



TOTAL BOUND NITROGEN (TN_b)

WHY MONITOR TOTAL NITROGEN IN WATER AND WASTEWATER?

Nitrogen is a natural and essential nutrient, but when industry discharges too much nitrogen it can result in algae blooms that deplete oxygen needed by aquatic life (eutrophication). Nitrogen-based pollutants can appear in the form of ammonia, ammonium salts, nitrate, nitrite, and organic nitrogen compounds. Monitoring nitrogen in effluent enables industry to discharge at compliant levels, protecting the environment while avoiding surcharges.

The Prevailing Laboratory Method

Total Kjeldahl Nitrogen (TKN) has been formalized as EN 25663. TKN quantifies ammonium nitrogen and organic nitrogen compounds, but does not include inorganic compounds such as nitrate and nitrite. TKN requires large amounts of chemicals and several hours to complete. This manual, time-consuming, labor-intensive, laboratory method has no means of being incorporated into process control systems, making it unsuitable for fast and accurate online determination of nitrogen content.

Thermal TN_b determination

Total Bound Nitrogen (TN_b) provides a useful, online alternative to laboratory tests. TN_b is the sum of all nitrogen compounds and is standardized as DIN EN 12260:2003.

This method detects all forms of nitrogen except molecular nitrogen (N₂). It uses high temperature to oxidize all nitrogen compounds into nitrogen monoxide (NO). These reactions take place at temperatures about 700°C. However, higher

temperatures more reliably oxidize the nitrogen compounds.

The TN_b method provides accurate, repeatable, chemical-free results in as little as three minutes per batch. The method is automated, enabling integration into process control systems. Since no re-agents are needed the method is also very low maintenance.

Comparison

Due to the different oxidation power of these two types of measurement, TKN can be described as incomplete. By comparison, the total bound nitrogen method achieves a higher result, largely because it measures more compounds.

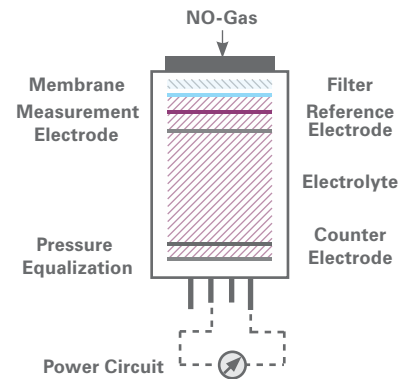
Thermal oxidation at 1,200°C

LAR's QuickTONUltra provides complete oxidation of organic and

inorganic compounds through high temperature oxidation at 1200°C. After oxidation NO is detected by an electrochemical sensor. This environmentally friendly method provides fast, accurate results. Optionally, the QuickTONUltra, is configurable to measure TN_b in combination with TOC and/or TOD. LAR's combustion analyzers are applicable in a variety of applications.



ELECTRO-CHEMICAL CELL
Innovative method for TN_b Determination



SUM PARAMETER	Organic Nitrogen	Nitrogen as Ammonia (NH ₄ -N)	Nitrogen as Nitrate (NO ₃ -N)	Nitrogen as Nitrite (NO ₂ -N)	Particles
Total Kjeldahl Nitrogen (TKN) EN 25663 (1993)	●	●			(●)
TN _b DIN 38409 H27 (EN 12260)	●	●	●	●	●

