

HI 83414 • HI 88703

# Precision Turbidity and Free/Total Chlorine Meters



## High Accuracy Turbidity Measurement

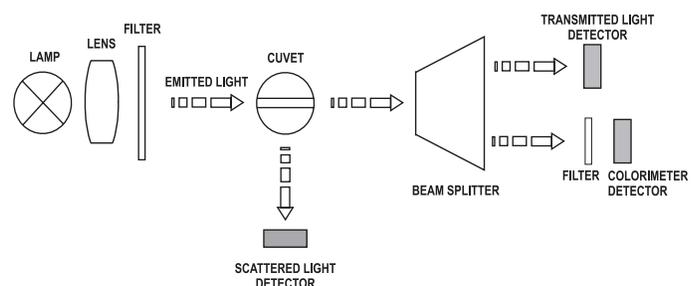
Turbidity is the optical property that causes light to be scattered and absorbed, rather than transmitted. The scattering of the light that passes through a liquid is primarily caused by the suspended solids. The higher the turbidity, the greater the amount of scattered light. Since molecules in a very pure liquid scatter light to a certain degree, no solution will have zero turbidity. The USEPA Method 180.1 specifies the key parameters for the optical system to measure turbidity for drinking, saline and surface water, in a 0 to 40 NTU range, using the nephelometric method.

HI 83414 and HI 88703 are designed to meet or exceed the criteria specified by the USEPA Method 180.1 and Standard Method 2130 B. The light beam that passes through the sample is scattered in all directions. The intensity and pattern of the scattered light is affected by many variables, such as wavelength of the incident light, particle size and shape, refractive index and color. The optical system includes a tungsten filament lamp, a scattered light detector (90°) and a transmitted light detector (180°).

In the ratio turbidimeter range, the microprocessor of the instrument calculates the NTU value from the signals that reach the two detectors by using an effective algorithm. This algorithm corrects and compensates for interferences of color, making the HI 83414 and HI 88703 color-compensated. The optical system and measuring technique also compensate for the lamp intensity fluctuations—minimizing the need of frequent calibration.

In the non ratio turbidimeter range, the NTU value is calculated from the signal on the scattered light detector (90°). This method offers a high linearity on the low range but is more sensitive to lamp intensity fluctuations.

The lower detection limit of a turbidimeter is determined by stray light. Stray light is the light detected by the sensors that is not caused by light scattering from suspended particles. The optical system of HI 83414 and HI 88703 is designed to have very low stray light, providing accurate results for low turbidity samples.



## Ideal for Drinking Water Applications

HI 83414 is a highly accurate dual parameter instrument that benefits from HANNA's years of experience. The HI 83414 successfully combines turbidity and colorimetric measurements to test the most important parameters of drinking water: turbidity and free/total chlorine. The meter is especially designed for water quality measurements, providing reliable and accurate readings on low turbidity and chlorine values. The HI 83414 meets and exceeds the requirements of USEPA and Standard Methods both for turbidity and colorimetric measurements.

With the powerful CAL CHECK™ function, reliable performance can be validated at any moment by using the exclusive HANNA ready-made, NIST traceable standards. A one-point calibration can be performed using the same CAL CHECK™ standard.

The HI 88703 measures turbidity only and is especially designed for water quality measurements, providing reliable and accurate readings on low turbidity ranges. The HI 88703 also meets and exceeds the requirements of USEPA and Standard Methods.

These instruments feature a state-of-the-art optical system to guarantee accurate results, assure long term stability and minimize stray light and color interferences. They also compensate for variations in intensity of the lamp for less frequent calibration. The 525 nm interference filter of the colorimeter assures precise and repeatable results. Repeatability of the measurements are ensured with 25 mm round cuvetts made from special optical glass.

Turbidity measurements can be made in the 0.00 to 4000 NTU (Nephelometric Turbidity Units) range when ratiometric

measurements are used and in the 0.00 to 40.0 NTU range when non ratio method is used. These instruments have an EPA compliance reading mode which rounds the reading to meet EPA reporting requirements. Alternative EBC and Nephelos measuring units are available. Depending on the measured sample and needed accuracy, normal measurement, continuous measurement or signal averaging measurement can be selected.

A two, three, four or five-point calibration can be performed by using the supplied (<0.1, 15, 100, 750 and 2000 NTU) standards. If user prepared standards are used, the calibration points can be modified. Free or Total Chlorine measurements can be made in the 0.00 to 5.00 mg/L (ppm) range.

HI 83414 and HI 88703 have complete G.L.P. (Good Laboratory Practice) functions that allow traceability of the calibration conditions. The last calibration points, time and date can be checked.

Both meters incorporate a user-friendly interface with an easy to understand, graphic LCD. All messages are in plain text making them easy to read and understand. Comprehensive contextual help is available at the press of a button. All messages and help screens are available in several languages. Confirmation and error acoustic signals help the user during instrument operation. Furthermore, a tutorial mode of operation guides the user step by step through the analysis process.

The instrument's logging function offers complete information for the measurement. Up to 200 measurements can be stored in the internal memory and consulted at any time. For further storage or analysis options, data can be downloaded to a PC using the USB port.

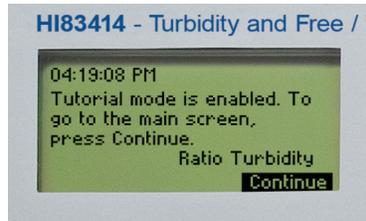


## Features

- HI 83414 features 4 measuring ranges:  
Ratio Turbidity; Non-Ratio Turbidity;  
Free Chlorine; Total Chlorine
- HI 88703 features 2 measuring ranges:  
Ratio Turbidity; Non-Ratio Turbidity
- Meets USEPA requirements
- Exclusive chlorine CAL CHECK™ calibration validation for HI 83414
- Good Laboratory Practice capabilities
- 2, 3, 4 or 5 point turbidity calibration
- USB PC connectivity
- Backlit LCD
- On-screen tutorial modes
- Log and recall up to 200 measurements
- Contextual help menus
- Auto shut-off

# Precision Turbidity and Free/Total Chlorine Meters

## Display Examples



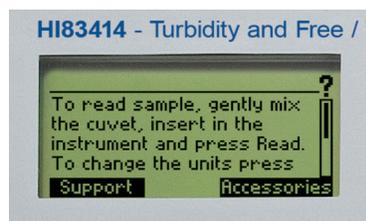
### Tutorial Mode

The HI 83414 and HI 88703 have a unique Tutorial Mode that provides additional information to help the inexperienced user during measurements. The instruments display a screen with explanations and confirmation button each time when a preparation or other operation has to be performed by the user. The instrument resumes the measuring sequence when the user confirms that the requested operation was done.



### Log and Recall

The HI 83414 has a powerful log function that can store up to 200 records.



### Help Mode

Both meters offer an interactive contextual help mode that assists the user at any moment.

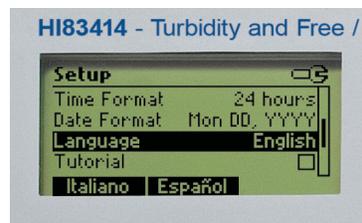


### Calibration Error Messages

If the value of the standard read during the calibration is too far from the set value, the instrument will display a standard low or a standard high message.

Check if the correct standard is used or prepare a fresh standard, if formazine is used, and repeat the reading of the standard.

If the calculated calibration coefficients are outside a certain range a calibration error message is displayed.



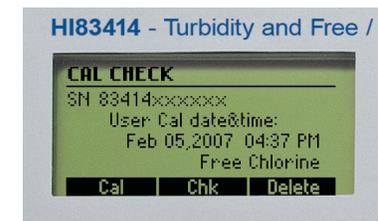
### GLP

The HI 83414 has built in complete GLP information. The calibration date and the calibration points are displayed in a comprehensive mode for each range.

To display the GLP information, simply press CAL CHECK key. A screen with instrument serial number and with information about the calibration is displayed. For further information, press the "GLP" functional key.

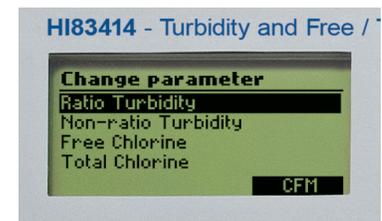
### Language

Press the corresponding function key to change the option. If the new selected language cannot be loaded, the previously selected language will be reloaded.



### CAL CHECK™

The HI 83414 free and total chlorine colorimeter has a powerful CAL CHECK™ function that allows the user to check the instrument calibration against a NIST traceable standard before making a set of measurements. With the same standard, the instrument could be re-calibrated if necessary.



### Ranges

The HI 83414 instrument has four measuring ranges: Ratio Turbidity, Non-Ratio Turbidity, Free Chlorine, Total Chlorine. The HI 88703 instrument has two measuring ranges: Ratio Turbidity, Non Ratio Turbidity.

# Precision Turbidity and Free/Total Chlorine Meters

## TURBIDITY SPECIFICATIONS

Range—Non Ratio Mode	0.00 to 9.99; 10.0 to 40.0 NTU; 0.0 to 99.9; 100 to 268 Nephelos 0.00 to 9.80 EBC
Resolution—Non Ratio Mode	0.01; 0.1 NTU 0.1; 1 Nephelos 0.01 EBC
Range—Ratio Mode	0.00 to 9.99; 10.0 to 99.9; 100 to 4000 NTU 0.0 to 99.9; 100 to 26800 Nephelos 0.00 to 9.99; 10.0 to 99.9; 100 to 980 EBC
Resolution—Ratio Mode	0.01; 0.1; 1 NTU 0.1; 1 Nephelos 0.01; 0.1, 1 EBC
Range Selection	Automatic
Accuracy	±2% of reading plus 0.02 NTU (0.15 Nephelos; 0.01 EBC) ±5% of reading above 1000 NTU (6700 Nephelos; 245 EBC)
Repeatability	±1% of reading or 0.02 NTU (0.15 Nephelos; 0.01 EBC) whichever is greater
Stray Light	< 0.02 NTU (0.15 Nephelos; 0.01 EBC)
Light Detector	Silicon Photocell
Method	Nephelometric method (90°) or Ratio Nephelometric Method (90° & 180°), Adaptation of the USEPA Method 108.1 and Standard Method 2130 B.
Measuring Mode	Normal, Average, Continuous
Turbidity Standards	<0.1, 15, 100, 750 and 2000 NTU
Calibration	Two, three, four or five-point calibration

## FREE AND TOTAL CHLORINE SPECIFICATIONS – HI 83414 ONLY

Range	Free Cl <sub>2</sub> : 0.00 to 5.00 mg/L Total Cl <sub>2</sub> : 0.00 to 5.00 mg/L
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L; 0.10 above 3.50 mg/L
Accuracy	±0.02 mg/L @ 1.00 mg/L
Detector	Silicon photocell with 525 nm narrow band interference filters
Method	Adaptation of the USEPA Method 330.5 and Standard Method 4500-Cl G.
Standards	1 mg/L free chlorine, 1 mg/L total chlorine
Calibration	One-point calibration

## GENERAL SPECIFICATIONS

Light Source/ Life	Tungsten filament lamp / Greater than 100,000 readings
Display	40 x 70 mm graphic LCD (64 x 28 pixels) with backlight
LOG Memory	200 records
PC Interface	USB
Auto Shut-off	After 15 minutes of non-use
Environment	0°C (32°F) to 50°C (122°F); max 95% RH non-condensing
Power Supply	230 V/50 Hz or 115 V/60 Hz 20 W
Dimensions / Weight	230 x 200 x 145 mm (9 x 7.9 x 5.7") L x W x H / 2.5 Kg (88 oz.)

## ORDERING INFORMATION

**HI 88703-01** (115 V) and **HI 88703-02** (230 V) are supplied with (5) sample cuvetts and caps, calibration cuvetts, silicone oil (HI 93703-58), tissue for wiping cuvetts, power cord and instruction manual.

**HI 83414-01** (115 V) and **HI 83414-02** (230 V) are supplied with (5) sample cuvetts and caps, calibration cuvetts for turbidimeter and colorimeter (HI 83414-11), silicone oil (HI 93703-58), tissue for wiping cuvetts, scissors, power cord and instruction manual.

## SOLUTIONS

- HI 93414-11** CAL CHECK™ Calibration set for Free & Total Chlorine
- HI 93701-01** Reagents for 100 Free Chlorine tests
- HI 93701-03** Reagents for 300 Free Chlorine tests
- HI 93711-01** Reagents for 100 Total Chlorine tests
- HI 93711-03** Reagents for 300 Total Chlorine tests
- HI 88703-11** Calibration set for turbidimeter (<0.1, 15, 100 750 and 2000 NTU)
- HI 93703-50** Cuvet cleaning solution, 250 mL

## ACCESSORIES

- HI 93703-58** Silicone oil (15 mL)
- HI 731318** Tissue for wiping cuvetts (4)
- HI 731331** Glass cuvetts (4)
- HI 731335N** Caps for cuvetts (4)
- HI 740234** Replacement lamp for EPA turbidimeter
- HI 92000** Windows® compatible software
- HI 920013** USB cable for PC connection