



# Your PDF Guides

You can read the recommendations in the user guide, the technical guide or the installation guide for HANNA INSTRUMENTS HI 2211. You'll find the answers to all your questions on the HANNA INSTRUMENTS HI 2211 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 2211**  
**User guide HANNA INSTRUMENTS HI 2211**  
**Operating instructions HANNA INSTRUMENTS HI 2211**  
**Instructions for use HANNA INSTRUMENTS HI 2211**  
**Instruction manual HANNA INSTRUMENTS HI 2211**

Instruction Manual

**HI 2210 HI 2211**

**Microprocessor-based  
pH/mV/°C  
Bench Meters**



**HANNA**  
instruments  
[www.hannainst.com](http://www.hannainst.com)



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**Manual abstract:**

@@@If you need additional technical information, do not hesitate to e-mail us at [tech@hannainst.com](mailto:tech@hannainst.com) or view our worldwide contact list at [www.hannainst.com](http://www.hannainst.com). These instruments are in compliance with directives. WARRANTY HI 2210 and HI 2211 are guaranteed for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. Electrodes and probes are guaranteed for six months. This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering or lack of prescribed maintenance is 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 packed for complete protection. TABLE OF CONTENTS WARRANTY .

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..... 21 2 3 PRELIMINARY EXAMINATION 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 with: · HI 1131B Glass-body Combination pH Electrode · HI 7662 Temperature Probe · HI 76404 Electrode Holder · pH 4.

01 & 7.01 Buffer Solutions, 20 mL each · HI 7071S Electrolyte Solution · 12VDC 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. FUNCTIONAL DESCRIPTION Front Panel Rear Panel GENERAL DESCRIPTION The Hanna HI 2210 and HI 2211 are microprocessor-based pH and temperature bench

meters. HI 2211 can also be used for ion concentration (ISE) and Oxidation Reduction Potential (ORP) in the mV range. pH measurements are compensated for temperature effect manually or automatically with the HI 7662 temperature probe. The instrument is equipped with a large easy-to-read LCD which shows the pH (or mV) and temperature simultaneously, together with graphic symbols. The calibration process is guided step by step through clear indications on the LCD. A stability indicator makes the calibration procedure error-free. Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

4) 1) Liquid Crystal Display (LCD). 2) CAL key, to enter or exit/escape calibration mode. 3) CFM key, to confirm different values. 4) °C key and °C keys, to manually increase/decrease temperature or select pH buffer. 5) RANGE key, to select measurement range (HI 2211 only).

6) MEM key, to store a value into memory. 7) MR key, to recall the stored value. 8) Secondary LCD. 9) Primary LCD. 10) ON/OFF switch.

11) Power adapter socket. 12) BNC electrode connector. 13) Temperature probe socket. 14) Electrode reference socket. 5 SPECIFICATIONS 2.00 to 16.00 pH RANGE  $\pm 399.9$  mV (HI 2211 only)  $\pm 2000$  mV (HI 2211 only) 9.9 to 120.0 °C 0.

01 pH RE SOLUTION 0.1 mV (HI 2211 only) 1 mV (HI 2211 only) 0.1 °C  $\pm 0.01$  pH ACCURACY @ 20°C / 68°F  $\pm 0.2$  mV (HI 2211 only)  $\pm 1$  mV (HI 2211 only)  $\pm 0.5$  °C (0.0 100.0 °C)  $\pm 1$  °C (outside) (excluding probe error) 1 or 2 point calibration, 5 buffers a va ila b le (4.01, 6.86, 7.

01, 9.18, 10.01) Manual or Automatic from: 9.9 to 120.0 °C (14.

2 to 248.0 °F) HI 1131B (included) HI 7662 (included) 1012 ohms 12 VD C adapter (included) 240x182x74 mm (9.4x7.1x2.9") 1.

1 Kg (2.5 lb); kit with holder 2.5 Kg (5.5 lb) 0 to 50 °C (32 to 122 °F) max. 95% RH non-condensing 2 years OPERATIONAL GUIDE POWER

CONNECTION Plug the 12 VDC adapter into the power supply socket. Notes: · These instruments use non volatile memory to retain the pH, mV, temperature calibrations and all other settings, even when unplugged. · Make sure a fuse protects the main line. ELECTRODE AND PROBE CONNECTIONS For pH or ORP combination electrode connect to the BNC connector on the back of the instrument. For electrodes with a separate reference connect the electrode's BNC to the BNC connector and the reference electrode plug to the reference socket. For temperature measurements and automatic temperature compensation connect the temperature probe to the appropriate socket.

INSTRUMENT START-UP · Turn the instrument on by pressing the ON/OFF switch located on the rear panel. · All LCD segments are displayed while the instrument performs a self test. pH Calibration Temperature compensation pH E lectrode Temperature probe Input impedance Power supply D imensions

Weight E nvironment Warranty pH MEASUREMENTS Make sure the electrode and the instrument have been calibrated together before taking pH measurements. · Submerge the electrode and the temperature probe approximately 4 cm (1½") into the sample to be tested and stir gently. Allow time for the electrode to stabilize. · The pH is displayed on the primary LCD and the temperature on the secondary LCD. pH C · If the pH reading is out of range, "----" will be displayed on the LCD. 6 7 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 in order to prevent cross-contamination. The pH reading is affected by temperature. In order to measure the pH accurately, the temperature effect must be compensated for.

To use the Automatic Temperature Compensation feature, connect and submerge the HI 7662 temperature probe into the sample as close as possible to the electrode and wait for a few seconds. If the temperature of the sample is known, manual temperature 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" tag blinking. The temperature can now be adjusted with the ARROW keys (from -9.9 °C to 120.

0 °C). C TEMPERATURE MEASUREMENTS Connect the HI 7662 temperature probe to the TEMP socket and turn the instrument on. Immerse the temperature probe into the sample and allow the reading on the secondary LCD to stabilize.



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**MEMORY FUNCTION** Press and hold down MEM. The last reading will appear on the LCD along with "MEM" tag until MEM is released.

Press MR and the previously memorized reading will be displayed with "MEM" tag on the LCD. (HI 22 only) ORP MEASUREMENTS (HI 2211 only) 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. · Press RANGE to enter mV range. · Submerge the tip of the ORP electrode 4 cm (1½") into the sample to be tested and allow a few seconds for the reading to stabilize. · The instrument displays the mV reading on the primary LCD and the temperature on the secondary LCD. mV C · If the reading is out of range, "----" will be displayed on the LCD. 8 9 p H CALIBRATION Calibrate the instrument often, especially if high accuracy is required. The instrument should be recalibrated: · Whenever the pH electrode is replaced.

· At least once a week. · After testing aggressive chemicals. PREPARATION Pour small quantities of the buffer solutions into clean beakers. If possible use plastic or glass beakers to minimize any EMC interferences. @@@@It is recommended to perform a two-point calibration. However, one-point calibration is also permitted by the instruments. @@The temperature probe should be close to the pH electrode. · Press CAL. @@· Press CFM to confirm calibration. @@It also skips 6.

86 if 7.01 buffer was used and vice versa. Likewise, it will skip 9.18 if 10.01 buffer was used and vice versa.

@@The temperature probe should be close to the pH electrode. @@@@· Press CFM to confirm calibration. The instrument will return to measurement mode. @@@@If necessary, change the buffer or the electrode. @@Calibration cannot be confirmed in this situation. pH BUFFER pH 1 CAL BUF @@@@· Press CAL after the first calibration point was confirmed. The instrument will return to measurement mode and will memorize the one-point calibration data. MEASUREMENT Rinse the electrode tip with distilled water. @@@@Note: NEVER STORE THE ELECTRODE IN DISTILLED OR DEIONIZED WATER. @@DO NOT BE ALARMED IF SALT DEPOSITS ARE PRESENT. 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, soak the electrode in HI 70300 or HI 80300 Storage Solution for at least one hour.

Inspect the electrode and the cable. The cable must be intact and well connected. No cracks should be seen 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). Allow the electrode to stand upright for 1 hour. Follow the Storage Procedure above. 16 17 CLEANING PROCEDURE Soak in Hanna HI 7061 or HI 8061 General Cleaning Solution for approximately ½ hour.

· Protein Soak in Hanna HI 7073 or HI 8073 Protein Cleaning Solution for 15 minutes. Soak in Hanna HI 7074 Inorganic Cleaning · Inorganic Solution for 15 minutes. · Oil/grease Rinse with Hanna HI 7077 or HI 8077 Oil and Fat Cleaning Solution. 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. · General TROUBLESHOOTING GUIDE SYMPTOMS Slow response/excessive drift.

PROBLEM Dirty pH electrode. SOLUTION Clean the electrode and then soak the tip in HI 7061 or HI 8061 solution for 30 minutes. Clean the electrode. Refill with fresh solution (for refillable electrodes only). Check cable and connector. Soak in HI 70300 or HI 80300 storage solution. Check cable and connector. Follow the cleaning procedure. If still no results, replace the electrode. Replace Buffer. Readings fluctuate up Clogged/dirty junction. and down (noise). Low electrolyte level (refillable electrodes only). Out of range in the mV scale. Dry membrane/junction.

The meter does not accept the buffer solution for calibration. The display shows "pH" and "----". pH electrode damaged. Wrong buffer used. Out of range in the pH a) Verify that the electrode scale. is connected. b) Verify that the shipping cap has been removed. c) Recalibrate the meter. d) Make sure the pH sample is in the specified range. e) Check the electrolyte level and the general state of the electrode.

Out of range in the mV scale. Broken temperature probe. Wrong temperature probe used. Broken pH electrode. Verify that the electrode is connected. Replace the temperature probe. The display shows "mV" and "----". The meter does not work with the temperature probe. The meter fails to calibrate or gives faulty readings. At startup the meter displays all LCD tags permanently.

"Error xx" error message displayed. Replace the electrode. One of the keys is stuck. Internal error. Check the keyboard or contact the vendor. Power off the meter and then power it on. If the error persists, contact the vendor. 18 19 TEMPERATURE CORRELATION FOR pH SENSITIVE GLASS The resistance of glass electrodes partially depends on the temperature. The lower the temperature, the higher the resistance. It takes more time for the reading to stabilize if the resistance is higher.

In addition, the response time will suffer to a greater degree at temperatures below 25 °C. ACCESSORIES pH BUFFER SOLUTIONS HI 70004P HI 70007P HI 70010P HI 7004L HI 7006L HI 7007L HI 7009L HI 7010L HI 8004L HI 8006L HI 8007L HI 8009L HI 8010L pH 4.01 Buffer Sachets, 20 mL, 25 pcs pH 7.01 Buffer Sachets, 20 mL, 25 pcs pH 10.01 Buffer Sachets, 20 mL, 25 pcs pH 4.01 Buffer Solution, 500 mL bottle pH 6.86 Buffer Solution, 500 mL bottle pH 7.01 Buffer Solution, 500 mL bottle pH 9.18 Buffer Solution, 500 mL bottle pH 10.01 Buffer Solution, 500 mL bottle pH 4.01 Buffer Sol. in FDA approved bottle, 500 mL pH 6.86 Buffer Sol. in FDA approved bottle, 500 mL pH 7.01 Buffer Sol. in FDA approved bottle, 500 mL pH 9.18 Buffer Sol. in FDA approved bottle, 500 mL pH 10.01 Buffer Sol. in FDA approved bottle, 500 mL Since the resistance of the pH electrode is in the range of 50-200 Mohms, the current across the membrane is in the pico Ampere range. Large currents can disturb the calibration of the electrode for many hours.



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For these reasons high humidity environments, short circuits and static discharges are detrimental to a stable pH reading. The pH electrode's life also depends on the temperature. If constantly used at high temperatures, the electrode life is drastically reduced. Typical Electrode Life Ambient Temperature 1-3 years 90 °C Less than 4 months 120 °C Less than 1 month 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. Hanna's glass formulations have the indicated characteristics. Sodium Ion Correction for Glass at 20-25 °C Concentration pH 13.00 0.

1 Mol L-1 Na+ 13.50 14.00 12.50 13.00 1.0 Mol L-1 Na+ 13.50 14.00 20 Error 0.10 0.14 0.

20 0.10 0.18 0.29 0.40 ELECTRODE STORAGE SOLUTIONS HI 70300L Storage Solution, 460 mL bottle HI 80300L Storage Solution in FDA approved bottle, 460 mL ELECTRODE CLEANING SOLUTIONS HI 70000P HI 7061L HI 7073L HI 7074L HI 7077L HI 8061L HI 8073L HI 8077L HI 7071 HI 7072 HI 7082 HI 8071 HI 8072 HI 8082 Electrode Rinse Sachets, 20 mL, 25 pcs General Cleaning Solution, 460 mL bottle Protein Cleaning Solution, 460 mL bottle Inorganic Cleaning Solution, 460 mL bottle Oil & Fat Cleaning Solution, 460 mL bottle General Cleaning Sol. in FDA approved bottle, 460 mL Protein Cleaning Solution in FDA approved bottle, 460 mL Oil & Fat Cleaning Sol. in FDA approved bottle, 460 mL 3.5M KCl+AgCl Electrolyte, 4x50 mL, for single junction electrodes 1M KNO3 Electrolyte, 4x50 mL 3.5M KCl Electrolyte, 4x50 mL, for double junction electrodes 3.5M KCl+AgCl Electrolyte in FDA approved bottle, 4x50 mL, for single junction electrodes 1M KNO3 Electrolyte in FDA approved bottle, 4x50 mL 3.5M KCl Electrolyte in FDA approved bottle, 4x50 mL 21 ELECTRODE REFILL ELECTROLYTE SOLUTIONS ORP PRETREATMENT SOLUTIONS HI 7091L Reducing Pretreatment Solution, 460 mL bottle HI 7092L Oxidizing Pretreatment Solution, 460 mL bottle HI 1330B Glass-body, semimicro, single junction, refillable, combination pH electrode. Use: laboratory, vials. 5mm DIA 0.2" 5mm 0.2" pH ELECTRODES All electrodes part numbers ending with B are supplied with BNC connector and 1 m (3.3') cable, as shown below: HI 1330 120 mm 4.7" "S" VERSION HI 1043B Glass-body, double junction, refillable, combination pH electrode. Use: strong acid/alkali. 9.5mm DIA 0.

37" 12 mm 0.5" HI 1331B Glass-body, semimicro, single junction, refillable, combination pH electrode. Use: flasks. 8 mm 0.3" 7.5mm DIA 0.29" HI 1331 210 mm 8.25" HI 1043 120 mm 4.7" "S" VERSION "S" VERSION HI 1053B Glass-body, triple ceramic, conic shape, refillable, combination pH electrode.

@@@@@@@Use: general purpose.

9.5mm DIA 0.37" 12 mm 0.5" HI 1332B Plastic-body (PEI), double junction, refillable, combination pH electrode. Use: general purpose.

12 mm 0.5" HI 1131 HI 1332 "S" VERSION 120 mm 4.7" "S" VERSION 120 mm 4.7" 22 23 FC 100B Plastic-body (PVDF), double junction, refillable, combination pH electrode. Use: general purpose for food industry.

12 mm 0.5" FC 100 120 mm 4.7" HI 1413B Glass-body, single junction, flat tip, Viscolene, non-refillable, combination pH electrode. Use: surface measurement. 12 mm 0.5" HI 1413 110 mm 4.3" FC 200B Plastic-body (PVDF), open junction, conic, Viscolene, non-refillable, combination pH electrode. Use: meat & cheese. 6 mm 0.25" ORP ELECTRODES HI 3131B Glass-body, refillable, combination platinum ORP electrode.

Use: titration. 12 mm 0.5" FC 200 75 mm 2.95" HI 3131 150 mm 5.9" FC 210B Glass-body, double junction, conic, Viscolene, non-refillable, combination pH electrode. Use: milk, yogurt. 12 mm 0.5" "S" VERSION HI 3230B Plastic-body (PEI), gel-filled, combination platinum ORP electrode. Use: general purpose. 12 mm 0.

5" FC 210 HI 3230 120 mm 4.7" FC 220B Glass-body, triple-ceramic, single junction, refillable, combination pH electrode. Use: food processing. 9.5mm DIA 0.

37" 12 mm 0.5" "S" VERSION 120 mm 4.7" HI 4430B Plastic-body (PEI), gel-filled, combination gold ORP electrode. Use: general purpose. 12 mm 0.5" FC 220 HI 4430 120 mm 4.7" FC 911B Plastic-body (PVDF), double junction, refillable with built-in amplifier, combination pH electrode. Use: very high humidity. 12 mm 0.5" "S" VERSION 120 mm 4.7" Consult the Hanna General Catalog for more electrodes with screwtype or BNC connectors. FC 911 110 mm 4.3" 24 25 EXTENSION CABLE FOR SCREW-TYPE ELECTRODES (SCREW TO BNC ADAPTER) HI 7855/1 Extension cable 1 m (3.3') long HI 7855/3 Extension cable 3 m (9.9') long HI 7855 SERIES CABLE CONNECTORS CONNECTOR AND 3.

0 mm (0.12") CABLE WITH BNC RECOMMENDATIONS FOR USERS Before using these products, make sure they are entirely suitable for the environment in which they are used. Operation of these instruments in residential areas could cause unacceptable interferences to radio and TV equipment, requiring the operator to follow all necessary steps to correct interferences. The glass bulb at the end of the pH electrode is sensitive to electrostatic discharges. Avoid touching this glass bulb at all times. 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 these instruments 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. CONNECT TO SCREW TYPE ELECTRODES CONNECT TO THE BNC SOCKET OF THE METER OTHER ACCESSORIES HI 710005 HI 710006 HI 710012 HI 710013 HI 710014 HI 76405 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 Africa plug) Voltage adapter from 230 VAC to 12 VDC (Australia plug) Electrode holder pH and ORP electrode simulator with 1 m (3.3')

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 7662 Temperature probe with 1 m (3.3') cable HI 8427 Windows® is registered Trademark of "Microsoft Co." 26 27 SALES AND TECHNICAL SERVICE CONTACTS Australia: Tel. (03) 9769.

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