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You can read the recommendations in the user guide, the technical guide or the installation guide for HANNA INSTRUMENTS HI 2212. You'll find the answers to all your questions on the HANNA INSTRUMENTS HI 2212 in the user manual (information, specifications, safety advice, size, accessories, etc.). Detailed instructions for use are in the User's Guide.

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Instruction Manual

HI 2212 HI 2213

pH/mV/°C
Bench Meters
with Custom Buffers



HANNA
Instruments
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Manual abstract:

@@@@@If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or view our worldwide contact list at www.hannainst.com. WARRANTY HI 2212, HI 2213 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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00 pH RANGE HI 2213 only $\pm 699.9 \text{ mV}$ $\pm 2000 \text{ mV}$ 20.0 to 120.0 °C (-4.0 to 248°F) 0.

01 pH RE SOLUTION HI 2213 only 0.1 mV 1 mV 0.1 °C $\pm 0.01 \text{ pH}$ ACCURACY @ 20°C / 68°F $\pm 0.2 \text{ mV}$ ($\pm 699.$

9 mV)(HI 2213 only) $\pm 1 \text{ mV}$ ($\pm 2000 \text{ mV}$)(HI 2213 only) $\pm 0.2 \text{ °C}$ (excluding probe error) Rel mV offset range $\pm 2000 \text{ mV}$ (HI 2213 only) 1, 2 or 3 point calibration, 5 standard buffers available (4.01, 6.86, 7.01, 9.18, 10.01), and 2 custom buffers Manual or Automatic from: 20.0 to 120.0 °C (4.0 to 248.

0 °F) HI 1131B HI 7662 1012 ohms 12 VDC adapter 235 x 222 x 109 mm (9.2 x 8.7 x 4.3") 1.3 Kg (2.9 lbs); kit with holder 2.1 Kg (4.6 lb) 0 50 °C (32 122 °F) max. 95% RH non-condensing 2 years pH Calibration Temperature compensation pH Electrode Temperature probe Input impedance Power supply Dimensions Weight Environment Warranty 5 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 located on the rear panel.

· All LCD tags are displayed and a beep is sounded while the instruments perform a self test. pH MEASUREMENTS Make sure the instrument has been calibrated before taking pH measurements. · Submerge the electrode tip and the temperature probe approximately 3 cm (1 1/4") into the sample 3 cm to be tested and stir gently. Allow time for the (1 1/4") electrode to stabilize. · The pH is displayed on the primary LCD and the temperature on the secondary LCD.

· If the reading is out of range, the closest full-scale value will be displayed blinking on the primary LCD. 6 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, 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 used by disconnecting the temperature probe.



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The display will show the last temperature reading with the "°C" tag blinking. The temperature can now be adjusted with the ARROW keys (from 20.0 °C to 120.0 °C).

mV/ORP MEASUREMENTS (HI 2213) 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. The surface of the ORP electrode must be clean and smooth in order to obtain an accurate measurement. · Press RANGE to enter mV range. 3 cm · Submerge the tip of the ORP electrode 3 cm (1¼") (1¼") 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. · If the reading is out of range, the closest full-scale value will be displayed blinking on the primary LCD. **7 RELATIVE mV MEASUREMENTS (HI 2213)** · Press RANGE until "rEL" message will be displayed on the secondary LCD line for one second and "mV" tag will blink.

After one second the temperature will be displayed on the secondary LCD. The reading displayed by the instrument is equal to the difference between the current mV input value and relative mV offset established in the relative mV calibration.

TEMPERATURE MEASUREMENTS Connect the HI 7662 temperature probe to the appropriate socket and turn the instrument on. Submerge the temperature probe into the sample and allow the reading on the secondary LCD to stabilize. **MEMORY FUNCTION** Press and hold down MEM key to store the last reading in the meters memory. The "MEM" tag will be displayed. Press MR (memory recall) key to display the memorized reading.

The "MEM" tag will be displayed. **8 p H CALIBRATION** Calibrate the instrument frequently, 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.

· If "CAL" "INTV" tags are blinking during measurement. Every time you calibrate the instrument use fresh buffers and perform an electrode Cleaning Procedure (see page 26). **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 or 6.86 as first buffer and pH 4.01 as second buffer.

If you are measuring in the alkaline range, use pH 7.01 or 6.86 as first buffer and pH 10.01, 9.18 as second buffer. **PROCEDURE** Calibration can be performed up to three-points. For accurate measurements, a three-point calibration is recommended. However, a one or two point calibration can also be used. The calibration buffers can be selected from the calibration buffer list that includes custom buffers and the memorized standard buffers: · pH 4.01, 6.86, 7.01, 9.18 and 10.01. The custom buffers allow the user to calibrate in a buffer solution different from a standard one.

Up to two custom buffers can be set in SETUP menu (see page 17). Each custom buffer value can be changed in a ± 1.0 pH window around the set value (in accordance with temperature), during calibration, when it is selected; the "BUFFER pH" tag will blink. The instruments will automatically skip the buffer used during calibration and the buffers which are in a ± 0.2 pH window, around one of the calibrated buffers.

All new calibrations will override existing stored calibration data in a ± 0.2 pH window. The slopes adjacent to the new points will be reevaluated. **9 THREE-POINT CALIBRATION** · Submerge the pH electrode and the temperature probe approximately 3 cm (1¼") into a buffer solution and stir gently. The temperature probe should be close to the pH electrode. · Press CAL. The "CAL" and " " tags will appear and the "7.01" buffer will be displayed on the secondary LCD. **BUF eters** for all buffers starting with current buffer, press and hold down CFM, then press CAL. The calibration will continue from the current point.

If this procedure is performed while calibrating in the first calibration point "CLr ALL" message is displayed for a few seconds then the instrument returns to measurement. · Press RANGE (for HI 2212) to toggle between pH buffer and temperature reading. · Each time a buffer is confirmed, the new calibration data replaces the old calibration data of the corresponding buffer. If current confirmed buffer has no previous data stored and the calibration is not full (three buffers), the current buffer is added to the existing data. If the existing calibration is full, the instrument asks which buffer to replace. Press the ARROW keys to select another buffer to be replaced. Press CFM to confirm the buffer that will be replaced. Press CAL to leave calibration without replacing. Note: If the replaced buffer is outside the ± 0.2 pH window, around each of the calibrated buffers, it is possible to select this buffer for next calibration during current calibration.

WORKING WITH CUSTOM BUFFERS If a custom buffer was set in SETUP menu, it can be selected for calibration by pressing the ARROW keys. The "BUFFER pH" tag will blink. Press SETUP if you want to adjust the buffer value. The buffer value will start blinking. Use the ARROW keys to change the buffer value.

After 5 seconds the buffer value is updated. Press SETUP if you want to change it again. Note: Custom buffer value can be adjusted in a ± 1.00 pH window, around the set value. **12 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 4.07 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 6.85 6.85 6.

86 6.86 6.87 6.88 6.89 7.01 7.13 7.10 7.07 7.04 7.

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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 9.73 9.74 9.75 9.76 During calibration the instrument will display the pH buffer value at 25 °C. **13 GOOD LABORATORY PRACTICE (GLP)** GLP is a set of functions that allows storage and retrieval of data regarding the maintenance and status of the electrode.



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All data regarding the last calibration (one, two, or three point) is stored for the user to review when necessary.

This data includes the following: calibration time stamp, offset (mV), average of slope (%), calibration buffers and the time until a new calibration is required. @@ This value can be set from 1 to 7 days. The default setting is OFF (disabled). The instruments check if the time-out time has expired.

@@@ To view the pH calibration data, press GLP while in measurement mode.

@@@@ Select a parameter with the ARROW keys. Press CAL if you want to change a parameter value. The selected parameter will start blinking. Press RANGE (for HI 2212) to toggle between displayed parameters. Press the ARROW keys to increase or decrease the displayed value.

Press CFM to save the modified value or CAL to escape. @@@ Press CFM to save the modified calibration time-out value. Press CAL to escape without saving. FIRST CUSTOM BUFFER Press CAL when "cb1" is displayed. @@ Press CFM to save the modified custom buffer value. Press CAL to escape without saving. @@@ Press CFM to save the modified custom buffer value. Press CAL to escape without saving. @@@ Press CFM to save the behavior for one-point calibration. Press CAL to escape without saving.

CURRENT TIME Press CAL when the current time is displayed. @@ Press RANGE (HI 2213) or (HI 2212). @@ Press CFM to save the modified value. @@@ Press RANGE (HI 2213) or (HI 2212). @@ Press RANGE (HI 2213) or (HI 2212). The day and "CFM" will start blinking. Press the ARROW keys to change the day. Press CFM to save the modified value. Press CAL to escape without saving. BEEP STATUS Press CAL when the beep status is displayed. Beep status ("On" or "OFF") and "CFM" will start blinking. Press the ARROW keys to change the beep status (On or OFF). Press CFM to save the modified beep status. Press CAL to escape without saving. TEMPERATURE UNIT Press CAL when "mP is displayed.

The temperature unit and "CFM" will start blinking. Press the ARROW keys to change the option. Press CFM to save the modified temperature unit. Press CAL to escape without saving. 19 TEMPERATURE CALIBRATION y) (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 below. · 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. · Use a calibrated thermometer with a resolution of 0.1 °C as a reference thermometer. · With the instrument off, press and hold down the CFM & SETUP keys, then power on the instrument. The "CAL" tag will appear and the secondary LCD will show "0.0 °C".

· Submerge 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. When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink. · Press CFM to confirm. The secondary LCD will show "50.0 °C". · Submerge the temperature probe in the second vessel as near as possible to the reference thermometer. Allow a few seconds for the probe to stabilize. 20 · Use the ARROW keys to set the reading on the secondary LCD to that of the hot water.

· When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink. · Press CFM to confirm. The instrument returns to measurement mode. Note: If the reading is not close to the selected calibration point, "WRONG" tag will blink. Change the temperature probe and restart calibration.

21 mV CALIBRATION y) (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-point calibration can be performed at 0.

0 mV and 1800.0 mV. · Attach to the BNC connector a mV simulator with an accuracy of ± 0.1 mV. · With the instrument off, press and hold down the CAL & keys, then power on the instrument. The "CAL" tag will appear and the secondary LCD will show "0.0 mV". · Set 0.0 mV on the simulator. When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink.

· Press CFM to confirm. The secondary LCD will display "1800 mV". · Set 1800.0 mV on the simulator. When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink. · Press CFM to confirm. The instrument returns to measurement mode. Note: If the reading is not close to the selected calibration point, "WRONG" tag will blink. Verify calibration condition or contact your vendor if you can not calibrate. 22 RELATIVE mV CALIBRATION (HI 2213) · Press CAL when the instrument is in RELATIVE mV measurement mode.

The "mV" and " " tags will blink. Absolute mV is displayed on the primary LCD and "Abs" message is displayed on the secondary LCD. · When the absolute reading is stable and in measurement range, the instrument asks for confirmation. · If the reading is out of range, "WRONG" tag will be displayed. · Press CFM to confirm the absolute value.

The instrument will display "0.0 mV" on the primary LCD and "rEL" message on the secondary LCD. In this moment the relative mV offset is equal to absolute mV reading. · Use the ARROW keys if you want to change the displayed relative mV value. · Press CFM to confirm the relative mV value. The relative mV offset is displayed on the primary LCD and "OFF" message on the secondary LCD for a few seconds. The instrument returns to measurement mode. Note: The relative mV value can be changed only inside the relative mV offset window (± 2000 mV). 23 ELECTRODE CONDITIONING & 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.



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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.

24 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. Submerge the tip (3 cm /1¼") 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 24 before taking measurements. Note: NEVER STORE THE ELECTRODE IN DISTILLED OR DEIONIZED WATER. PERIODIC MAINTENANCE 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 and HI 7082 or HI 8082 for double junction electrodes). Allow the electrode to stand upright for 1 hour. Follow the Storage Procedure above.

25 CLEANING PROCEDURE · General 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. · Inorganic Soak in Hanna HI 7074 Inorganic Cleaning 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. 26 TROUBLESHOOTING GUIDE SYMPTOMS PROBLEM SOLUTION Clean the electrode and then soak the tip in HI 7061 or HI 8061 for 30 minutes. Clean the electrode. Refill with fresh solution (for refillable electrodes only). Check cables and connectors. Follow the cleaning procedure.

If still no results, replace the electrode. Replace Buffer. Slow response/excessive D irt y pH electrode. drift. Readings fluctuate up Clogged/dirty junction. and down (noise). Low electrolyte level (refillable electrodes only). The meter does not accept the buffer solution for calibration. If the display shows: "pH" and "-2.00" or "16.

00" blinking. D irt y electrode or contaminated buffer. Out of range in the pH a) Verify that the electrode scale. is connected. b) Verify that the shipping cap has been removed.

Recalibrate the meter. Make sure the pH sample is in the specified range. c) Check electrolyte level and general state of the electrode. Verify that the electrode is connected. Replace the temperature probe.

If the display shows: Out of range in the "mV" and "-2000" or mV scale. "2000" blinking 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. "Err xx" error message displayed. Broken temperature probe. Wrong temperature probe used. Broken pH electrode. 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. 27

TEMPERATURE CORRELATION FOR p H 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. Since the resistance of the pH electrode is in the range of 50 200 Mohm, 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 the Glass at 20-25 °C 0.1 Mol L-1 Na+ 13.00 13.50 14.00 12.50 13.00 13.50 28 14.00 0.10 0.14 0.20 0.10 0.

18 0.29 1.0 Mol L-1 Na+ ACCESSORIES pH BUFFER SOLUTIONS HI 70004P HI 70007P HI 70010P HI 7001L 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 1.68 Buffer Solution, 500 mL pH 4.01 Buffer Solution, 500 mL pH 6.86 Buffer Solution, 500 mL pH 7.01 Buffer Solution, 500 mL pH 9.

18 Buffer Solution, 500 mL pH 10.01 Buffer Solution, 500 mL pH 4.01 Buffer Solution in FDA approved bottle, 500 mL pH 6.86 Buffer Solution in FDA approved bottle, 500 mL pH 7.01 Buffer Solution in FDA approved bottle, 500 mL pH 9.

18 Buffer Solution in FDA approved bottle, 500 mL pH 10.01 Buffer Solution in FDA approved bottle, 500 mL ELECTRODE STORAGE SOLUTIONS HI 70300L Storage Solution, 500 mL HI 80300L Storage Solution in FDA approved bottle, 500 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, 500 mL Protein Cleaning Solution, 500 mL Inorganic Cleaning Solution, 500 mL Oil & Fat Cleaning Solution, 500 mL General Cleaning Solution in FDA approved bottle, 500 mL Protein Cleaning Solution in FDA approved bottle, 500 mL Oil & Fat Cleaning Solution in FDA approved bottle, 500 mL 3.



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5M KCl + AgCl Electrolyte, 4x30 mL, for single junction electrodes 1M KNO₃ Electrolyte, 4x30 mL 3.5M KCl Electrolyte, 4x30 mL, for double junction electrodes 3.5M KCl + AgCl Electrolyte in FDA approved bottle, 4x30 mL, for single junction electrodes 1M KNO₃ Electrolyte in FDA approved bottle, 4x30 mL 3.

5M KCl Electrolyte in FDA approved bottle, 4x30 mL, for double junction electrodes. ELECTRODE REFILL ELECTROLYTE SOLUTIONS 29 ORP PRETREATMENT SOLUTIONS HI 7091L Reducing Pretreatment Solution, 500 mL HI 7092L Oxidizing Pretreatment Solution, 500 mL pH ELECTRODES All electrodes part numbers ending in B are supplied with a BNC connector and 1 m (3.3') cable, as shown below : HI 1043B Glass-body, double junction, refillable, combination pH electrode. Use: strong acid/alkali. HI 1053B Glass-body, triple ceramic, conic shape, refillable, combination pH electrode. Use: emulsions. HI 1083B Glass-body, micro, Viscolene, non-refillable, combination pH electrode. @@@@ Use: general, field. HI 2031B Glass-body, semimicro, conic, refillable, combination pH electrode. Use: semisolid products.

HI 1332B Plastic-body (PES), double junction, refillable, combination pH electrode. Use: general purpose. 31 FC 100B Plastic-body (PVDF), double junction, refillable, combination pH electrode. Use: general purpose for food industry. FC 200B Plastic-body (PVDF), open junction, conic, Viscolene, non-refillable, combination pH electrode. Use: meat & cheese. FC 210B Glass-body, double junction, conic, Viscolene, non-refillable, combination pH electrode.

Use: milk, yogurt. FC 220B Glass-body, triple-ceramic, single junction, refillable, combination pH electrode. Use: food processing.

FC 911B Plastic-body (PVDF), double junction, refillable with built-in amplifier, combination pH electrode. Use: very high humidity. 32 HI 1413B Glass-body, single junction, flat tip, Viscolene, non-refillable, combination pH electrode. Use: surface measurement. ORP ELECTRODES HI 3131B Glass-body, refillable, combination platinum ORP electrode.

Use: titration. HI 3230B Plastic-body (PES), gel-filled, combination platinum ORP electrode. Use: general purpose. HI 4430B Plastic-body (PES), gel-filled, combination gold ORP electrode. Use: general purpose.

Consult the Hanna General Catalog for more electrodes with screw-type or BNC connectors. 33 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 OTHER ACCESSORIES HI 710005 HI 710006 HI 710012 HI 710013 HI 710014 HI 76404N 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 (Australiaplug) Electrode holder HI 8427 HI 931001 HI 7662 pH and ORP electrode simulator with 1 m (3.3') coaxial cable ending in female BNC connectors pH and ORP electrode simulator with LCD and 1 m (3.3') coaxial cable ending in female BNC connectors Temperature probe with 1 m (3.3') cable. 34 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 instruments' 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. Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice. 35 Hanna Instruments Inc. Highland Industrial Park 584 Park East Drive Woonsocket, RI 02895 USA Technical Support for Customers Tel. (800) 426 6287 Fax (401) 765 7575 E-mail tech@hannainst.com www.

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