

# Kjeldahl System

## Kjeldahl Method for Determining Nitrogen

The Koehler program for the determination of nitrogen using the Kjeldahl method provides the user individually configurable complete solutions for the laboratory.

The Kjeldahl method consist of the following components:

- Digestion Unit
- Scrubber
- Steam Distillation
- Titration Station



## Applications

Nitrogen Determination is used for many applications including:

- Protein content of feedstuff
- Protein content of food
- Crude protein content
- Total Nitrogen in soil, fertilizers, and sewage sludge

Areas of application include dairies, meats, biogas plants, preserves, canned foods, cocoa, spirits, coffee, nuts, feedstuffs, wastewater, etc.

## Digestion Units

Koehler offers two different types of Digestion: Block Digestion Systems and Infrared Digestion Systems.

### Block Digestion Systems

Block digestion systems with corrosion-resistant block housing made of stainless steel. High-efficiency heating and extraction hood with exhaust collector.



- Manual or Automatic Lift
- Single-knob control for particularly easy and fast programming
- 10 freely configurable programs for block temperature and digestion time
- Standard Systems - 250 mL volume (8, 12, or 20 sample slots)
- Micro Systems - 100mL volume (16, 24, or 40 sample slots)



### Infrared Digestion Systems

The Infrared Digestion Systems are equipped with efficient quartz glass infrared heating. The quality and positioning of the Koehler infrared heaters guarantees the user identical heating phases and digestion temperatures on all sample slots. Direct heating by the infrared heaters prevents the long heating and cooling times of conventional heating block systems.

Some advantages of the quartz heaters include:

- Uniform effect along the entire length
- Insulated from the housing, no energy loss through heat transfer
- Full heat output within 1 minute, no preheating required
- Can reach a radiation temperature of 830°C within one minute and heat up the samples in 10 minutes to their boiling temperature of 10°C

The Rapid Digestion Systems are available in manual or programmable versions. The following configurations are also available:

- 6 positions, 250mL
- 12 position, 100mL
- 12 position, 250mL
- 4 position, 500mL
- 4 position, 750mL



### Scrubber Unit

The two-stage scrubber process extraction system prevents any acid fumes whatsoever from reaching the environment. It is a compact system for extracting and neutralizing aggressive acid fumes, especially from the Kjeldahl digestion method.

An upstream two-stage pre-separator washes out the toxic substances. The process extraction system is equipped with a vacuum pump (40 L/min) and there is no need to connect to a water supply.

An additional cooling system can be added for samples with high water content.



## Steam Distillation

Koehler series steam distillers are the optimum addition to the Kjeldahl digestion system. Depending on the requirements, the user can choose between five automatic steam distillers. These five different models have identical base designs, however, their ease of use and degree of automation differ. The table below shows the different automation options for each of the 5 models.

	-1	-2	-3	-4	-5
Automatic Addition of H <sub>2</sub> O	-	+	+	+	+
Automatic Addition of NaOH	+	+	+	+	+
Automatic Addition of H <sub>3</sub> BO <sub>3</sub>	-	-	-	+	+
Manual Addition of H <sub>2</sub> O	-	+	+	+	+
Manual Addition of NaOH	+	+	+	+	+
Manual Addition of H <sub>3</sub> BO <sub>3</sub>	-	-	-	+	+
Automatic extraction of sample residue	-	-	+	+	+
Number of Programs	1	1	10	99	99
Titration Connection option	-	-	-	-	+

Koehler steam distillers are not only efficient and reliable partners in everyday laboratory life, an important issue during the development and design of the equipment was also the safety of the users.

All Koehler steam distillers have the following safety features:

- Protection switch as the master switch, which automatically trips in the event of overload and short circuit.
- A mechanical overpressure safety valve to prevent excessive pressure in the steam generator.
- Vessel monitoring (distillation is not possible until a vessel has been inserted)
- A door contact switch which automatically switches off if the distiller door is open.
- A resettable excess temperature thermostat (in the event of lack of water in the steam generator).
- Cooling circuit monitoring by means of pressure switches.
- Temperature-controlled steam heating phase and pressure control via solenoid valve.



## Titration Unit

The final step in the Nitrogen Determination process is the titration. The Koehler manual titration station or an automatic titrator ensure reliable, safe and fast titration for completion of the Nitrogen determination.

The manual titration station consists of:

- A burette with digital display
- A magnetic stirrer with precise fitting holder for an Erlenmeyer flask

A screen serves as a neutral background that enables the user to precisely determine the color alteration at the end of the titration. This means that the titrations are always performed under similar optical conditions. This improves the accuracy and reproducibility of the results.

The precise positioning of the vessel in the holder at the top of the magnetic stirrer also contributes towards the accuracy and reproducibility. The angular sides of the screen provide additional protection against lateral glare.



## Data Collection

The Koehler data collection system consists of analytical scales, titration station, and collection and evaluation software.



The software receives data from the scales and titration station via USB-interface points, collates and automatically calculates the nitrogen and protein content of the samples. Precise sample classification and manipulation assurance according to GLP are thus guaranteed.

Export of all data in Excel format facilitates the transfer to LIMS. There is also an option for export in PDF format.