

Instruction Manual

HI 83746 REDUCING SUGARS ISM for wine analysis



Dear Customer,

Thank you for choosing a Hanna product. This manual will provide you with the necessary information for the correct use of the instrument. Please read it carefully before using the meter. If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com.

This instrument is in compliance with **CE** directives.

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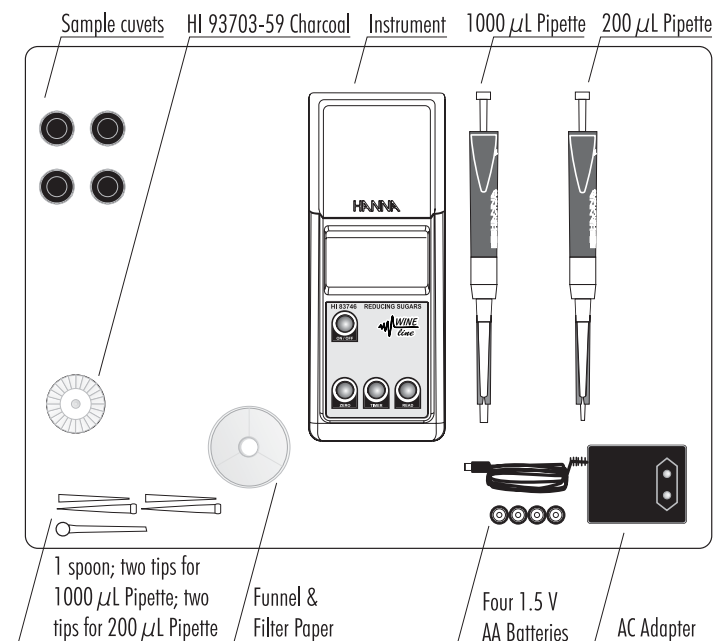
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PRELIMINARY EXAMINATION

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 83746** Ion Selective Meter is supplied complete with:

- Four glass cuvetts and caps
- Reagents for about 20 tests (HI 83746A-0 and HI 83746B-0)
- HI 93703-59 Charcoal
- One 200 μ L Automatic Pipette with two plastic tips
- One 1000 μ L Automatic Pipette with two plastic tips
- Instruction Sheet for Automatic Pipette
- One Spoon; one Funnel; Filter paper (25 pieces)
- AC Adapter
- Four 1,5V AA batteries
- Tissue for wiping cuvetts
- Instruction manual
- Instrument Quality Certificate and Warranty Card
- 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.

GENERAL DESCRIPTION

The **HI 83746** is an auto-diagnostic portable microprocessor meter that benefits from Hanna's years of experience as a manufacturer of analytical instruments. It has an 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.

The auto-diagnostic feature of this meter ensures always optimal measurement conditions to ensure most precise readings. The light level is automatically adjusted each time a zero-measurement is made, and the temperature of the lamp is controlled to avoid overheating.

SIGNIFICANCE OF USE

The determination of concentration of reducing sugars (RS) is one of the most important parameters that need to be measured during the wine making process.

Following the increase of RS during maturation of grapes can help to decide when to start harvest. Having the highest possible sugar content is important because this is the main parameter that defines the commercial value of grapes.

During the alcoholic fermentation instead, the decrease of sugars can be followed to decide when fermentation is completed, or allows making corrective actions if the content of RS is too low to obtain the desired alcohol degree or sweetness.

The predominant RS in grape products are glucose and fructose (hexoses). After reaction with excess alkaline cupric tartrate (Fehling reagents), the RS content can be determined colorimetrically. The Fehling method is not an exact determination but an index of the reducing sugar concentration, because the reaction depends upon the amount and kind of RS present. When the reducing sugar content is known at the beginning of fermentation, the potential alcohol degree can be estimated multiplying the sugar concentration (in g/L) by 0.06.

Phenols interfere in the Fehling reaction and therefore red wine must be decolorized prior to analysis. Wine also contains non-fermentable reducing sugars like pentose which will also be analysed by this method.

Typical content of reducing sugars in must and wine

Must	sweet must	20-25 %	200-250 g/L
	normal	10-20 %	100-200 g/L
	in fermentation	4-12.5 %	40-125 g/L
Wine	Sweet	2.5-12.5 %	25-125 g/L
	Semi sweet	0.8-2.5 %	8-25 g/L
	Almost dry	0.2-0.8 %	2-8 g/L
	Dry	0-0.2 %	0-2 g/L

SPECIFICATIONS

Range	0.00-50.00 g/L
Resolution	0.25 g/L
Precision	±0.50 @ 10.00 g/L
Light Source	Tungsten lamp with narrow band interference filter @ 610 nm
Light Detector	Silicon Photocell
Method	Fehling Method
Environment	0 to 50°C (32 to 122°F); max 95% RH non-condensing
Battery Type	4 x 1,5 volt AA batteries / 12 to 20 VDC through voltage adapter
Dimensions	224 x 87 x 77 mm (8.7 x 3.3 x 3.1")
Weight	512 g (17,6 oz.)

REQUIRED REAGENTS

Code	Description	Quantity/test
HI 83746A-0	Fehling solution A	1 vial
HI 83746B-0	Fehling solution B	1 mL

OPTIONAL REAGENTS

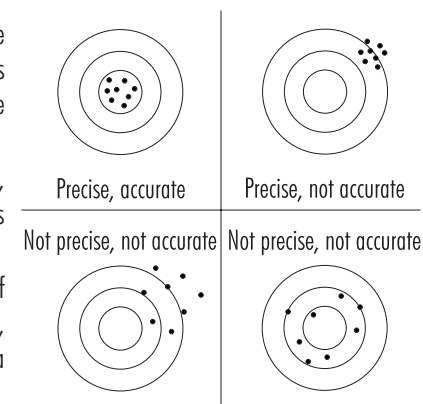
Code	Description	Quantity/test
HI 93703-59	Charcoal	2 spoons

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 10.00 g/L of Reducing Sugars and a representative lot of reagent, an operator obtained with a single instrument a standard deviation of ±0.50 g/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:

$$-\log \frac{I}{I_0} = \epsilon_{\lambda} c d$$

or

$$A = \epsilon_{\lambda} c d$$

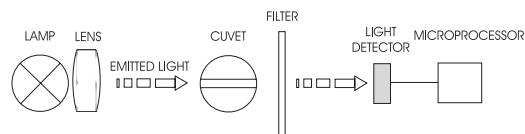
Where:

$-\log I/I_0$	=	Absorbance (A)
I_0	=	intensity of incident light beam
I	=	intensity of light beam after absorption
ϵ_{λ}	=	molar extinction coefficient at wavelength λ
c	=	molar concentration of the substance
d	=	optical path through the substance

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 83000** series colorimeters is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.



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 cuvet. The optical path is fixed by the diameter of the cuvet. Then the light is spectrally filtered to a narrow spectral bandwidth, to obtain a light beam of intensity I_0 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 cuvet 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) cuvetts are optically identical to provide the same measurement conditions. Whenever possible use the same cuvet for both. It is necessary that the surface of the cuvet 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 cuvet walls with hands.

Furthermore, in order to maintain the same conditions during the zeroing and the measuring phases, it is necessary to close the cuvet to prevent any contamination.

ABBREVIATIONS

°C: degree Celsius

°F: degree Fahrenheit

g/L: grams per liter. g/L is equivalent to ppt (part per thousand)

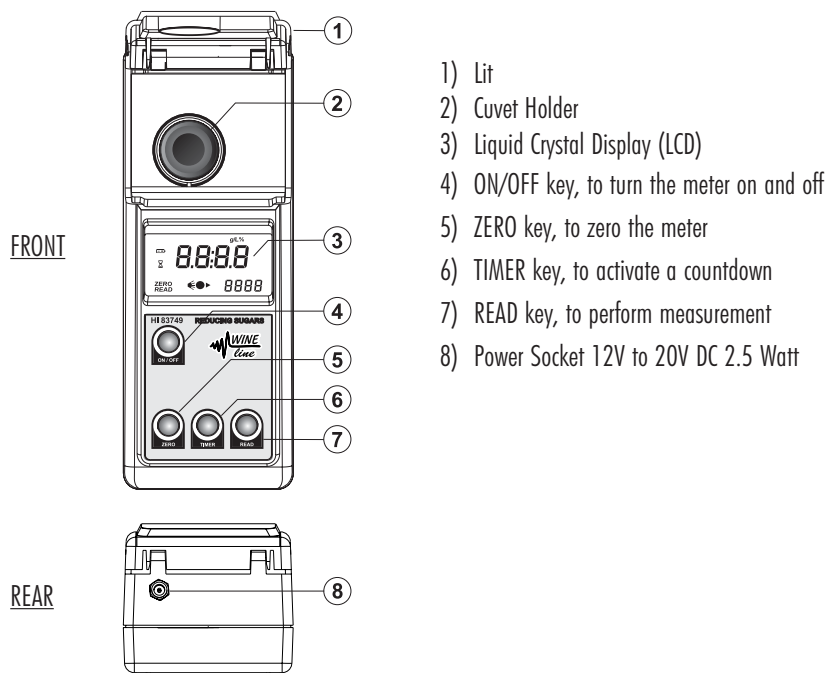
mL: milliliter

μL: microliter

LCD: Liquid Crystal Display

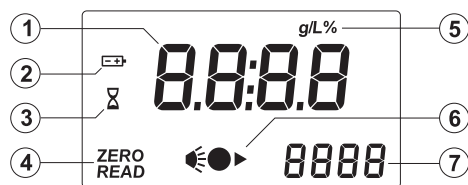
FUNCTIONAL DESCRIPTION

INSTRUMENT DESCRIPTION



- 1) Lit
- 2) Cuvet Holder
- 3) Liquid Crystal Display (LCD)
- 4) ON/OFF key, to turn the meter on and off
- 5) ZERO key, to zero the meter
- 6) TIMER key, to activate a countdown
- 7) READ key, to perform measurement
- 8) Power Socket 12V to 20V DC 2.5 Watt

DISPLAY ELEMENTS DESCRIPTION

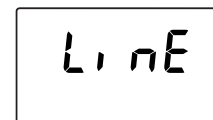


- 1) Four digit main display.
- 2) Battery icon: appears when the battery voltage is getting low.
- 3) The hourglass icon: appears during the countdown.
- 4) Status information.
- 5) Measurement unit.
- 6) Lamp status indicator.
- 7) Four digit secondary display.

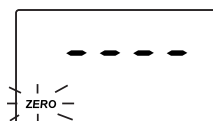
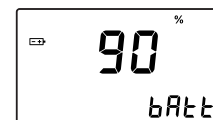
GUIDE TO DISPLAY CODES



This prompt appears for a few seconds each time the instrument is turned ON.



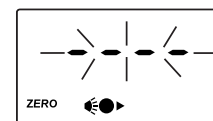
These prompts indicate the type of power supply: "Line" (if the external power supply is used) or the battery level.



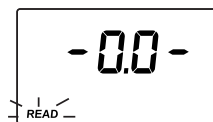
Indicates that the instrument is in a ready state and waiting for the next command (Timer or Zero).



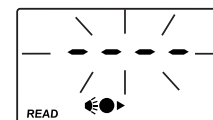
After TIMER is pressed, a blinking hourglass icon appears and the display shows a 7 minutes countdown. Also the Zero tag might blink if no zero measurement has been made before. At the end of the countdown an acoustic signal alerts the user that the timer is finished.



Indicates that the meter is performing a zero measurement. The light intensity is automatically re-adjusted (auto-calibration features) if necessary.



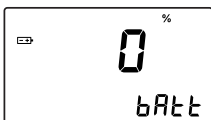
The instrument is zeroed and a measurement can be made.



Indicates that the meter is making a measurement.



Batteries voltage is getting low and the batteries need to be replaced.

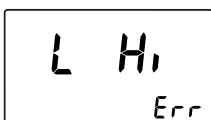


Indicates that the batteries are dead and must be replaced. After this message appears, the instrument is switched off. Change the batteries and restart the meter.

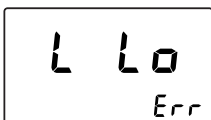


ERROR MESSAGES

The meter has lost its configuration. Contact your dealer or the nearest Hanna Customer Service Center.



“Light high”: there is too much light to perform a measurement. Please check the preparation of the zero cuvet.

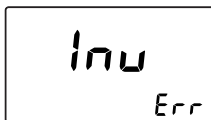


“Light low”: there is not enough light to perform a measurement. Please check the preparation of the zero cuvet.



“No Light”: the lamp is not working because of a malfunction. Contact your dealer or the nearest Hanna Customer Service Center.

b) on sample reading:



“Inverted”: the sample and the zero cuvet are inverted.



The sample absorbs less light than the zero reference. Check the procedure and make sure you use the same cuvet for reference (zero) and measurement.



A flashing value of the maximum concentration indicates an over range condition. The concentration of the sample is beyond the programmed range: dilute the sample and measure again.

GENERAL TIPS FOR AN ACCURATE MEASUREMENT

The instructions listed below should be carefully followed during testing to ensure best accuracy.

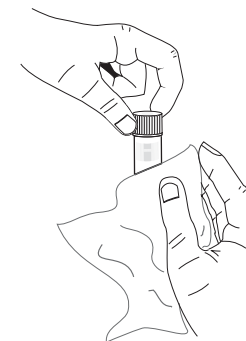
- For dosing the wine sample and the reagent, we recommend to use the supplied Hanna automatic pipettes **HI 731340** (200 μL) and **HI 731341** (1000 μL). For a correct use of the Hanna automatic pipette, please follow the related Instruction Sheet.



- All the reaction times reported in this manual are referred to 20°C (68°F). As a general rule of thumb, they should be doubled at 10°C (50°F) and halved at 30°C (86°F).

USING VIALS

- Never insert hot vials into the instrument, or the cuvet holder may be damaged.
- In order to avoid reagent leaking and to obtain most accurate results, it is recommended to close the vial tightly with the supplied cap after addition of reagents or sample.
- Whenever the vial is placed into the measurement cell, it must be dry outside, and completely free of fingerprints, oil or dirt. Wipe it thoroughly with **HI 731318** or a lint-free cloth prior to insertion.



DIGESTION

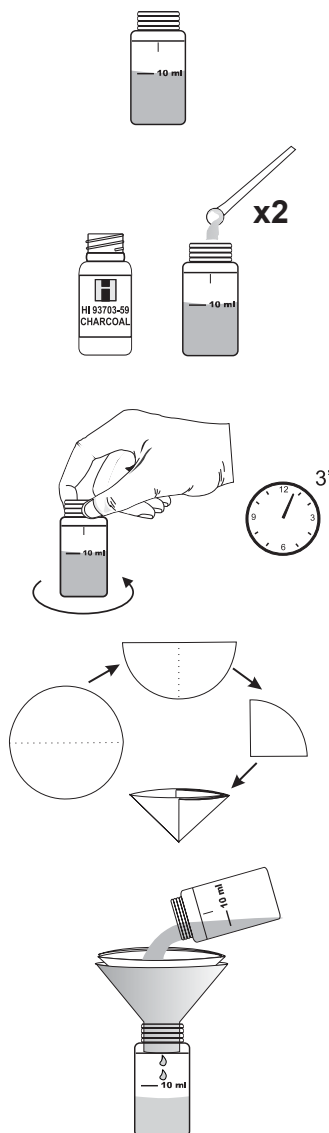
- Use of the optional **HI 740217 safety shield** is recommended. For correct use of the reactor follow the Reactor Instruction Manual. At the end of the digestion period, the vials are still hot: allow the vials to cool to room temperature in the optional **HI 740216 test tube cooling rack**.

MEASUREMENT PROCEDURE

SAMPLE PREPARATION FOR RED WINE

To remove interference of phenols, samples of Red Wine must be treated with activated carbon.

- Fill one cuvet with 10 mL of Red Wine.
- Add 2 spoons of HI 93703-59 Charcoal to the cuvet.
- Swirl the cuvet for 2 minutes to mix. Then wait for 3 minutes.
- Fold a filter disc twice as shown in the figure. Separate one side from the other three to form a cone. Insert the folded filter disc in the funnel.
- Filter the treated wine into an empty cuvet. This is the wine sample.



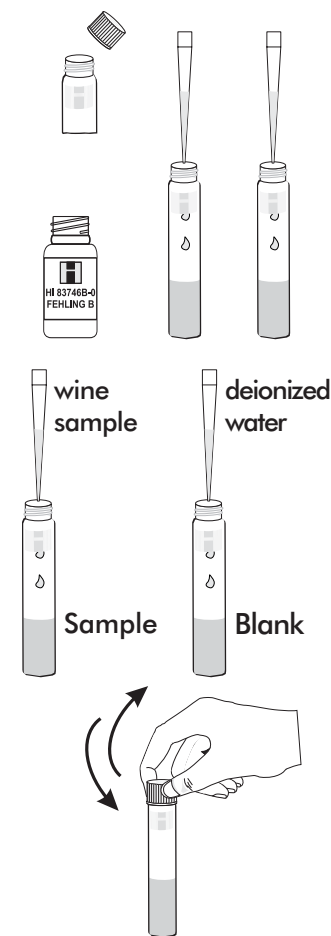
MEASUREMENT

Note: A single blank vial may be used more than once; the blank vial is stable up to one week if stored in a dark place at room temperature. Always use the same lot of reagents for blank and samples. For most accurate measurement run a blank for each set of measurement.

Note: If the expected RS concentration is above 50.00 g/L (for example for must analysis), it is recommended to dilute the sample 4 or 5 times with water.

- Preheat the Hanna Reactor HI 839800 to 105 °C (221 °F). For a correct use of the reactor follow the Reactor Instruction Manual. Use of the optional HI 740217 safety shield is recommended. Do not use an oven or microwave.
- Remove the cap from two vials HI 83746A-0 Fehling Solution A.
- Use the HI 731341 1000 μ L automatic pipette to add exactly 1 mL of HI 83746B-0 Fehling Solution B to each vial. For a correct use of the automatic pipette please follow the related Instruction Sheet.

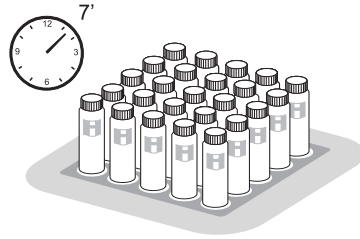
- Use the HI 731340 200 μ L automatic pipette to add exactly 200 μ L of wine sample to one vial (Sample) and 200 μ L of deionized water to the other vial (Blank).
- Replace the cap and invert the vials several times to mix. Wipe the vials thoroughly with a lint-free cloth.



- Insert the vials into the reactor and heat them for 7 minutes at 105°C.

Note: to obtain most accurate results, it is recommended to use the pre-programmed timer of the instrument, and remove the vials from the reactor after exactly 7 minutes.

Turn the meter on by pressing ON/OFF and then press TIMER to activate a 7 minutes countdown.



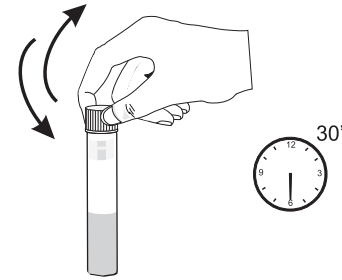
- At the end of the digestion period switch off the reactor, place the vials carefully in the test tube rack and wait for 10 minutes.

Warning: as the vials are still hot, be careful in handling them.

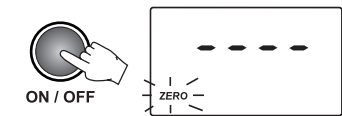


- Invert the vials two times to mix. Then wait for 30 minutes to allow the vials cool to room temperature.

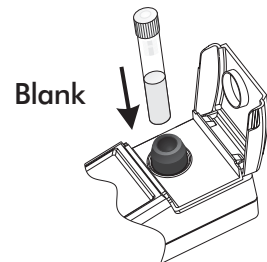
Note: This operation is necessary to recover the condensed water after heating.



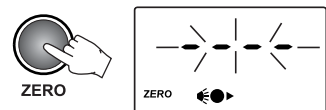
- Turn the instrument ON by pressing ON/OFF. When the LCD displays "---", it is ready.



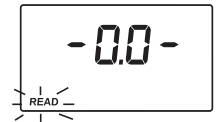
- Place the Blank Vial into the instrument.



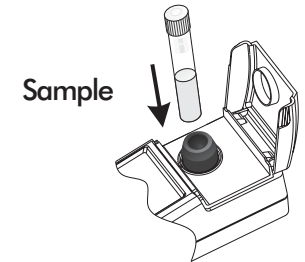
- Press ZERO and "---" will blink on the display.



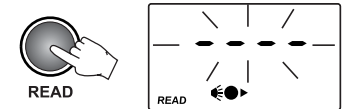
- After a few seconds the display will show "-0.0-". The meter is now zeroed and ready for measurement. Remove the Blank Vial.



- Insert the Sample Vial into the instrument.
Note: Do not shake or invert the Sample Vial anymore otherwise the samples may become turbid.



- Press READ and the display will show "----" during measurement.



- The instrument directly displays concentration in g/L (ppt) of Reducing Sugars on the Liquid Crystal Display.

Note

To convert the Reducing Sugars concentration from g/L to %, multiply the reading by 0.1.
e.g. 12.5g/L x 0.1 = 1.25%.

To calculate the potential alcohol degree multiply the read sugar concentration (g/L) by 0.06.

e.g. 175g/L x 0.06 = 10.5% vol (potential alcohol degree)

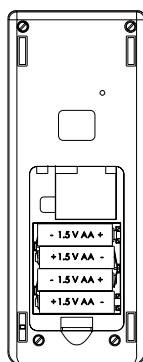
BATTERIES REPLACEMENT

Battery replacement must only take place in a non-hazardous area.

The blinking “” will appear when the batteries power gets low.

When batteries are completely discharged, “0% bAtt” will appear and after two seconds the instrument is switched off.

Remove the battery cover from the bottom of the instrument and change the old batteries with 4 fresh 1.5V batteries, paying attention to the correct polarity. Replace the cover.



ACCESSORIES

REAGENT SETS

- HI 83746-20 Reducing Sugars reagents set (ca. 20 tests)
- HI 93703-59 Charcoal for decoloration of Red Wine (about 100 tests)

OTHER ACCESSORIES

- HI 839800 Reactor
- HI 740216 Test tube cooling rack (for 25 vials)
- HI 740217 Laboratory bench safety shield
- HI 731331 Glass cuvetts (4 pcs)
- HI 731340 200 μ L automatic pipette
- HI 731350 Plastic tips for 200 μ L automatic pipette (25 pcs)
- HI 731341 1000 μ L automatic pipette
- HI 731351 Plastic tips for 1000 μ L automatic pipette (25 pcs)
- HI 740232 Filter paper type I (100 pcs)
- HI 731318 Tissue for wiping cuvetts (4 pcs)
- HI 731325W Caps for cuvetts (4 pcs)
- HI 93703-50 Cuvetts cleaning solution (230 mL)
- HI 740027P 1.5V AA batteries (10 pcs)
- HI 710005 Voltage adapter from 115V to 12 VDC (USA plug)
- HI 710006 Voltage adapter from 230V to 12 VDC (European plug)

CE DECLARATION OF CONFORMITY

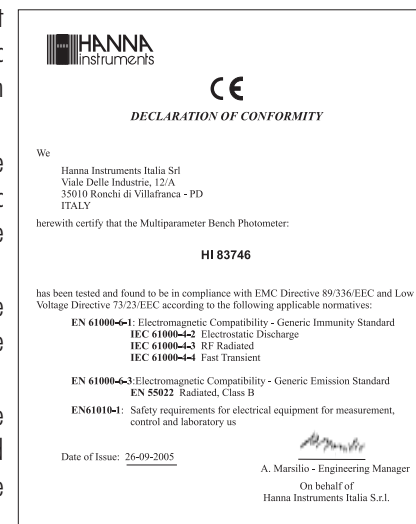
Recommendations for Users

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 ovens. For yours and the instrument safety do not use or store the instrument in hazardous environments.



WARRANTY

HI 83746 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.

Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

HANNA LITERATURE

Hanna publishes a wide range of catalogs and handbooks for an equally wide range of applications. The reference literature currently covers areas such as:

- Water Treatment
- Process
- Swimming Pools
- Agriculture
- Food
- Laboratory

and many others. New reference material is constantly being added to the library.

For these and other catalogs, handbooks and leaflets contact your dealer or the Hanna Customer Service Center nearest to you. To find the Hanna Office in your vicinity, check our home page at www.hannainst.com.

USER NOTES

Date	Reducing Sugars (g/L)	Notes



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MAN83746 10/05