logger data are read by the interface | When transfer completed the device will automatically return to normal measuring display, no remedy necessary |
| No display or confused characters, device does not react on keypress | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| ***Err.1*** | Measured value above allowable range | Check: pressure above 350 mbar? -> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | Check: pressure below –10 mbar? -> measuring value to low |
| ***Err.4*** | Sensor defective | Return to manufacturer for repair |
| ***Err.9*** | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| ***Err.7*** | System error | Return to manufacturer for repair |

## 7.7 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificated for its accuracy, it is the best solution to return it to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

# 8. Maintenance

## 8.1 Battery Operation

If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up. The battery has to be taken out, when storing device above 50 °C.

**Please note: We recommend to take out battery if device is not used for a longer period of time!**

# 9. Technical Information

| | | |
|---|---|---|
| Measuring range: | | -1,00 to 25,00 mbar<br>Under pressure down to -25 mbar |
| Overload: | | max. 100 mbar rel. (without destruction or recalibration of sensor being necessary) |
| Resolution: | | 0.01 mbar (1 Pa) |
| Pressure units: | | mbar, bar, Pa, kPa, mmHg, PSI, $mH_2O$ (display `m`), selectable |
| Accuracy: (typ.): | | ±0.3 % FS. (hysteresis and linearity)<br>±0.4 % FS (temperature dependency 0-50 °C) |
| Measuring rate: | | slow: 4 meas./sec (ConF-Rate=Slow)<br>fast: >1000 meas./sec<br>(ConF-Rate=FASt and P.dEt) |
| Nominal temperature: | | 25°C |
| **Sensor:** | | **Piezo-resistive relative pressure sensor, for air and non-corrosive and non-ionising gases and liquids, not for water!** |
| Connection: | | 2 metal pressure ports for connection to 6x1 mm tubes at the top of device ( 4 mm inner tube ø) |
| **Logger:** | | 2 Functions: individual value logger (“Func-Stor”) and cyclic logger (“Func-CYCL) |
| Memory: | Stor: | 99 data sets |
| | CYCL: | 10000 data sets (in max. 64 recording sequences) |
| Cycle time CYCL: | | 1...3600 seconds |
| **Display:** | | 2 four digit LCDs (12.4 mm high and 7 mm high) for measuring values, and for min/max memories, hold function, etc. As well as additional functional arrows. |
| Pushbuttons: | | 6 membrane keys |
| **Output:** | | 3.5 mm audio plug, stereo |

| | |
|---|---|
| **Output function:** | selectable as serial interface or analog output |
| **Interface:** | Serial interface (3.5 mm jack) can be connected to RS 232 or USB interface of a PC via electrically isolated interface adapter. |
| **Analog output:** | 0...1 Volt, freely scalable (resolution 12 bit) |
| **Power supply:** | 9 V battery. Type: IEC 6F22 (included in the scope of supply) as well as additional d.c. connector for external 10.5-12 $V_{DC}$. |
| Power consumption: | Slow measuring rate: ~0.6 mA<br>Fast measuring rate: <2.5 mA<br>Low-Power-Logger: <0.1 mA (for cycle time >30 s, without interface communication active and no alarm horn sounding) up to 0.4 mA (at cycle time 1 s) |
| Low battery warning: | `bAt` |
| Material: | housing made of impact-resistant ABS plastic |
| Degree of protect.: | IP65, front side |
| Dimensions: | 142 x 71 x 26 mm (LxWxD) |
| Weight: | approx. 165 g |
| Power-Off-Function: | Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated. |
| Min/Max-Alarm: | The measuring value is constantly monitored for the min and max rails set. Alarming is done by integrated horn, display and interface. |
| Real time clock: | Integrated clock with date and year |

# 10. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P 231** | 2 measuring inputs with additional functions (see techn. data) |

## 10.1 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10.5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose 6.4 on hose 6.4 |
| **HND-Z082** | Hose clamp for hose 6.4 |
| **HND-Z088** | Adapter made of brass for G ½ internal threads on hose 6.4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

* Pay attention to instrument dimensions

Further accessories on request

# 11. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Hand-Held Pressure Measuring Devices with Integrated Pressure Sensors**
**Model: HND-P231**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 8. May 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Manual Pressure Measuring Devices with External and Integrated Pressure Sensors

## Model:

**HND-P231** **HND-P233**

**HND-P236** **HND-P239**

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

## 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

## 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Manual Pressure Measuring Devices with External and Integrated Pressure Sensors model: HND-P231/HND-P233/HND-P236/HND-P239
- Operating Instructions

## 4. Regulation Use

Any use of the Manual Pressure Measuring Devices with External and Integrated Pressure Sensors, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The highly precise KOBOLD hand-held pressure measuring devices HND-P231/-P233/-P236 are measuring devices with integrated pressure sensors. They have two pressure measurement inputs on the top of the housing, which are connected to the measuring points by means of stable metal connections and plastic hoses that are available as accessories. Numerous measuring ranges in the overpressure and under pressure range are available for various measurement tasks, such as differential pressure measurement. In addition to pressure display, these first-rate, compact, universally applicable measuring units offer additional functions such as minimum/maximum value memory, a hold function, tare function, automatic self-shut-off, or zero point offset. The devices with an expanded spectrum of functions also have a logger function, a peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

The KOBOLD hand-held pressure measuring devices HND-P239 have an integrated pressure sensor for absolute pressure measurement. The measuring device is connected to the measuring point by means of a stable, metal connection on the top of the housing and an optional plastic hose. This device design offers the possibility of also displaying the barometric air pressure in relation to sea level »zero«. In this case, air pressure is corrected by entering the height above »zero« in meters. Naturally, these devices also have the minimum/maximum value memory, a hold function, a tare function, automatic self-shut-off function, and zero point adjustment. The KOBOLD HND-P239 devices also offer additional functions like the logger function, peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

# 6. Electrical Connection

## 6.1 Mains Operation with Power Supply

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!! Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002. Prior to connecting the power supply to the mains, make sure that the operating voltage stated at the power supply is identical to the mains voltage.**

# 7. Operation

## 7.1 General

### 7.1.1 Safety Requirements

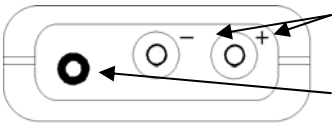
This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under *Technical Information*.
   If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
   If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
   Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

   In case of doubt, please return device to manufacturer for repair or maintenance.
2. When connecting the device to other devices the connection has to be designed most thoroughly as internal connections in third-party devices (e.g. connection GND with protective earth) may lead to undesired voltage potentials that can lead to malfunctions or destroying of the device and the connected devices.
3. Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage. Failure to comply with these instructions could result in death or serious injury and material damage.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

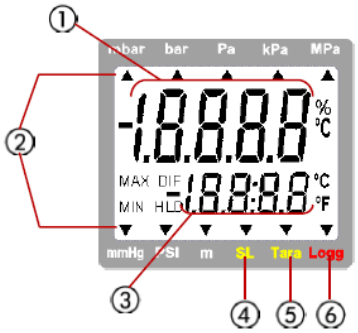
## 7.2 Connections




Connection for pressure tubes:
„+“ = higher pressure, „-“ = lower pressure
Interface: Connection for el. isolated interface adapter (p.r.t. chapter 8.5 Serial Interface)

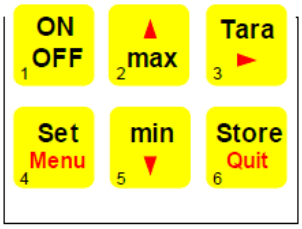
The mains adapter socket is located at the left side of the device.

## 7.3 Display




| | |
|---|---|
| 1 | **Main display:** shows actual value |
| 2 | Arrow points to the chosen measuring **unit** |
| 3 | **Secondary display:** shows min./max. or hold value |
| 4 | **SL:** appears if sea-level-correction is activated (only HND-P239) |
| 5 | **Tara:** appears if tara-function is activated |
| 6 | **Logg:** appears if logger function is chosen, flashes while logger is running |

## 7.4 Basic Operation




| | | |
|---|---|---|
| ON OFF | **On / Off** | |
| max + min | **min/max bei Messung:** | |
| | press short: | shows the min./max. value |
| | press again: | hides min./max. value |
| | press 2 sec.: | clears particular value |
| Tara | **Tara, zero-point adjustment:** | |
| | press short: | display will be set to 0<br>The following measuring will be relatively displayed to the set tara value |
| | press 2 sec.: | deactivates tara-function |
| | press 5 sec.: | Zero-Point Adjustment[1)] |
| Set Menu | **Set/Menu:** | |
| | press short: | invokes configuration menu |
| Store Quit | **Store/Quit:** | |
| | press short: | hold-function, the last measuring value will be held in the secondary display. |
| | press again: | hides the value |
| | at active logger: | invokes logger functions |

**Please Note: Activating/deactivating tara clears the max- & min-memories.**

[1] **Zero-Point Adjustment:** If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press button 3 for approx. 5 seconds (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration menu).
To recall the manufacturer's calibration press button 3 for approx. 15 seconds.

**Please Note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits!**

**If a zero point adjustment was carried out the display shows "Corr" after a restart .**

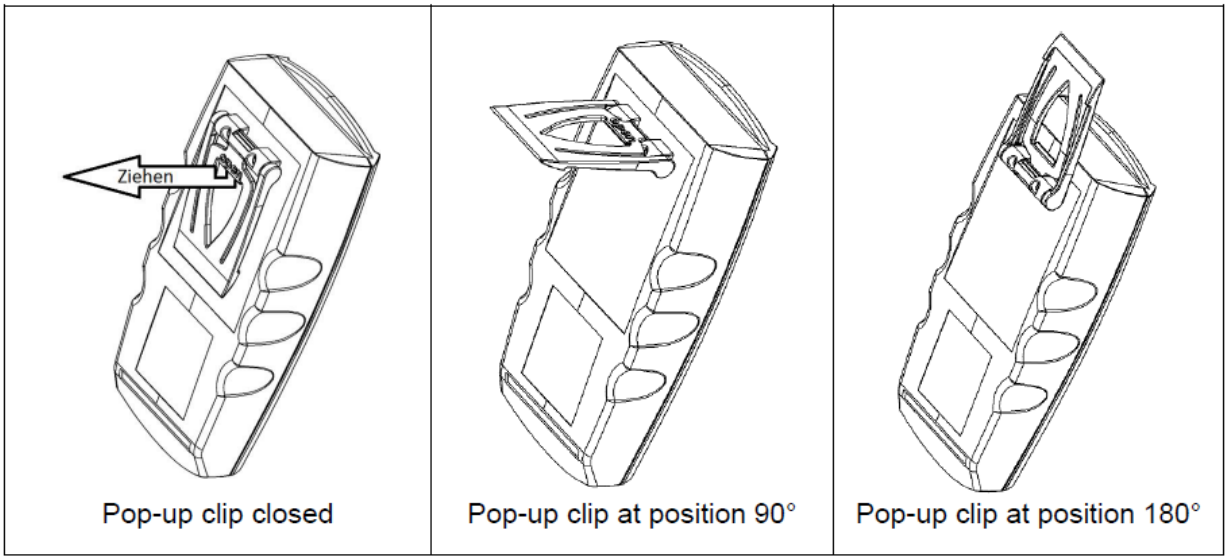
## 7.5 Operation

**After turning on**, if the logger function is not off, the time of the integrated clock will shortly be displayed. If a zero point adjustment was carried out the display shows shortly „nuLL Corr".
**After changing the battery** the clock-setting menu is activated automatically (‚CLOC'). Check the clock and adjust, if necessary (p.r.t. chapter 7.7).

## 7.6 Pop-up clip

Handling:

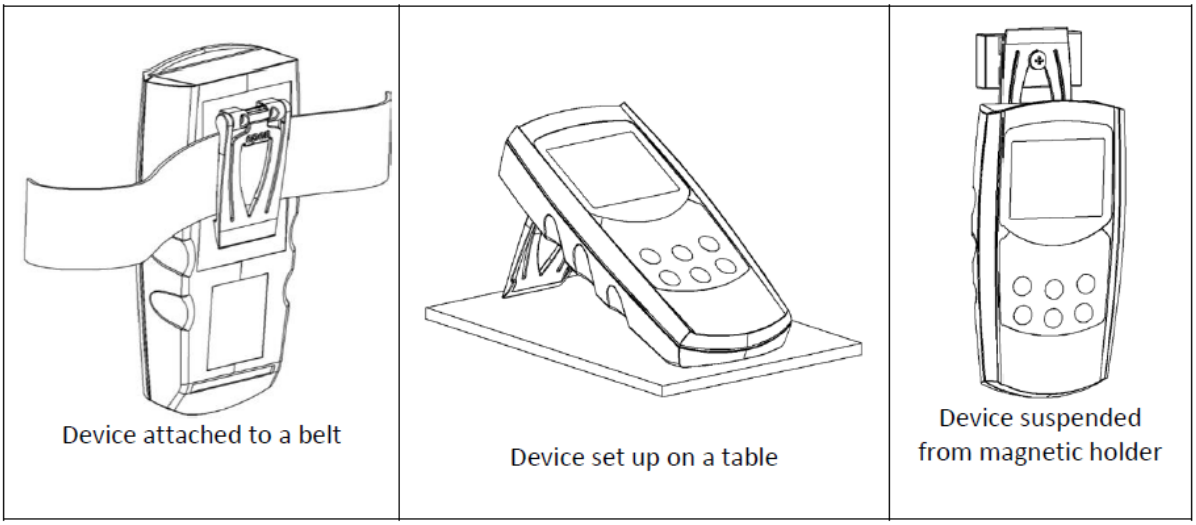
- Pull at label “open” in order to swing open the pop-up clip.
- Pull at label “open” again to swing open the pop-up clip further.




Pop-up clip closed | Pop-up clip at position 90° | Pop-up clip at position 180°

Function:

- The device with a closed pop-up clip can be plainly laid onto a table or attached to a belt, etc.
- The device with pop-up clip at position 90° can be set up on a table, etc.
- The device with pop-up clip at position 180° can be suspended from a screw or the magnetic holder.



Device attached to a belt | Device set up on a table | Device suspended from magnetic holder

## 7.7 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu (main display: „SEt“).
Pressing key ***Menu*** changes between the menues, pressing ▸ (key 3) jumps to the refering parameters, which can be selected with key ▸ (key 3).
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
Pressing ***Menu*** again jumps back to the main configuration menu and saves the settings.
***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

| Menu | PARAM. | Values | Meaning | C_log | C_dat | Stor |
|---|---|---|---|---|---|---|
| ‚Menu‘ | ▸ | ▲ or ▼ | | | | |
| **SEt ConF** | **Set Configuration: Generic Configurations** | | | | | |
| | **Unit** | mbar,bar.. | Unit: Unit of display | * | | * |
| | **SL** | oFF/on | **Sea-Level:** Sea level correction on/off (only HND-P239) | * | | * |
| | **Alti** | -2000…9999 | **Altitude:** Input of altitude above sea level [m] (only if SL=on) (only for HND-P239) | * | | * |
| | **rAtE** | | **Rate**: Measuring rate (p.r.t. chapter 8.1) | * | | * |
| | | Slo | **Slow** measuring rate (4 Hz filtered, low power consumption) | * | | * |
| | | FASt | **Fast** measuring rate, filtered (>1000 Hz) | * | | * |
| | | P.dEt | **Peak detection**: fast measuring rate, unfiltered (>1000 Hz) | * | | * |
| | **t.AVG** | 1-120 | Averaging period in seconds, used by the averaging function | * | | * |
| | | oFF | Averaging function deactivated | * | | * |
| | **P.oFF** | 1-120 | **Auto Power Off** time in minutes | | | |
| | | oFF | Auto Power Off deactivated | | | |
| | **Out** | oFF | Function of the outout: No outout function, lowest power consumption | | | |
| | | SEr | Output is serial interface | | | |
| | | dAC | Outout is analogue output 0…1 V | | | |
| | **Adr.** | 01,11..91 | Base **address** of interface | | | |
| | **dAC.0** | p.r.t. chart | Enter desired value at which the analogue output potential should be 0 V (if Out=dAC) | | | |
| | **dAC.1** | p.r.t. chart | Enter desired value at which the analogue output potential should be 1 V (if Out=dAC) | | | |
| **Set CAL** | **Set Calibration: Adjustment of Sensor** | | | * | | |
| | **OFFS** | p.r.t. chart | The **offset of sensor** will be displaced by this value to compensate for deviations in the probe or in the measuring device. | * | | |
| | | OFF | Zero displacement inactive (=0.00) | * | | |
| | **SCAL** | -2.000… 2.000 | The measuring **scale of sensor** will be changed by this factor [%] to compensate deviations of temperature probe or measuring devices | * | | |
| | | oFF | Scale correction factor inactive (=0.000) | * | | |

| Menu | PARAM. | Values | Meaning | C_log | C_dat | Stor |
|---|---|---|---|---|---|---|
| ‚Menu' | ▶ | ▲ or ▼ | | | | |
| **Set AL.** | **Set Alarm: Settings Of Alarm Function** | | | | | |
| | **AL.** | On | **Alarm** on, with horn-sound | | | |
| | | no.So | Alarm on, without horn-sound | | | |
| | | oFF | Alarm deactivated | | | |
| | **AL.Lo** | p.r.t. chart | Min alarm rail (not when AL. oFF, Sensor-Min is the lower display range of connected sensor) | | | |
| | **AL.Hi** | p.r.t. chart | Max alarm rail (not when AL. oFF, Sensor-Max is the upper display range of connected sensor) | | | |
| **SEt LoGG** | **Set Logger: Configuration Of Logger Function** | | | * | | * |
| | **Func** | CYCL | **Cyclic**: logger function ‚cyclic logger' | * | * | * |
| | | Stor | **Store**: logger function ‚individual value logger' | * | * | * |
| | | oFF | no logger function | * | * | * |
| | **CYCL** | 1..3600 | Cycle time of cyclic logger [seconds] | * | | * |
| | **Lo.Po** | on/oFF | **Low-power logger** with very low power consumption (only for cyclic logger and slow measuring rate) | * | | * |
| **SEt CLOC** | **Set Clock: Setting Of Real Time Clock** | | | | | |
| | **CLOC** | HH:MM | **Clock**: Setting of time hours:minutes | | | |
| | **dAtE** | TT.MM | **Date**: Setting of date day.month | | | |
| | **YEAr** | YYYY | **Year:** Setting of year | | | |

C_log: cyclic Logger (active) C_dat: cyclic logger with data (no active logging) C_stor: individual value logger with data

**Please Note: When using the logger function some settings in the menu may not be accessible (*).**
**If these settings should be changed, the logger has to be stopped before, eventually the logger data has to be cleared. (key 6, p.r.t. chapter 8.4)**

| device type | analog output | adjustment of sensor | alarm function | |
|---|---|---|---|---|
| | dAC.0/dAC.1 | OFFS | Al.Lo | Al.Hi |
| HND-P231 | -1.00…25.00 mbar | -5.00..5.00 mbar | -1 mbar…AL.Hi | AL-Lo…25 mbar |
| HND-P233 | -10.0…350.0 mbar | -50.0…50.0 mbar | -10 mbar…AL.Hi | AL.Lo…350 mbar |
| HND-P236 | -100…2000 mbar | -500…500 mbar | -100 mbar…AL.Hi | AL.Lo…2000 mbar |
| HND-P239 | 0…13000 mbar abs. | -500…500 mbar | 0 bar…AL.Hi | AL.LO…1300 mbar |

# 8. Remarks to special features

## 8.1 Different Kinds of Measuring: „rAtE-Slo, -P.dEt, -FASt“

Three different kinds of measuring pressure are supported. Two of them are working with high measuring frequency of more than 100 measurings per second. If one of them was chosen in the configuration (see above), this will be displayed in the secondary display: „P.dEt“ or „FASt“.

### 8.1.1 rAtE-Slo: Standard Measuring

Measuring rate 4 Hz, averaging and filter functions are active.
Application: Measuring of slowly changing or static pressures, e.g. measuring of leakproofness, athmospheric pressure...
Highest accuracy, high noise immunity (EMI and unstable measuring signals), low power consumption.

### 8.1.2 rAtE-P.dEt: Peak detection

Measuring rate >1000 Hz, the value is displayed unfiltered.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of < 1 ms. The cyclic logger function records the arithmetic mean value, the highest and the lowest peak of the referring time interval.
Attention: higher power consumption, measuring is sensitive to noise (EMI,..).

### 8.1.3 rAtE-FASt: Fast filtered measuring

Measuring rate >1000 Hz, the value is filtered slightly (higher noise immunity than P.dEt, small peaks will be filtered out), apart from that identical behavior like P.dEt.

## 8.2 Sea Level Correction (only for HND-P239)

The device displays the absolute pressure measured at the sensor. This is not necessarily the same like the values given by weather stations! The weather stations‘ values are giving the pressure at sea level. Usually the sensor is placed above sea level and therefore, if the value at sea level (zero) is to be measured, the pressure loss resulting from the actual level above sea level has to be considered! To correct the measuring display, activate the „Sea-Level-Function“. Then enter the altitude above sea level of the sensor‘s location in meters (Alti, p.r.t. chapter 7.7). When activated, the display shows the SL-arrow and the device displays the pressure value at sea level.

## 8.3 Averaging Function

The averaging function concerns the display values (LCD and interface). It is completely independent from the averaging of the logger function, please don't mix them up!
The averaging integrates the measuring values during a selectable period of time and then calculates the average display value. It is independent from the selected kind of measuring (slow, fast, peak detect).
As long as not enough values are collected (selected averaging time) to calculate a average value, the upper display shows "----", the lower display a 'countdown'.
During an active low-power-logging procedure the avering is always deactivated
Function of min/max-value memory during averaging:

- If averaging is activated and slow measuring is selected (rAtE-Slo), the min-/max-value memory refers to the average display value.
- If averaging is activated and fast measuring is selected (rAtE-FASt or P.dEt) , the min-/max-value memory refers to the internal measured values (fast peaks can be detected).

### 8.3.1 Power off Time

If there won't be pressed any key and no interface communication takes place for the time of the power off time setting (P.Off), the device will be switched off automatically to save battery power.
If P.oFF = oFF then the automatic switch off is deactivated.

### 8.3.2 Address

Up to 10 devices of the HND-handheld-family can be connected to a serial interface at once (depending on interface converter). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on. See also chapter 8.5 Serial Interface.

### 8.3.3 Alarm

There are three possible settings: Alarm off (AL. oFF), on with horn sound (AL. on), on without horn sound (AL. no.So).
Following conditions will display an alarm, when the function is activated (on or no.So):

- Value is below lower (AL. Lo) or above upper alarm rail (AL.Hi).
- Sensor error (Sens Erro)
- Low battery (bAt)
- Fe 7: System error (always with sound)

In case of an alarm and when polling the interface, the prio-flag is set in the returned interface message.

### 8.3.4 Real Time Clock

The real time clock is used for the logger function: Recorded values are also containing the point of time, when they were measured. Please check the settings when necessary.
If the battery was replaced the referring menu ‚CLOC' will automatically be started.

## 8.4 Operation of Logger

The device supports two different logger functions:

**„Func-Stor":** each time when „store" (key 6) is pressed a measurement will be recorded.

**„Func-CYCL":** measurements will automatically be recorded each interval, which was set in the logger menu ‚CYCL' until the logger will be stopped or the logger memory is full. The recording is started by pressing „Store" 2 seconds.

The logger records 3 measurement results each time:
current or mean value (depending on logger setting, see below), min peak and max peak.
**Min and max peak** are the minimum resp. the maximum of the measured values since the last recording.
Using them allows f.e. analysis of fluctuating pressures.
For the evaluation of the data the software HND-Z034 has to be used. The software also allows easy configuration and starting of the logger.
When the logger is activated (Func Stor or Func CYCL) the hold function is no more available, the key 6 is solely used for the operation of the logger functions.

### 8.4.1 Func-Stor": Storing Single Measurements

Each time when „store" (key 6) is pressed a measurement and its time stamp will be recorded.
The recorded data can be viewed either in the display (when calling the configuration an additional menu „REAd LoGG" is displayed, see below) or by means of the interface and a PC.

Max. number of measurings 99

A measuring contains:
- current measuring value at the time of recording
- min peak, max peak since the last recording
- time and date of the recording

After each recording „St. XX" will be displayed for a short time. XX represents the number of the recording.

**If logger memory contains recordings already:**
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording

Clear nothing (cancel menu)

If the logger memory is full, the display will show: 


**Viewing Recorded Measurings**
Within the „LoGG Stor“ function the measurings can be viewed directly in the display not only by means of a computer (like at „Func CYCL“): press 2 seconds „Set“ (key 4): The first menu displayed now is „rEAd LoGG“ (read logger data). After pressing ▸ (key 3) the measurement recorded last will be displayed, changing between the different values referring to the measurement also is done by pressing ▸.
Changing the measurement is done by pressing the keys ▲ or ▼.

### 8.4.2 „Func-CYCL“: Automatic Recording with Selectable Logger-Cycle-Time

The Logger-Cycle-Time is setable (p.r.t. configuration).
For example „CYCL“ = 60: A measuring is recorded after each 60 seconds.
When the slow measurement "rAtE-Slo" is chosen, additionally a low power function is available: „Lo.Po“.
If „Lo.Po“ is on, the device only will take a measurement at the point of time of the recording. In between the recordings the measuring shut’s down. This decreases the power consumption enormously and therefore is recommended e.g. for long time recordings where no mains adapter is available.

Max. number of measurings: 10000

Cycle time: 1...3600 seconds (=1 h), selectable in the configuration

A measuring contains:

- rAtE SLo: - current measuring value at the time of recording
  - min peak, max peak since the last recording
- rAtE FASt,P.dEt - arithmetic mean value since the last recording
  - min peak, max peak since the last recording

**Starting a recording:**
By pressing "Store" (key 6) for 2 seconds the recording will be initiated. After that the display shows ‘St.XXXX‘ for a short time whenever a measuring is recorded. XXXX is the number of the measuring 1..10000.

If the logger memory is full, the display will show: 

The recording

If Low-Power-Logger-Function „Lo.Po = on“ the device switches itself off as soon as the memory gets filled.

**Stopping the recording manually:**
By pressing "Store" (key 6) the recording can be stopped manually. Then the following choice appears:

Stop the recording

Do not stop the recording

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

**Note: If you try to switch off the instrument in the cyclic recording operation you will be asked once again if the recording is to be stopped. The device can only be switched off after the recording has been stopped! The Auto-Power-Off-function is deactivated during recording!**

**Clear Recordings:**
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

## 8.5 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031) the device can be connected to a computer for data transfer. To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:

- **HND-Z034**: Operation and read out of logger function, data display in diagrams and tables
- **BUS-S20M**: 20-channel software to display the measuring values

**The device has 3 channels:**

1: current measuring value (base address)
2: min peak (p.r.t. chapter 8.4)
3: max peak (p.r.t. chapter 8.4)

**Note: The measuring-/ alarm- and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Channel | | | Code | Name/Function | Channel | | | Code | Name/Function |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | | | 1 | | 3 | | |
| x | x | x | 0 | Read measurement value | x | x | x | 201 | Read max display range |
| x | x | x | 3 | Read system state | x | x | x | 202 | Read display range - unit |
| x | | | 6 | Read min memory | x | x | x | 204 | Read display range – decimal point |
| x | | | 7 | Read max memory | x | | | 208 | Read # of channels |
| x | x | x | 12 | Read ID number | X | | | 214 | Read scale adjustment |
| x | | | 22 | Read min alarm rail (AL. - AL.Lo) | X | | | 216 | Read offset adjustment |
| x | | | 23 | Read max alarm rail (AL. - AL.Hi) | X | | | 220 | Read offset adjustment |
| x | | | 32 | Read configuration flag BitAlarmOn:1; BitAlarmSound:3; BitPeakDetection:33; BitFastFiltered:34; BitLoggerOn:50; BitCyclicLogger:51; BitLowPowerLogger:52 | X | | | 221 | Read altitude * |
| | | | | | x | | | 222 | Set altitude * |
| | | | | | x | | | 223 | Set power off time (Conf-P.oFF) |
| | | | | | x | x | x | 224 | Logger: Read data of CYCL-Logger |
| x | | | 102 | Set min alarm rail (AL. - AL.Lo) | x | | | 225 | Logger: Read cycle time (LoGG - CYCL) |
| x | | | 103 | Set max alarm rail (AL. - AL.Hi) | x | | | 226 | Logger: set cycle time (LoGG - CYCL) |
| x | | | 160 | Set configuration flag (refer to 32) | x | | | 227 | Logger: start recording |
| x | | | 174 | Clear min memory | x | | | 228 | Logger: Read # of recordings made |
| x | | | 175 | Clear max memory | x | | | 229 | Logger: Read state |
| x | x | x | 176 | Read min measuring range | x | | | 231 | Logger: Read stop time |
| x | x | x | 177 | Read max measuring range | x | | | 233 | Read real time clock (CLOC) |
| x | x | x | 178 | Read measuring range – measuring unit | x | | | 234 | Set real time clock (CLOC) |
| x | x | x | 179 | Read measuring range – decimal point | X | | | 236 | Read logger memory size |
| x | x | x | 180 | Read kind of measuring of sensor | X | | | 240 | Reset |
| x | x | x | 199 | Read kind of measuring of display | X | | | 254 | Program version |
| x | x | x | 200 | Read min display range | x | | | 260 | Logger: read data of STOR logger |

* only available at HND-P239

## 8.6 Pressure Connection

### 8.6.1 Device type with absolute pressure (HND-P239)

Connect plastic tube to pressure port.

### 8.6.2 Device type with relative pressure

- **For measurements of over pressure** (refer to summary):
  Connect plastic tube with internal dia of 4 mm to pressure port "+". Port "-" will not be used!
- **For measurements of under pressure** (refer to summary):
  Plug the tube to pressure port "-". The measuring range covers then up to max. overpressure range.

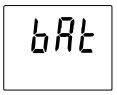
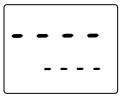
  **Note: All values are displayed now as positive values. No minus sign will be shown.**

  Example: it is possible to measure under pressure down to -25.00 mbar, the display shows then the value 25.00 (no minus sign).
- **For measurements of pressure differences:**
  Connect both plastic tubes with an internal dia of 4 mm to pressure port "+" and "-"; make sure to apply higher pressure to port "+".

Measure ranges:

| device type | over- or underpressure | underpressure |
|---|---|---|
| **HND-P231** | -1.00…25.00 mbar | -25.00…0.00 mbar |
| **HND-P233** | -10.00…350.0 mbar | -350.0...0.0 mbar |
| **HND-P236** | -100…2000 mbar | -2000…0 mbar |

## 8.7 Error and System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
|  | Logger data are read by the interface | When transfer completed the device will automatically return to normal measuring display, no remedy necessary |
| No display or confused characters device does not react on keypress | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| ***Err.1*** | Measured value above allowable range | Check: pressure above 350 mbar? -> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | Check: pressure below –10 mbar? -> measuring value to low |
| ***Err.4*** | Sensor defective | Return to manufacturer for repair |
| ***Err.9*** | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| ***Err.7*** | System error | Return to manufacturer for repair |

## 8.8 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificated for its accuracy, it is the best solution to return it to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

# 9. Maintenance

## 9.1 Battery Operation

If ´bAt´ is shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up. The battery has to be taken out, when storing device above 50 °C.

**Please note: We recommend taking out battery if device is not used for a longer period of time!**

# 10. Technical Information

**HND-P231:**

| | |
|---|---|
| Measuring range[1)]: | -1.0 to 25.0 mbar |
| Overload[2)]: | max. 100 mbar |
| Resolution: | 1 Pa (0.01 mbar) |
| Accuracy: | ±0.3 % F.S.<br>(Hysteresis and linearity)<br>±0.4 % F.S.<br>(in the range of 0-50 °C) |
| Units: | mbar, bar, Pa, kPa, PSI, m $H_2O$<br>(display “m”) |

**HND-P233:**

| | |
|---|---|
| Measuring range[1)]: | -10.0 to 350.0 mbar |
| Overload[2)]: | max. 1 bar |
| Resolution: | 0.1 mbar |
| Accuracy: | ±0.2 % F.S.<br>(Hysteresis and linearity)<br>±0.4 % F.S.<br>(in the range of 0-50 °C) |
| Units: | mbar, bar, kPa, MPa, mmHg, PSI, m $H_2O$<br>(display “m”) |

**HND-P236:**

| | |
|---|---|
| Measuring range[1)]: | -100.0 to 2000.0 mbar |
| Overload[2)]: | max. 4 bar |
| Resolution: | 1 mbar |
| Accuracy: | ±0.2 % F.S.<br>(Hysteresis and linearity)<br>±0.4 % F.S.<br>(in the range of 0-50 °C) |
| Units: | mbar, bar, kPa, MPa, mmHg, PSI, m $H_2O$<br>(display “m”) |

**HND-P239:**

| | |
|---|---|
| Measuring range[1)]: | 0 to 1300.0 mbar absolute |
| Overload[2)]: | max. 4 bar absolute |
| Resolution: | 1 mbar |
| Accuracy: | ±0.2 % F.S.<br>(Hysteresis and linearity)<br>±0.4 % F.S.<br>(in the range of 0-50 °C) |
| Units: | mbar, bar, kPa, MPa, mmHg, PSI, m $H_2O$<br>(display “m”) |

*[1)] underpressure measurement up to the overpressure measuring range suitable (refer to chapter 8.6.2)*
*[2)] without destruction or recalibration of sensor being necessary*

| | |
|---|---|
| Measurement input: | by means of two (HND-P239: one) metal hose stems |
| **Sensor:** | **piezo-resistive relative pressure sensor, for air or non-corrosive and non-ionising gases and liquids, not for water!** |
| Display: | 2 x 4½ - digit LC-displays |
| Operating temp.: | -20 to +50 °C |
| Storage temp.: | -20 to +70 °C |
| Storage humidity: | 0 to 95 % r.H. (non-condensing) |
| Output: | serial interface<br>(via 3-pin jack, transformer on RS232 or USB optional) |
| Power supply: | 9 V-monobloc battery<br>(included in the scope of delivery),<br>extern 10.5-12 $V_{DC}$ via jack |
| Current consumpt.: | < 1 mA (HND-P121...),<br>max. 3 mA (HND-P231...) |
| Material: | housing made of impact-resistant ABS plastic |
| Degree of protect.: | IP65, front |
| Dimensions: | 142 x 71 x 26 mm (HxWxD) |
| Weight: | approx. 170 g |

**Scope of functions:**
Minimum/maximum value memory
**Hold function:** »freezing« of the current value
**Automatic-off function:** 1...120 min (can be deactivated)
Zero point adjustment via keyboard possible
**Tare function:**
display, minimum/maximum values are set to zero
**Battery change notification**

**Minimum/maximum alarm** can be deactivated
Alarm (3 alarm settings)

| | |
|---|---|
| Off: | Alarm function inactive |
| On: | Alarm notification via display, internal horn and serial interface |
| No Sound: | Alarm notification only via display and interface |

Averaging
Peak value memory unfiltered pressure peaks ≥ 1 msec
**Adjustable measuring cycle:**

| | |
|---|---|
| »slow« | 4 measurements/sec |
| »fast« | ≥ 1000 measurements/ sec (filtered) |
| »peak-detect« | ≥ 1000 measurements/sec |

**Power saving mode** for measuring cycle »slow«
**Real-time clock:** current time
**Logger functions:**

| | |
|---|---|
| Manual: | 99 datasets |
| Cyclic: | 10000 datasets<br>Adjustable cycle time: 1 sec...1 h |

# 11. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P231** | 2 measuring inputs with additional functions (see techn. data) |
| **HND-P233** | 2 measuring inputs with additional functions (see techn. data) |
| **HND-P236** | 2 measuring inputs with additional functions (see techn. data) |
| **HND-P239** | 1 pressure sensor input with additional functions (see techn. data) |

## 11.1 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10,5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **BUS-S20M** | Software for recording measuring data on a PC for 20 modules, for devices of the HND-series without logger function |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose $^{6}/_{4}$ on hose $^{6}/_{4}$ |
| **HND-Z082** | Hose clamp for hose $^{6}/_{4}$ |
| **HND-Z083** | Adapter made of brass for G ¼ internal threads on hose $^{6}/_{4}$ |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

* observe instrument dimensions
Additional accessories on request

# 12. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Manual Pressure Measuring Devices with External and Integrated Pressure Sensors Model: HND-P231/-P233/-P236/-P239**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 27. Mai 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Handheld Pressure Measuring Devices with Integrated Pressure Sensors

## Model: HND-P236

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Handheld Pressure Measuring Devices with Integrated Pressure Sensors model: HND-P236
- Operating Instructions

# 4. Regulation Use

Any use of the Manual Pressure Measuring Devices with External and Integrated Pressure Sensors, model: HND-P236, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The highly precise KOBOLD handheld pressure measuring devices HND-P236 are measuring devices with integrated pressure sensors. They have two pressure measurement inputs on the top of the housing, which are connected to the measuring points by means of stable metal connections and plastic hoses that are available as accessories. Numerous measuring ranges in the overpressure and underpressure range are available for various measurement tasks, such as differential pressure measurement. In addition to pressure display, these first-rate, compact, universally applicable measuring units offer additional functions such as minimum/maximum value memory, a hold function, tare function, automatic self-shut-off, or zero point offset. The devices with an expanded spectrum of functions also have a logger function, a peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

# 6. Electrical Connection

## 6.1 Mains Operation With Power Supply

**Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!! Cheap 12 V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002. Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.**

# 7. Operation / Configuration / Adjustments

## 7.1 General

### 7.1.1 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

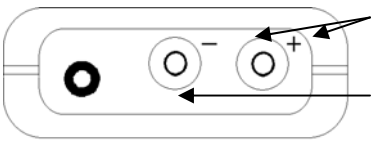
1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting. Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

   In case of doubt, please return device to manufacturer for repair or maintenance.

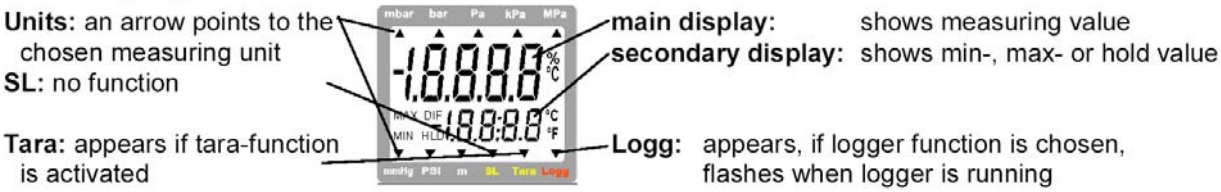
### 7.1.2 Connections




Connection for pressure tubes: „+“ = higher pressure, „-“ = lower pressure
Interface: Connection for el. isolated interface adapter (p.r.t. chapter *7.4 The Serial Interface* )

The mains adapter socket is located at the left side of the device.

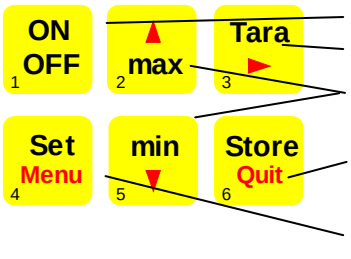
### 7.1.3 Display




### 7.1.4 Basic Operation

**When switching on** the device and the logger function is not off the time of the integrated clock will shortly be displayed. If a **zero point adjustment** was carried out the display shows shortly „nuLL Corr“.

**After changing the battery** the clock-setting menu is activated automatically (‚CLOC‘). Check the clock and adjust, if necessary (p.r.t. chapter *7.2 Configuration*).




**On-/Off-Switch**

**Tara:** Calling of tara function, zero point adjustment

**min/max:** Showing the min- resp. max-memory in sec. display

**Store/Quit:** Calling of hold function resp. calling of logger functions (p.r.t. ch. *7.3 Operation Of Logger*)

**Set/Menu:** Calling of configuration

**Max Memory:** Pressing ´max´ (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max memory press key ´max´ for >2 seconds.

**Min Memory:** Pressing ´min´ (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min memory press key ´min´ for >2 seconds.

**Hold Function:** By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it. (only when logger = ‚off‘).

**Tare Function:** By pressing ´Tara´ (key 3) the display will be set to 0. All measurings from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds. ***Please Note: Activating/deactivating tara clears the max- & min-memories.***

**Zero-Point Adjustment:** If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press button 3 for approx. 5 seconds (Auto Null will be displayed shortly). The adjustment is done via the OFFSET-value of the sensor (referring configuration menu).

*Please note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits.*

To recall the manufacturer`s calibration press button 3 for approx. 15 seconds.

## 7.2 Configuration

To change device settings, press ***Menu*** (key 4) for 2 seconds. This will call the configuration menu (main display: „SEt“).
Pressing key ***Menu*** changes between the menues, pressing ▸ (key 3) jumps to the refering parameters, which can be selected with key ▸ (key 3).
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
Pressing ***Menu*** again jumps back to the main configuration menu and saves the settings.
***Quit*** (key 6) finishes the configuration and returns to standard measuring operation.

| | PARAM. | Values | Meaning | C log | C dat | Stor |
|---|---|---|---|---|---|---|
| **‚Menu‘** | ▸ | ▲ or ▼ | | | | |
| **SEt ConF** | **Set Configuration: Generic Configurations** | | | | | |
| | **Unit** | mbar,bar.. | **Unit**: Unit of display | * | | * |
| | **rAtE** | | **Rate**: Measuring rate (p.r.t. chapter *7.2.1 Different Kinds Of Measuring: „rAtE-Slo, -P.dEt, -FASt“)* | * | | * |
| | | Slo | **Slow** measuring rate (4 Hz filtered, low power consumption) | * | | * |
| | | FASt | **Fast** measuring rate, filtered (>100 Hz) | * | | * |
| | | P.dEt | **Peak detection**: fast measuring rate, unfiltered (>100 Hz) | * | | * |
| | **t.AVG** | 1-120 | Averaging period in seconds, used by the averaging function | * | | * |
| | | oFF | Averaging function deactivated | * | | * |
| | **P.oFF** | 1-120 | **Auto Power Off** time in minutes | | | |
| | | oFF | Auto Power Off deactivated | | | |
| | **Out** | oFF | Function of the output | | | |
| | | Ser | Output is serial interface | | | |
| | | dAC | Output is analogue output 0...1 V | | | |
| | **Adr.** | 01,11..91 | Base **address** of interface | | | |
| | **dAC.0** | -100... 2000 mbar | Enter desired value which the analogue output potential should be 0V (if Out=dAC) | | | |
| | **dAC.1** | -100... 2000 mbar | Enter desired value at which the analogue output potential should be 1V (if Out=dAC) | | | |
| **Set CAL** | **Set Calibration: Adjustment of Sensor** | | | * | | |
| | **OFFS** | -500... 500 mbar | The **offset of sensor** will be displaced by this value to compensate for deviations in the probe or in the measuring device. | * | | |
| | | oFF | Zero displacement inactive (=0.00) | * | | |
| | **SCAL** | -2.000... 2.000 | The measuring scale of sensor will be changed by this factor [%] to compensate deviations of temperature probe or measuring device | * | | |
| | | oFF | Scale correction factor inactive (=0.000) | * | | |
| **Set AL.** | **Set Alarm: Settings Of Alarm Function** | | | | | |
| | **AL.** | On | **Alarm** on, with horn-sound | | | |
| | | no.So | Alarm on, without horn-sound | | | |
| | | oFF | Alarm deactivated | | | |
| | **AL.Lo** | -100 mbar ... AL.Hi | Min alarm rail (not when AL. oFF, Sensor-Min is the lower display range of connected sensor) | | | |
| | **AL.Hi** | AL.Lo ... 2000 mbar | Max alarm rail (not when AL. oFF, Sensor-Max is the upper display range of connected sensor) | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **SEt LoGG** | **Set Logger: Configuration Of Logger Function** | | | ***** | | ***** |
| | **Func** | CYCL | **Cyclic**: logger function ‚cyclic logger' | ***** | ***** | ***** |
| | | Stor | **Store**: logger function ‚individual value logger' | ***** | ***** | ***** |
| | | oFF | no logger function | * | * | * |
| | **CYCL** | 1..3600 | Cycle time of cyclic logger [seconds] | * | | * |
| | **Lo.Po** | on/oFF | **Low-power logger** with very low power consumption (only for cyclic logger and slow measuring rate) | ***** | | ***** |
| **SEt CLOC** | **Set Clock: Setting Of Real Time Clock** | | | | | |
| | **CLOC** | HH:MM | **Clock**: Setting of time hours:minutes | | | |
| | **dAtE** | TT.MM | **Date** day.month | | | |
| | **YEAr** | YYYY | **Year** | | | |

**Note: If the logger memory contains data already, the menues/parameters marked with (*) can not be invoked! If these should be altered the logger memory has to be cleared before! (key 6, p.r.t. chapter *7.3 Operation Of Logger*)**

### 7.2.1 Different Kinds Of Measuring: „rAtE-Slo, -P.dEt, -FASt"

Three different kinds of measuring pressure are supported. Two of them are working with high measuring frequency of more than 1000 measurings per second. If one of them was chosen in the configuration (see above), this will be displayed in the secondary display: „P.dEt" or „FASt".

#### 7.2.1.1 rAtE-Slo: Standard Measuring

Measuring rate 4 Hz, averaging and filter functions are active.
Application: Measuring of slowly changing or static pressures, e.g. measuring of leakproofness, athmospheric pressure...
Highest accuracy, high noise immunity (EMI and unstable measuring signals), low power consumption.

#### 7.2.1.2 rAtE-P.dEt: Peak detection

Measuring rate >1000 Hz, the value is displayed unfiltered.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of < 1 ms. The cyclic logger function records the arithmetic mean value, the highest and the lowest peak of the refering time interval.
Attention: higher power consumption, measuring is sensitive to noise (EMI,..).

#### 7.2.1.3 rAtE-FASt: Fast filtered measuring

Measuring rate >1000 Hz, the value is filtered slighlty (higher noise immunity than P.dEt, small peaks will be filtered out), apart from that identical behaviour like P.dEt.

### 7.2.2 Averaging Function

The averaging function concerns the display values (LCD and interface). It is completely independent from the averaging of the logger function, please don't mix them up!
The averaging integrates the measuring values during a selectable period of time and then calulates the average display value. It is independent from the selected kind of measuring (slow, fast, peak detect).
As long as not enough values are collected (selected avereaging time) to calculate a average value, the upper display shows "----", the lower display a 'countdown'.
During an active low-power-logging procedure the avering is always deactivated
Function of min/max-value memory during averaging:

- If averaging is activated and slow measuring is selected (rAtE-Slo), the min-/max-value memory refers to the average display value.
- If averaging is activated and fast measuring is selected (rAtE-FASt or P.dEt) , the min-/max-value memory refers to the internal measured values (fast peaks can be detected).

### 7.2.3 Zero Displacement Sensor

A zero displacement can be carried out for the measured value:

**value displayed = value measured – offset**

Standard setting: `off`= 0.0, i.e. no zero displacement will be carried out.
Together with the scale correction (see below) this factor is mainly used to compensate for sensor deviations. Input is in the display unit.

### 7.2.4 Scale Correction Sensor (`SCAL`)

The scale of the measuring can be influenced by this setting (factor is in %):

**displayed value = measured value*(1+SCAL/100)**

Standard setting: `off`=0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

### 7.2.5 Power Off Time

If there won't be pressed any key and no interface communication takes place for the time of the power off time setting (P.Off), the device will be switched off automatically to save battery power.
If P.oFF = oFF then the automatic switch off is deactivated.

### 7.2.6 Output

The output can be used as a serial interface (for HND-Z031, HND-Z034 interface adapters) or as analogue output (0-1V).

#### 7.2.6.1 Interface – Base Address (`Adr.`)

Up to 10 devices of the HND-P-handheld-family can be connected to a serial interface at once (depending on interface converter). To get access to each

device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

### 7.2.7 Address

Up to 10 devices of the HND-Pxxx- handheld-family can be connected to a serial interface at once (depending on interface converter). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on. See also chapter *7.4 The Serial Interface*.

### 7.2.8 Alarm

There are three possible settings: Alarm off (AL. oFF), on with horn sound (AL. on), on without horn sound (AL. no.So).
Following conditions will display an alarm, when the function is activated (on or no.So):

- Value is below lower (AL. Lo) or above upper alarm rail (AL.Hi).
- Sensor error (Sens Erro)
- Low battery (bAt)
- Fe 7: System error (always with sound)

In case of an alarm and when polling the interface the prio-flag is set in the returned interface message.

### 7.2.9 Real Time Clock

The real time clock is used for the logger function: Recorded values are also containing the point of time, when they were measured. Please check the settings when necessary.
If the battery was replaced the refering menu ‚CLOC' will automatically be started.

## 7.3 Operation Of Logger

The device supports two different logger functions:

**„Func-Stor":** each time when „store" (key 6) is pressed a measurement will be recorded.

**„Func-CYCL":** measurements will automatically be recorded each interval, which was set in the logger menu ‚CYCL' until the logger will be stopped or the logger memory is full. The recording is started by pressing „Store" 2 seconds.

The logger records 3 measurement results each time:
current or mean value (depending on logger setting, see below), min peak and max peak.

**Min and max peak** are the minimum resp. the maximum of the measured values since the last recording.
Using them allows f.e. analysis of fluctuating pressures.

For the evaluation of the data the software HND-Z034 has to be used. The software also allows easy configuration and starting of the logger.
When the logger is activated (Func Stor or Func CYCL) the hold function is no more available, the key 6 is solely used for the operation of the logger functions.

### 7.3.1 „Func-Stor“: Storing Single Measurements

Each time when „store“ (key 6) is pressed a measurement and its time stamp will be recorded.
The recorded data can be viewed either in the display (when calling the configuration an additional menu „REAd LoGG“ is displayed, see below) or by means of the interface and a PC with HND-Z034-software.

Max. number of measurings: 99

A measuring contains:
- current measuring value at the time of recording
- min peak, max peak since the last recording
- time and date of the recording

After each recording „St. XX“ will be displayed for a short time. XX represents the number of the recording.

**If logger memory contains recordings already:**
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

If the logger memory is full, the display will show: 


**Viewing Recorded Measurings**
Within the „LoGG Stor“ function the measurings can be viewed directly in the display not only by means of a computer (like at „Func CYCL“): press 2 seconds „Set“ (key 4): The first menu displayed now is „rEAd LoGG“ (read logger data). After pressing ▶ (key 3) the measurement recorded last will be displayed, changing between the different values refering to the measurement also is done by pressing ▶. Changing the measurement is done by pressing the keys ▲ or ▼.

### 7.3.2 „Func-CYCL“: Automatic Recording With Selectable Logger-Cycle-Time

The Logger-Cycle-Time is setable (p.r.t. Configuration). For example „CYCL“ = 60: A measuring is recorded after each 60 seconds.
When the slow measurement "rAtE-Slo" is chosen, additionaly a low power function is available: „Lo.Po“.

If „Lo.Po“ is on, the device only will take a measurement at the point of time of the recording. In between the recordings the measuring shut’s down. This decreases the power consumption enormously and therefore is recommended e.g. for long time recordings where no mains adapter is available.

Max. number of measurings: 10000

Cycle time: 1...3600 seconds (=1h), selectable in the configuration

A data set contains:

rAtE SLo: - current measuring value at the time of recording
- min peak, max peak since the last recording

rAtE FASt,P.dEt - arithmetic mean value since the last recording
- min peak, max peak since the last recording

#### 7.3.2.1 Starting a recording:

By pressing "Store" (key 6) for 2 seconds the recording will be called. The display will show: 


By pressing “Store” again the recording will be initiated. After that the display shows ‘St.XXXX‘ for a short time whenever a measuring is recorded. XXXX is the number of the measuring 1..10000.

If the logger memory is full, the display will show: 

The recording automatically will be stopped.
If Low-Power-Logger-Function „Lo.Po = on“ the device switches itself off as soon as the memory gets filled.

### 7.3.3 Stopping the recording manually:

By pressing "Store" (key 6) the recording can be stopped manually. Then the following choice appears:

Stop the recording

Do not stop the recording

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

**Note: If you try to switch off the instrument in the cyclic recording operation You will be asked once again if the recording is to be stopped. The device can only be switched off after the recording has been stopped! The Auto-Power-Off-function is deactivated during recording!**

### 7.3.4 Clear Recordings:

By pressing „Store“ (key 6) for 2 seconds the logger memory will be called.

The display will show: 

By pressing the keys ▲ (key 2) or ▼ (key 5) the display will change to 

. When “Store” is pressed, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

## 7.4 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031 or HND-Z032) the device can be connected to a computer for data transfer.
To avoid transmission errors, there are several security checks implemented e.g. CRC.
The following standard software packages are available:

**HND-Z034**: Operation and read out of logger function, data display in diagrams and tables
**BUS-SW9M**: 9-channel software to display the measuring values

**The device has 3 channels:**

1. 1: current measuring value (base address)
2. 2: min peak (p.r.t. chapter *7.3 Operation Of Logger*)
3. 3: max peak (p.r.t. chapter *7.3 Operation Of Logger*)

**Note: The measuring-/ alarm- and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Channel | | | Code | Name/Function | Channel | | | Code | Name/Function |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | | | 1 | 2 | 3 | | |
| x | x | x | 0 | Read measurement value | x | x | x | 200 | Read min display range |
| x | x | x | 3 | Read system state | x | x | x | 201 | Read max display range |
| x | | | 6 | Read min memory | x | x | x | 202 | Read display range - unit |
| x | | | 7 | Read max memory | x | x | x | 204 | Read display range – decimal point |
| x | x | x | 12 | Read ID number | x | | | 208 | Read # of channels |
| x | | | 22 | Read min alarm rail (AL. - AL.Lo) | x | | | 214 | Read scale adjustment [%] |
| x | | | 23 | Read max alarm rail (AL. - AL.Hi) | x | | | 216 | Read offset adjustment |
| x | | | 32 | Read configuration flag BitAlarmOn:1; BitAlarmSound:3; BitPeakDetection:33; BitFastFiltered:34; BitLoggerOn:50; BitCyclicLogger:51; BitLowPowerLogger:52 | x | | | 222 | Read power off time (Conf-P.oFF) |
| | | | | | x | | | 223 | Set power off time (Conf-P.oFF) |
| | | | | | x | x | x | 224 | Logger: Read data of CYCL- Logger |
| | | | | | x | | | 225 | Logger: Read cycle time (LoGG - CYCL) |
| | | | | | x | | | 226 | Logger: set cycle time (LoGG - CYCL) |
| x | | | 102 | Set min alarm rail (AL. - AL.Lo) | x | | | 227 | Logger: start recording |
| x | | | 103 | Set max alarm rail (AL. - AL.Hi) | x | | | 228 | Logger: Read # of recordings made |
| x | | | 160 | Set configuration flag (refer to 32) | x | | | 229 | Logger: Read state |
| x | | | 174 | Clear min memory | x | | | 231 | Logger: Read stop time |
| x | | | 175 | Clear max memory | x | | | 233 | Read real time clock (CLOC) |
| x | x | x | 176 | Read min measuring range | x | | | 234 | Set real time clock (CLOC) |
| x | x | x | 177 | Read max measuring range | x | | | 236 | Read logger memory size |
| x | x | x | 178 | Read measuring range – measuring unit | x | | | 240 | Reset |
| x | x | x | 179 | Read measuring range – decimal point | x | | | 254 | Program version |
| x | x | x | 180 | Read kind of measuring of sensor | x | | | 260 | Logger: read data of STOR Logger |
| x | | | 194 | Set display unit | | | | | |
| x | x | x | 199 | Read kind of measuring of display | | | | | |

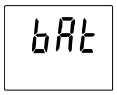
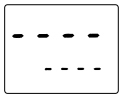
## 7.5 Pressure Connection To The Sensors

**For measurements of over pressure (-100 mbar...2000 mbar):**
Connect plastic tube with internal dia of 4 mm to pressure port "+". Port "-" will not be used!

**For measurements of under pressure (-2000 mbar...0 mbar):**
Plug the tube to pressure port "-". The measuring range covers then -2000 to 0 mbar.
Note: All values are displayed now as positive values. No minus sign will be shown.
Example: it is possible to messure under pressure down to -2000 mbar, the display shows then the value 2000 (no minus sign).

**For measurements of pressure differences:**
Connect both plastic tubes with an internal dia of 4 mm to pressure port "+" and "-"; make sure to apply higher pressure to port "+".

## 7.6 Error and System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
|  | Logger data are read by the interface | When transfer completed the device will automatically return to normal measuring display, no remedy necessary |
| No display or confused characters, device does not react on keypress | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| ***Err.1*** | Measured value above allowable range | Check: pressure above 2000 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.2*** | Measured value below allowable range | Check: pressure below –100 mbar?<br>-> measuring value to low |
| | Sensor defective | Return to manufacturer for repair |
| ***Err.4*** | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| ***Err.9*** | Measured value far out of allowable range | Check: pressure not within sensor range? |
| ***Err.7*** | System error | Return to manufacturer for repair |

### 7.7 Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificated for its accuracy, it is the best solution to return it to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

## 8. Maintenance

### 8.1 Battery Operation

If ⚠ and ´bAt´ are shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up. The battery has to be taken out, when storing device above 50 °C.

**Please note: We recommend to take out battery if device is not used for a longer period of time!**

## 9. Technical Information

| | |
|---|---|
| Measuring range: | -100 to 2000 mbar relative<br>(under pressure down to -2000 mbar, p.r.t.) |
| -option: MB: -1...2 bar | -1000 to 2000 mbar relative<br>(under pressure down to -2000 mbar, p.r.t.) |
| Overload: | max. 4000 mbar rel. (without destruction or recalibration of sensor being necessary) |
| Resolution: | 1 mbar |
| Pressure units: | mbar, bar, kPa, MPa, mmHg, PSI, $mH_2O$<br>(display `m`), selectable |
| Accuracy: (typ.) | ±0.2 % F.S. (hysteresis and linearity)<br>±0.4 % F.S. (temperature dependency 0-50 °C) |
| -option: higher accuracy: | ±0.1 % F.S. (hysteresis and linearity)<br>±0.4 % F.S. (temperature dependency 0-50 °C) |
| Measuring rate: | slow: 4 meas./sec(ConF-Rate = Slow)<br>fast: >1000 meas./sec<br>(ConF-Rate=FASt and P.dEt) |
| Nominal temperature: | 25 °C |
| **Sensor:** | piezo-resistive relative pressure sensor integrated in device. |

| | | |
|---|---|---|
| | | Suitable for air and non-corrosive and non-ionising gases and liquids.<br>Not suitable for water-use air buffering) |
| Connetion: | | 2 metal pressures ports for connection to 6x1 mm tubes at the top of device (4 mm inner tube ø) |
| **Logger:** | | 2 Functions: individual value logger (“Func-Stor”) and cyclic logger (“Func-CYCL”) |
| Memory: | Stor: | 99 data sets |
| | CYCL: | 10000 data sets (in max. 64 recording sequences) |
| Cycle time CYCL: | | 1...3600 seconds |
| **Display:** | | 2 four digit LCDs (12.4 mm high and 7 mm high) for measuring values, and for min/max memories, hold function, etc. As well as additional functional arrows. |
| **Pushbuttons**: | | 6 membrane keys |
| **Output:** | | 3.5 mm audio plug, stereo |
| **Output function:** | | selectable as serial interface or analogue output |
| **Interface:** | | Serial interface (3.5 mm jack) can be connected to RS232 or USB interface of a PC via electrically isolated interface adapter. |
| **Analogue output:** | | 0...1 Volt, freely scalable (resolution 12 bit) |
| **Power supply:** | | 9 V battery, type: IEC 6F22<br>(included in the scope of supply)<br>As well as additional d.c. connector (diameter of internal pin 1.9 mm) for external 10.5-12 V direct voltage supply. |
| Power consumption: | | Slow measuring rate: ~0.6 mA<br>Fast measuring rate: <2.5 mA<br>Low-Power-Logger: <0,1 mA (for cycle time >30s, without interface communication active and no alarm horn sounding) up to 0.4 mA (at cycle-time 1s) |
| Low battery warning: | | `bAt` |
| **Additional functions:** | | |
| Power-Off-Function: | | Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated. |
| Min/Max Alarm: | | The measuring value is constantly monitored for the min and max rails set. Alarming is done by integrated horn, display and interface |
| Real-time clock: | | Integrated clock with date and year |
| Housing: | | impact-resistant ABS, membrane keyboard, transparent panel, Front side IP65 |
| Dimensions: | | 142x71x26 mm (LxWxD) |
| Weight: | | approx. 165 g |
| Working temperature: | | -20...+50 °C |
| Allowable rel. humidity: | | 0...95 % RH (not condensing) |
| Storage temperature: | | -20...+70 °C |

# 10. Order Codes

| Order-no. | Housing design |
|---|---|
| **HND-P236** | 2 measuring inputs with additional functions (see techn. data) |

## 10.1 Accessories

| Order-no. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/60 Hz), 10.5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection |
| **HND-Z021*** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022*** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023*** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Interface converter on USB, galvanically isolated |
| **HND-Z033** | Adapter RS232 converter on USB- interface |
| **HND-Z034** | Windows software for setting and data read- and print-out of instruments of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose 6.4 on hose 6.4 |
| **HND-Z082** | Hose clamp for hose 6.4 |
| **HND-Z088** | Adapter made of brass for G ½ internal threads on hose 6.4 |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

* Pay attention to instrument dimensions

Further Accessories on request

# 11. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Handheld Pressure Measuring Devices with Integrated Pressure Sensors**
**Model: HND-P236**

to which this declaration relates is in conformity with the standards noted below:

| | |
|---|---|
| **EN 61326-1:2006** | Electrical equipment for measurement, control and laboratory use. EMC requirements |

Also the following EC guidelines are fulfilled:

| | |
|---|---|
| **2004/108/EC** | Electromagnetic compatibility |
| **2006/95/EC** | Low voltage guideline |

Hofheim, 8. May 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Operating Instructions

# for

# Handheld Digital Pressure Meter

# with internal pressure sensor

## Model: HND-P239

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Handheld Digital Pessure Meter with internal pressure sensor
  model: HND-P239
- Operating Instructions

# 4. Regulation Use

Any use of the Handheld Digital Pressure Meter, model: HND-P239, which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

The KOBOLD Handheld Digital Pressure Meters HND-P239 have an integrated pressure sensor for absolute pressure measurement. The measuring device is connected to the measuring point by means of a stable, metal connection on the top of the housing and an optional plastic hose. This device design offers the possibility of also displaying the barometric air pressure in relation to sea level »zero«. In this case, air pressure is corrected by entering the height above »zero« in meters. Naturally, these devices also have the minimum/maximum value memory, a hold function, a tare function, automatic self-shut-off function, and zero point adjustment. The HND-P239 devices also offer additional functions like the logger function, peak value memory, minimum/maximum alarm, an adjustable measuring cycle, and averaging.

# 6. Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Technical Information".
2. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
3. If device is to be connected to other devices the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

**Warning! If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).**

4. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting. Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer period of time.

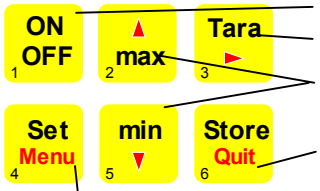
In case of doubt, please return device to manufacturer for repair or maintenance.

# 7. Electrical Connection

By operation with external power supply:
When using a power supply please note that operating voltage has to be 10.5 to 12 $V_{DC}$. Do not apply overvoltage!!! Cheap 12V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply HND-Z002. Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.

# 8. Operation

**When switching on** the device and the logger function is not off the time of the integrated clock will shortly be displayed.
**After changing the battery** the clock-setting menu is activated automatically (‚CLOC'). Check the clock and adjust, if necessary (see chapter 9. Configuration).




**On-/Off-Switch**
**Tara:** Calling of tara function, zero point adjustment
**min/max:** Showing the min- resp. max-memory in sec. display
**Store/Quit:** Calling of hold function resp. calling of logger functions
(please refer to chapter 10. "Operation Of Logger")
**Set/Menu:** Calling of configuration

**Max Memory:** Pressing "max" (key 2) shows the maximum of the measured values. Pressing it again hides it. To clear the max memory press key „max" for >2 seconds.

**Min Memory:** Pressing "min" (key 5) shows the minimum of the measured values. Pressing it again hides it. To clear the min memory press key „min" for >2 seconds.

**Hold Function:** By pressing "Store/Quit" (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it. (only when logger = ‚off').

**Tare Function:** By pressing "Tara" (key 3) the display will be set to 0. All measurings from then on will be displayed relatively to the set tare value. When tara function is activated, the arrow "Tara" appears in the display. To deactivate tare function press "Tara" for >2 seconds.

**Note: Activating/deactivating tara clears the max- & min-memories.**

# 9. Configuration

To change device settings, press ***"Menu"*** (key 4) for 2 seconds. This will call the configuration menu (main display: „SEt").
Pressing key ***"Menu"*** changes between the menu, pressing " ▸ " (key 3) jumps to the referring parameters, which can be selected with key " ▸ " (key 3).
The parameters can be changed with " ▲ " (key 2) or " ▼ " (key 5).
Pressing ***"Menu"*** again jumps back to the main configuration menu and saves the settings.
***"Quit"*** (key 6) finishes the configuration and returns to standard measuring operation.

| Menu | Param. | Values | Meaning | |
|---|---|---|---|---|
| ‚Menu' | ▸ | ▲ or ▼ | | |
| **SEt ConF** | **Set Configuration: Generic Configuration** | | | |
| | **Unit** | mbar,bar.. | **Unit**: Unit of display | * |
| | **SL** | oFF/on | **Sea-Level**: on or off | * |
| | **Alti** | -2000..9999 | **Altitude**: Input of altitude above sea level [m] (only if SL on) | * |
| | **rAtE** | | **Rate**: Measuring rate (see chapter 9.1 Different Kinds Of Measuring: „rAtE-Slo, -P.dEt, -FASt") | * |
| | | Slo | **Slow**: measuring rate (4 Hz filtered, low power consumption) | * |
| | | FASt | **Fast**: measuring rate, filtered (>100 Hz) | * |
| | | P.dEt | **Peak detection**: fast measuring rate, unfiltered (>100 Hz) | * |
| | **t.AVG** | 1-120 | Averaging period in seconds, used by the averaging function | |
| | | oFF | Averaging function deactivated | |
| | **P.oFF** | 1-120 | **Auto Power-Off** time in minutes | |
| | | oFF | Auto Power-Off deactivated | |
| | **Adr.** | 01,11..91 | Base **address** of interface | |
| **SEt AL.** | **Set Alarm: Settings Of Alarm Function** | | | |
| | **AL.** | On | **Alarm** on, with horn-sound | |
| | | no.So | Alarm on, without horn-sound | |
| | | oFF | Alarm deactivated | |
| | **AL.Lo** | 0 bar ... AL.Hi | Min alarm rail (not when AL. oFF. Sensor-Min is the lower display range of connected sensor) | |
| | **AL.Hi** | AL.Lo ...1.3 bar | Max alarm rail (not when AL. oFF. Sensor-Max is the upper display range of connected sensor) | |
| **SEt LoGG** | **Set Logger: Configuration Of Logger Function** | | | * |
| | **Func** | CYCL | **Store**: logger function, ‚cyclic logger' | * |
| | | Stor | **Cyclic**: logger function ‚individual value logger' | * |
| | | oFF | no logger function | * |
| | **CYCL** | 1..3600 | Cycle time of cyclic logger [seconds] | * |
| | **Lo.Po** | on/oFF | **Low-power logger** with very low power consumption (only for cyclic logger and slow measuring rate) | * |
| **SEt CLOC** | **Set Clock: Setting Of Real Time Clock** | | | |
| | **CLOC** | HH:MM | **Clock**: Setting of time hours: minutes | |
| | **dAtE** | TT.MM | **Date**: day. month | |
| | **YEAr** | YYYY | **Year**: | |

**Note! If the logger memory contains data already, the menus/parameters marked with (*) can not be invoked! If these should be altered the logger memory has to be cleared before! (key 6, please refer to. chapter 10. "Operation Of Logger")**

## 9.1 Different Kinds Of Measuring: „rAtE-Slo, -P.dEt, -FASt“

Three different kinds of measuring pressure are supported. Two of them are working with high measuring frequency of more than 100 measurings per second. If one of them was chosen in the configuration (see above), this will be displayed in the secondary display: „P.dEt“ or „FASt“.

### 9.1.1 rAtE-Slo: Standard Measuring

Measuring rate 4Hz, averaging and filter functions are active.
Application: Measuring of slowly changing or static pressures, e.g. measuring of leak proofness, atmospheric pressure...
Highest accuracy, high noise immunity (EMI and unstable measuring signals), low power consumption.

### 9.1.2 rAtE-P.dEt: Peak detection

Measuring rate >100Hz, the value is displayed **unfiltered**.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of <10ms. The cyclic logger function records the arithmetic mean value, the highest and the lowest peak of the referring time interval.
Attention: higher power consumption, measuring is sensitive to noise (EMI,..).

### 9.1.3 rAtE-FASt: Fast filtered measuring

Measuring rate >100Hz, the value is **filtered** slightly (higher noise immunity than P.dEt, small peaks will be filtered out), apart from that identical behaviour like P.dEt.

## 9.2 Sea Level Correction

The device displays the absolute pressure measured at the sensor. This is not necessarily the same like the values given by weather stations! The weather stations‘ values are giving the pressure at sea level. Usually the sensor is placed above sea level and therefore, if the value at sea level(zero) is to be measured, the pressure loss resulting from the actual level above sea level has to be considered! To correct the measuring display activate the „Sea-Level-Function“ (SL, please refer to chapter 9. “Configuration”). Then enter the altitude above sea level of the sensor‘s location in meters (Alti, please refer to chapter 9. Configuration). When activated, the display shows the SL-arrow and the device displays the pressure value at sea level.

## 9.3 Averaging Function

The averaging function concerns the display values (LCD and interface). It is completely independent from the averaging of the logger function, please don't mix them up!
The averaging integrates the measuring values during a selectable period of time and then calculates the average display value. It is independent from the selected kind of measuring (slow, fast, peak detect)
As long as not enough values are collected (selected averaging time) to calculate a average value, the upper display shows "----", the lower display a 'countdown'.
During an active low-power-logging procedure the averaging is always deactivated.
Function of min/max-value memory during averaging:

- If averaging is activated and slow measuring is selected (rAtE-Slo), the min-/max-value memory refers to the average display value.
- If averaging is activated and fast measuring is selected (rAtE-FASt or P.dEt) , the min-/max-value memory refers to the internal measured values (fast peaks can be detected).

## 9.4 Power Off Time

If there won't be pressed any key and no interface communication takes place for the time of the power off time setting (P.Off), the device will be switched off automatically to save battery power.
If P.oFF = oFF then the automatic switch off is deactivated.

## 9.5 Address

Up to 10 devices of the GMH3xxx- handheld-family can be connected to a serial interface at once (depending on interface converter, e.g. GRS3105: 5 devices). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on. See also chapter 11. "The Serial Interface".

## 9.6 Alarm

There are three possible settings: Alarm off (AL. oFF), on with horn sound (AL. on), on without horn sound (AL. no.So).
Following conditions will display an alarm, when the function is activated (on or no.So):

- Value is below lower (AL. Lo) or above upper alarm rail (AL.Hi).
- Sensor error (Sens Erro)
- Low battery (bAt)
- Fe 7: System error (always with sound)

In case of an alarm and when polling the interface the prio-flag is set in the returned interface message.

### 9.7 Real Time Clock

The real time clock is used for the logger function: Recorded values are also containing the point of time, when they were measured. Please check the settings when necessary.
If the battery was replaced the referring menu ‚CLOC' will automatically be started.

## 10. Operation Of Logger

The device supports two different logger functions:

**„Func-Stor":**
each time when „store" (key 6) is pressed a measurement will be recorded.
**„Func-CYCL":**
measurements will automatically be recorded each interval, which was set in the logger menu ‚CYCL' until the logger will be stopped or the logger memory is full. The recording is started by pressing „Store" 2 seconds.

The logger records 3 measurement results each time:
Current or mean value (depending on logger setting, see below), min peak and max peak.
**Min and max peak** are the minimum resp. the maximum of the measured values since the last recording.
Using them allows f.e. analysis of fluctuating pressures.
For the evaluation of the data the software HND-Z034 has to be used. The software also allows easy configuration and starting of the logger.
When the logger is activated (Func Stor or Func CYCL) the hold function is no more available, the key 6 is solely used for the operation of the logger functions.

### 10.1 „Func-Stor": Storing Single Measurements

Each time when „store" (key 6) is pressed a measurement and its time stamp will be recorded.
The recorded data can be viewed either in the display (when calling the configuration an additional menu „REAd LoGG" is displayed, see below) or by means of the interface and a PC with GSOFT3050-software.

Max. number of measurings: 99
A measuring contains:

- current measuring value at the time of recording
- min peak, max peak since the last recording
- - time and date of the recording

After each recording „St. XX“ will be displayed for a short time. XX represents the number of the recording.
If logger memory contains recordings already:
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear the last recording

Clear nothing (Cancel menu)

The selection can be made by “▲“ (key 2) and “▼“ (key 5). "Quit" (key 6) enters the choice.

If the logger memory is full, the display will show: 


**Viewing Recorded Measurements**
Within the „LoGG Stor“ function the measurements can be viewed directly in the display not only by means of a computer (like at „Func CYCL“): press 2 seconds „Set“ (key 4): The first menu displayed now is „rEAd LoGG“ (read logger data). After pressing “▶“ (key 3) the measurement recorded last will be displayed, changing between the different values referring to the measurement also is done by pressing “▶“.
Changing the measurement is done by pressing the keys “▲“ or “▼“.

## 10.2„Func-CYCL“: Automatic Recording With Selectable Logger-Cycle-Time

The Logger-Cycle-Time is settable (please refer to Configuration). For example „CYCL“ = 60: A measuring is recorded after each 60 seconds.
When the slow measurement "rAtE-Slo" is chosen, additionally a low power function is available: „Lo.Po“.
If „Lo.Po“ is on, the device only will take a measurement at the point of time of the recording. In between the recordings the measuring shuts down. This decreases the power consumption enormously and therefore is recommended e.g. for long time recordings where no mains adapter is available.

Max. number of measurings: 9999

Cycle time: 1...3600 seconds (=1h), selectable in the configuration

A measurement comprises of:
by slow measurements (rAtE Slo):
- current measuring value at the time of recording
- min peak, max peak since the last recording

by fast measurements (rAtE FASt,P.dEt)

- arithmetic mean value since the last recording
- min peak, max peak since the last recording

**Starting a recording:**
By pressing "Store" (key 6) for 2 seconds the recording will be initiated. After that the display shows ‘St.XXXX‘ for a short time whenever a measuring is recorded. XXXX is the number of the measuring 1..9999.

If the logger memory is full, the display will show: 

The recording automatically will be stopped.

If Low-Power-Logger-Function „Lo.Po = on“ the device switches itself off as soon as the memory gets filled.

**Stopping the recording manually:**
By pressing "Store" (key 6) the recording can be stopped manually. Then the following choice appears:

Stop the recording

Do not stop the recording

The selection can be made by “▲“ (key 2) and “▼“ (key 5). "Quit" (key 6) enters the choice.

**Note: If you try to switch off the instrument in the cyclic recording operation You will be asked once again if the recording is to be stopped. The device can only be switched off after the recording has been stopped!**

The Auto-Power-Off-function is deactivated during recording!

**Clear Recordings:**
When „Store“ is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

Clear all recordings

Clear nothing (cancel menu)

The selection can be made by “▲“ (key 2) and “▼“ (key 5). "Quit" (key 6) enters the choice.

# 11. The Serial Interface

With an electrically isolated interface converter HND-Z031 (accessories) the device can be directly connected a RS232 interface of a computer (HND-Z032 complies with USB-interface). To avoid transmission errors, there are several security checks implemented (CRC).

The following standard software packages are available:

**HND-Z034**: Operation and read out of logger function, data display in diagrams and tables

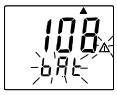
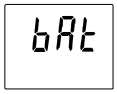
The device has 3 channels:
Channel 1: current measuring value (base address)
Channel 2: min peak (please refer to chapter 10. Operation Of Logger)
Channel 3: max peak (please refer to chapter 10. Operation Of Logger)

**Note! The measuring-/ alarm- and display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!**

Supported functions:

| Channel | | | Code | Name/Function | Channel | | | Code | Name/Function |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | | | 1 | 2 | 3 | | |
| x | x | x | 0 | Read measurement value | x | x | x | 199 | Read kind of measuring of display |
| x | x | x | 3 | Read system state | x | x | x | 200 | Read min display range |
| x | | | 6 | Read min memory | x | x | x | 201 | Read max display range |
| x | | | 7 | Read max memory | x | x | x | 202 | Read display range - unit |
| x | x | x | 12 | Read ID number | x | x | x | 204 | Read display range – decimal point |
| x | | | 22 | Read min alarm rail (AL. - AL.Lo) | x | | | 208 | Read # of channels |
| x | | | 23 | Read max alarm rail (AL. - AL.Hi) | x | | | 220 | Read altitude (only abs. press sensors) |
| x | | | 32 | Read configuration flag BitAlarmOn:1; BitAlarmSound:3; BitCorrectToSealevel:32 (only abs. press. Sensors); BitPeakDetection:33; BitFastFiltered:34; BitLoggerOn:50; BitCyclicLogger:51; BitLowPowerLogger:52 | x | | | 221 | Set altitude (only abs. press sensors) |
| | | | | | x | | | 222 | Read power off time (Conf-P.oFF) |
| | | | | | x | | | 223 | Set power off time (Conf-P.oFF) |
| | | | | | x | x | x | 224 | Logger: Read data of CYCL- Logger |
| | | | | | x | | | 225 | Logger: Read cycle time (LoGG - CYCL) |
| x | | | 102 | Set min alarm rail (AL. - AL.Lo) | x | | | 226 | Logger: set cycle time (LoGG - CYCL) |
| x | | | 103 | Set max alarm rail (AL. - AL.Hi) | x | | | 227 | Logger: start recording |
| x | | | 160 | Set configuration flag (refer to 32) | x | | | 228 | Logger: Read # of recordings made |
| x | | | 174 | Clear min memory | x | | | 229 | Logger: Read state |
| x | | | 175 | Clear max memory | x | | | 231 | Logger: Read stop time |
| x | x | x | 176 | Read min measuring range | x | | | 233 | Read real time clock (CLOC) |
| x | x | x | 177 | Read max measuring range | x | | | 234 | Set real time clock (CLOC) |
| x | x | x | 178 | Read measuring range – measuring unit | x | | | 236 | Read logger memory size |
| x | x | x | 179 | Read measuring range – decimal point | x | | | 240 | Reset |
| x | x | x | 180 | Read kind of measuring of sensor | x | | | 254 | Program version |
| x | | | 194 | Set display unit | x | | | 260 | Logger: read data of STOR Logger |

## 12. Error And System Messages

| Display | Meaning | What to do? |
|---|---|---|
|  | Low battery power, device will only continue operation for a short period of time | Replace battery |
|  | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage | Check power supply, replace it when necessary |
| - - - -<br>- - - - | Logger data are read by the interface | When transfer completed the device will automatically return to normal measuring display, no remedy necessary |
| No display or confused characters,<br><br>device does not react on keypress | Battery empty | Replace battery |
| | Mains operation without battery: wrong voltage or polarity | Check power supply, replace it when necessary |
| | System error | Disconnect battery and power supplies, wait shortly, then reconnect |
| | Device defective | Return to manufacturer for repair |
| Err.1 | Measured value above allowable range | Check: pressure above 1300 mbar?<br>-> measuring value to high |
| | Sensor defective | Return to manufacturer for repair |
| Err.2 | Measured value below allowable range | -> measuring value to low |
| | Sensor defective | Return to manufacturer for repair |
| Err.4 | Value is too low to be displayed, tara is set | Check: display below -2000 (tara?)? |
| Err.9 | Measured value far out of allowable range | Check: pressure not within sensor range? |
| Err.7 | System error | Return to manufacturer for repair |

## 13. Calibration Services

Calibration certificates – DKD-certificates – other certificates:
If device should be certificated for its accuracy, it is the best solution to return it to the manufacturer.
Only the manufacturer is capable to do efficient recalibration if necessary to get results with highest accuracy!

# 14. Maintenance

## 14.1 Battery Operation

If ⚠ and ´bAt´ are shown in the secondary display, the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.
The battery has to be taken out, when, the device is stored above 50°C.

**We recommend to take out battery if device is not used for a longer period of time!**

# 15. Technical Information

| | |
|---|---|
| Measuring range: | 0 to 1300 mbar |
| Accuracy: | ±0,2 % F.S.<br>(hysteresis and linearity)<br>±0.4 % F.S.<br>(temperature dependency 0-50 °C) |
| Resolution: | 1 mbar |
| Pressure units: | mbar, bar, kPa, MPa, mmHg, PSI, m<br>(switchable) |
| Overload: | max. 4 bar absolute |
| Measuring input: | by means of a metal-hose stem |
| Sensor: | piezo-resistive absolute pressure sensor,<br>for air or non-corrosive and<br>non-ionising gases and liquids,<br>not for water! |
| Display: | 2 x 4-digit LC-displays |
| Operating temperature: | 0…50 °C |
| Storage temperature: | -20…+70 °C |
| Relative humidity: | 0...95 % r.H. (non-condensing) |
| Output: | serial interface<br>(via 3-pin jack, transformer on<br>RS232 or USB optional) |
| Power supply: | 9V-monobloc battery<br>(included in scope of delivery),<br>external 10.5 - 12VDC via jack |
| Current consumption: | max. 3 mA (HND-P239) |
| Materials: | housing made of impact-resistant ABS plastic |
| Protection: | IP65, front side |
| Dimensions: | 142 x 71 x 26 mm (L x W x D) |
| Weight: | approx. 160g |

**Scope of functions:**

- Min-/Max-value memory
- Hold function: »freezing« of the current value
- Automatic-off function: 1...120 min (can be deactivated)
- Zero point adjustment via keyboard possible
- Tare function: Display, minimum/maximum values are set to zero
- Battery change notification

**Additional functions for the HND-P239:**

- Minimum/maximum alarm can be deactivated
- Alarm (3 alarm settings)

| | |
|---|---|
| Off: | Alarm function inactive |
| On: | Alarm notification via display, internal horn and serial interface |
| No Sound: | Alarm notification only via display and interface |

- Averaging
- Peak value memory unfiltered pressure peaks ≥ 10 msec
- Adjustable measuring cycle:

| | |
|---|---|
| »slow« | 4 measurements/sec |
| »fast« | ≥ 100 measurements/sec (filtered) |
| »peak-detect« | ≤ 100 measurements/sec |

- Power saving mode in the measuring cycle »slow«
- Real-time clock: current time
- Logger functions:

| | |
|---|---|
| Manual: | 99 datasets |
| Cyclic: | 9999 datasets<br>Adjustable cycle time: 1sec...1h |

# 16. Order Codes

| Order-No. | Design |
|---|---|
| **HND-P 239** | 1x pressure sensor input, with additional functions (see Technical Information) |

## 16.1 Accessories for HND-P

| Order-No. | Description |
|---|---|
| **HND-Z002** | Plug power supply unit (220/240 V, 50/ 60 Hz), 10,5 V/10 mA |
| **HND-Z011** | Equipment protective housing bag, nappa leather, with 1 cut-out for round sensor connection |
| **HND-Z012** | Equipment protective housing bag, nappa leather, with 2 cut-outs for round sensor connection of the HND- series with logger function |
| **HND-Z021** | Case with recess (275 x 229 x 83 mm) |
| **HND-Z022** | Universal case with egg crate foam (275 x 229 x 83 mm) |
| **HND-Z023** | Large case with recess (394 x 294 x 106 mm) |
| **HND-Z031** | Interface converter on RS232, galvanically isolated |
| **HND-Z032** | Adapter RS232 converter on USB- interface |
| **HND-Z033** | Interface converter on USB, galvanically isolated |
| **HND-Z034** | Windows software for setting, data read-out, and printing of the data of housings of the HND- series with logger function |
| **HND-Z081** | Double nozzle for hose $^{6}/_{4}$ on hose $^{6}/_{4}$ |
| **HND-Z082** | Hose clamp for hose $^{6}/_{4}$ |
| **HND-Z083** | Adapter made of brass for G ¼ internal threads on hose $^{6}/_{4}$ |
| **HND-Z084** | PVC-hose (5 bar), 6 mm external / 4 mm internal |
| **HND-Z085** | PE-hose (10 bar), 6 mm external / 4 mm internal |
| **HND-Z086** | PU-hose (9 bar), 6 mm external / 4 mm internal |
| **HND-Z087** | PA-hose (25 bar), 6 mm external / 4 mm internal |

Additional accessories on request.

# 17. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Handheld Digital Pressure Meter**
**with external pressure sensor** **Model: HND-P239**

to which this declaration relates is in conformity with the standards noted below:

Also the following EEC guidelines are fulfilled:

| | |
|---|---|
| **93/38/EEC, 2004/108/EC** | Electromagnetic compatibility |
| **73/23/EEC, 93/68 EEC** | Low voltage guideline (for usage of the external power supply HND-Z002) |

Hofheim, 28. Jul. 2005

H. Peters
General Manager

M. Wenzel
Proxy Holder

# Digital Pressure Sensors

# Model HND-PS19...PS33, HND-PS20...PS23

# for

# HND-P105, HND-P210 and HND-P215

# Content



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 1 Intended use

The pressure sensors are designed for the connection to an hand-held instrument of the following types:

**HND-P105, HND-P210, HND-P215**

The sensors have following application areas:

- air, aggressive gases
- water, aggressive media, etc.

# 2 General

Read through this document attentively and make yourself familiar to the  of the device before you use it.
Keep this document in a ready-to-hand way in order to be able to look up in the case of doubt.

# 3 Operating and Maintenance Advice

a.) You must only use the sensor with suitable devices!
Usage of other devices may result in destruction of sensor and device.

b) Treat sensor and device carefully. Use only in accordance with above specification. (do not throw, hit against etc.).
Protect plug from soiling.

c) To disconnect pressure sensor adapter cable from the device do not pull at the cable but at the plug (to open lock).
When connecting the sensor make sure that arrows are pointing upwards and that plug is entered into device socket centrally. Do not twist plug when entering socket.
If plug is entered correctly, it will slide in smoothly

If plug is twisted or entered incorrectly the connecting pins of the plug can be spoilt by bending or broken
=> Plug can no longer be used and connecting cable needs to be replaced.

d) **HND-PS...** (= relative pressure sensor):

Caution: The pressure compensation hole has to be kept clean! It is placed at the back part of the housing.
Do not cover with stickers or similar things!

# 4 General Safety requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".
2. If the device is transported from a cold to a warm environment condensation may result in a failure of the device. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
3. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.

   Operator safety may be at risk if:

   - there is visible damage to the device.
   - the device is not working as specified.
   - the device has been stored under unsuitable conditions for a longer time.

   In case of doubt, please return device to manufacturer for repair or maintenance.
4. **Warning:** Do not use this product as safety or emergency stop device or in any other application where failure of the product could result in personal injury or material damage.
   Failure to comply with these instructions could result in death or serious injury and material damage.
5. **Any changes or repair of the device is not allowed.**
   **Please return device to manufacturer for repair or maintenance.**

# 5 Specification

## 5.1 Specification (HND-PA...):

| | HND-PA20 | HND-PA21 | HND-PA22 | HND-PA23 | HND-PA... (special range) |
|---|---|---|---|---|---|
| **Measuring range:** | 0 ... 1000 mbar abs. | 0 ... 2500 mbar abs. | 0 ... 4000 mbar abs. | 0 ... 6000 mbar abs. | *refer to type plate* |
| **Overload:** (max.) | 5 bar abs. | 10 bar abs. | 17 bar abs. | 35 bar abs. | *refer to type plate* |
| **Resolution:** | 1 mbar | 1 mbar | 1 mbar | 1 mbar | *refer to type plate* |

**Sensortyp:** stainless steel absolute pressure sensor.
Suitable for aggressive media, water, etc.

## 5.2 Specification (HND-PS...):

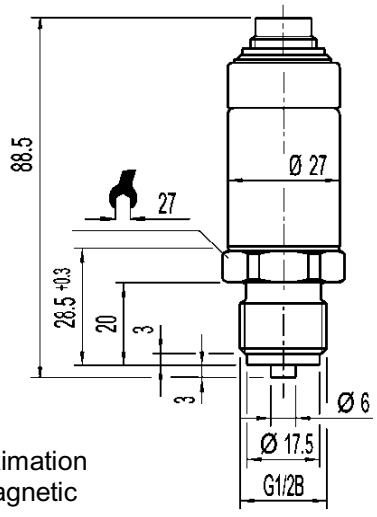
| | HND-PS19 | HND-PS20 | HND-PS21 | HND-PS22 | HND-PS23 | HND-PS24 | HND-PS25 | HND-PS26 |
|---|---|---|---|---|---|---|---|---|
| **Measuring range:** | 0,0 ... 400,0 mbar rel. | 0 ... 1000 mbar rel. | 0 ... 2500 mbar rel. | 0 ... 4000 mbar rel. | 0 ... 6000 mbar rel. | 0,00 ... 10,00 bar rel. | 0,00 ... 25,00 bar rel. | 0,00 ... 40,00 bar rel. |
| **Overload:** (max.) | 2 bar | 5 bar | 10 bar | 17 bar | 35 bar | 35 bar | 50 bar | 80 bar |
| **Resolution:** | 0,1 mbar | 1 mbar | 1 mbar | 1 mbar | 1 mbar | 0,01 bar | 0,01 bar | 0,01 bar |

| | HND-PS27 | HND-PS28 | HND-PS29 | HND-PS30 | HND-PS31 | HND-PS32 | HND-PS33 | HND-PS... (Sonderbereich) |
|---|---|---|---|---|---|---|---|---|
| **Measuring range:** | 0,00 ... 60,00 bar rel. | 0,0 ... 100,0 bar rel. | 0,0 ... 160,0 bar rel. | 0,0 ... 250,0 bar rel. | 0,0 ... 400,0 bar rel. | 0, 0 ... 600,0 bar rel. | 0 ... 1000 bar rel. | *refer to type plate* |
| **Overload:** (max.) | 120 bar | 200 bar | 320 bar | 500 bar | 800 bar | 1200 bar | 1500 bar | *refer to type plate* |
| **Resolution:** | 0,01 bar | 0,1 bar | 0,1 bar | 0,1 bar | 0,1 bar | 0,1 bar | 1 bar | *refer to type plate* |

**Sensortyp:** stainless steel relative pressure sensor for overpressure measuring.
Suitable for aggressive media, water, etc.
*Caution: The pressure compensation hole at the back part of the housing has to be kept clean!*

## 5.3 Common specifications (HND-PA..., HND-PS...):

**Accuracy:** (typ. values) ±0,2%FS (hysteresis and linearity)
±0,4%FS (temperature influence from 0-50°C)
**Pressure connection:** connections thread G1/4. Key width: 27 mm
**Device Connection:** M12-plug, for connection cable HND-K31
**Electronics:** PC-board with amplifier and data memory for sensor data (measuring data, calibration etc.) integrated in sensor housing.
**Nominal temperature:** 25 °C
**Operating conditions:** -20 to +70 °C (compensated range: 0 to 70 °C)
**Storage temperature:** -40 to +80 °C
**Housing:** made of stainless steel (CrNi steel or Elgiloy®)
**Weight:** 220 g
**IP rating:** IP 67 (sensor), IP 54 (plug)
**EMC:** The HND... corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (2004/108/EG). Additional fault: <1%



# Operating Instructions

# for

# Digital Pressure Sensor

## Model: HND-PS04

# 1. Contents



**Manufactured and sold by:**

Kobold Messring GmbH
Nordring 22-24
D-65719 Hofheim
Tel.: +49(0)6192-2990
Fax: +49(0)6192-23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Digital Pressure Sensor model: HND-PS04
- Operating Instructions

# 4. Regulation Use

Any use of the Digital Pressure Sensor, model: HND-PS04, which exceeds the manufacturers specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Operating Principle

With the appropriate external pressure sensors, precise measurement results over the entire measuring range can be achieved. Various pressure sensors are available for a multitude of measuring tasks and special applications.

# 6. Mechanical Connection

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".
2. If the device is transported from a cold to a warm environment condensation may result in a failure of the device. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
3. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting. Operator safety may be at risk if:

   - there is visible damage to the device.
   - the device is not working as specified.
   - the device has been stored under unsuitable conditions for a longer time.

   In case of doubt, please return device to manufacturer for repair or maintenance.

**Warning: Do not use this product as safety or emergency stop device or in any other application where failure of the product could result in personal injury or material damage.**
**Failure to comply with these instructions could result in death or serious injury and material damage.**

4. Any changes or repair of the device is not allowed.
   Please return device to manufacturer for repair or maintenance.

# 7. Operation

a) You must only use the sensor with HND-P-devices (see Datasheet)!
Usage of other devices may result in destruction of sensor and device.
b) Treat sensor and device carefully. Use only in accordance with above specification. (Do not throw, hit against etc.). Protect plug from soiling.
c) To disconnect pressure sensor do not pull at the cable but at the plug (to open lock).
When connecting the sensor make sure that arrows are pointing upwards and that plug is entered into device socket centrally. Do not twist plug when entering socket.
If plug is entered correctly, it will slide in smoothly.
If plug is twisted or entered incorrectly the connecting pins of the plug can be spoilt by bending or broken => Plug can no longer be used and connecting cable needs to be replaced.
d) HND-PS01...HND-PS08 (= standard (plastic) pressure sensors): Connection diagram for sensor tube connection:

**For measurements of over pressure (relative pressure sensor):**

- Connect plastic tube with internal dia of 4 mm to cable gland "B". Connection "A" will not be used!

**For measurements of pressure differences (relative pressure sensor):**

- Connect both plastic tubes with an internal dia of 4 mm to cable gland "B" and "A"; make sure to apply higher pressure to connection "B"

**For measurements of absolute pressure (absolute pressure sensor):**

- Connect plastic tube with an internal dia of 4 mm to cable gland "A".(Cable gland "B" is not used.)

# 8. Technical Information

| Measuring range | Linearity/temperature dependency 0...50 °C | Resolution | Overload | Operating temperature | Connection | Order-no. |
|---|---|---|---|---|---|---|
| -1000… 2000 mbar rel. | ±0,2% of full scale/ ±0,4% of full scale* | 1 mbar | max. 4 bar | 0…+50 °C | Nylon spigot for hose 6x1 mm | **HND-PS04** |

* in the range from 0 to 50 °C

# 9. Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Digital Pressure Sensor Model: HND-PS04**

to which this declaration relates is in conformity with the standards noted below:

**EN 61326-1:2006** Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Also the following EC guidelines are fulfilled:

**2004/108/EC** EMC Directive
**2006/95/EC** Low Voltage Directive

Hofheim, 23. Sept. 2014

H. Peters
General Manager

M. Wenzel
Proxy Holder