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You can read the recommendations in the user guide, the technical guide or the installation guide for HANNA INSTRUMENTS PH 211. You'll find the answers to all your questions on the HANNA INSTRUMENTS PH 211 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 PH 211
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Instruction Manual

pH 210 pH 211
pH 212 pH 213

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



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°C key, to manually increase temperature or select pH buffer. MR key, to recall the stored value. MEM key, to store a value into memory. COMM key, to set the baud rate and the command prefix. RANGE key, to select measurement range. ON/OFF switch. Power adapter socket. BNC electrode connector.

Electrode reference socket. Temperature probe socket. RS232 serial communication connector. pH Calibration Temperature compensation pH Electrode Temperature probe Input impedance Computer interface Power supply Dimensions Weight Environment Warranty 6 7 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 measurements connect an electrode with internal reference 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. · All LCD tags are displayed and a beep is heard while the instruments perform a self test (pH 212 and pH 213 only). pH 210 & pH 211 · 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. 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 7669/2W 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, simple 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 pH 212 & pH 213 C C (pH only) ORP MEASUREMENTS (pH 211 and pH 213 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. 9 pH MEASUREMENTS Make sure the instrument has been calibrated before taking pH measurements. · Submerge the electrode tip and the temperature probe approximately 4 cm (1½") into the sample to be tested and stir gently. Allow time for the electrode to stabilize.

8 · The instrument displays the mV reading on the primary LCD and the temperature on the secondary LCD. mV C pH 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. For accurate calibration and to minimize cross-contamination, use two beakers for each buffer solution: one for rinsing the electrode and one for calibration.

If you are measuring in the acidic range, use pH 7.01 as first buffer and pH 4.01 as second buffer. If you are defined temperature range of the buffer.

Calibration cannot be confirmed in this situation. 12 13 TEMPERATURE CALIBRATION (for technical personnel only) All the instruments are factory calibrated for temperature. Hanna's temperature probes are interchangeable and no temperature calibration is needed when they are replaced.

If the temperature measurements are inaccurate, temperature recalibration should be performed. For an accurate recalibration, contact your dealer or the nearest Hanna Customer Service Center, or follow the instructions bellow. · Prepare a vessel containing ice and water and another one containing hot water (at a temperature of around 50 °C). Place insulation material around the vessels to minimize temperature changes. · Use a calibrated thermometer with a resolution of 0.1 °C as a reference thermometer. · With the instrument off, press and hold down the CAL&MEM keys, then power on the instrument. The "CAL" tag will appear and the secondary LCD will show 0.0 °C. CAL C · Immerse the temperature probe in the second vessel as near as possible to the reference thermometer.

Allow a few seconds for the probe to stabilize. · Use the ARROW keys to set the reading on the secondary LCD to that of the hot water. C C · @@ · Press CFM to confirm. The instrument returns to measurement mode. Note: If the reading is not close to the selected CFM calibration point, "WRONG" tag will blink. Change the temperature probe and restart calibration. · Immerse the temperature probe in the vessel with ice and water as near as possible to the reference thermometer. Allow a few seconds for the probe to stabilize. · Use the ARROW keys to set the reading on the secondary LCD to that of ice and water, measured by the reference thermometer. C C · @@ · Press CFM to confirm.

The secondary LCD will show 50.0 °C. CAL C CFM 14 15 (pH only) mV CALIBRATION (pH 213 only) (for technical personnel only) All the instruments are factory calibrated for mV. Hanna's ORP electrodes are interchangeable and no mV calibration is needed when they are replaced. If the mV measurements are inaccurate, mV recalibration should be performed. For an accurate recalibration, contact your dealer or the nearest Hanna Customer Service Center, or follow the instructions below. A two or three-point calibration can be performed at 0.0 mV, 600.0 mV and 1800.0 mV.

· Attach to the BNC connector a mV simulator with an accuracy of ±0.1 mV. @@@@ · Set 0.0 mV on the simulator. @@ · Press CFM to confirm. The secondary LCD will display 600 mV. · Set 600.



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0 mV on the simulator. @@ · Press CFM to confirm. The secondary LCD will display 1800 mV.

· Set 1800.0 mV on the simulator. @@ · Press CFM to confirm. The instrument returns to measurement mode. @@@@ · Press CAL in any moment of the calibration process.

The instrument will return to measurement mode. @@@@HI 92000 also offers graphing and on-line help feature. @@@@The primary LCD COMM will show the current baud rate. @@@@ · Press CFM to confirm. The meter returns to measurement mode.

@@@@@Note: All the terminal programs that support the ANSI escape sequence, represent the DLE character by the string '^P' and the CR character by the string '^M'. SIMPLE COMMANDS PHR sets the range to pH MVR sets the range to mV (pH 213 only) CAL is equivalent to pressing CAL CFM is equivalent to pressing CFM UPC is equivalent to pressing the °C key DWC is equivalent to pressing the °C key MEM is equivalent to pressing MEM MRR is equivalent to pressing MR COM is equivalent to pressing COMM COMMANDS REQUIRING AN ANSWER 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 sent. MV? 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 sent. TM? Causes the instrument to send the temperature reading ("Err 3" is sent if out of range). Notes: · Either small or capital letters can be used. · The characters sent by the meter are always capital letters. · A "CAN" character (ASCII Code 24) is sent when the instrument receives an unknown or a corrupted command. Note: Invalid commands will be ignored.

pH? p H BUFFER TEMPERATURE DEPENDENCE The temperature has an effect on pH. The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions. During calibration the instrument will automatically calibrate to the pH value corresponding to the measured or set temperature. TEMP °C 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 °F 32 41 50 59 68 77 86 95 104 113 122 131 140 149 158

167 176 185 194 203 4. 01 4.01 4.00 4.00 4.00 4.00 4.

01 4.02 4.03 4.04 4.05 4.

06 4.08 4.09 4.11 4.12 4.

14 4.16 4.17 4.19 4.20 pH BUFFERS 6. 86 6.98 6.95 6.92 6.90 6.

88 6.86 6.85 6.84 6.84 6.83 6.83 6.84 6.84 6.84 6.

85 6.86 6.87 6.87 6.88 6.

89 7. 01 7.13 7.10 7.07 7.

05 7.03 7.01 7.00 6.99 6.98 6.98 6.98 6.98 6.98 6.

99 6.99 7.00 7.01 7.02 7.03 7.04 9. 18 9.46 9.39 9.

33 9.27 9.22 9.18 9.14 9.

11 9.07 9.04 9.01 8.99 8.

97 8.95 8.93 8.91 8.89 8.87 8.85 8.83 10. 01 10.32 10.

24 10.18 10.12 10.06 10.01 9.96 9.92 9.88 9.85 9.82 9.

79 9.77 9.76 9.75 9.74 9.

74 9.74 9.75 9.76 During calibration the instrument will display the pH buffer value at 25 °C. 18 19 ELECTRODE CONDITIONING & MAINTENANCE 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. For faster response, unscrew the fill hole screw during measurements. For AmpHel ® electrodes: If the electrode does not respond to pH changes, the battery is run down and the electrode should be replaced. MEASUREMENT Rinse the electrode tip with distilled water. Immerse the tip (bottom 4 cm /1½") in the sample and stir gently for a few seconds. For a faster response and to avoid cross-contamination of the samples, rinse the electrode tip with a few drops of the solution to be tested, before taking measurements. STORAGE PROCEDURE 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 and HI 7082 or HI 8082 for double junction electrodes). Follow the Preparation Procedure on page 20 before taking measurements.

Note: NEVER STORE THE ELECTRODE IN DISTILLED OR DEIONIZED WATER. PERIODIC MAINTENANCE PREPARATION PROCEDURE Remove the protective cap of the pH electrode. 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 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).

Allow the electrode to stand upright for 1 hour.

Follow the Storage Procedure above. 21 20 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 Soak the electrode tip in HI 7061 or HI 8061 solution for 30 minutes and then clean the electrode. Clean the electrode. Refill with fresh solution (for refillable electrodes only). Soak in HI 70300 or HI 80300 storage solution. Follow the cleaning procedure. If still no results, replace the electrode. Readings fluctuate up Clogged/dirty junction.

and down (noise). Low electrolyte level (refillable electrodes only). Out of range in the mV scale. The meter does not accept the buffer solution for calibration. The display shows "pH" and "----". Dry membrane/junction. Out of order pH electrode. Out of range in the pH a) Recalibrate the meter. scale. b) Make sure the pH sample is in the specified range.

c) Check the electrolyte level and the general state of the electrode. Out of range in the mV scale. Broken temperature probe. Broken pH electrode. E lectrode not connected.

Replace the temperature probe.



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Replace the electrode. 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. One of the keys is blocked. Check the keyboard or contact the vendor. Power off the meter and then power it on. If the error persists, contact the vendor. "E r r xx" error message Internal error. displayed. 22 23 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. 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 24 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 25 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: semisolid products. 6 mm 0.25" HI 2031 75 mm 2.95" HI 1083 120 mm 4.7" "S" VERSION HI 1131B Glass-body, single junction, refillable, combination pH electrode. Use: general purpose. 9.5mm DIA 0.

37" 12 mm 0.5" HI 1332B Plastic-body (Ultem®), 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" 26 27 FC 100B Plastic-body (Kynar®), 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 (Kynar®), 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 (Ultem®), 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 (Ultem®), 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 (Kynar®), 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" Ultem® is registered Trademark of "General Electric Co." Kynar® is registered Trademark of "Pennwalt Corp." 28 29 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.



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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 7669/2W Temperature probe with 1 m (3.3') cable HI 92000 Windows® compatible software application HI 920010 9 to 9-pin RS232 cable HI 8427 Windows® is registered Trademark of "Microsoft Co." 30 31 SALES AND TECHNICAL SERVICE CONTACTS Australia: Tel. (03) 9769.0666 · Fax (03) 9769.0699 China: Tel. (10) 88570068 · Fax (10) 88570060 Egypt: Tel. & Fax (02) 2758.683 Germany: Tel. (07851) 9129-0 · Fax (07851) 9129-99 Greece: Tel. (210) 823.5192 · Fax (210) 884.0210 Indonesia: Tel. (21) 4584.2941 · Fax (21) 4584.2942 Japan: Tel. (03) 3258.9565 · Fax (03) 3258.9567 Korea: Tel.

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