

TNTplus 830 Ammonia Measuring Range Exceedance

Background

Ammonia nitrogen is found in many surface waters, some groundwater, in all household wastewater, and in many industrial wastewaters. The Hach TNT830 cuvette chemistry uses the salicylate method to measure ammonia colorimetrically. TNT830 provides accurate ammonia nitrogen measurements through the range of 0.015–2.0 mg/L ($\text{NH}_3\text{-N}$).

Samples which contain much higher ammonia nitrogen concentrations outside this range can produce a false low concentration value, and should be diluted prior to analysis with TNT830. This false low value is a function of the salicylate chemistry, and is common to any procedure which is based on this technique.

This application note describes how to prevent false measurements when using this chemistry. This may be encountered when measuring samples of unknown ammonia nitrogen concentration when concentrations might be very low or very high. Analyses of samples with ammonia nitrogen concentrations which are typically within the TNT830 range will not be affected.

Method

In the TNT830, chemistry ammonium ions at a pH value of 12.6 react with hypochlorite ions and salicylate ions in the presence of sodium nitroprusside as a catalyst to form the blue dye indophenol blue. Excess sodium nitroprusside gives the solution a yellow color. The combination of the blue and yellow gives reacted sample a green hue. This green color is measured spectrophotometrically at 690 nm. The amount of green color is proportional to the concentration of ammonia nitrogen in the sample.

High concentrations of ammonia nitrogen consume some of the excess sodium nitroprusside, thereby removing a portion of the yellow color complex, and changing the overall color of the sample from green to turquoise. As the yellow color is removed, the intensity of green ceases to increase in relation to ammonia nitrogen concentration and actually begins to decrease (see Figure 1). This phenomenon can produce a false “in range” result even though the actual concentration is “out of range.”

In order to eliminate this error, Hach® DR-Series spectrophotometers can be configured to measure TNT830 samples at multiple wavelengths, indicating when the quantitation range has been exceeded. When properly configured, the spectrophotometer will not display a false low value, but will instead display the warning message: “Over measuring range.” This message indicates that the sample must be diluted prior to analysis with TNT830.



Figure 1: Cuvettes 1–3 within the measurement range, cuvettes 4–6 with too high ammonia nitrogen content

Materials

Spectrophotometer	DR2800 or
Spectrophotometer	DR3800 or
Spectrophotometer	DR5000 or
Spectrophotometer	DR3900 or
Spectrophotometer	DR6000
TNT830	Ammonia cuvette test

When Using the DR2800 / DR3800 / DR5000 / DR3900 / DR6000 for the First Time

1. Go to hach.com and search for TNT830 in the search bar.
2. On the TNT830 product page select the Downloads tab.
3. Under Methods/Procedures select the application, “Ammonium Measuring Range Exceedance” and save it to your PC.
4. Open the zipped file and save the appropriate folder for your photometer to a USB stick:
 - a. DR 2800/DR 3800 dbhlc
 - b. DR 5000 dbhl
 - c. DR 3900 dbhlm
 - d. DR 6000 dbhlh
5. Take the USB stick and upload the application to your photometer.
6. In the PDF file you will find the application note.

For further information, please see the operating instructions for your photometer.

Sample Preparation

Prepare the samples per the instructions for TNT830.55

Spectrophotometric Measurement

1. Switch on the spectrophotometer and insert the cuvette.
2. Select the method MW (Multiple Wavelength) in the selection box (see Figure 2) and press the Start key.
3. Select this method as Start Permanent where appropriate.
4. The measurement is carried out.
 - If the ammonia nitrogen concentration is within the quantitation range, the true concentration value will be displayed.
 - If the ammonia nitrogen concentration is too high for the quantitation range the concentration value displayed will be extremely high and accompanied by the error message: “Over measuring range!” This displayed result is not the true result, but rather indicates that the sample must be diluted in order to use TNTplus 830.
 - Figures 3 and 4 show the different values obtained for a high concentration standard measured with the single and multiple wavelength programs.
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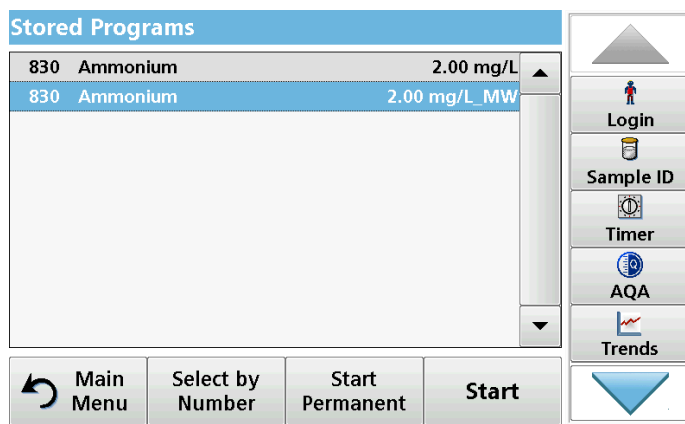


Figure 2: Select multiple wavelength (MW) program

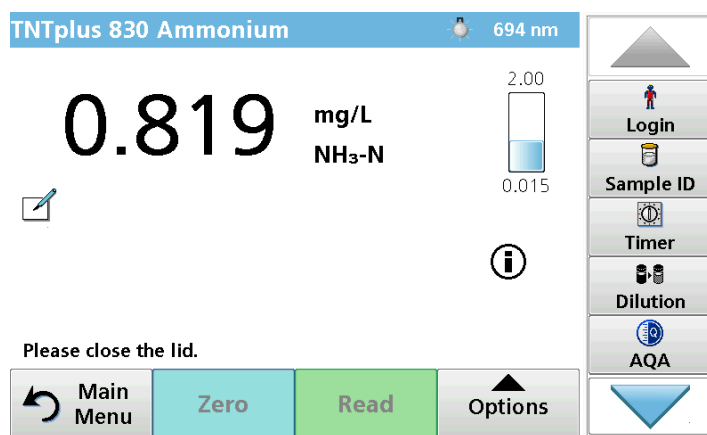


Figure 3: Over range sample measured on single wavelength program

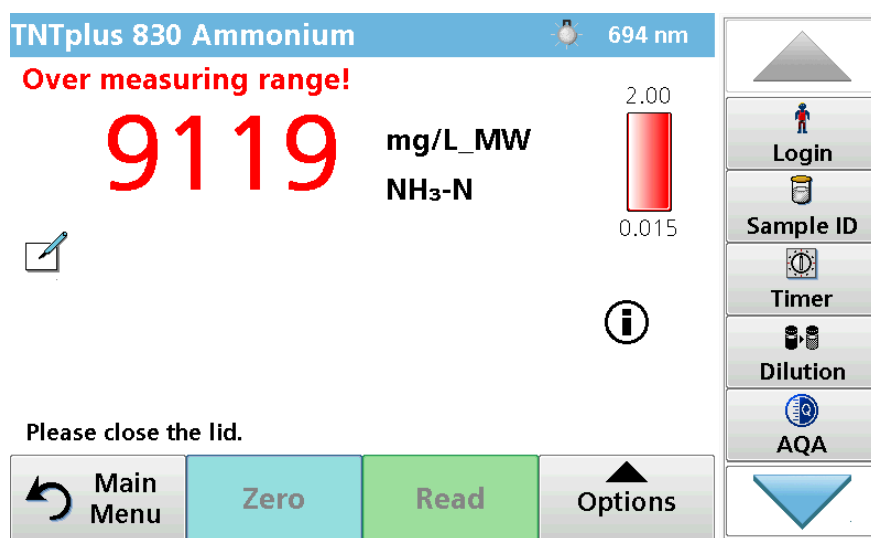


Figure 4: Over range sample measured on MW program

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