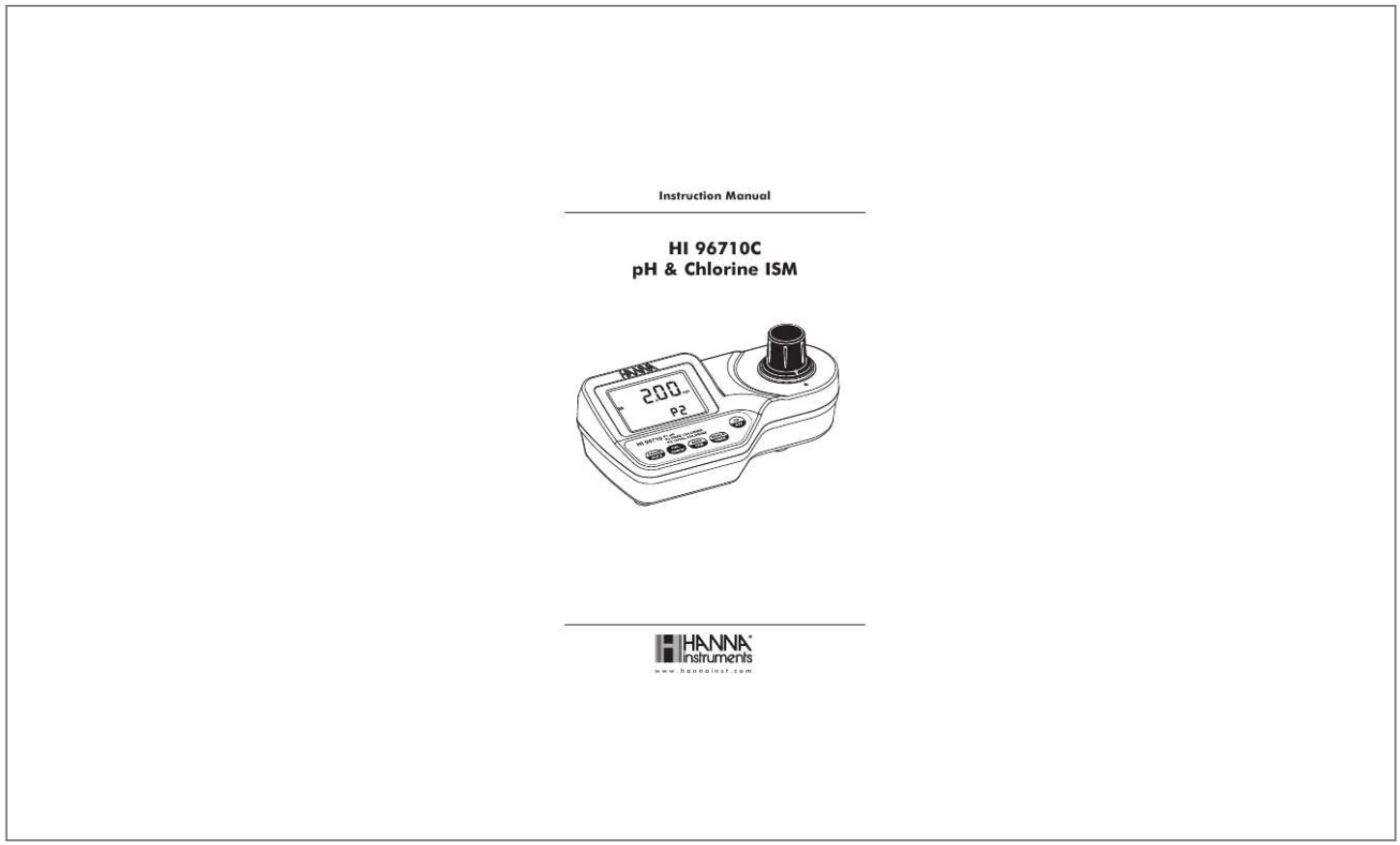
Instruction Manual

HI 96710C
pH & Chlorine ISM

Manual abstract:

@@@@4 ABBREVIATIONS .....

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.... 4 SPECIFICATIONS .....

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.... 5 PRECISION AND ACCURACY .

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..... 6 PRINCIPLE OF OPERATION ...

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 2 PRELIMINARY EXAMINATION Please examine this product carefully. Make sure that the instrument is not damaged. If any damage occurred during shipment, please notify your Dealer. Each HI 96710 Ion Selective Meter is supplied complete with: · Two Sample Cuvettes and Caps · Four CAL CHECK standard cuvettes HI 96710KIT · 9V Battery · Scissors · Tissue for wiping cuvettes · Instrument quality certificate · Instruction Manual · Rigid carrying case Note:Save all packing material until you are sure that the instrument works correctly. Any defective item must be returned in its original packing.

3 GENERAL DESCRIPTION The HI 96710 is an auto diagnostic portable microprocessor meter that benefits from Hanna's years of experience as a manufacturer of analytical instruments. It has the advanced optical system based on a special tungsten lamp and a narrow band interference filter that allows most accurate and repeatable readings. All instruments are factory calibrated and the electronic and optical design minimizes the need of frequent calibration. With the powerful CAL CHECKTM validation function, you are able to validate good performance of your instrument at any time. The validation procedure is extremely user friendly.

Just use the exclusive HANNA ready-made, NIST traceable standards to verify the performance of the instrument and recalibrate if necessary. All instruments are splash waterproof and the lamp and filter units are protected from dust or dirt by a transparent cup. This makes the instruments fulfill field applications. Display messages aid the user in routine operation. The meter has an auto-shut off feature that will turn off the instrument after 10 minutes of non use in measurement mode or after 1 hour if left in calibration mode.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results. The HI 96710 meter measures both pH and chlorine (free and total) content in water and wastewater in the following ranges: pH 6.5 to 8.5 pH units Free Chlorine 0.00 to 5.00 mg/L (ppm) Total Chlorine 0.00 to 5.00 mg/L (ppm).

The method is an adaptation of the USEPA method 330.5 and Standard Method 4500-Cl G. For pH, Phenol red method. The reagents are in liquid and powder form depending on the parameter and they are supplied in dropper bottles and packets. The amount of reagent is precisely dosed to ensure the maximum repeatability. ABBREVIATIONS °C: EPA: °F: mg/L: mL: mV: degree Celsius US Environmental Protection Agency degree Fahrenheit milligrams per liter. mg/L is equivalent to ppm (parts per million) milliliter millivolts 4 SPECIFICATIONS pH 6.5 to 8.5 Free Chlorine 0.00 to 5.
00 mg/L Total Chlorine 0.00 to 5.00 mg/L Resolution 0.1 pH 0.01 mg/L under 3.
50 mg/L Chlorine 0.10 mg/L above 3.50 mg/L Chlorine Accuracy pH ±0.1 pH @ 25°C Free Chlorine ±0.03 mg/L ±3% of reading @ 25°C Total Chlorine ±0.
03 mg/L ±3% of reading @ 25°C Typical EMC Deviation ±0.1 pH ±0.01 mg/L Chlorine Light Source Tungsten lamp Light Detector Silicon Photocell with narrow band interference filter @ 525 nm Method For pH: Phenol red method. The reaction with reagents causes a red tint in the sample. For Chlorine: Adaptation of the USEPA method and Standard Method 4500-Cl G. The reaction with reagents causes a pink tint in the sample. Environment 0 to 50°C (32 to 122°F); max 95% RH non-condensing Battery Type 1 x 9 volt Auto-Shut off After 10' of non-use in measurement mode; after 1 hour of non-use in calibration mode; with last reading reminder. Dimensions 192 x 104 x 69 mm (7.6 x 4.1 x 2.

7") Weight 360 g (12.7 oz.). Range REQUIRED REAGENTS Code Unit HI 93710-0 HI 93701-0 HI 93711-0 pH Free Chlorine Total Chlorine Description Phenol red DPD Powder Reagent DPD Powder Reagent Quantity/test 5 drops 1 packet 1 packet 5 PRECISION AND ACCURACY Precision is how closely repeated measurements agree with each other. Precision is usually expressed as standard deviation (SD). Accuracy is defined as the nearness of a test result to the true value. Although good precision suggests good accuracy, precise results can be inaccurate. The figure explains these definitions. In a laboratory using a standard solution of 7.0 pH and a representative lot of reagent, an operator obtained with a single instrument a standard deviation of 0.

1 pH units. In a laboratory using a standard solution of 1.00 mg/L free and total chlorine and a representative lot of reagent, an operator obtained with a single instrument a standard deviation of 0.02 mg/L. PRINCIPLE OF OPERATION Absorption of Light is a typical phenomenon of interaction between electromagnetic radiation and matter.

When a light beam crosses a substance, some of the radiation may be absorbed by atoms, molecules or crystal lattices. If pure absorption occurs, the fraction of light absorbed depends both on the optical path length through the matter and on the physical-chemical characteristics of the substance according to the Lambert-Beer Law: -log I/Io = c d or A = c d Where: -log I/Io = Absorbance (A) Io = intensity of incident light beam I = intensity of light beam after absorption = molar extinction coefficient at wavelength c = molar concentration of the substance d = optical path through the substance 6 Therefore, the concentration "c" can be calculated from the absorbance of the substance as the other factors are known. Photometric chemical analysis is based on the possibility to develop an absorbing compound from a specific chemical reaction between sample and reagents. Given that the absorption of a compound strictly depends on the wavelength of the incident light beam, a narrow spectral bandwidth should be selected as well as a proper central wavelength to optimize measurements. The optical system of Hanna's HI 96 series colorimeters is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 96 series block diagram (optical layout) A microprocessor controlled special tungsten lamp emits radiation which is first optically conditioned and beamed to the sample contained in the cuvette.

The optical path is fixed by the diameter of the cuvette. Then the light is spectrally filtered to a narrow spectral bandwidth, to obtain a light beam of intensity Io or I. The photoelectric cell collects the radiation I that is not absorbed by the sample and converts it into an electric current, producing a potential in the mV range. The microprocessor uses this potential to convert the incoming value into the desired measuring unit and to display it on the LCD. The measurement process is carried out in two phases: first the meter is zeroed and then the actual measurement is performed. The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions. Whenever possible use the same cuvette for both. It is necessary that the surface of the cuvette is clean and not scratched.

This to avoid measurement interference due to unwanted reflection and absorption of light. It is recommended not to touch the cuvette walls with hands. Furthermore, in order to maintain the same conditions during the zeroing and the measuring phases, it is necessary to close the cuvette to prevent any contamination. 7 FUNCTIONAL DESCRIPTION INSTRUMENT DESCRIPTION 1) 2) 3) 4) 5) 6) 7) 8) RANGE/GLP/ key CAL CHECK key ZERO/CFM key READ/ /TIMER key ON/OFF key Liquid Cristal Display (LCD) Cuvette alignment indicator Cuvette holder KEYPAD DESCRIPTION · ON/OFF: to turn the meter on and off. · ZERO/CFM: this is a bi-functional key. Just press to zero the meter prior to measurement, or to confirm edited values. In calibration mode press to confirm factory calibration restore. · READ/ /TIMER: this is a multi-functional key. In measurement mode, press to make a measurement, or press and hold for three seconds to start a pre-programmed countdown prior to measurement. In GLP mode press to view the next screen.
· CAL CHECK: this is a bi-functional key. Just press to perform the validation of the meter, or press and hold for three seconds to enter calibration mode. · RANGE/GLP/ : this is a multi-functional key. Just press to change the parameter. Press and hold for three seconds to enter GLP mode.
In calibration mode press to edit the date and time. OPERATING MODES · Measurement mode: default operation mode, enables both validation and measurement. · Calibration mode: may be entered by keeping CAL CHECK pressed for three seconds (the "CAL" tag appears), it enables calibration of the instrument. · GLP mode: may be entered by keeping RANGE/GLP/ pressed for three seconds ("GLP" appears), it enables consulting of user calibration date or restore factory calibration. 8 DISPLAY ELEMENTS DESCRIPTION 5 4 3 9 2 1 10 6 7 8 1) The measuring scheme (lamp, cuvette, detector), appears during different phases of zero or reading measurement 2) Error messages and warnings 3) The battery icon indicates the charge state of the battery 4) The hourglass appears when an internal check is in progress 5) Status messages 6) The chronometer appears when the reaction timer is running 7) The month, day and date icons appear when a date is displayed 8) Four digit main display 9) Measuring units 10) Four digit secondary display 9 ERRORS AND WARNINGS The instrument shows rement follow the validation procedure to be sure that the instrument is properly calibrated.
If necessary, calibrate the instrument. STARTUP Prepare the instrument for measurement as follows: · Unpack the instrument by removing the dust protection sleeve from the instrument cuvette holder. · Place the battery in the instrument as described in the "BATTERY REPLACEMENT" chapter. · Place the instrument on a flat table. · Do not place the instrument under direct sun light. 13 RANGE SELECTION The HI 96710 can measure pH when range P1 is selected, Free Chlorine when range P2 is selected or Total Chlorine when range P3 is selected. To change the active range follow the procedure: · Turn the meter on by pressing ON/OFF. The display briefly shows all tags on. · After startup, the range identification number is displayed on the secondary LCD as P1, P2 or P3. Code P1 P2 P3 Parameter pH Free Chlorine Total Chlorine · Press RANGE/GLP/ to change the range.

@@@@First, the meter is zeroed using the unreacted sample. After the reagents are added the reacted sample is measured. @@· Turn the meter on by pressing ON/OFF. @@@@· Pay attention to the selected range. To change the range, simply press RANGE/GLP/ . @@@@@@@@The meter is now zeroed and ready for measurement. @@Replace the cap and swirl the solution. @@15 · Press READ/ /TIMER. @@@@@@@@@@@@The meter is now zeroed and ready for measurement. · Remove the cuvette.
· Add the content of one packet of HI 93701-0 reagent. @@16 · Press and hold READ/ /TIMER for three seconds. The display will show the countdown prior to measurement. @@@@@@In case of water with alkalinity greater than 250 mg/L CaCO3 or acidity greater than 150 mg/L CaCO3, the color of the sample could disappear or develop only partially. To resolve this, neutralize the sample with diluted HCl or NaOH.
17 TOTAL CHLORINE MEASUREMENT · Fill the cuvette up to the mark with 10 mL of unreacted sample and replace the cap. @@The meter is now zeroed and ready for measurement. · Remove the cuvette and add one packet of HI 93711-0 reagent. · Press and hold READ/ /TIMER for three seconds. The display will show the countdown prior to measurement.
An audible "beep" indicates the end of the countdown period. 18 · Alternatively, wait for 2 minutes and 30 seconds and just press READ/ /TIMER. In both cases, the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase. · The instrument directly displays the concentration in mg/L of total chlorine on the Liquid Crystal Display. INTERFERENCES Interference may be caused by: Bromine Iodine Chlorine Dioxide Ozone Oxidized manganese and Chromium. In case of water with hardness greater than 500 mg/L CaCO3, shake the sample for approximately 1 minute after adding the reagent. In case of water with alkalinity greater than 250 mg/L CaCO3 or acidity greater than 150 mg/L CaCO3, the color of the sample could disappear or develop only partially. To resolve this, neutralize the sample with diluted HCl or NaOH. 19 VALIDATION PROCEDURE Use the validation procedure to ensure that the instrument is properly calibrated. Warning: Do not validate the instrument with any standard solutions other than the HANNA CAL CHECKTM Standards, otherwise erroneous results will be obtained.

Note: The validation is performed only for the selected parameter. For full validation of the instrument, the following procedure must be performed for each parameter.

· Turn the meter on by pressing ON/OFF. · When the beeper sounds briefly and the LCD displays dashes, the meter is ready. · Place the CAL CHECK TM Standard Cuvette A into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove. @@@@The meter is now zeroed and ready for validation. · Remove the cuvette. · Place the corresponding CAL CHECKTM Standard Cuvette B into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove. 20 · Press CAL CHECK and the lamp, cuvette and detector icons together with "CAL CHECK" will appear on the display, depending on the measurement phase. · At the end of the measurement the display will show the validation standard value.

The reading should be within specifications as reported in the CAL CHECKTM Standard Certificate. If the value is found out of the specifications, please check that the cuvettes are free of fingerprints, oil or dirt and repeat validation. If results are still found out of specifications, then recalibrate the instrument. CALIBRATION PROCEDURE Note: It is possible to interrupt calibration procedure at any time by pressing CAL CHECK or ON/OFF keys. Warning: Do not calibrate the instrument with standard solutions other than the HANNA CAL CHECKTM Standards, otherwise erroneous results will be obtained.

When calibrating, only the selected range is affected. · Turn the meter on by pressing ON/OFF. When the beeper sounds briefly and the LCD displays dashes, the meter is ready. · Press and hold CAL CHECK for three seconds to enter calibration mode. The display will show "CAL" during calibration procedure. The blinking "ZERO" asks for instrument zeroing. · Place the CAL CHECK TM Standard HI 96710-11 Cuvette A into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove. 21 @@· After a few seconds the display will show "-0.0-". The meter is now zeroed and ready for calibration. The blinking "READ" asks for reading calibration standard. · Remove the cuvette. · Place the corresponding CAL CHECKTM Standard Cuvette B into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove. · Press READ/ /TIMER and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase. · After measurement the instrument will show for three seconds the CAL CHECKTM Standard value.

Note: If the display shows "STD HIGH", the standard value was too high. If the display shows "STD LOW", the standard value was too low. Verify that all CAL CHECKTM Standards Cuvettes, A and B are free from fingerprints or dirt and that they are inserted correctly. · Then the date of the last calibration (e.g.: "01.08.2009") appears on the display, or "01.01.2009" if the factory calibration was selected before.

In both cases the year number is blinking, ready for date input. 22 DATE INPUT · Press RANGE/GLP/ to edit the desired year (2009-2099). If the key is kept pressed, the year number is automatically increased. or · When the correct year has been set, press ZERO/CFM or READ/ /TIMER to confirm. Now the display will show the month blinking.

· Press RANGE/GLP/ to edit the desired month (01-12). If the key is kept pressed, the month number is automatically increased. or · When the correct month has been set, press ZERO/CFM or READ/ /TIMER to confirm. Now the display will show the day blinking. · Press RANGE/GLP/ to edit the desired day (01-31).

If the key is kept pressed, the day number is automatically increased. Note: It is possible to change the editing from day to year and to month by pressing READ/ /TIMER. · Press ZERO/CFM to save the calibration date. · The instrument displays "Stor" for one second and the calibration is saved. 23 · The instrument will return automatically to measurement mode by displaying dashes on the LCD. GLP In the GLP mode, the last user calibration date can be verified and the factory calibration can be restored. LAST CALIBRATION DATE To display the calibration date: · Press RANGE/GLP/ to enter GLP mode. The calibration month and day will appear on the main display and the year on the secondary display. · If no calibration was performed, the factory calibration message, "F.CAL" will appear on the main display and the instrument returns to measurement mode after three seconds.

FACTORY CALIBRATION RESTORE It is possible to delete the calibration and restore factory calibration. · Press RANGE/GLP/ to enter GLP mode. · Press READ/ /TIMER to enter in the factory calibration restore screen. The instrument asks for confirmation of user calibration delete. @@@@@@@@The blinking "ZERO" means that a new zero has to be performed. One fresh battery lasts for around 750 measurements, depending on the light level. The remaining battery capacity is evaluated at the instrument startup and after each measurement. The instrument displays a battery indicator with three levels as follows: · 3 lines for 100 % capacity · 2 lines for 66 % capacity · 1 line for 33 % capacity · Battery icon blinking if the capacity is under 10 %. If the battery is empty and accurate measurements can't be taken anymore, the instrument shows "dEAd bAtt" and turns off. To restart the instrument, the battery must be replaced with a fresh one.

BATTERY REPLACEMENT To replace the instrument's battery, follow the steps: · Turn the instrument off by pressing ON/OFF. · Turn the instrument upside down and remove the battery cover by turning it counterclockwise. · Extract the battery from its location and replace it with a fresh one. · Insert back the battery cover and turn it clockwise to close. 25 ACCESORIES REAGENT SET HI 93701-01 HI 93701-03 HI 93710-01 HI 93710-03 HI 93711-01 HI 93711-03 Reagents for 100 free chlorine tests Reagents for 300 free chlorine tests Reagents for 100 pH tests Reagents for 300 pH tests Reagents for 100 total chlorine tests Reagents for 300 total chlorine tests OTHER ACCESORIES HI 96701-11 CAL CHECKTM Standard Cuvettes for Free Chlorine (1 set) HI 96710-11 CAL CHECKTM Standard Cuvettes for pH (1 set) HI 96711-11 CAL CHECKTM Standard Cuvettes for Total Chlorine (1 set) HI 721310 9V battery (10 pcs.

) HI 731318 Tissue for wiping cuvettes (4 pcs.) HI 731331 Glass cuvettes (4 pcs.) HI 731335 Caps for cuvettes HI 93703-50 Cuvettes cleaning solution (230 mL) 26 WARRANTY HI 96710 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to the instructions. This warranty is limited to repair or replacement free of charge. Damages due to accident, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact your dealer. 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 Customer Service Department and then send it with shipment costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection. To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase. Recommendations for Users Before using these products, make sure that they are entirely suitable for your specific application and for the environment in which they are used. Operation of these instruments may cause unacceptable interferences to other electronic equipments, this requiring the operator to take all necessary steps to correct interferences. Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance. To avoid damages or burns, do not put the instrument in microwave oven.

For yours and the instrument safety do not use or store the instrument in hazardous environments. Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice. 27 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.hannainst.com Local Sales and Customer Service Office Printed in EUROPE (ROMANIA) MAN96710 07/10 28 .