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You can read the recommendations in the user guide, the technical guide or the installation guide for HANNA INSTRUMENTS HI 221. You'll find the answers to all your questions on the HANNA INSTRUMENTS HI 221 in the user manual (information, specifications, safety advice, size, accessories, etc.). Detailed instructions for use are in the User's Guide.

User manual HANNA INSTRUMENTS HI 221
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Instruction Manual
HI 221 HI 223
pH/mV/°C
Bench Meters
with Calibration Check



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Manual abstract:

@@@Com or turn to the back cover for our worldwide contact list. These instruments are in compliance with directives. @@The electrodes and the probes are guaranteed for a period of six months. This warranty is limited to repair or replacement free of charge. damage due to accidents , misuse , tampering or lack of prescribed maintenance are not covered. If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Technical Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any damage, notify your Dealer or the nearest Hanna Customer Service Center. Each instrument is supplied complete with: HI 1131P Glass-body Combination pH Electrode with 1 m (3.01 Buffer Solutions (20 mL each) HI 7071S Electrolyte Solution 12 VDC Power Adapter Instruction Manual Note: Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in the original packing with the supplied accessories.

HI 221 and HI 223 are logging microprocessor-based pH/ORP/temperature bench meters with Calibration Check. Calibration Check performs a set of diagnostic tests during calibration using the history of electrode slope and offset to detect problems that can cause loss of accuracy. calibration Check Features are: Enhanced Calibration Messages During calibration the user is warned if one or more parameters are not suitable to perform an accurate calibration. Determined from electrode performance during calibration. Can be programmed from 1 to 7 days or can be disabled.

Other features include: One or two point calibration with seven memorized buffers (1. 2) CFM / GLP key, to confirm different values or to display Good Laboratory Practice information. 3) CAL key, to enter and exit/escape the calibration mode. 4) / °C key, to manually decrease temperature, or other parameters. 5) / °C key, to manually increase temperature, or other parameters. 6) RCL key, to enter or exit the recall mode. 9) SET / CLR key, to enter the Setup mode or clear calibration history. Note: Pin input socket cannot be used as a reference input for electrodes with separate reference. 45) 100 points Manual or Automatic from: 20 to 120 °C HI 1131P glass body, single junction refillable cell, BNC + pin (included) HI 7669/2W stainless steel probe (included) 1012 9 12 VD C adapter (included) 240 x 182 x 74 mm (9. 45) 500 points Manual or Automatic from: 20 to 120 °C HI 1131P glass body, single junction refillable cell, BNC + pin (included) HI 7669/2W stainless steel probe (included) 1012 9 12 VD C adapter 240 x 182 x 74 mm (9.

POWER CONNECTION Plug the 12 VDC adapter into the power supply socket. Note: These instruments use non volatile memory to retain the pH, mV, temperature calibrations and all other settings, even when unplugged. Note: Electrode condition and response information is displayed on the bar graph gauges during the day the calibration is performed, only if HANNA P type (PIN) electrodes are used. If the electrode is not recognized as a HANNA P type electrode, the bar graph gauges will blink (25 seconds OFF, 4 seconds ON, full bar graph). All LCD tags are displayed and a beep is sounded while the instrument performs a self test. **PH MEASUREMENT** Make sure the instrument has been calibrated before taking pH measurements. The pH reading is out of range, the closest full-scale value will be displayed blinking on the primary LCD. It is also possible to view the mV reading by pressing the RANGE key. If measurements are taken successively in different samples, it is recommended to rinse the electrode thoroughly with deionized water or tap water and then with some of the next sample to prevent cross-contamination. the pH reading is affected by temperature.

In order to measure the pH accurately, this temperature effect must be compensated for. To use the Automatic Temperature Compensation feature, connect and submerge the HI 7669/2W temperature probe into the sample as close to the electrode as possible and wait for a few minutes. If the temperature of the sample is known, manual compensation can be performed by disconnecting the temperature probe. The display will then show the default temperature of 25 °C or the last recorded temperature reading with the °C symbol blinking. The temperature can now be adjusted with the ARROW keys (from -20.

ORP MEASUREMENTS An optional ORP electrode must be used to perform ORP measurements (see Accessories). oxidation-Reduction Potential (REDOX) measurements provide the quantification of the oxidizing or reducing power of the tested sample. To correctly perform a REDOX measurement, the surface of the ORP electrode must be clean and smooth. Pretreatment solutions are available to condition the electrode and speed up the response time. Allow a few minutes for the reading to stabilize.

If the reading is out of range, the closest full-scale value will be displayed blinking on the primary LCD. **TAKING TEMPERATURE MEASUREMENTS** Connect the HI 7669/2W temperature probe and turn the instrument on. Dip the temperature probe into the sample and allow the reading on the secondary LCD to stabilize. For best results and constant display of electrode condition and electrode response on the bar graph gauges we suggest at least a daily calibration. Every time you calibrate the instrument use fresh buffers and perform an electrode cleaning procedure (see page 32). **PREPARATION** Pour small quantities of the buffer solutions into clean beakers. If possible, use plastic or glass beakers to minimize any EMC interferences. For accurate calibration and to minimize cross-contamination, use two beakers for each buffer solution. It is always recommended to perform a two-point calibration, however the instrument also allows a one-point calibration, as described on page 11. 86 buffers be used as the first calibration point and pH 4.

45 buffer is not for general measurement; use only if the sample is very alkaline to avoid sodium error. Immerse the pH electrode and the temperature probe approximately 4 cm (1½) into the buffer solution of your choice (pH 1. The temperature probe should be close to the pH electrode. Press the CLR key if you are using a new electrode or want to clear the calibration history. It is very important to clear the calibration history when a new electrode is used because all error and warning messages that appear during calibration depend on the calibration history. Press the CAL key, or wait a few seconds to continue.



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Note: The above behavior happens only if calibration history is not empty. The tag will blink until the reading has stabilized. Press the ARROW keys to select a different buffer value, if necessary. When the reading is stable and close to the selected buffer, the CFM tag will blink and if enabled, an audible signal will sound.

The instrument will ask for a second calibration buffer and display the measured pH on the first LCD line and the second calibration buffer on the second LCD line. If necessary, press the ARROW keys to select a different buffer value. Note: The instrument will automatically skip the buffer used for the first point. Rinse the electrode in one of the beakers of the second buffer solution, then immerse the pH electrode and the temperature probe approximately 4 cm (1½) into the second buffer solution and stir gently. The temperature probe should be close to the pH electrode.

The indication will blink on LCD until the reading has stabilized. When the reading is stable and close to the selected buffer, the CFM tag will blink. Note: Press the RANGE key any time during calibration to display the temperature reading. Press the CAL key after the first calibration point has been confirmed.

The stored calibration history to used issue error and warning messages during calibration to help ensure the highest accuracy.

As electrode aging is normally a slow process, substantial changes from previous calibrations are likely due to a temporary problem with the electrode or buffers. When these messages are displayed calibration cannot be confirmed. **WRONG BUFFER** This message appears when the difference between the pH reading and the value of the selected buffer is too big. If this error message is displayed, check if you have selected the proper calibration buffer. **CLEAN ELECTRODE** This error message indicates a bad electrode condition (offset out of accepted window, or slope under the accepted lower limit). Clean the electrode according to the Cleaning Procedure on page 32 to improve its condition and repeat the calibration. **CHECK ELECTRODE** alternating with **CHECK BUFFER** This error message appears when electrode slope exceeds the highest accepted slope limit. You should check your electrode and use fresh buffer. **ELECTRODE** This message appears if the cleaning procedure performed as a result of the above two messages is found by the instrument to be unsuccessful. During calibration, the Calibration Check feature analyzes the electrode calibration history and warns the user when problems have been detected.

It is possible to over ride the warning messages and confirm the calibration but it is not recommended. **CLEAR CAL IF NEW ELECTRODE** This warning is displayed any time the new calibration parameters are better than the previous parameters. You can clear the calibration history by pressing the CLR key, or continue by pressing the CAL key. **CLEAN ELECTRODE** This warning appears during Calibration Check for the second calibration buffer when the instrument has detected a small variation of offset or both offset and slope parameters. This variation may result from dirt on the electrode. **CLEAN ELECTRODE** alternating with **CHECK BUFFER** This warning appears during Calibration Check in the first calibration buffer as This variation may result from dirt on the electrode or contaminated buffer. @@@@ @@@@ @@@@ @@@@ The condition and response are also visible when viewing GLP data.

@@@@ @@@@@ @@@@@ @@@@@ This value can be set from 1 to 7 days. @@ If the instrument was calibrated uar pH Resolution (HI 223 only) Beep Status Baud Rate (serial communication) Command Prefix (serial communication) To enter the Setup mode press the SET/CLR key while the instrument is in measuring mode. Press the RANGE key to toggle between the displayed parameters.

press the ARROW keys to increase or decrease the displayed value. @ @ press the ARROW keys to select the next/previous parameter.

@@@@ @@@@@ @@@@@ @@@@@ Press the CFM key to save the modified pH resolution or press the CAL key to escape without saving the pH resolution. Press the CFM key to save the modified beep status or press the CAL key to cancel without saving the beep status. note: If enabled , an audible signal will follow each key press.

Inactive keys have a longer beep. A longer beep is also sounded when the limits of the range of a parameter are reached. An audible signal will also sound when the reading becomes stable during calibration. Press the CFM key to save the modified baud rate or press the CAL key to cancel without saving the baud rate. **SERIAL COMMUNICATION COMMAND PREFIX SET** Press the CAL key when the command prefix is displayed.

Press the CFM key to save the modified command prefix value or press the CAL key to cancel without saving the command prefix. note: See the PC Interface section on page 28 for a complete explanation. The command prefix must be 16 if the HI 92000 PC software is used. Hannas temperature probes are interchangeable and temperature calibration is not necessary when replaced. If the temperature measurements are not accurate, temperature recalibration should be performed. For an accurate recalibration, contact your dealer or the nearest Hanna Customer Service Center, or follow the instructions below. switch off the instrument. Prepare a vessel containing ice and water and another one containing hot water (around 50 °C). Place insulation material around the vessels to minimize temperature changes during calibration. Use a ChecktempC or a calibrated thermometer with a resolution of 0.

Wait a few minutes for the probe to stabilize. Press the CAL and LOG keys simultaneously and then switch the instrument on. After a few seconds, the instrument enters the temperature calibration mode. The tag will blink until the reading has stabilized. Use the ARROW keys to set the reading on the secondary LCD to that of ice and water measured by ChecktempC (for example, -0. When the reading is stable and close to the selected calibration point, the CFM tag will blink. Press the CFM key to confirm the calibration or the CAL key to leave the calibration mode. Immerse the temperature probe and the ChecktempC into the second vessel. Allow a few minutes for the probe to stabilize. The tag will blink until the reading has stabilized.

Use the ARROW keys to set the reading on the secondary LCD to that of the hot water bath. When the reading is stable and close to the selected calibration point, the CFM tag will blink. Press the CFM key to confirm the calibration or the CAL key to leave the calibration mode. Note: If the measured value is not close enough to the displayed value on secondary LCD, the WRONG tag will blink. In this case, check if the value set on secondary LCD and the temperature measured with ChecktempC are close.

Hannas pH and ORP electrodes are interchangeable and mV calibration is not needed when replaced. If the mV measurements are not accurate, mV recalibration should be carried out. For an accurate recalibration, contact your dealer or the nearest Hanna Customer Service Center or follow the instructions below.



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A two or three point calibration can be performed at 0 mV, +600 mV and +1800 mV. switch off the instrument.

Attach a mV simulator with an accuracy of at least ± 0.1 . After a few seconds, the instrument enters the mV calibration mode. The tag will blink on LCD until the reading has stabilized. When the reading is stable, the CFM tag will blink. The tag will blink on the LCD until the reading has stabilized. When the reading is stable, the CFM tag will start to blink. Note: Press the CAL key to leave the calibration mode at any time. Data transmission from the instrument to the PC can be done with the HI 92000 Windows® compatible software (optional).

the HI 92000 also offers graphing and on-line help. Data can also be exported to the most popular spreadsheet programs for further analysis. To connect your instrument to a PC, use the optional Hanna HI 920010 cable. Make sure that your instrument is switched off and plug one end into the instruments RS232C socket and the other end into the serial port of your PC. Note: Cables other than HI 920010 may use a different configuration, in which case communication between the instrument and the PC may not be possible. If you are not using optional Hanna HI 92000 software, please see the following instructions. The Command Prefix must be 16 when using HI 92000 software. COMMAND TYPES To send a command to the pH meter the scheme is: <command prefix> <command> <CR> where: <command prefix> is a selectable ASCII character between 0 and 47 (default 16). <command> is the command code (3 characters). Note: Either small or capital letters can be used.

COMMANDS Is equivalent to pressing the RANGE key Is equivalent to pressing the CAL key Is equivalent to pressing the CFM/GLP key Is equivalent to pressing the UP arrow key Is equivalent to pressing the DOWN arrow key Is equivalent to pressing the SET/CLR key MDR PAR NSL GLP LOD xxx LOD ALL Causes the instrument to send the pH reading (Err 1 is sent if out of range). if the range is set to mV , Err 6 is received. Causes the instrument to send the mV reading (Err 2 is sent if out of range). if the range is set to pH , Err 6 is received. Causes the instrument to send the temperature reading (Err 3 is sent if out of range).

When the instrument receives an unknown or a corrupted command, it will send a character CAN (ASCII Code 24). The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions. This is normal with electrodes. They will disappear when rinsed with water. During transport, tiny bubbles of air may form inside the glass bulb affecting proper functioning of the electrode.

These bubbles can be removed by shaking down the electrode as you would do with a glass thermometer. If the bulb and/or junction is dry condition the electrode by soaking it in HI 70300 or HI 80300 storage solution for at least one hour. For Refillable Electrodes: If the filling solution (electrolyte) is more than 2½ cm (1") below the fill hole, add HI 7082 or HI 8082 3. 5M KCl Electrolyte Solution for double junction or HI 7071 or HI 8071 3. 5M KCl+AgCl Electrolyte Solution for single junction electrodes using a plastic refilling pipette (HI 740157). As recommended by the LCD message on instrument on start-up, remove or loosen the fill hole screw on the electrode for better performance. STORAGE To minimize clogging and assure a quick response time, the glass bulb and the junction should be kept moist and not allowed to dry out. Replace the solution in the protective cap with a few drops of HI 70300 or HI 80300 Storage Solution or, in its absence, Filling Solution (HI 7071 or HI 8071 for single junction or HI 7082 or HI 8082 for double junction electrodes). Follow the Preparation Procedure on page 31 before taking measurements. The cable used for connection to the instrument must be intact and there must be no points of broken insulation on the cable or cracks on the electrode stem or bulb.

Connectors must be perfectly clean and dry. If any scratches or cracks are present, replace the electrode. Rinse off any salt deposits with water. For Refillable Electrodes: Refill the reference chamber with fresh electrolyte (HI 7071 or HI 8071 for single junction or HI 7082 or HI 8082 for double junction electrodes) using a plastic refilling pipette (HI 740157). IMPORTANT: After performing any of the cleaning procedures, rinse the electrode thoroughly with distilled water, refill the reference chamber with fresh electrolyte (not necessary for gel-filled electrodes) and soak the electrode in HI 70300 or HI 80300 Storage Solution for at least 1 hour before taking measurements. If the display shows first LCD line blinking during pH measurement. If the display shows first LCD line blinking during mV measurement. out of range in the mV scale. The meter does not work with the temperature probe. Low electrolyte level Refill with fresh solution (refillable electrodes only).

Out of range in the mV Electrode not connected. Explicit warnings are displayed on the LCD during pH calibration. The electrode condition and response gauges are not displayed after calibration. The electrode condition and response gauges are empty. @@@@ Repeat calibration more carefully. Power OFF the meter and then power it ON. The lower the temperature, the higher the resistance. @@@@ Since the resistance of the pH electrode is in the range of 50-200 Mohm depending on the composition of the glass, the current across the membrane is in the pico Ampere range. Large currents can disturb the calibration of the electrode for many hours. For these reasons high humidity environments, short circuits and static discharges are detrimental to a stable pH reading.

The pH electrodes life also depends on the temperature. If constantly used at high temperatures, the electrode life is drastically reduced. typical Electrode Life Ambient Temperature 90 °C 120 °C Alkaline Error High concentrations of sodium ions interfere with readings in alkaline solutions. The pH at which the interference starts to be significant depends upon the composition of the glass. This interference is called alkaline error and causes the pH to be underestimated. 40 1- 3 years Less than 4 months Less than 1 month HI 70000P HI 7061L HI 7073L HI 7074L HI 7077L HI 8061L HI 8073L HI 8077L HI 7071 HI 7072 HI 7082 HI 8071 Electrode Rinse Sachets, 20 mL, 25 pcs General Cleaning Solution, 460 mL Protein Cleaning Solution, 460 mL Inorganic Cleaning Solution, 460 mL Oil & Fat Cleaning Solution, 460 mL General Cleaning Solution in FDA approved bottle, 460 mL Protein Cleaning Solution in FDA approved bottle, 460 mL Oil & Fat Cleaning Solution in FDA approved bottle, 460 mL 3. 5M KCl + AgCl Electrolyte in FDA approved bottle, 4x30 mL, for single junction electrodes All electrodes with part numbers ending in P are supplied with a BNC and pin connector and 1 m (3).



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Consult the Hanna General Catalog for more electrodes with BNC and pin connectors. Voltage adapter from 115 VAC to 12 VDC (USA plug) Voltage adapter from 230 VAC to 12 VDC (European plug) Voltage adapter from 240 VAC to 12 VDC (UK plug) Voltage adapter from 230 VAC to 12 VDC (South African plug) Voltage adapter from 230 VAC to 12 VDC (Australian plug) Pocket-size thermometer (range -50. 3') coaxial cable ending in female BNC connectors HI 931001 pH and ORP electrode simulator with LCD and 1 m (3.

3') coaxial cable ending in female BNC connectors HI 7669/2W Temperature probe with 1 m (3. Before using this product, make sure that it is entirely suitable for the environment in which it is used. Operation of this instrument in residential areas could cause unacceptable interferences to radio and TV equipment, requiring the operator to take all necessary steps to correct interferences. During operation, ESD wrist straps should be worn to avoid possible damage to the electrode by electrostatic discharges. Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance. To avoid electrical shock, do not use this instrument when voltages at the measurement surface exceed 24 VAC or 60 VDC. To avoid damage or burns, do not perform any measurement in microwave ovens. Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice. .



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