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MAN4521
10/06

Instruction Manual

HI 4521 & HI 4522

pH/mV/ISE/Temperature/ Conductivity/Resistivity/TDS/Salinity Bench Meters

HANNA instruments
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Manual abstract:

@@@@& 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. (02) 2278.5147 · Fax (02) 2264.1729 Malaysia: Tel.
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2983 Thailand: Tel. @@(01525) 850.855 · Fax (01525) 853.668 USA: Tel. @@w w w. h a n n a i n s t . c o m 116 1 OTHER ACCESSORIES HI 710005/8 HI 710006/8 ChecktempC HI 76404N HI 8427 HI 931001 HI HI HI HI 76312 7662-T 92000 920010 Voltage adapter from 115 VAC / 12 VDC 800 mA (USA plug) Voltage adapter from 230 VAC / 12 VDC 800 mA (European plug) Pocket-size thermometer (range 50.0 to 150.0 ºC) Electrode holder 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 Platinum 4-ring conductivity/TDS probe with temperature sensor and 1 m (3.3') cable Temperature probe with 1 m (3.3') cable Windows® compatible software 9 to 9-pin RS232 cable 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.
2 115 ORP ELECTRODES HI 3131B Glass-body, refillable, combination platinum ORP electrode. Use: titration. Dear Customer, Thank you for choosing a Hanna Instruments product. This manual will provide you with the necessary information for correct use of the instrument. Please read this instruction manual carefully before using the instrument. If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or see the back side of this manual for our worldwide sales and technical service contacts. directives. These instruments are in compliance with HI 3230B Plastic-body, gel-filled, combination platinum ORP electrode. Use: general purpose.

WARRANTY HI 4430B Plastic-body, gel-filled, combination gold ORP electrode. Use: general purpose. HI 4521 and HI 4522 are warranted 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 failure. 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. To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase. Consult the Hanna General Catalog for more electrodes with screw-type or BNC connectors. EXTENSION (SCREW TO HI 7855/1 HI 7855/3 CABLE FOR SCREW-TYPE ELECTRODES BNC ADAPTER) Extension cable 1 m (3.3') long Extension cable 3 m (9.
9') long 114 3 TABLE OF CONTENTS WARRANTY .....
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..... 3 PRELIMINARY EXAMINATION .

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FC 100B Plastic-body, double junction, refillable, combination pH electrode. Use: general purpose for food industry. 112 5 GENERAL DESCRIPTION HI 4521 and HI 4522 are professional bench meters with color graphic LCD for pH, ORP (Oxidation Reduction Potential), ISE (HI 4522 only), conductivity, resistivity, TDS, salinity and temperature measurements.

The display can be configured as a single channel or dual channel display in various modes: Basic information only, GLP information, Graph and Log History mode. The main features of the instruments are: · Two input channels; · Eight measurement parameters: pH, mV, ISE (HI 4522 only), conductivity, resistivity, TDS, salinity and temperature; · Manual selection, automatic and semiautomatic pH calibration in up to five points, with standard (1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and custom buffers (up to 5 custom buffers); · Manual Selection and Custom Standard ISE calibration in up to five points, with standard (up to five standard solutions for each measurement unit) and custom solutions (up to 5 custom solutions), with or without temperature compensation (HI 4522 only); · Pure water checking using the USP <645> standard; · Conductivity probe automatic recognition; · Automatic or custom standard conductivity calibration in up to four points, probe offset calibration; · One fixed point salinity calibration (Percent Scale only); · AutoHold feature to freeze first stable reading on the LCD; · Two selectable alarm limits (for pH, mV, ISE, conductivity, resistivity, TDS, salinity)092L Test Solution 200-275 mV, 500 mL bottle Test Solution 240 mV, 500 mL bottle Test Solution 470 mV, 500 mL bottle Reducing Pretreatment Solution, 500 mL Oxidizing Pretreatment Solution, 500 mL 8 109 ACCESSORIES pH BUFFER SOLUTIONS HI HI HI HI HI HI HI HI HI HI HI HI HI 6001 6003 8004L 6004 8006L 6068 8007L 6007 6091 8009L 8010L 6010 6124 pH pH pH pH pH pH pH pH pH pH pH pH 1.

679 Buffer Solution, 500 mL bottle 3.000 Buffer Solution, 500 mL bottle 4.01 Buffer Solution in FDA approved bottle, 500 mL 4.010 Buffer Solution, 500 mL bottle 6.86 Buffer Solution in FDA approved bottle, 500 mL 6.862 Buffer Solution, 500 mL bottle 7.01 Buffer Solution in FDA approved bottle, 500 mL 7.010 Buffer Solution, 500 mL bottle 9.177 Buffer Solution, 500 mL bottle 9.18 Buffer Solution in FDA approved bottle, 500 mL 10.

01 Buffer Solution in FDA approved bottle, 500 mL 10.010 Buffer Solution, 500 mL bottle 12.450 Buffer Solution, 500 mL bottle SPECIFICATIONS HI 4521 pH Range Resolution Accuracy 2.000 to 20.000 pH 0.

1 pH / 0.01 pH / 0.001 pH ±0.1 pH ±0.01 pH ±0.

002 pH ± 1LSD Up to five-point calibration, 8 standard buffers available (1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and 5 custom buffers ±2000.0 mV 0.

*1 mV ±0.2 mV ± 1LSD ±2000.0 mV 1*106 to 9.99*1010 conc. 1 conc. / 0.1 conc. / 0.01 conc. / 0.*

001 conc. ±0.5% (monovalent ions) ±1% (divalent ions) Up to five-point calibration, 5 fixed standard solutions available for each measurement unit, and 5 custom solutions HI 4522 Calibration mV Range Resolution Accuracy Relative mV offset range ISE Range Resolution CONDUCTIVITY BUFFER SOLUTIONS HI 70033P 84 µS/cm (µmho/cm), 20 mL sachets (25 pcs.) HI 7033M 84 µS/cm (µmho/cm), 230 mL bottle HI 7033L 84 µS/cm (µmho/cm), 500 mL bottle HI 8033L 84 µS/cm (µmho/cm), 500 mL FDA approved bottle HI 70031P 1413 µS/cm (µmho/cm), 20 mL sachets (25 pcs.) HI 7031M 1413 µS/cm (µmho/cm), 230 mL bottle HI 7031L 1413 µS/cm (µmho/cm), 500 mL bottle HI 8031L 1413 µS/cm (µmho/cm), 500 mL FDA approved bottle HI 70039P 5000 µS/cm (µmho/cm), 20 mL sachets (25 pcs.

) HI 7039M 5000 µS/cm (µmho/cm), 230 mL bottle HI 7039L 5000 µS/cm (µmho/cm), 500 mL bottle HI 8039L 5000 µS/cm (µmho/cm), 500 mL FDA approved bottle HI 70030P 12880 µS/cm (µmho/cm), 20 mL sachets (25 pcs.) HI 7030M 12880 µS/cm (µmho/cm), 230 mL bottle HI 7030L 12880 µS/cm (µmho/cm), 500 mL bottle HI 8030L 12880 µS/cm (µmho/cm), 500 mL FDA approved bottle HI 7034M 80000 µS/cm (µmho/cm), 230 mL bottle HI 7034L 80000 µS/cm (µmho/cm), 500 mL bottle HI 8034L 80000 µS/cm (µmho/cm), 500 mL FDA approved bottle 108 Accuracy Calibration 9 HI 4521 0.000 to 9.999 µ S/cm 10.00 to 99.

99 µ S/cm 100.0 to 999.9 µ S/cm 1.000 to 9.999 mS/cm 10.00 to 99.99 mS/cm 100.0 to 1000.0 mS/cm 0.001 µ S/cm 0.

01 µ S/cm 0.1 µ S/cm 0.001 mS/cm 0.01 mS/cm 0.1 mS/cm ±1% of rea d ing (±0.01 µ S/cm) 0.0500 to 200.00 2, 4 cells Auto sta nd a rd recog nition, User sta nd a rd Sing le Point / Multi Point ca lib ra tion Yes HI 4522 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 ºC (77 ºF). Ra nge Resolution Accura cy Cond uctivity Cell consta nt Cell type Ca lib ra tion type/p oints Ca lib ra tion reminder Tempera ture compensa tion Tempera ture coefficient Reference tempera ture Profiles USP comp lia nt D isa b led / L inea r / Non linea r (na tura l wa ter) 0.00 to 10.00 %/°C 15.0 °C to 30.

0 °C Up to 10 Yes 1.0 to 99.9 Ohms x cm 100 to 999 Ohms x cm 1.00 to 9.99 KOhms x cm 10.

0 to 99.9 KOhms x cm 100 to 999 KOhms x cm 1.00 to 9.99 MOhms x cm 10.0 to 100.0 MOhms x cm 0.1 Ohms x cm 1 Ohms x cm 0.01 KOhms x cm 0.1 KOhms x cm 1 KOhms x cm 0.01 MOhms x cm 0.

1 MOhms x cm ±2 % of rea d ing (±1 Ohm x cm) No 0.000 to 9.999 p p m 10.00 to 99.99 p p m 100.0 to 999.9 p p m 1.000 to 9.999 p p t 10.00 to 99.

99 p p t 100.0 to 400.0 p p t a ctua l TD S (with 1.00 fa ctor) 0.001 p p m 0.

01 p p m 0.1 p p m 0.001 p p t 0.01 p p t 0.1 p p t ±1% of rea d ing (±0.

01 p p m) Ra nge Resistivity Resolution Accura cy Ca lib ra tion Ra nge 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 ºC (194 ºF) Less than 4 months 120 ºC (248 ºF) 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 ºC (68-77 ºF) Concentration pH Error 0.

10 13.00 0.1 Mol L-1 Na+ 0.14 13.50 0.20 14.00 0.10 12.50 0.18 13.
00 1.0 Mol L-1 Na+ 0.29 13.50 0.40 14.
00 TD S Resolution Accura cy 10 107 mV / pH / ISE CHANNEL SYMPTOMS Slow response/excessive drift. PROBLEM D irty pH electrode. SOLUTI ON Soak the electrode tip in HI 7061 solution for 30 minutes and then clean the electrode. Clean the electrode. Refill with fresh solution (for refillable electrodes only).
Make sure the sample is in the specified range. Recalibrate. Check the electrolyte level and the general state of the pH/ORP or ISE electrode. Soak in HI 70300 Storage solution for at least one hour. Replace the probe. Logging feature Range HI 4521 Practical Scale 0.00 to 42.00 psu Water Scale 0.00 to 80.00 ppt Percent Scale 0.

0 to 400.0 % Resolution Accuracy Calibration Range Temperature Resolution Accuracy Keyboard Input channels PC interface GLP Auto-Hold Record samples Logging interval Type HI 4522 Salinity Readings fluctuate up Clogged/dirty junction. and down (noise). L ow electrolyte level (refillable electrodes only). The LCD displays "-----" Out of range in the during measurements appropriate scale. (pH, mV, mV Rel or ISE). 0.01 for Practical Scale / Natural Sea Water 0.1 % for Percent Scale ±1% of reading Percent Scale - 1 point (with HI 7037 buffer) -20.0 to 120.
0 °C -4.0 to 248.0 °F 253.15 to 393.15 K 0.
1 °C / 0.1 °F / 0.1 K ±0.2 °C / ±0.4 °F / ±0.
2 K (without probe) 8 keys 2 opto-isolated RS232 and USB Cell constant, ref temp / coefficient, calibration points, cal time stamp, probe offset for conductivity Yes 100 lots with 10000 records / lot Settable between 1 and max log time Automatic, Log on demand, AutoHold Yes Color Graphic LCD 240 x 320 pixels Yes (with settable backlight saver) 8 pin D IN, BNC RS232, USB 12VD C adapter 160 x 231 x 94 mm (6.3 x 9.1 x 3.7") 1.2 Kg (2.6 lb) USP stage 1, 2, 3 Yes 84.0 µS/cm, 1413 µS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm, 111.

8 mS/cm 2 cell probe (0.1 cell const, 0 to 400 µS) 4 cell probe (1.0 cell constant wide range) USP kit (flow cell, resistor set for low range checking) Out of range in the mV scale. The instrument does not work with the temperature probe. The meter fails to calibrate or gives faulty readings. E xplicit warnings are displayed during calibration. The electrode condition is not displayed after calibration. The instrument does not override the loading process. D ry membrane/junction. Out of order temperature probe.
Broken or out of order electrode. D irty/broken electrode, contaminated buffers. Replace the electrode. Replatinization LCD Backlight Follow displayed instructions. Inputs Outputs Power D imensions Weight Implemented standards Conductivity probe recognition E C calibration solution Accesories Only one-point calibration has been performed.
Internal or software error. Perform at least a twopoint calibration. Restart the instrument using the power switch. If the error persists, contact your vendor. 106 11 OPERATIONAL GUIDE POWER CONNECTION Plug the 12 VDC adapter into the power supply socket.
Note: These instruments use non volatile memory to retain the meter settings, even when unplugged. ELECTRODE AND PROBE CONNECTIONS For pH or ORP measurements connect a pH / ORP electrode with internal reference to the BNC connector located on the rear panel of the instrument. For ISE measurements (HI 4522) connect, an ISE electrode with internal reference to the BNC connector located on the rear panel of the instrument. For electrodes with a separate reference connect the electrode's BNC to the BNC connector and the electrode's reference to the reference input socket. For temperature measurements and automatic temperature compensation connect the temperature probe to the appropriate socket (mV channel only). For conductivity, resistivity, TDS or salinity measurements connect a conductivity probe to the DIN connector located on the rear panel of the instrument. INSTRUMENT START UP · Turn the instrument on from the power switch located on the rear panel of the instrument. · Please wait until the instrument finishes the initialization process. Note: It is normal for the loading process to take a few seconds. If the instrument doesn't display the next screen, restart the meter using the power switch.

If the problem persists, contact your dealer. TROUBLESHOOTING GUIDE CONDUCTIVITY / RESISTIVITY / TDS / SALINITY CHANNEL SYMPTOMS Reading fluctuates up and down (noise). D isplay shows "-----" during measurements. PROBLEM Conductivity probe not properly connected. Reading out of range. SOLUTION Insert the probe. Recalibrate the meter; Check the sample is within the measurable range. Replace the probe. Meter fails to calibrate or gives faulty readings. The instrument doesn't measure the temperature from the probe.
Broken Conductivity probe. The probe temperature sensor is broken. / The temperature source is set as manual. The probe is damaged. Replace the probe. / Set the temperature source as automatic. The meter fails to calibrate or gives faulty readings. E xplicit warnings are displayed during calibration. The instrument does not override the loading process. Replace the probe.
D irty / damaged probe, contaminated standards. Initializing / software error. Follow displayed instructions. Restart the instrument using the power switch. If the error persists contact your vendor. Visualize the error (by pressing "Yes" key). Contact your vendor if critical error occurs. "E rror D etected" pop-up at start up. Initialization error. 12 105 For AmpHel ® electrodes: If the electrode does not respond to pH changes, the battery run down and the electrode should be replaced.

MEASURE Rinse the pH 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 of pH electrode 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 103 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. pH Probe Maintenance 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.
pH 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.
CHANNEL SELECTION · Press while in Measure mode to access channel selection menu. Four available options will be displayed: Channel 1, Channel 2, or multi-channel with the first or the second channel focused. The "Choose Channel Configuration" message is displayed in the Reminder messages area when is pressed. · Select the desired option by pressing the appropriate key: , , or . The instrument will enter in the selected option Measure mode. 104 13 DISPLAYING MODES For each measurement mode (pH, mV, Rel mV, Ion, Conductivity, Resistivity, TDS or Salinity) the following display configurations are available: Basic, Good Laboratory Practice (GLP), Graph and Log History. Basic Accessing this option, the measured value and its units are displayed on the LCD, along with the temperature value, temperature compensation mode, and minimal GLP data. To choose the Basic displaying mode: while in Measure mode. The "Choose Display · Press Configuration" message will be displayed in the Reminder messages area. · Press .

The instrument will display the basic information for the selected measurement mode. ELECTRODE CONDITIONING & MAINTENANCE GLP Accessing this option, a detailed GLP data will be displayed on the LCD for pH / ISE: Last Calibration Date and Time, Offset and Slope values, Calibration Buffers, Electrode Condition and for conductivity / salinity: Last Calibration Date and Time, Calibration Standards, Cell Constant, Probe Offset, Reference Temperature, Compensation Coefficient, Temperature Compensation. Note: If only a one-point pH calibration is performed or the current calibration does not include at least two consecutive standard buffers of pH 4.01, 7.01 (6.86) and 10.01 (9.18) buffers, the Electrode Condition will be unknown. To access the GLP displaying mode: while in Measure mode. The "Choose Display · Press Configuration" message will be displayed in the Reminder messages area. · Press data. . The instrument will display the detailed GLP 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. 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. 103 14 PROBE CONDITIONING & MAINTENANCE MEASURE Rinse the conductivity probe 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 probe with a few drops of the solution to be tested, before taking measurements. PERIODIC MAINTENANCE Inspect the probe 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. Connectors must be perfectly clean and dry. Rinse off any salt deposits with water.

If more cleaning is required, remove the probe sleeve and clean the probe with a cloth or a nonabrasive detergent. Make sure to reinsert the sleeve onto the probe properly and in the right direction. After cleaning the probe, recalibrate the instrument. The platinum rings are sustained with glass. Take great care while handling the probe. Graph Accessing this option, the online graph with the currently logged values (pH, mV, Rel mV, ISE respectively Conductivity, Resistivity, TDS, Salinity vs. Seconds) will be displayed. If there is no active log, the previously logged data for the selected parameter will be plotted. Notes: · If no data were logged, the graph displaying mode will not be accessible. · If no automatic log is saved, the offline graph will not be available.
To access the offline / online graph: while in Measure mode. The "Choose Display · Press Configuration" message will be displayed in the Reminder messages area. · Press . When the online graph is displayed: · Use and to move the graph along horizontal (Time) axis. or for · Press to access the zoom menu for the vertical (Parameter) axis.
Use zooming vertical axis. to return to the main menu. · Press When the offline graph is displayed: · Use the arrow keys to move the graph along the horizontal and vertical axes. · Press / to access the zoom menu for horizontal and vertical axes. Use / respectively or / key is not accessible.
/ / to zoom the selected axis. , or / to switch IMPORTANT: After performing any of the cleaning procedures, rinse the electrode thoroughly with distilled water. between the active zooming axes. Press Note: While in zoom graph menu the · Press to return to the main menu. 102 15 Log History Accessing this option, last logged records will be displayed on the LCD. The log history list also contains the appropriate main parameter values, the logged temperature, the temperature compensation source / mode, as well as the records time stamp. To access the Log History displaying mode: while in Measure mode. The "Choose Display · Press Configuration" message will be displayed in the Reminder messages area. . The instrument will display the log history · Press regarding the selected measure mode.

p H BUFFER TEMPERATURE DEPENDENCE Temperature has an effect on pH.

The calibration buffer solutions are affected by temperature changes to a lower degree than normal solutions. During calibration the instrument will automatically calibrate to the pH value corresponding to the measured or set temperature. TEMP ºC 0 5 10 ºK 273 278 283 288 293 298 303 308 313 318 323 328 333 338 343 348 353 358 363 368 ºF 32 41 50 59 68 77 86 95 104 113 122 131 140 149 158 167 176 185 194 203 pH BUFFERS 1.679 3.000 4.010 6.862 1.670 1.670 1.
671 1.673 1.675 1.679 1.683 1.
688 1.693 1.700 1.707 1.715 1.
724 1.734 1.744 1.755 1.767 1.780 1.793 1.807 3.072 3.051 3.

033 3.019 3.008 3.000 2.995 2.991 2.990 2.990 2.991 2.993 2.
995 2.998 3.000 3.002 3.003 3.
002 3.000 2.996 4.007 4.002 4.
000 4.001 4.004 4.010 4.017 4.026 4.037 4.049 4.062 4.076 4.

091 4.107 4.123 4.139 4.156 4.172 4.187 4.202 6.982 6.949 6.
921 6.897 6.878 6.862 6.851 6.
842 6.837 6.834 6.834 6.836 6.
839 6.844 6.850 6.857 6.865 6.873 6.880 6.888 7.010 9.177 7.

130 7.098 7.070 7.046 7.027 7.010 6.998 6.989 6.983 6.979 6.
978 6.979 6.982 6.987 6.993 7.
001 7.010 7.019 7.029 7.040 9.
459 9.391 9.328 9.273 9.222 9.177 9.137 9.108 9.069 9.040 9.

014 8.990 8.969 8.948 8.929 8.910 8.891 8.871 8.851 8.829 10.
010 10.316 10.245 10.180 10.118 10.
062 10.010 9.962 9.919 9.881 9.
847 9.817 9.793 9.773 9.757 9.746 9.740 9.738 9.740 9.748 9.

759 12.454 13.379 13.178 12.985 12.799 12.621 12.450 12.286 12.128 11.
978 11.834 11.697 11.566 11.442 11.
323 11.211 11.104 11.003 10.908 10.
819 10.734 Notes: · · · · When an alarm condition is active, all logged records will have an exclamation mark (!). When a meter is in auto-hold, the logged records will have an "H" symbol. If another measure mode is selected, the Log History will be cleared. If the temperature unit is changed, all logged temperature values will be automatically displayed in the new temperature unit. 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 During calibration the instrument will display the pH buffer value at 25 ºC. 16 101 PC INTERFACE Data transmission from the instrument to the PC can be done with the HI 92000 Windows® compatible software (optional). HI 92000 also offers graphing and on-line help feature. Data can be exported to the most popular spreadsheet programs for further analysis. HI 4521 and HI 4522 instruments have two available serial interfaces: RS232 and USB.

The desired serial interface can be selected from the settings window of the HI 92000 software. If choosing the RS232 serial interface, use the optional Hanna HI 920010 cable connector to connect your instrument to a PC. Make sure that your instrument is switched off and then plug one connector to the instrument RS232 socket and the other one to the serial port of your PC. Note: Other cables than HI 920010 may use a different configuration. In this case, communication between instrument and PC may not be possible. If choosing the USB serial interface, use a standard USB cable to connect your instrument to the PC. For both serial interfaces, make sure that the instrument and the HI 92000 software have the same baud rate and the appropriate communication port. SYSTEM SETUP The System Setup menu allows the user to customize the user interface, consult the meter information, set the external serial communication interface and to restore the manufacturer settings. Accessing System Setup · Press while in Measure mode. · Press .
The system setup options will be displayed on the LCD. To access a System Setup option: · Use or to highlight the desired option. · Press to access the selected option. The following is a detailed description of the System Setup option screen. Beeper This option allows the user to enable or disable the beeper. When the beeper is enabled, a specific beep will be heard when the reading becomes stable, when an alarm condition is reached, when pressing a key or if a wrong key is pressed. Stability Indicator When the reading becomes stable, the instrument delivers a medium beep only if this option is ON, along with the "Stable" indicator on the LCD. Alarm If this option is ON, a continuous double beep will be heard each time the set limits in Measure mode are exceeded, along with the "Alarm" indicator on the LCD. Key Pressed If this option is ON, a short beep will be heard each time a valid key is pressed. Wrong Key If this option is ON, a long beep will be heard when an incorrect key is pressed.
100 17 To set the Beeper: · Use or to select the Beeper option. · Press and use or to highlight the desired beeper associated parameter you want to modify. · Press and use beeper status option. · Press menu or press or to highlight the highlighted lot. The "Please wait..." message will be displayed on the LCD for a short period. The user customised report will be displayed on the LCD. Note: For automatic logging only, it is possible to view the plotted graph.

· Press to display the graph. it is possible to move the graph · By pressing along the horizontal or vertical axis with the arrow keys. · If pressing while the graph is displayed, the zoom menu for the horizontal and vertical axes will be , or / / accessed. Press / / / / / to switch between the active zooming axes and then zoom in or out on the selected axis by pressing the appropriate virtual key. · Press To delete lots: · Press · Press Otherwise, press while in Log Recall mode. or to access delete or delete all mode. to return to Log Recall view mode. or or to return to the previous menu at any time. to confirm your selection and return to the Beeper to return without changing. Saving Confirmation When enabling this option, a prompt will appear on the LCD alerting the user to save the modified values by pressing , exiting without saving by pressing or canceling the saving operation .
If disabled, the and return to the editing mode by pressing modified values will be saved automatically. To enable / disable the saving confirmation: · Use · Press / disabled. or and use or to select the Saving Confirmation option. to choose enabled to · Press to confirm your selection or press cancel operation. · After selecting one of the deleting modes, use to select one lot and then press GLP Data This option allows the user to set general information which will appear in the log reports.
The options can have a max of 10 characters. Operator ID this option allows you to edit the name of the operator. Instrument ID this option allows you to

edit an identification name/number for the instrument. Company Name this option allows you to edit the company name. Additional Info 1 & Additional Info 2 for general purpose notations.

18 to delete the selected lot or all lots. The "Please wait..." message will be displayed on the LCD until the selected lot or all lots are deleted. · Press and then press return to Log Recall view mode. to exit deleting mode and · Press to exit Log Recall mode and return to Measure mode. Note: Logged lots should also be deleted whenever "Please Delete Old Log Files" or "Low Data Logging Space" message appears on the LCD, in the Reminder messages area.

99 set as Direct/AutoHold in order to use this logging mode. To log data using this mode: · Press while in Measure mode to start the logging session.

The logged values are only the ones was pressed and the stability criterion reached. to return to normal logging mode and then again. frozen on the LCD, after · To store another frozen value, press To set the GLP Data: · Use or to select the GLP Data option. or to highlight the · Press and use desired option. or / . · To stop the logging session, press Notes: · For the automatic logging, if the maximum logging time (24h) has been reached, a warning popup will be displayed on the LCD in order to stop the current log and start another one in a new lot. · If 100 lots have been saved or maximum 10000 records have been manually stored, a warning pop-up will be displayed on the LCD in order to delete one lot or to select a new lot for the manual logging to log other records. LOG RECALL This feature allows the user to view all stored data. If no data were logged, the "No records were found" message will be displayed on the LCD in the Log Recall screen. Otherwise, the instrument will display all the memorized lots in accordance with the selected option: Automatic Log, Manual Log ISE Method Report (HI 4522), or USP Report.

To view the memorized data: · Press while in Measure mode. . The "Choose Log Report Type" message will · Press be displayed in the Reminder messages area. · Press , , , or to select the desired Log / ISE/ USP Report type. All logged lots for the selected Log Report type will be displayed on the LCD.

· To filter the displayed lots, press desired unit (, , and then the (HI 4522), · Press to edit the desired information. The Text Editor menu will be displayed on the LCD. and to · Enter the desired information by using highlight the desired character. It is also possible to delete the last character by positioning the cursor on the Backspace character ( ) and pressing . · Press to return to the GLP Data menu.

If the Saving to accept the modified Confirmation is enabled, press option, to escape without saving or to return to the editing mode. Otherwise, the modified options are saved automatically. Date & Time This option allows the user to set the current date & time and the format in which they appear. , , or). Only the selected measurement unit lots will be displayed on the LCD. · Select the desired lot with or and press to display the logged / report data from the Set Date and Time This option allows you to set the current date (year/month/day) and time (hour/minute/second). Notes: · Only years starting with 2000 are accepted. · The time is set using the selected time format. For 12 Hour time format only, the AM/PM can also be selected with or . Set Time Format This option allows you to choose between 12 Hour (AM/PM) time format and 24 Hour time format from the displayed pop-up menu.

Set Date Format This option allows you to choose the desired date format from 6 available options: DD/MM/YYYY; MM/DD/YYYY; YYYY/MM/DD; Mon DD, YYYY; DD-MM-YYYY and YYYY-Mon-DD. To set the Date & Time: · Use or to select the Date& Time option. · Press and use or to highlight the desired option you want to modify. 98 19 · Press or to confirm your selection. Use and then use and The "Logging", sampling period and "AutoHold" indicators will be displayed on the LCD. · To store another frozen value, press · To stop the logging session, press / / . again. to modify the value with to confirm your selection and or . (for Set Date and Time option). For the other two options press select one of the displayed formats with · Press to confirm your selection and return to the Date & Time options.

· Press to return to the previous mode. Notes: · For the Set Date and Time option, if the Saving Confirmation is enabled, press to accept the modified option, to escape without saving or to return to the editing mode. Otherwise, the modified option is saved automatically. · If the time is changed with more than one hour before last pH/ION calibration, a pop-up warning will appear on the LCD, notifying the user that a date/time conflict has occured and some time-dependent modes could work improperly (e.g.

Measure, GLP, Log). LCD Setup This option allows the user to set the Contrast, the Backlight of the LCD and the Backlight Saver. The Contrast parameter can be adjusted within 7 steps, while the Backlight parameter within 4 steps. The Backlight Saver can be set from 1 to 60 minutes or it can be OFF (disabled). All the changes are visible on the LCD for each parameter.

Note: If the instrument backlight is turned off after the set period of time, press any key to turn it back on. LOGGING MODE 3 This logging mode can be used for any sample measurements. By / will be availchoosing this logging mode, able in Measure mode. To log data using this mode: · Press while in Measure mode to manually log a record. The "Logged" indicator will be displayed on the LCD. · The records will be stored in one lot. In order to change the logging lot, see the measured parameter setup for details, Log option, New Lot generation. LOGGING MODE 4 This logging mode can be used for multiple samples measurement. By choosing this logging mode, / and / To log data using this mode: · Press / will be available in Measure mode. while in Measure mode to manually log a record.

Each value is logged at the time / when the key was pressed. When the measured value is frozen on the LCD by pressing and the stability criterion is reached, the logged value is the one that has been frozen on the LCD. to return to normal logging mode and then again. · To store another frozen value, press · The records will be stored in one lot. In order to change the logging lot, see the measured unit Setup for details, Log option, New Lot generation. LOGGING MODE 5 This logging mode can be used for multiple samples measurement. By choosing this logging mode, and will be available in Measure mode. Notes: · The or and or will be available in multichannel Measure mode, depending on the focused channel. · If the Reading Mode option is set as Direct and the Logging Mode 5 session is started, a warning pop-up will be displayed on the LCD, informing the user that the Reading Mode option must be 97 To set the LCD Setup: · Use · Press parameter. · Use · Press or and use or to select the LCD Setup option.

key to highlight the desired to adjust the selected parameter. to return to the System Setup menu with saving. 20 · To stop the logging session, press / . The Log Save screen will display thelog lot ID, the settable log interval / sampling: · Press to adjust the log interval and/or the log to save the current log in sampling or press the displayed format.

· Press or Language This option allows the user to choose the desired language in which all information will be displayed.
To select the Language: · Use or to select the Language option. or to highlight the and use · Press desired language. · Press to enter log interval edit menu and use to adjust the logging start-stop to save the or to adjust time or the log sampling. Press current value and use next / previous parameter. · Press to confirm your selection and return to the System to return to the System Setup Setup menu or press menu without changing.
to exit log interval edit menu and then Serial Communication This option allows the user to set the desired speed for the serial communication (baud rate) between the instrument and PC from 1200, 2400, 4800 or 9600. To set the serial communication: · Use option. or to select the Serial Communication or to highlight the press to save the current log. · While the instrument is saving the data, a "Please wait..." pop-up message will be displayed on the LCD. LOGGING MODE 2 This logging mode can be used for multiple samples measurement. By choosing this logging mode, / and / will be available in Measure mode. To log data using this mode: · Press / while in Measure mode to start the logging session.

When the measured value is frozen on the LCD by pressing / and the stability criterion is reached, the logged value is the one that has been frozen on the LCD until returning to normal logging mode by pressing . 96 · Press and use desired baud rate. · Press to confirm your selection and return to the System to return without changing. Setup menu or press Note: The meter and the PC program must have the same baud rate. 21 Meter Information This option provides general information about the instrument serial number (each instrument has an unique identification serial number), the software version and the factory calibration date and time (for mV, conductivity and temperature). Note: All the instruments are factory calibrated for mV, conductivity and temperature. After one year following factory calibration, the "Factory Calibration Due" message will appear on the LCD, in the Reminder messages area, notifying the user that the instrument should be taken to the nearest Hanna Customer Service for factory calibration. To view the meter information: · Use · Press menu. or to select the Meter Information option. to return to the System Setup to confirm and to view the meter information or press LOGGING This feature allows the user to log pH, mV, ISE (HI 4522), conductivity, resistivity, TDS, salinity and temperature.
The logging behaviour is dependent on the Logging Type and Reading Mode options from the parameter setup. The Logging Data Configuration options from the appropriate unit setup must be set first in order to be saved into the log report. The maximum number of logged records is 10.000/lot, the maximum logging time is 24h and up to 100 lots can be saved. Regarding data logging, the available logging modes are shown in the table below: Logging Mode 1 2 3 4 5 Logging Type Automatic Automatic Manual Manual AutoHold Reading Mode D irect D irect/AutoHold D irect D irect/AutoHold D irect/AutoHold Restore Factory Settings This option allows the user to reset the instrument to the default factory settings.
To restore the factory settings: · Use option. or to select the Restore Factory Settings LOGGING MODE 1 This logging mode can be used to monitor a chemical reaction. By choosing this logging mode, be available in Measure mode. To log data using this mode: · Press / while in Measure mode to start the logging session. The "Logging" and the Sampling Period indicators will be displayed on the LCD and data will be stored at the set sampling period. Note: While automatic logging is running, the measured parameter setup is not available. A warning message will be displayed if the setup is accessed. · If accessing Graph option while logging, the online graph can be visualized on the LCD (see Display Mode section). · If accessing Log History option while logging, last logged data can be visualized on the LCD (see Display Mode). will · Press to confirm your selection. A pop-up box will be displayed, asking for confirmation. · Press to confirm your selection and return to the System to return without restoring defaults. Setup or press 22 95 TEMPERATURE CALIBRATION The temperature user calibration menu can be accessed at the meter startup by pressing simultaniously three keys as in the below drawing: p H SETUP The pH Setup menu allows the user to set the parameters associated with pH measurement and calibration. Accessing pH Setup while in Measure mode and then · Press select pH range for the desired channel. · Press · Use and then or To access a pH Setup option: to highlight the desired option.

to to access pH Setup menu. Note: The temperature user calibration is performed in three points: around 0°C, 50°C, 100°C. To perform temperature user calibration: · Select the desired temperature channel by pressing (the temperature channel is switched between temperature EC channel and temperature pH channel). · Press to start the temperature calibration. Adjust the when temperature preset value using or necessary. · Insert the probe in the beaker with water at 0°C. · Press to access the selected option. The following is a detailed description of the pH Setup option screens. Profile Choosing this option the measuring and the calibration mode can be customized. Up to 10 profiles can be defined by the user.
The available options are: Save Current Profile: save the current profile. Load Profile: load from available profiles. · Wait to stabilize and then press to confirm the calibration point. · Repeat the previous three steps for 50°C and 100°C. · Save the calibration.
· Press Note: Press to return to measure mode. if you want to clear the temperature user calibration. Delete Profile: delete a profile. Save Current Profile To save the current profile: · Use or to select the Profile option. · Press and then select Save Current Profile option.
The Text Editor box will be displayed on the LCD. · Enter the desired profile name by using and to highlight the desired character and then press to add it to the text bar. It is also possible to delete the last character by positioning the cursor on the Backspace character ( ) and pressing . · Press to return to the Profile options. 23 94 Note: The saved profile will automatically become the current profile. PRACTICAL SALINITY SCALE (UNESCO 1978) According to the definition, salinity of a sample in psu (practical salinity units) is calculated using the following formula: Load Profile To load one profile: · Use or · Press and use Load Profile option.

to select the Profile option. or to highlight the · Press . A list with all customised profiles will be displayed on the screen. · Use or to confirm or to select the desired profile and press to exit without selecting.

where: RT - coefficient; Delete Profile To delete one of the existing profiles: · Use or to select the Profile option. · Press and use Delete Profile option. · Press the screen. · Use or to highlight the CT(sample) - uncompensated conductivity at T °C; C(35,15)= 42914 µS/cm - the corresponding conductivity of KCl solution containing a mass of 32.4356 g KCl / 1 Kg solution; rT - temperature compensation polynom a0=0.008 a1=-0.1692 a2=25.3851 a3=14.0941 a4=-7.0261 a5=2.

7081 c0=0.008 c1=0.0005 X=400RT Y=100RT b0=0.0005 b1=-0.0056 b2=-0.

0066 b3=-0.0375 b4=0.0636 b5=-0.0144 . A list with all customised profiles will appear on or to select the desired profile and press .

· Press to return to the previous menu. f(T)=(T-15)/[1+0.0162(T-15)] Note: The formula can be applied for salinity values between 0 and 42 psu. The formula can be applied for temperatures between -2 °C and 35 °C. 24 93 SALINITY CALIBRATION Salinity calibration is a one-point calibration procedure at 100.0% NaCl. Use the HI 7037L calibration solution (sea water solution) as a 100% NaCl standard solution. To enter salinity calibration: · Set the meter for salinity range; · Select the Percent Scale (see Salinity Setup section); · Rinse the probe with some of the calibration solution or deionized water; · Immerse the probe into HI 7037L solution. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

· Enter in calibration mode by pressing · Wait to stabilize; · Press ; to cancel calibration. to finish salinity calibration or press Temperature The temperature has a direct influence on pH. This option allows the user to choose the temperature source and units, as well as the desired manual temperature for manual temperature compensation mode. Temperature Source If using a temperature probe, Automatic Temperature Compensation will be performed relative to the displayed temperature, with the "ATC 1 / 2" indicator displayed on the LCD. The ATC option can be selected for Channel 1 or Channel 2, in accordance with the configurated channel utilizing a temperature probe. If no temperature probe is detected, Manual Temperature Compensation will be performed, with the "MTC" indicator on the LCD. Temperature Unit Accessing this option, the desired temperature unit can be chosen (Celsius, Fahrenheit or Kelvin degrees) and the meter will automatically make the conversion for the selected unit. Manual Temperature If no temperature probe is connected or the Temperature Source is set as Manual, the desired temperature can be set manually. To set one of the temperature options: · Use or to select the Temperature option. · Press and use or to highlight the desired temperature option you wish to modify.

· Press and use or to highlight the desired option (for Temperature Source & Unit options) or use or to adjust the temperature value between the displayed limits (for Manual Temperature option). · Press to confirm your selection (for Temperature Source & MEASUREMENT SALINITY MEASURE MENT Three measurement scales are available for salinity (Natural Sea Water Scale, Practical Salinity Scale and Percent Scale). NATURAL SEA WATER SCALE (UNESCO 1966) According to the definition, salinity of a sample in ppt is calculated using the following formula: Unit options) or press to save the current value (for Manual Temperature option). Otherwise, press to cancel operation. where: RT - coefficient; CT(sample) - uncompensated conductivity at T °C; C(35,15)= 42914 µS/cm - the corresponding conductivity of KCl solution containing a mass of 32.

4356 g KCl / 1 Kg solution; rT - temperature compensation polynom. Note: The formula can be applied for temperatures between 10 °C and 31 °C. 92 Calibration This option allows the user to set all the data regarding the pH calibration process. Buffer Entry Type Three entry modes for the pH buffers used for calibration are available: Automatic the instrument automatically selects the closest buffer to the measured pH value from the edited buffer group. Semiautomatic the instrument automatically selects the closest buffers to the measured pH value from all 25 available buffers and you can choose the one used.

Manual Selection the desired pH buffer is manually selected from all available buffers, regardless of measured value. To select the Buffer Entry Type: · Use or to select the Calibration option. or or to highlight the to highlight the to · Press and use Buffer Entry Type option. · Press and use desired option. TDS MEASURE MENT Make sure the TDS factor has been set before taking TDS measurements (see TDS Setup section). DIRECT MEASUREMENT To measure the TDS of a sample using the Direct reading mode: · Press and then to select TDS measure mode. · Select the Direct reading mode (see TDS Setup section). · Proceed as for the conductivity measurement (see Conductivity Measurement section). · Press to confirm your selection or press cancel operation. 1st Cal.

Point Two options are available for the 1st Cal.: Point and Offset. If Point option is selected, the slope values adjacent to the calibration points will be reevaluated (normal calibration). If at least a two-point calibration has been performed and an offset correction of the electrode is wanted (maintaining the existing slope values), perform a one-point calibration using the Offset option. To set the 1st Cal. Point: · Use or to select the Calibration option. · Press and use 1st Cal. Point option. · Press and use desired option. or or to highlight the to highlight the to DIRECT/AUTOHOLD MEASUREMENT To measure TDS of a sample using the Direct / AutoHold reading mode: · Select the Direct / AutoHold reading mode (see TDS Setup section).

· Proceed as for the conductivity measurement. (see Conductivity Measurement section) · Press to confirm your selection or press cancel operation. Edit Custom Buffers If you want to use other buffers than the ones already memorized (standard buffers), the Edit Custom Buffers option is available, allowing you to set the desired pH buffers. Up to five pH custom buffers can be set. 26 91 RESISTIVITY MEASURE MENT Make sure the instrument has been calibrated before taking resistivity measurements.

DIRECT MEASUREMENT To measure the resistivity of a sample using the Direct reading mode: · Press and then to select resistivity measure mode. · Select the Direct reading mode (see Resistivity Setup section). · Proceed as for the conductivity measurement (see Conductivity Measurement section).

To edit the Custom Buffers: · Use or to select the Calibration option. or to highlight the to set the custom buffer value , to set the or to · Press and use Edit Custom Buffers option.

· For a previous set value, press otherwise press to "----" if desired and confirm the setting by pressing to edit the selected custom buffer. · While in edit custom buffer menu press custom buffer value to 7.000 pH and then use to set the desired custom buffer value. · Press to exit custom buffer edit menu. If the Saving Confirmation is enabled, press accept the modified option, to escape without saving or Otherwise, the modified option is saved automatically. · Use key to select the next custom buffer to be set or press to return to the editing mode. to return to Calibration options. DIRECT/AUTOHOLD MEASUREMENT To measure resistivity of a sample using the Direct / AutoHold reading mode: · Select the Direct / AutoHold reading mode (see Resistivity Setup section). · Proceed as for the conductivity measurement. (see Conductivity Measurement section) Edit Buffer Group Accessing this option the user can edit the desired group of five pH buffers for automatic buffer recognition (Automatic Buffer Entry Type).

If the Buffer Group already contains five pH buffers, at least one pH buffer has to be removed in order to add another buffer. To set the Buffer Group: · Use or to select the Calibration option. · Press and use Edit Buffer Group option. or to highlight the to choose the · Press and use and pH buffer to be included in the buffer group. · Press or to add / remove the selected pH buffer to / from the buffer group. · Press to return to Calibration options and to save the changes. 90 27 Calibration Reminder In order to have accurate readings, the instrument must be calibrated frecquently. Three options are available for the calibration reminder: Daily, Periodic or Disabled. To set the Calibration Reminder: · Use or to select the Calibration option. · Press and use Calibration Reminder option.

· Press and use desired option. or or to highlight the to highlight the to Stage 3 - this is an off-line test. To perform this test: · Take the water sample from the previous test and increase its ionic strength for a pH measurement at 25 °C; · Record the pH and round it to the nearest 0.1 pH; · Look up the corresponding conducivity value measured in Stage 2 above; · If the conductivity is lower than the conductivity from the below table, then the sample has met the USP requirements. Otherwise, the water didn't meet the USP requirements.

pH 5.0 5.1 5.2 5.3 5.

4 5.5 5.6 5.7 5.8 5.9 6.0 Conductivity (µS/cm) 4.7 4.1 3.6 3.

3 3.0 2.8 2.6 2.5 2.4 2.4 2.4 pH 6.1 6.2 6.

3 6.4 6.5 6.6 6.7 6.

8 6.9 7.0 Conductivity (µS/cm) 2.4 2.5 2.

4 2.3 2.2 2.1 2.6 3.1 3.8 4.6 · Press to confirm your selection or press cancel operation. Set Reminder Period If choosing Daily or Periodic options for the Calibration Reminder, the Set Remind Period must be accessed in order to set the time interval until next calibration. The time interval between two calibrations can be set up to 1 day / 1 year for Daily / Periodic options.

Note: If Set Reminder Period parameter is accessed and the Calibration Reminder is disabled, a warning message appears on the LCD informing the user that the reminder period can be set only if the Calibration Reminder is set as Daily or Periodic. To set the Reminder Period: or to select the Calibration option. · Use · Press and use Set Reminder Period option. and use · Press previous entry to be edit. · Press · Press and use value, then press or / or to highlight the to select next / to set the desired To access the USP menu: · Select the Direct / USP reading mode (see Conductivity Setup); · Return to measure mode; · Press (USP) and then select the desired USP stage. to save the modified value. to accept the modified to return to the editing mode. Otherwise, the modified 28 89 to return to the Calibration options. If the Saving Confirmation is enabled, press option, to escape without saving or option is saved automatically. DIRECT/USP MEASUREMENT In this measure mode the user can check for ultra pure water using the United States Pharmacopeia standard (USP <645>). This USP standard consists of three stages (one in-line and two off-line tests) as following: Stage 1 - this is an in-line test. To perform this test: · Measure the temperature of the water and the uncompensated conductivity readings. The measurement may be performed in a suitable container or as in-line measurement. · The temperature will be round down to the nearest 5 °C and look up the corresponding conductivity value in the below table. · If the measured conductivity is lower than the conductivity in the table, then the water meets the USP requirements.

· Otherwise, proceed to Stage 2 testing. Temperature (°C) 0 5 10 15 20 25 30 35 40 45 50 Conductivity (µS/cm) 0.6 0.8 0.9 1.

0 1.1 1.3 1.4 1.5 1.7 1.8 1.9 Temperature (°C) 55 60 65 70 75 80 85 90 95 100 Conductivity (µS/cm) 2.1 2.2 2.

4 2.5 2.7 2.7 2.7 2.7 2.9 3.1 Clear Calibration Accessing this option, the existent pH calibration can be cleared. If the calibration is cleared, another calibration has to be performed. To clear Calibration: or to select the Calibration option.

· Use · Press and use Clear Calibration option. or to highlight the · Press to clear calibration. A pop-up menu will be displayed asking for confirmation. · Press to confirm or press to escape without saving and return to the Calibration options. Sample ID This option allows the user to give to the measured samples an identification number/name.

Two Sample ID options are available: ID Increment Mode and Edit Sample ID. ID Increment Mode Two increment modes for the sample ID can be selected: None the sample ID will be fixed and it can be set alphanumerically. Automatic the sample ID will be increased with 1 for each new log lot. To set the ID Increment Mode: or to select the Sample ID option. · Use · Press and use ID Increment Mode option.

and use · Press desired option. or or to highlight the to highlight the to Stage 2 - this is an off-line test. To perform this test: · Store the water sample in an enclosed clean container that has been rinsed previously with water of the same quality. · Adjust the sample's temperature to 25 °C and agitate the sample to ensure that it has equilibrated with ambient CO2. · If the measured conductivity is less than 2.1 µS/cm, then the sample has met the USP requirements. · Otherwise, proceed to Stage 3 testing. · Press to confirm your selection or press cancel operation. 88 29 Edit Sample ID This option allows the user to edit the sample ID.