

# Turbidity Units and Calibration Solutions

YSI Turbidity Sensors  
 Technical Note T627

## Turbidity Units - NTU vs. FNU

The units associated with turbidity readings can be confusing. These are typically represented as Nephelometric Turbidity Units (NTU) or Formazin Nephelometric Units (FNU) for most in-situ turbidity sensors. In the early days of turbidity data collection, it was common to use NTU as the unit regardless of the actual method used to collect the data, but more recently it has become desirable to start using units which reflect the method in which the turbidity measurements were obtained. Technically speaking, NTU is a unit of measure that is best used to represent turbidity readings captured using a white light at a 90 degree detection angle and FNU is best used when the data is measured using an 860 nm light (near IR) with a 90 degree detection angle (ISO7027 compliant).

The use of units that are associated with the measurement method can help pinpoint limitations with the collected data and help identify potential interferences. Some manufacturers have run into a predicament in regards to turbidity units in recent years. YSI has been around for nearly 70 years and has offered in-situ turbidity sensors since early 1995. As was mentioned previously, turbidity was expressed in NTU in those early days of field measurements even though the method used to collect the data may have been ISO7027, which we now know is typically



Turbidity can help determine the health of a water body.

represented in FNU. YSI's turbidity sensors have always followed the ISO7027 method, so a better representation of the measurements would be to use FNU. Many agencies have historic turbidity data that was collected as NTU and now newer YSI instruments like the [EXO sondes](#) and the [ProDSS](#) provide the option to record data in either of these units. Therefore, the agency collecting the turbidity data needs to decide whether they will continue using NTU or switch to using FNU. The actual values associated with measurements made with YSI turbidity sensors will be comparable whether NTU or FNU is used for the units, as YSI has always used methodology consistent with ISO7027. Therefore, no conversion of the data values is necessary if YSI instrumentation has been used to collect the data.

## Which Calibration Solutions Should I Use?

The solutions used during calibration are just as important as the instrument. The manufacturers of turbidity sensors should specify the solutions that are approved for successful calibration and these approved solutions are the only ones that should be used. In addition, some manufacturers, like YSI, have turbidity solutions that are specifically made for their instrumentation, so even though other solutions may appear to be the same they, in fact, are not. YSI recommends only two types of turbidity solutions for a successful calibration.



All YSI turbidity sensors utilize ISO7027 methodology, which is associated with the unit of FNU.



a xylem brand

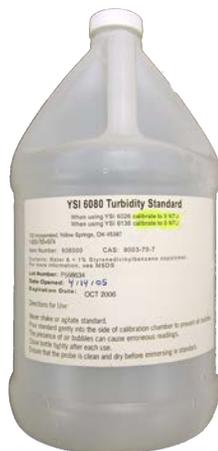
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Technical Note T627  
Page 2

The first is the AMCO-AEPA turbidity standards *prepared and tested specifically for YSI turbidity sensors*. The other is Formazin-based standards that can be self-prepared, purchased with specific assigned values, or purchased at high concentrations and diluted.

**Please note:** Formazin standards will settle so it is always necessary to follow the turbidity standard manufacturer's recommendations when handling the solution for proper suspension and dilution techniques as well as using it within the specified time frame during calibration. The AMCO standard does not settle and it is typically not recommended to perform dilutions with it.

*If AMCO turbidity standards are used to calibrate YSI turbidity sensors, they must be YSI branded.* Other AMCO standards have not necessarily been tested to YSI's specifications and it is highly likely the value of the turbidity standard printed on the label of the standard does not reflect what a YSI turbidity sensor will read when placed in that standard.



If not using formazin-based standards, YSI branded AMCO-AEPA standards must be used when calibrating YSI turbidity sensors.



The YSI ProDSS is an ideal instrument for environmental spot-sampling, while the YSI EXO sonde platform is perfect for continuous environmental monitoring.

As a final note on calibration standards, deionized (DI) or distilled water is often used for the zeroing portion of the calibration to help reduce cost. However, not all DI or distilled water is created equal and cannot be assumed to contain exactly zero turbidity, as DI water may register up to 1 NTU (FNU). Using DI or distilled water for calibration and then taking measurements in waters containing low turbidity may exhibit slightly negative readings since the water that is being measured may actually contain less turbidity than the zero standard that was used during calibration. For these applications, it is typically necessary to use a certified zero standard for calibration.

For information, including YSI instrument specifications, visit: [www.ysi.com](http://www.ysi.com)

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