Operating Instructions

for

Hand-Held Pressure Measuring Devices with Integrated Pressure Sensors

Model: HND-P231

1. Contents

1. Contents 2
2. Note 3
3. Instrument Inspection 3
4. Regulation Use 3
5. Operating Principle 4
6. Electrical Connection 4
   6.1 General 4
7. Operation 5
   7.1 General 5
   7.2 Configuration 7
   7.3 Operation Of Logger 9
   7.4 The Serial Interface 12
   7.5 Pressure Connection To The Sensors 13
   7.6 Error And System Messages 14
   7.7 Calibration Services 14
8. Maintenance 15
   8.1 Battery Operation 15
9. Technical Information 15
10. Order Codes 16
11. Declaration of Conformance 17

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.

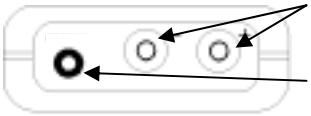
1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under chapter 9 Technical Information.
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets 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.

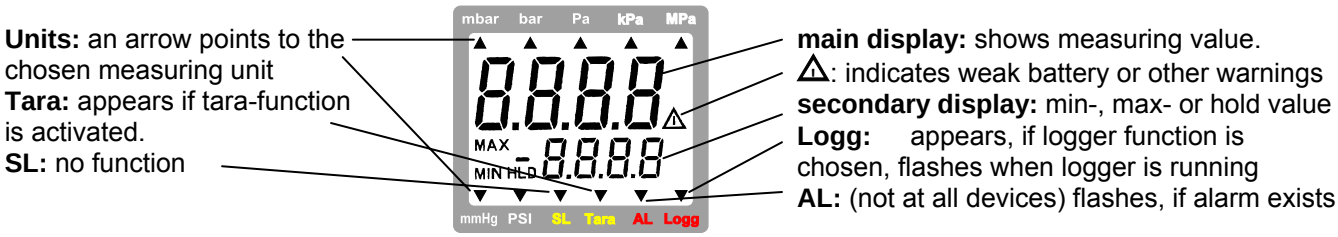
   In case of doubt, please return device to manufacturer for repair or maintenance.

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.

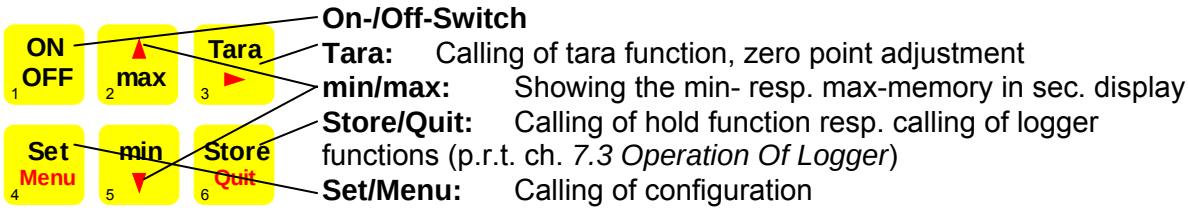
7.1.3 Display



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*).



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: (for rel. pressure sensors only) 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 button 3 for approx. 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.

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	
‚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	
	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	-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 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“.

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 >100 Hz, the value is displayed unfiltered.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of < 10 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 >100 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 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.

7.2.4 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.

7.2.5 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.

7.2.6 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.

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 GSOFT3050 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 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 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: 9999

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..9999.

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.

Supported functions:

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			194	Set display unit
x	x	x	3	Read system state	x	x	x	199	Read kind of measuring of display
x			6	Read min memory	x	x	x	200	Read min display range
x			7	Read max memory	x	x	x	201	Read max display range
x	x	x	12	Read ID number	x	x	x	202	Read display range - unit
x			22	Read min alarm rail (AL. - AL.Lo)	x	x	x	204	Read display range – decimal point
x			23	Read max alarm rail (AL. - AL.Hi)	x			208	Read # of channels
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

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?
108 bAt	Low battery power, device will only continue operation for a short period of time	Replace battery
bAt	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 (-25,00...+25,00 mbar)
Accuracy:	±0.3 % f.s. (Hysteresis and linearity) ±0.4 % f.s. (in the range o f 0-50 °C)
Resolution:	0.01 mbar
Units:	mbar, bar, Pa, kPa, mmHg, PSI, m (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 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 (via 3-pin jack, transformer on RS232 or USB optional)
Power supply:	9 V-monobloc battery (included in the scope of delivery), extern 10.5-12 V_{DC} via jack
Current consumpt.:	max. 3 mA
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

Additional functions with
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 ¡Ý10 msec
Adjustable measuring cycle:

»slow«	4 measurements/sec
»fast«	≥ 100 measurements/ sec (filtered)
»peak-detect«	≥ 100 measurements/sec

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

Manual:	99 datasets
Cyclic:	9999 datasets Adjustable cycle time: 1 sec...1 h

10. Order Codes

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

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+A1+A2

Also the following EEC guidelines are fulfilled:

2004/108/EG Electromagnetic Compatibility Directive

2006/95/EG Low Voltage Directive

Hofheim, 01. April 2006

H. Peters	M. Wenzel
General Manager	Proxy Holder