Operating Instructions

for

pH-, Redox- and Temperature Portable Measuring Instruments

Model: HND-R106

1. Contents

Manufactured and sold by:

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2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The instruction manuals on our website www.kobold.com are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

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:

- pH-, Redox- and Temperature Portable Measuring Instruments
  model: HND-R106

4. Regulation Use

Any use of the pH-, Redox- and Temperature Portable Measuring Instruments, model: HND-R106, 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 hand-held pH, Redox and temperature measuring instruments of the HND-R106 model are compact and universally applicable measuring units for electrodes with BNC plug connection. An extensive selection of electrodes makes it possible to use the HND-R106 in almost all application areas. The KOBOLD HND-R105 measuring unit offers functions like minimum/maximum value memory, hold function, auto off function and automatic temperature compensation. In addition to pH, Redox and temperature measurement, the device can display the rH value. This is calculated from the measured Redox-value and the previously measured or manually entered pH-value.

6. Electrical Connection and Maintenance Advice

Treat device and sensor carefully. Use only in accordance with above specification (do not throw, hit against etc.). Protect plug and socket from soiling.

6.1 Mains operation

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

6.2 Battery operation

The devices are always delivered with the battery disconnected.

The battery must be connected before commissioning.

6.3 When to replace battery

If ⚠ and ´bAt´ are shown in the lower display the battery has been used up and needs to be replaced. The device will, however, 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.

6.4 Temperature probe

When connecting the temperature probe the connector may not lock to the jack correctly.
In such a case hold the connector not at the case but at the buckling protection of the cable during the plug in. Don't connect electrode canted! If plug is entered correctly, it will slide in smoothly. To disconnect temperature probe do not pull at the cable but at the plug.
If plug is entered incorrectly the connecting pins of the plug can be damaged. => Plug can no longer be used and connecting cable needs to be replaced.

6.5 Damaged electrode

Display values for damaged electrode cable or if no pH or redox-electrode has been connected:
If no electrode is connected or the connection cable is damaged the display will nevertheless show mV, pH or rH values.
Please note that these values can never be correct measuring results!

7. 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 Technical Data.
   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.
2. 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 (short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. sensor socket, serial interface).

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 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 time.

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

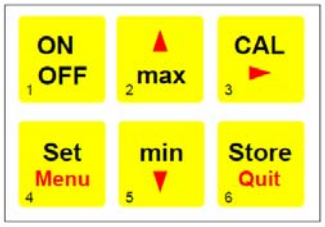
Warning: Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage. Failure to comply with these instructions could result in death or serious injury and material damage.

8. Instrument Description

8.1 Displays

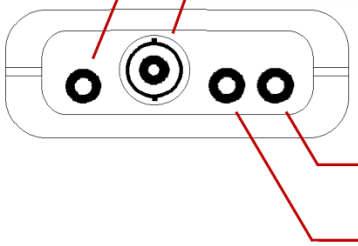
1	**Main display**: pH value, ORP value (mV, mV_H), rH value	
2	Display elements to show minimum/maximum/ memorized measuring value	
3	Arrows to selected **measuring unit**	
4	**Warning signal** (low battery or recalibration prompt)	
5	**atc arrow**:	indicates if temperature sensor is connected and therefore **automatic temperature compensation** is active (only for 'pH', 'mV_H' and 'rH' measuring mode)
6	**stab arrow**:	indicates stable measuring value
7	**cal arrow**:	indicates a running calibration (at operation mode '**pH**').
8	**Secondary display**: temperature value	
9	**No function**	

8.2 Pushbuttons



ON / OFF 1	**On / off key**
max 2 + min 5	**min/max when taking measurements:** press shortly: min. or max. meas. value so far will be displayed press for 2 sec.: the min. or max. value will be deleted **Configuration**: to enter values, or change settings
CAL 3	**Cal**: only at mode 'pH': press shortly: display of electrode state rating (electrode symbol +bar graph display) press for 2 sec: start pH calibration
Set Menu 4	**Set/Menu**: press shortly: at 'pH', 'rH' and 'mV_H': manual temperature input (if no temperature probe is connected) additionally at 'rH': manual input of pH value press for 2 sec. (menu): invoke configuration menu
Store Quit 6	**Store/Quit**: Measuring: hold and save current measuring value ('HLD' is displayed) Set/Menu: confirm settings, return to measuring

8.3 Connections



Interface: connection for galv. isolated interface adapter (accessory: HND-Z031, HND-Z032)

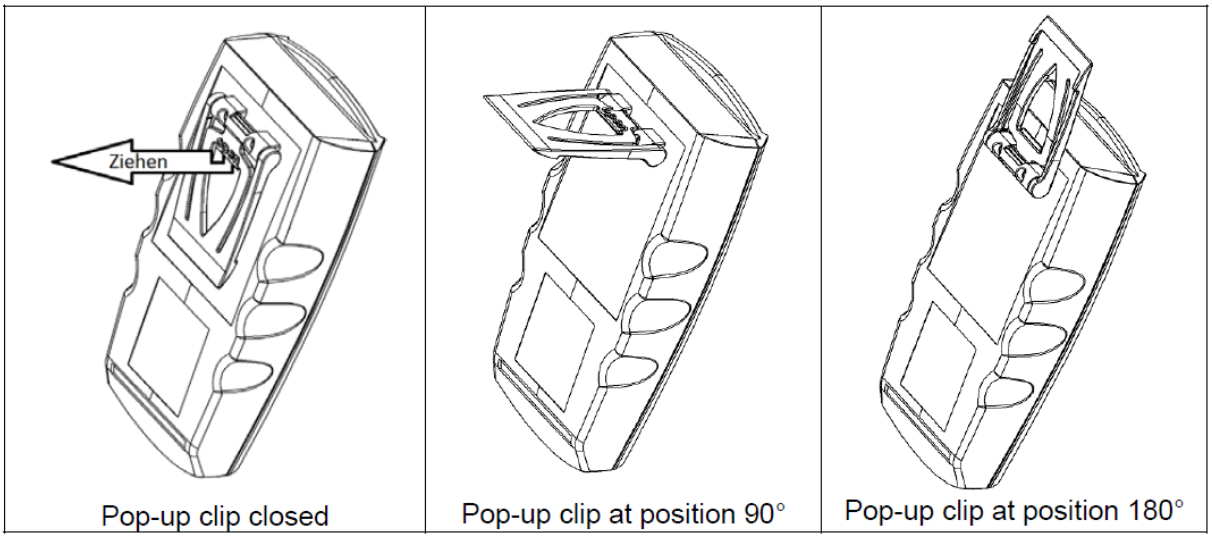
BNC socket: connection of ph or ORP electrode (glass electrodes or combination electrodes)

Banana sockets:
Connection of PT1000 temperature probe
Electrodes with integrated temperature sensor:
The banana plug is connected from outside
Separately lead through reference electrode:
It is connected from inside

Power supply: additional d.c. connector (internal pin ø 1.9 mm) for external 10.5-12 V direct supply

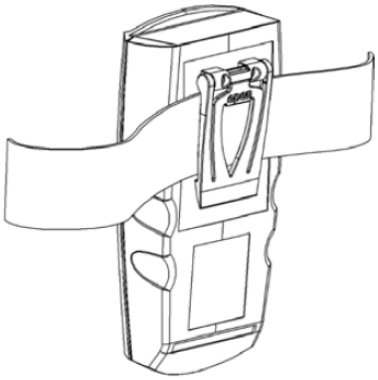
8.4 Pop-up clip

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.



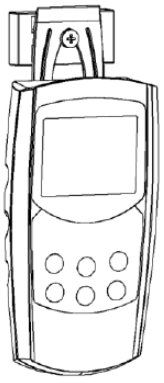
Pop-up clip closed | Pop-up clip at position 90° | Pop-up clip at position 180°

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

8.5 Start Operation

Turn device on via ON/OFF key.

After segment test  the device displays some information on its configuration:

Corr if zero point or slope correction is active (see chapter 13 Adjustment of temperature input)

After that the device is ready for measuring.

9. Principles of the measurements

9.1 pH measurement

The pH value specifies the acid or alkaline behaviour of aqueous solutions.
Solutions with a pH values below 7 are acid (the more below 7 the more acid), values higher than 7 mean alkaline and pH = 7 means neutral.
The pH value is the negative common logarithm of the hydrogen ion activity (this is often approximately equal to the concentration of dissolved hydronium ions):

$$pH\ value = -\log_{10}\left(\frac{c(\mathrm{H^+}) \cdot f(\mathrm{H^+})}{1\mathrm{mol/l}}\right)$$

with $c(H^+)$: concentration of dissolved hydronium ions in mol/l
$f(H^+)$: activity coefficient (normally lower than 1)

The abbreviation “pH” stands for pondus Hydrogenii (Latin pondus: “weight“; Hydrogenium: “hydrogen“).
pH values should always be measured and saved together with the temperature of the solution: i.e. pH 5.87; 22.8 °C.
Reason: The pH values of most liquids are depending on temperature.

The pH measurement is highly precise but also very sensitive. The measured signals are very weak (high resistance), especially if measured in low-ion media. Therefore, it is very important that:
- disturbances (electrostatic charge, etc.) are prevented.
- a stable value is reached by slow stirring.
- contact plugs are kept clean and dry.
- the electrode shaft is not submersed for a longer period (exception: special water-proof types).
- the electrode is calibrated often enough (see below). The needed calibration frequency depends on the used electrode and application and varies between once every hour to once in several weeks.
- A suitable electrode is chosen. Please refer to chapter 9.4

9.2 ORP measurement

The ORP potential (also known as reduction potential or ORP) is a measure of the oxidizing or reducing potential of the measured media compared to the standard hydrogen electrode.
This potential is often used in swimming pools to rate the disinfectant effect of chlorination. Also, for aquarium keepers the ORP value is an important parameter, because fishes need ORP values within specified boundaries to live. Drinking water purification, water monitoring and industrial applications are some further fields where the ORP value is of importance.
The measurement is done with a common silver chloride electrode (reference system with 3-molar potassium chloride solution). The measured value can be directly displayed (mode mV) or converted to “reference system: standard hydrogen electrode” and temperature compensated at mode mVH.

There is no calibration comparable with that of the pH measurement. However, the electrode's capability can be checked with ORP test solutions (for example HND-Z074).
Suitable ORP electrodes: e.g. HND-RF08

9.3 rH measurement

The rH value is a calculated value of a pH and an ORP measurement. For example, it is used to describe the anti-oxidative effect of food. This is a measure for the ability of food to reduce harmful free radicals.

To measure the rH value of a solution, proceed as follows:

9.3.1 Manual input of pH value (and temperature)

You can set the value for pH and temperature (if no temperature sensor is connected) manually. Press key Set Menu shortly and set the temperature value with keys max and min Press Set Menu shortly again and enter the pH value. Confirm with Store Quit.

9.3.2 Automatic input of pH value from preceding pH measurement

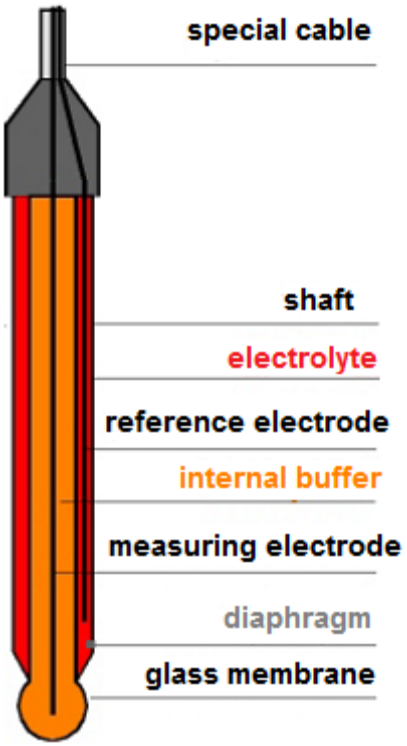
It is important that the pH and ORP electrodes are in sound condition and that they are cleaned and dried well before they are inserted to the solution.
First place pH and ORP electrode and temperature probe in the solution and stir carefully.

1. **Measuring pH value:**
   Connect the pH electrode and temperature probe to the device.
   Then set device to pH measuring mode and calibrate electrode if necessary (p.r.t. chapter 9.5 Calibration of pH measurement and chapter 10 Configuration).

   Measure the pH value of the solution and store the measured value with Store Quit.
   Do not turn off the device until the tH measurement is finished. If the device is turned off the saved pH value is deleted and has to be set manually for the following rH measurement.

2. **Get the rH value:**
   Connect ORP electrode and set device to rH measuring mode. The main display shows the calculated rH value of the solution, the secondary display shows the prior measured pH value and the temperature alternatingly.

9.4 pH electrode



9.4.1 Design

In most cases so-called combination electrodes are used. That means that all needed elements are integrated in a single electrode (including reference electrode).
Sometimes even a temperature sensor is integrated.
The picture on the right shows an electrode without temperature sensor.
There are several design types for the diaphragm, but generally said it is the connection between electrolyte and the measured solution. A blockade or soiling of the diaphragm is often the reason for the electrode's idleness and erratic behaviour.
The glass membrane has to be treated with care. The hydrated gel layer forms on the surface of the glass membrane, which is of highest importance for the measurement. The electrode has to be kept wet to preserve the hydrated gel layer (see below).

9.4.2 Further Information

PH-electrodes are wearing parts which need to be replaced, if the values required can no longer be kept even after thorough cleaning and recovery or the electrode signal gets to slow. The actual lifetime of an electrode depends highly on the chemical or mechanical stress it is subjected to. Please take into account that there are several materials that are in aqueous solutions aggressive to glass; other chemicals may react with the KCl-solution in the electrode thus causing blockades in the diaphragm.

Examples:
- with solutions containing protein, like they are used on the medical and biological sector, KCl may result in the denaturation of the protein. - coagulated varnish
- solutions with a relatively high concentration of silver ions

Any material depositing on the measuring membrane or the diaphragm will influence the measurements and have to be removed at regular intervals. This can be done by means of automatic cleaning equipment.

Electrodes have to be stored in a way that they are kept wet. An adequate solution is to store them with suitable protective cap filled with KCl 3 M. Please consider also the instructions in the electrode's manual!

Standard cleaning: apply 0.1 molar HCl-solution for at least 5 minutes or protein cleaning agent.
The average service life of an electrode is 8 to 10 months but may be increased to 2 years if electrode is well maintained and treated carefully. We regret not being able to give more detailed information as this is highly dependent on the individual case of application.

9.5 Calibration of pH measurement

The electrode data of pH electrodes are subject to fluctuation due to ageing and manufacturing tolerances. Therefore, it is necessary to check the calibration with buffer solutions before measurements take place. If deviations are too large, a recalibration is necessary. See also chapter 20 Preparation of ph Buffer Solution.

Buffer solutions are liquids with an accurate pH-value. The following buffers can be used for calibration:
- Technical buffer series PHL (ready to use, pH 4.01, pH 7.00 und pH 10.01)
- Standard series GPH (buffer capsules to be mixed with water pH 4.01, pH 7.00 and pH 10.01) - DIN series CAL dIn (pH 1.68 (A), pH 4.01 (C), pH 6.87 (D), pH 9.18(F) und pH 12.45(G))
- Arbitrary buffer CAL Edit (neutral buffer ranging from 6.5 ... 7.5pH)

Service life of a buffer solution is limited and will be further reduced unless the electrodes are properly rinsed and dried when changing over the solutions. This may even result in incorrect calibration! We recommend to use new buffer solution for calibration, as far as possible, and to rinse with deionized or distilled water.

9.5.1 Automatic temperature compensation during calibration

Both the signal of the pH-electrode and the pH-buffer are depending on temperature. If a temperature probe is connected, the temperature influence of the electrode is compensated automatically during measuring as well as during calibration. Otherwise enter actual buffer temperature as accurate as possible (see below). When working with the standard or DIN-buffer series, the influences of buffer temperature are also compensated. If buffers are entered manually, make sure to enter the pH-values of the buffers at the relevant temperature to ensure optimum calibration of the device.

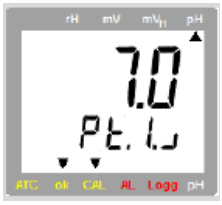
9.5.2 How to carry out calibration

Please note: the calibration can only carried out at a temperature range of 0 - 60°C !

If you have not yet done so set device to measuring mode 'pH'. Make sure that either the 1-, 2- or 3- point calibration (whichever is required) and desired buffer series (PHL, GPH, dIn or Edit) the has been activated (further information in chapter 7 „Configuration").
Carefully remove electrode safety cap (Attention! Contains 3 mol KCl!).
Rinse electrode with distilled water and dry it carefully.

How to start calibration: press CAL key for 2 seconds.
The display will prompt you to measure the first calibration solution. You can abort calibration at any time by pressing Set Menu key. In such a case the last calibration before this one remains valid.

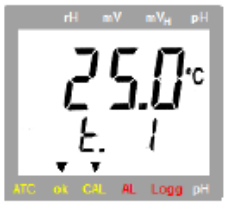
1. Calibration point 1: 'Pt. 1'



Place electrode and temperature probe (if any) in the neutral solution stirring gently.
(For 1-point calibration: solutions with arbitrary pH value (e.g. pH 4) can be used)
As soon as the measured pH value got stable the next calibration step will be displayed.

***1)**

No temperature sensor: manual input of temperature of buffer 1



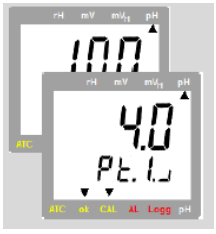
Use max or min to enter the temperature of the buffer solution.

Use Store Quit to confirm the value; the next calibration step is displayed.

If 1-point calibration is chosen the calibration is already done at this point, the bar graph display on the left shows the electrode's state rating.

2. Rinse electrode in distilled or deionized water, dry electrode

3. Calibration point 2: 'Pt. 2' (only for 2- or 3- point calibration)

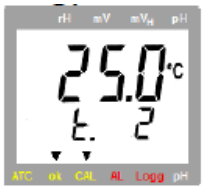


Place electrode and temperature probe (if any) in the second buffer solution (e.g. for standard series this is: pH 4.0 or pH 10.0) and stir gently.

As soon as the measured pH value got stable the next calibration step will be displayed.

***1)**

No temperature sensor: manual input of temperature of buffer 2

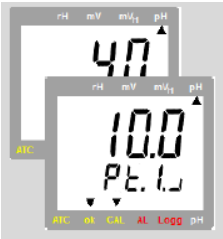


Use max or min to enter the temperature of the buffer solution. Use Store Quit to confirm the value; the next calibration step is displayed.
If 2-point calibration is chosen the calibration is already done at this point, the bar graph display on the left shows the electrode's state rating.

4. Rinse electrode in distilled or deionized water, dry electrode

5. Calibration point 3: 'Pt. 2' (only for 3- point calibration)

Please note: both, an alkaline and acid calibration point are needed for a 3-point calibration.

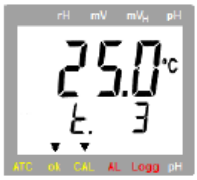


Place electrode and temperature probe (if any) in the third buffer solution (e.g. for standard series this is: pH 10.0) and stir gently.

As soon as the measured pH value got stable the next calibration step will be displayed.

***1)**

No temperature sensor: manual input of temperature of buffer 3



Use max or min to enter the temperature of the buffer solution.

Use Store Quit to confirm the value; the next calibration step is displayed.

Calibration has finished, the bar graph display on the left shows the electrode's state rating.

***1)** In case of manual buffer selection (CAL Edit) use max or min to enter pH value of the used solution. If solutions from the standard and DIN series are used their pH value will be automatically detected.

Use Store Quit to confirm the value; the next calibration step is displayed.

Error messages of pH calibration:

CAL Err.1	Neutral buffer not permissible - wrong buffer solution - Buffer solution defective - Electrode defective	Always use neutral buffer as first solution (exception: 1 point calibration) Use new buffer solution Clean electrode and calibrate again, if error occurs again →replace electrode
CAL Err.2	Slope is too low: - Buffer solution defective - Electrode defective	 Use new buffer solution Replace electrode
CAL Err.3	Slope is too high: - Buffer solution defective - Electrode defective	 Use new buffer solution Replace electrode
CAL Err.4	Incorrect calibration temperature	Calibration can only be done at 0...60°C

Permissible electrodes' data:
Asymmetry: ±55 mV, Slope: -62 ...-45 mV/pH

10. Configuration

Some menu points depend on current device settings.
To change device settings, press **“Menu”** Set Menu for 2 seconds. This will activate the configuration menu (main display: “SEt”). Pressing **“Menu”** Set Menu changes between the menus points, pressing CAL jumps to the referring parameters, which can be selected with key CAL.
The parameter can be changed with max or min. Pressing **“Menu”** Set Menu again jumps back to the main configuration menu and saves the settings. Pressing “Quit” Store Quit finishes the configuration and returns back to standard measuring operation.

Pressing “menu” and “store” at the same time for more than 2 seconds will reset the device to factory defaults.
If no key is pressed for more than 2 minutes the configuration will be aborted. All changes will not be saved!

Menu	Parameter	Value	Description		
Set Menu	CAL	max or min .			
SEt ConF	**Set Configuration: General configuration**				
	InP	**Input: Selection of measured values**			
		Arrow **„rh“**	rH value measurement		
		Arrow **„mV“**	mV value measurement (REDOX or ORP)		
		Arrow **„mV$_H$“**	mV value measurement referring to standard hydrogen system		
		Arrow**„pH“**	pH value measurement		
	rES pH	**Resolution pH: resolution of pH display**			
		0.1..0.01	tenth pH..hundredth pH		
	CAL	**Calibration: Select number of calibration points**			
		1-Pt	1-point (only offset calibration, slope = -59.2 mV/pH)		
		2-Pt	2-point (neutral + another one)		
		3-Pt	3-point (neutral + one acid + one alkaline buffer)		

Menü	Parameter	Value	Description		
SEt ConF	CAL.P	**Calibration: Select buffer series**			
		GPH	Technical Buffer series: GPH-Capsules (pH 7, pH 4, pH 10)		
		PHL	Technical liquid buffer series: PHL (pH 7, pH 4, pH 10)		
		dIn	DIN 19266 buffer series pH 1.68(A), pH 4.01 (C), pH 6.87 (D), pH 9.18 (F), pH 12.45 (G)		
		Edit	Arbitrary buffer, manual input		
	C.int	**Calibration: Calibration reminder period (factory setting: off)**			
		1...365	Calibration reminder period (in days)		
		oFF	No calibration reminder		
	Unit t	**Unit t: Select temperature unit**			
		°C	All temperatures in degree Celsius		
		°F	All temperatures in degree Fahrenheit		
	HLD Auto	**Auto Hold: Auto measuring value identification**			
		on	Auto measuring value identification Auto Hold		
		oFF	Standard hold function on key press		
	P.oFF	**Auto Power-Off: Select power-off delay**			
		1…120	Power-off delay in minutes. Device will be automatically switched off as soon as this time has elapsed if no key is pressed/no interface communication takes place.		
		oFF	Automatic power-off function deactivated (continuous operation)		
	Out	**Universal Output**			
		oFF	Interface off → minimal power consumption		
		SEr:	Serial interface activated		
		dAC:	Analog output activated		
	Adr.	**01,11..91**	Base address for serial interface communication		

SEt Corr	**Set Corr: Input adjustment**				
	mV OFFS	**Zero adjustemnt/offset of voltage measurement**			
		oFF	No zero adjustment for voltage measurement		
		-10…10 mV	Offset of voltage measurement in mV		
	mV SCAL %	**Slope adjustment of voltage measurement**			
		oFF	No slope adjustment for voltage measurement		
		-5.00…5.00%	Slope correction of voltage measurement in %		
	OFFS °C	**Zero adjustment/offset of temperature measurement**			
		oFF	No zero adjustment for temperature measurement		
		-5.0...5.0 °C	Offset of temperature measurement in °C		
	SCAL °C %	**Slope adjustment of temperature measurement**			
		oFF	No slope adjustment for temperature measurement		
		-5.00..5.00 %	Slope correction of temperature measurement in %		
SEt CLOC	**Set Clock: Settings for real time clock**				
	CLOC	**HH:MM**	**Clock:** set time hours:minutes		
	YEAr	**YYYY**	**Year:** set year		
	dAtE	**TT.MM**	**Date:** set date day.month		
rEAd CAL.	**rEAd CAL: Read calibration data:** **p.r.t. chapter 13.2 calibration storage (rEAd CAL)**				

11. Universal output

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

11.1 Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (HND-Z031, 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-S20M:** 20-channel software to display the measuring values

The device has 2 channels:
- Channel 1: actual-value-channel pH, mV or rH and base address
- Channel 2: temperature value

The unit of all transmitter values (including measuring / boundary values) is the unit of corresponding displayed values.

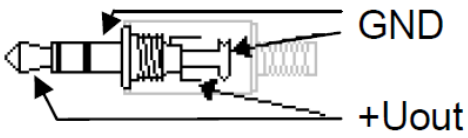
11.2 Analog Output

An analog voltage 0-1 V can be connected at the universal output connector (mode: “Out dAC”).
The analog output cannot be scaled.

Unit	0 V output signal	1 V output signal
pH	0.00 pH	14.00 pH
mV/mV_H	-2000 mV	2000 mV
rH	0.0 rH	70.0 rH

Please take care not to load the analog output too healy, otherwise the output value will be distorted and the power consumption will rise. Loads up to approx. 10 kOhm are unproblematic.
If the displayed value goes beyond the fixed value, the output voltage will be 1 V.
If the displayed value falls below the fixed value, the output voltage will be 0 V.
In error case (Err.1, Err.2, etc.) the output voltage will be slightly higher than 1 V.

plug wiring:



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

12. Input adjustment

The zero point and slope of each measuring inputs can be adjusted with the parameters offset (“OFFS”) and scale (“SCAL”).
A reasonable adjustment presumes reliable references (e.g. ice water, controlled precision water bath, etc.). If the inputs are adjusted (i.e. offset and scale are different from default settings) the device will shortly display “Corr” after turned on.
Default setting for offset and scale are ‘off’ = 0.0, i.e. inputs are not changed.

Zero point correction:
Displayed value = measured value – OFFS

Zero point and slope correction:
Displayed value = (measured value – OFFS) * (1 + SCAL / 100)
Displayed value °F = (meas. value °F - 32°F - OFFS) • (1 + SCAL / 100)

13. GLP

GLP (Good Laboratory Practice) includes regular check of devices and accessories. For pH measurements it is highly important to ensure correct pH calibration. The device provides the following functions to help with this.
The usage of the GLP functions is only reasonable if the electrode is not changed. Although all data is stored in the device, it refers to the particular electrode.

13.1 Calibration interval (C.Int)

You can input the interval after which the device reminds you to recalibrate.
The interval times should be chosen according to the application and the stability of the electrode. “CAL” flashes on the display as soon as the interval has expired.

13.2 Calibration storage (rEAd CAL)

The last 16 calibrations are stored with results and date and can be read out.
Display calibration data:
Historical calibration data can be comfortably read out via PC software HND-Z034 or displayed directly at the device:

Set Menu	**Press for 2 seconds** The display will show:	rEAd LoGG oder SEt ConF (configuration level)
Set Menu	**Press several times until this is displayed:**	rEAd CAL. **read cal. = “read calibration data”**
CAL	**Press shortly:** switch between - U.ASY = asymmetry voltage in mV - SL. 1 = slope acid in mV/pH *1) - SL. 2 = slope alkaline in mV/pH *1) - date+time display of data set	
max or min	Change between the different calibration data sets	
Store Quit	Quit calibration data sets display	

*1) 1-point calibration: slope acid = slope alkaline = 59.16mV/pH is assumed
2-point calibration: slope acid = slope alkaline = determined slope
3-point calibration: slope acid and slope alkaline are determined separately

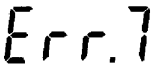
14. Real Time Clock (“CLOC”)

The real time clock is used for chronological assignment of the logger data and calibration points. Please check the settings when necessary.

15. Accuracy Check / Adjustment Service

You can send the device to the manufacturer for adjustment and inspection.
Calibration certificate - DKD certificate - official certifications:
If the measuring instrument is supposed to receive a calibration certificate, it has to be sent to the manufacturer (declare test levels, e.g. -20; 0°C; 70°C).
If the device is certificated together with a suitable sensor very high overall accuracies are possible.
Basic settings can only be checked and – if necessary – corrected by the manufacturer.
A calibration protocol is enclosed to the device ex works. This documents the precision reached by the production process.

16. Error and System Messages

Display	Description	What to do?
No display or confused characters, device does not react on keypress	Battery empty Mains operation: wrong voltage or polarity System error Device defective	Replace battery Check power supply, replace it when necessary Disconnect battery and power supplies, wait shortly, then reconnect Return to manufacturer for repair
	Measured value above allowable range Sensor defective	Check: Measuring value not within sensor range? -> measuring value to high! Return to manufacturer for repair
	Measured value below allowable range Sensor defective	Check: Measuring value not within sensor range? -> measuring value to low! Return to manufacturer for repair
	System error Value extremely out of measuring range	Return to manufacturer for repair Check: Value not within sensor range?
> CAL < CAL flashing in display	Either preset calibration interval has expired or last calibration is not valid	Device has to be calibrated!
	Neutral buffer not permissible Wrong buffer solution Buffer solution defective Electrode defective	Always use neutral buffer as first solution (exception: 1 point calibration) Use new buffer solution Clean electrode and calibrate again, if error occurs again -> replace electrode
	Slope is too low Electrode defective Buffer solution defective	Replace electrode Use new buffer solution
	Slope is too high Electrode defective Buffer solution defective	Replace electrode Use new buffer solution
	Incorrect calibration temperature	Calibration can only be done at 0…60 °C

17. Technical Information

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

18. Order Codes

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

19. Dimensions

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

20. Preparation of ph Buffer Solution

Working and Calibration set HND-Z0763 (see chapter 20.1 Accessories**)**

How to prepare a calibrating solution:

- Fill 2 plastic bottles with 100 ml distilled water (e.g. battery water) each. 100 ml will cover the entire cylindrical area, i.e. approx. 55 mm as of bottle base.

- Open pH 7 capsule (green) carefully (turn one half of the capsule while pulling and make sure not to spill any solution); put content (including both capsule parts) into one of the bottles.

- Put content of pH 4 capsule (orange) (resp. pH 10), including both capsule parts, in the second bottle. The capsule shell will colour the liquid with the respective characteristic colour:
orange = pH 4.0; green = pH 7.0, blue = pH 10.0

Make sure to prepare buffer solutions in time as they can only be used after 3 hours. Shake well before use.
Eventually the capsules won't resolve totally. The residues can stay in the liquid without any negative effect, or they can be removed after colouring the liquid.
The buffer solutions have a limited operational life of 3 - 4 months and should be renewed after this period. The capsules itself are practically stable for an unlimited time and should be kept in reserve.

General maintenance and measuring instructions for pH combi-electrodes:

Make sure to observe the following points to maintain optimum capacity and accuracy of electrode as long as possible:

- **Important!** Make sure to always keep pH-glass diaphragm in a slightly moist condition. If electrode is not used, the pH-glass diaphragm has to be immersed into a 3 mol/l KCl solution for storage.
Drying out of the pH-glass diaphragm will affect both its capacity and sensitivity. In order to wet it throughout, put glass diaphragm in a 3 mol KCl solution for 24 hours.
- Check liquid level of reference electrolyte at regular intervals; if necessary, top up with 3 mol/l KCl solution through filling hole using a syringe or pipette.
- As they will influence the measurements, any deposits that may accumulate on the measuring membrane or diaphragm have to be removed regularly.
When conducting measurements in cheese, milk and other products containing proteins, a special cleaning agent HND-Z073 (pepsin solution) has to be used for cleaning of the electrode.

- Dirty electrodes have to be cleaned. You will find suitable cleaning agents for the pH-glass diaphragm in the following table:

Contamination	Cleaning agent
Various deposits	Light cleaning agent
Inorganic coatings	Commercial liquids for cleaning of glass
Metal compounds	1 mol/l HCl solution
Oil, grease	Special cleaning agents or solvents
Biological coatings containing proteins	1 % pepsin enzyme in 0.1 molar HCl solution
Resin-lignines	Acetones
Highly resistant deposits	Hydrogen superoxide, sodium hypochloride

20.1 Accessories

Order-no.	Description
HND-Z002	Plug power supply unit (220/240 V_{AC}, 50 / 60 Hz), 10.5 V_{DC}/10 mA
HND-Z012	Protective housing bag, nappa leather, 2 with cut-outs for round sensor connections
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 RS 232, galvanically isolated
HND-Z003	Interface converter on USB, galvanically isolated
HND-Z033	Adapter RS 232-converter on USB-interface
BUS-S20M	Software for recording measurement data on a computer, for instruments of the HND-series without logger function
HND-Z071	3 mol/L KCl-electrolyte for refilling or storing electrodes, 100 ml wash bottle
HND-Z073	100 ml Pepsin cleaning solution
HND-Z074	100 ml Redox testing solution (220 mV at 25 °C)
HND-Z075	100 ml plastic wide mouth bottle
HND-Z076	Work and calibration set, consisting of 5 buffer capsules each pH 4, pH 7, pH 10, 3 xHND-Z075, 1 xHND-Z071, 1 xHND-Z073

*observe instrument dimension
Additional accessories on request

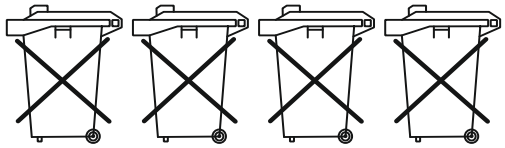
21. Disposal

Note!

- Avoid environmental damage caused by media-contaminated parts
- Dispose of the device and packaging in an environmentally friendly manner
- Comply with applicable national and international disposal regulations and environmental regulations.

Batteries

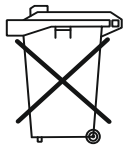
Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:



Cd[1] Hg[2] Pb[3] Li[4]

1. „Cd" stands for cadmium
2. „Hg" stands for mercury
3. „Pb" stands for lead
4. „Li" stands for lithium

Electrical and electronic equipment



22. EU Declaration of Conformance

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

pH-, Redox-, and Temperature Portable Measuring Units model: HND-R106

to which this declaration relates is in conformity with the following EU directives stated below:

2014/30/EU	Electromagnetic compatibility
2011/65/EU	**RoHS** (category 9)
2015/863/EU	Delegated Directive (RoHS III)

Also, the following standards are fulfilled:

EN 61326-1:2013
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

EN 50581:2012
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Hofheim, 10 October 2023

H. Volz
General Manager

J. Burke
Compliance Manager