Turbidity Meters

Turbidity Meters

Comparison Chart

	HI 93114	HI 93703**	HI 93102	HI 93124**	HI 93125	LP 2000**
Portable Model	•	•	•	•	•	
Bench Model						•
Compliant with ISO 7027 Standard		•		•	•	•
Compliant with US EPA 180.1 and Standard Methods 2130B	•		•			
Range 0.00 to 50.0 FTU (NTU/FNU)	•	•	•	•		•
Range 50 to 1000 FTU (NTU/FNU)		•				•
Auto-off	•*	•	•*	•	•	
Log-on-demand	•		•		•	
Selectable Calibration Points	•		•			
GLP (Good Laboratory Practice)	•	•	•	•	•	•
Real Time Clock	•		•	•		
Turbidity Range	•	•	•	•		•
Free and Total Chlorine Range	•		•			
pH Range			•			
Iodine Range			•			
Iron Range LR			•			
Bromine Range			•			
Cyanuric Acid Range			•			
EBC Range				•		
Supplied with Cuvets	•	•	•	•	•	•
12 Vdc Adapter						•
Supplied with Batteries	•	•	•	•	•	
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* user-selectable after 10, 20, 30, 40, 50 or 60 minutes.
** models with serial port for PC connection and log-on-demand are available.

Turbidity Meters

Turbidity in liquids is caused by the presence of undissolved but finely dispersed matter. The turbidity can be determined by measuring the attenuation of a radiant flux as it passes through the liquid, or by measuring the intensity of diffused radiation. The diffusion radiation is a property of liquids and is utilized to obtain turbidity measurements.

The US and Europe have not agreed on one standard method. Whereas the USEPA and the Standard Methods recommend the use of visible light in the 400-600 nm wavelength for turbidity, the European Community has subscribed to the Infrared method (ISO standard 7027). The latter system has the advantage of low sensitivity to color.

The HANNA instruments® line of turbidity meters use both methods and employ the "90° angle" sensor which provides better accuracy than similar instruments. In the following section, we will present you with several hi-tech, yet easy-to-use turbidity meters that can resolve your measurement needs in the lab, as well as in the field.

HI 93703 and LP 2000 have been manufactured according to the European Standards, whereas the HI 93102 and HI 93114 combination models have incorporated the American requirements.

HI 93703 is a portable microprocessor-based meter providing lab-grade accuracy in on-site conditions. Two measurement ranges from 0.00 to 50.00 and from 50 to 1000 FTU (equal to FNU) ensure maximum accuracy over a wide range.

The HI 93102 and HI 93114 have been designed for operators who need to measure multiple parameters in the field. In fact, in addition to turbidity, you can take quick and accurate readings of pH, free and total chlorine, bromine, iodine, low range iron and cyanuric acid.

LP 2000 is a complete and accurate turbidity meter for laboratories.

HI 93703 and LP 2000 contain a microprocessor that will automatically recognize the calibration standards at 0 FTU, 10 FTU and 500 FTU. 10 FTU was chosen as the default calibration point for these meters because it is the value that best fits water turbidity measurements in a wide range of applications from drinking water to wastewater treatment. The supplied calibration solutions of AMCO-AEPA-1 at 0 FTU, 10 FTU, 20 FTU and 500 FTU are preferred over the commonly used formazine standard, because they are more stable, nontoxic, can be reused and last more than a year. If necessary, the meters can also be used with formazine standards.

The models HI 93703-11 and LP 2000-11 also provide log-on-demand and feature an easy to use RS232 interface. HANNA instruments® has also equipped these meters with GLP (Good Laboratory Practice) features. The last calibration data together with time and date are automatically stored and retrieved at the touch of a button.

All HANNA instruments® meters comply with the CE directives. This ensures the highest accuracy and safety in the lab, as well as in the field.

Two new models have been recently added to the turbidity meter family: HI 93124 and HI 93125 have been designed specifically for beer and wine analysis.

Turbidity Measurement

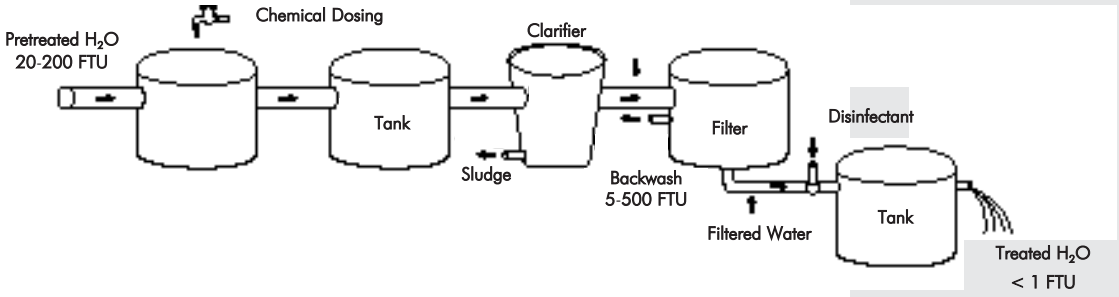
Introduction to Turbidity

The cloudy appearance of water (called *Turbidity*) is caused by suspended material. The unit of measure adopted by the ISO Standard is the FNU (Formazine Nephelometric Unit) and by EPA is NTU (Nephelometric Turbidity Unit). The other two methods used to test for turbidity and their measurement units are the JTU (Jackson Turbidity Unit) and the Silica unit (mg/L SiO_2). See the conversion table of these methods and their units for your reference.

	JTU	FTU (NTU/FNU)	SiO_2 (mg/l)
JTU	1	19	2.5
FTU (NTU/FNU)	0.053	1	0.13
SiO_2 (mg/l)	0.4	7.5	1

Purification of Drinking Water

Turbidity is one of the most important parameters used to determine the quality of drinking water. Public water suppliers are required to treat their water to remove turbidity. Adequately treated surface water does not usually present a turbidity problem. The World Health Organization indicates 5 FTU as the reference turbidity value of water for trade. This value has been established based on the aesthetic characteristics of water. From a hygienic point of view, 1 FTU is the recommended value. Turbidity is an indicator and will not give results for a specific pollutant. It will, however, provide information on the degree of overall contamination. The flow chart below for the water treatment process of drinking water shows the turbidity reference values for each phase.



Monitoring for Natural Water Supplies

In natural water, turbidity measurements are taken to gauge general water quality and its compatibility in applications where there are aquatic organisms. It has been found that there is a strong correlation between the turbidity level and the BOD value. Moreover, by definition, turbidity obstructs light, thus reducing the growth of marine plants, eggs and larvae, which are usually found in the lower levels of an aquatic ecosystem.

Wastewater Treatment and Turbidity

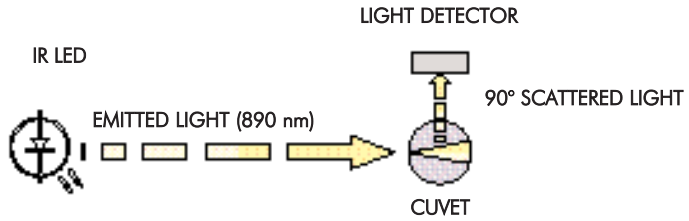
Historically, turbidity is one of the main parameters monitored in wastewater. In fact, the monitoring and treatment process was once solely based on the control of turbidity. Currently, the measurement of turbidity at the end of the wastewater treatment process is necessary to verify that the values are within regulatory standards. Generally speaking, the turbidity value has to be between 0 and 50 FTU , with an accuracy of ±3 FTU, depending on the phase of the wastewater treatment process. By monitoring the turbidity level, it can be determined if the different stages of the process, particularly in the filtration and purification stages, have been completed correctly.

The HANNA instruments® *Solution to Turbidity Measurement*

There are two different standards to comply with: the USEPA and Standard Methods recommend a particular wavelength in the visible range of the spectrum and the European system requiring an infrared light source (ISO 7027). In order to satisfy these different requirements, HANNA instruments® has developed products that meet both standards. HI 93703, LP 2000, HI 93124 and HI 93125 follow the European guidelines whereas HI 93102 and HI 93114 meet the US EPA 180.1 method and Standard Methods 2130B.

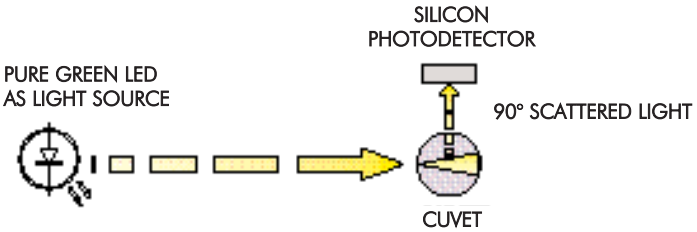
The Infrared Method (ISO 7027)

HI 93703, LP 2000, HI 93124 and HI 93125 operate by passing a beam of infrared light through a vial containing the sample to be tested. The light source is a High Emission Infrared LED. A sensor, positioned at 90° with respect to the direction of the light, detects the amount of light scattered by the undissolved particles present in the sample. A microprocessor converts these readings into FTU (FNU) values.



The USEPA (Environmental Protection Agency) Approved Method

When employing the USEPA accepted nephelometric principle, a pure green LED is used as a light source. The 90° receptor is a silicon photodetector aligned to receive the light scattering from the suspended particles. The amount of light received by the photodetector is linearly proportional to the turbidity of the sample (for samples with turbidities less than 50 FTU). The HANNA instruments® design of cuvet holder and cuvet cap minimizes the amount of stray light in this system.



HANNA instruments® *Calibration Method*

10 FTU has been chosen as a calibration point because it is the value that best fits the water turbidity measurements in different applications. Calibration solutions of primary standard AMCO-AEPA-1 at 0 FTU, 10 FTU, 20 FTU and 500 FTU are supplied with the appropriate maintenance kit for each meter. This standard is generally preferred over the formazine standard, because it is much more stable and nontoxic. The HANNA instruments® meters can also be used with the formazine standard. HI 93102 and HI 93114, on the other hand, offer user-selectable calibration points in the 0.00 to 50.0 FTU range.