RAYPA

Leading
Lab Technologies

Food analysis

KJELDAHL DISTILLERS

DNP SERIES

PERFECT STEAM DISTILLATION SYSTEM FOR PERFORMING NITROGEN ANALYSIS ACCORDING TO KJELDAHL AND MUCH MORE

Steam distillation system

Our Kjeldahl distillers work according to the internationally recognized Kjeldahl method, a reference procedure to analyze nitrogen and protein content in several fields of application.

KJELDAHL DISTILLERS THAT CAN DETERMINE MUCH MORE THAN JUST NITROGEN

Besides performing protein nitrogen analysis according to Kjeldahl or volatile acidity, you can also determine alcohol, sorbic acid, SO_2, phenols, cyanide, ammonia and nitric nitrogen content.

DIFFERENT OPTIONS TO ADAPT TO EACH LABORATORY REQUIREMENTS

Different models of our Kjeldahl distillers adapt to each laboratory requirements, from semiautomatic models to fully automatic, all options guaranteeing safety for the users with automatic distillation interruption on overtemperature or overpressure and fixing cooling water input if required. Furthermore, our distillers work according to standardized procedures such as **AOAC**, **ISO**, **EPA** and **DIN**. The **DNP Series** distillers are designed to give reliable, accurate and precise results.

MAIN FIELDS OF APPLICATION

FOOD INDUSTRY

Protein, Non-protein nitrogen, Casein, Total volatile basic nitrogen, Sulphur dioxide, Formaldehyde | **Milk and derivatives** (ISO 8968-1), **Meat and derivatives** (ISO 937, AOAC 981.10), **Nuts** (AOAC 950.48).

BEVERAGES

Alcoholic strength by volume, Volatile acidity, Sorbic acid, Sulphur dioxide, Protein | **Beer and elaboration raw materials** (AOAC 920.53), **Alcohol content** (Reg. CEE 2676/90, Reg. CEE 2870/2000), **Sorbic Acid** (OIV).

ENVIRONMENTAL ANALYSIS

Ammonia, Total Kjeldahl nitrogen, Phenol, Formaldehyde, Nitrate, Nitrite, Cyanide | **Coal** (ISO 333:1996), **Water** (AOAC 973.48), **Rubber** (ISO 1656:1996).

ANIMAL FEED

Protein, Non-protein nitrogen | **Cereals and grains** (AOAC 979.09), **Forage** (AOAC 978.04), **Feeds** (AOAC 941.04).

AGRICULTURAL ANALYSIS

Ammonia, Nitrate, Nitrite, Cyanide, Total nitrogen | **Water** (ISO 10048:1991), **Industrial waste** (EPA 9065), **Fertilizers** (AOAC 920.03).

PHARMA

Organic nitrogen, Ammonia, Urea, Formaldehyde.

COSMETICS

Protein, Organic nitrogen, Ammonia, Urea, Formaldehyde.

FEATURES

EASY MAINTENANCE

DNP distillers are designed to simplify the maintenance process. They have predefined programs to preheat or perform a cleaning cycle when necessary. The calibration system for all dosing pumps is also integrated in the equipment itself.

ADAPTABLE TO DIFFERENT SAMPLES

DNP distillers allow application notes storage according to sample type. It contains a total of 21 programs of which 18 are editable and can be specifically arranged by each user. Steam generation intensity, reagents dosage volumes, delay, distillation times and sample aspiration* can be customised in each program, giving our distillers the flexibility to be used with a large number of applications.

ACCORDING TO STANDARDIZED METHODS

Nitrogen content and several other analyses with DNP distillers are performed in accordance to official methods described by international entities such as AOAC, ISO, EPA and DIN in order to guarantee accurate results.

RESOURCES OPTIMIZATION

Both steam generator and cooling water automatically stop water intake when the equipment is not distilling, resulting in a considerable amount of water saved. Reagents volumes are also regulated to minimize waste.

USER PROTECTION

DNP has all electrical and mechanical elements properly protected. The elements that may come into contact with chemical agents are also reagent-resistant. The equipment has a safety thermostat and pressure switch that are activated to stop the process if necessary.

EXCELLENT SAFETY MEASURES

DNP distillers has warning messages to guarantee operator security, correct maintenance and sample loss minimization. The equipment emits an acoustic signal and a text is shown on the screen if the steam generator does not have enough water. In addition, there are also tube and open door sensors that block the distillation.

INDIVIDUALIZED SOLUTIONS

We have different distiller models according to the desired degree of automation and we have a technical food analysis support service accessible to all our customers.

BENEFITS

- **Compatible with different methods and a wide variety of samples.**
- **Included application support service.**
- **21 user programs available.**
- **According to standardized analysis procedures.**
- **Accurate and reproducible results.**
- **Pumps calibration system included.**
- **Automatic dispensing of reagents.**
- **Efficient and fast distillations.**
- **Pre-installed methods for common applications.**
- **Environmentally friendly.**
- **Integrated preheating, cleaning and verification programs.**
- **Easy to use.**

*Only for DNP-2000-MP.

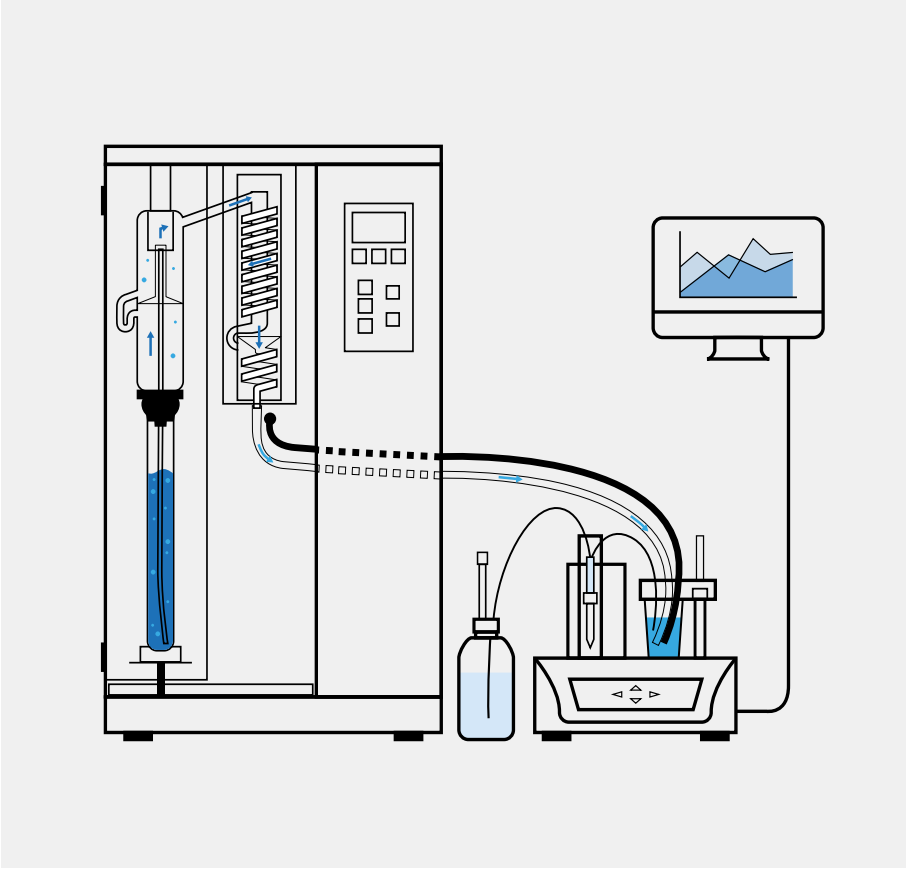
Steam distillation system

WORKING PRINCIPLE

Once the sample is digested and ready for distillation, load it into the DNP distiller and choose the required program. The equipment adds the selected reagents in the exact quantity and the analyte is separated by steam distillation. At first it is evaporated and then it condenses falling into the receiver flask. In the next step nitrogen content is accurately determined through titration and results are exported into your PC.

To save water, the steam generator and the water refrigeration circuit are only activated during distillation.

Once the distillation is completed, the residue left in the sample tube is aspired and removed.



The combination of the **DNP-2000-MP** distiller with the **TITRA-RAY** external titrator offers a unique, economic and very effective automatization of the Kjeldahl method by transferring samples, carrying out fast distillations, executing accurate analyte titrations and proper results registry in one solution.

MAIN FEATURES

SPECIFIC MENUS FOR:

- Distillation programs selection
- Pumps priming
- Pumps calibration
- Language selection

21 USER PROGRAMS

RESISTANT SAFETY DOOR

OPEN DOOR SENSOR

OPTIONAL ADAPTER TO USE BÜCHI® TUBES

DURABLE EXTERNAL FRAME

- AISI-304 stainless steel
- Epoxy coating
- Easy to clean
- Corrosion resistant

SAMPLE TUBE DETECTION

AUTOMATIC SAMPLE SUCTION AFTER DISTILLATION IS FINISHED*

* Only available for DNP-2000-MP

Steam distillation system

DNP-1500-MP

FOR SMALL LABORATORIES THAT DON'T REQUIRE A DEVICE WITH ADVANCED FEATURES BUT A RELIABLE KJELDAHL DISTILLER WITH ALL BASIC FUNCTIONS TO GUARANTEE COMPLETE AND SAFE SAMPLES DISTILLATION.

FEATURES

- 21 user programs including:
  - Preheating, washing and ammonium sulphate test.
  - Preset programs for alcohols, cereals, dairy products, meat, fish, sewage waters, fertilizers, nuts and animal feed.
  - Free programs to set as required.
- Electric steam generator with water level control.
- Automatic dilution water addition pump.
- Automatic alkaline addition pump.
- Pumps calibration by end user.
- Language selection (ENG, ESP, FR).
- Control of the system by microprocessor with LCD screen.
- Cooling water saving system.
- External frame made of AISI-304 stainless steel painted with epoxy resin.

SAFETY

- Open door sensor.
- Sample tube detection.
- Overtemperature thermostat.
- Overpressure switch.
- Cooling water inlet pressure regulator.

PROGRAMMABLE PARAMETERS AND VALUES

- Dilution water: 0-240 ml
- NaOH solution: 0-240 ml
- Reaction time (delay): 0-30 minutes.
- Distillation time: 0-30 minutes.
- Steam power regulation: 30-100 %

SUPPLIED WITH THE FOLLOWING COMPONENTS

- 1 macro sample tube of Ø 42x300 mm
- 2 containers of 10 liters for H_2O and NaOH.
- 1 Anti-drip tray.
- Several connection hoses.

INSTALLATION REQUIREMENTS

- Power supply: 230V 50/60Hz (or 115V 50/60Hz).
- Power consumption: 1800 W
- Water consumption (during distillation only): 2 l/min at 20 ºC
- Ambient temperature: 5 ºC to 40 ºC
- Ambient humidity: 30 % to 80 %
- Weight: 30 Kg
- Dimensions (LxDxH): 440x340x790 mm

DNP-2000-MP + TITRA-RAY

THE COMBINATION OF THE DNP-2000-MP AND TITRA-RAY IS OUR MOST AUTOMATED SOLUTION, OFFERING BOTH SAMPLE DISTILLATION AND TITRATION. SIMPLY PLACE THE SAMPLE TUBE, CHOOSE THE PARAMETERS AND LET BOTH DEVICES WORK, WITHIN FEW MINUTES YOU WILL GET YOUR RESULT IN TERMS OF THE NITROGEN AND/OR PROTEIN PERCENTAGE ON YOUR COMPUTER.

FEATURES

- 21 user programs including:
  - Preheating, washing and ammonium sulphate test.
  - Preset programs for alcohols, cereals, dairy products, meat, fish, sewage waters, fertilizers, nuts and animal feed.
  - Free programs to set as required.
- Electric steam generator with water level control.
- Automatic dilution water addition pump.
- Automatic alkaline addition pump.
- Automatic receiver solution addition pump.
- Pumps calibration by end user.
- Sample aspiration.
- Language selection (ENG, ESP, FR).
- Control of the system by microprocessor with LCD screen.
- Cooling water saving system.
- External frame made of AISI-304 stainless steel painted with epoxy resin.
- Optional external titrator.

SAFETY

- Open door sensor.
- Closed door detection.
- Digestion tube detection.
- Overtemperature thermostat.
- Overpressure switch.

PROGRAMMABLE PARAMETERS AND VALUES

- Dilution water: 0-240 ml
- NaOH solution: 0-240 ml
- H_3BO_3 solution: 0-240 ml
- Reaction time (delay): 0-30 minutes.
- Distillation time: 0-30 minutes.
- Steam power regulation: 30-100%

SUPPLIED WITH THE FOLLOWING COMPONENTS

- 1 macro sample tube of Ø 42x300 mm
- 2 containers of 10 L for H_2O and NaOH
- 1 container of 5 L for H_3BO_3
- 1 Anti-drip tray.
- 1 Additional aspiration tube without filter.
- Several connection hoses.

INSTALLATION REQUIREMENTS

For DNP

- Power supply: 230V 50/60Hz (or 115V 50/60Hz).
- Power consumption: 1800 W
- Water consumption (during distillation only): 2 L/min at 20 ºC
- Ambient temperature: 5 ºC to 40 ºC
- Ambient humidity: 30 % to 80 %
- Weight: 30 Kg
- Dimensions (LxDxH): 440x340x790 mm

For TITRA-RAY (optional accessory)

- Power supply: 230V 50/60Hz
- Power consumption: 80 W
- Ambient temperature: 15 ºC to 35 ºC
- Ambient humidity: 20 % to 80 %
- Weight: 4 Kg
- Dimensions (LxDxH): 220x400x360 mm

Steam distillation system

Accessories

KIT FOR AUTOMATIC TITRATION

Reference	KIT-TITRA-RAY
Titrator	✔
Stirrer	✔
Reaction vessels and connection hoses	✔
Dimensions L x D x H mm	220 x 400 x 360
Power W	80
Weight Kg	4
Voltage V	230
Frequency Hz	50/60

Features

- Potentiometric titrator.
- Multiple titration programs.
- Kjeldahl nitrogen determination.
- Results in N and protein percentage.
- pH calibration.
- Burette autocalibration.
- Titration calibration.
- Multiple users.
- 2 USB ports:
  - Copy analysis tests and extract data.
  - Connect printer, keyboard or mouse.
- Connect to balance.
- Ethernet port: optional software connection.

Specifications

- Resolution: 0,001 pH, 0,1 mV, ±0,3 ºC.
- Reproducibility: ±0,001 pH.
- Temperature compensation with probe Cat. Pt100.

Components

- Reaction vessels (5x50 mL and 5x150 mL).
- Conical adapter (1x).
- Magnetic stir bars (5x).
- Sensor (type and quantity depends on application).
- Syringe holding ring (1 for each syringe).
- Syringe.
- USB applications key.
- Bottle caps (1xGL45 and 1xGL25).
- Several connection hoses.

Installation requirements

- Power supply: 230V 50/60Hz
- Power consumption: 80 W
- Ambient temperature: 15 ºC to 35 ºC
- Ambient humidity: 20 % to 80 %
- Weight: 4 Kg
- Dimensions (LxDxH): 220x400x360 mm

EXTERNAL TITRATOR SOFTWARE

- Communication software between the titrator and a PC.
- The purchase of this accessory includes an Ethernet connection cable to use in conjunction with the external titrator.
- Control to start and stop analysis.
- Real-time data display directly from the workstation.
- Manage data stored locally or on a server (search, compare, delete, print).
- Export data.

Reference: **SOFT-TITRA**.

Accessories

DISTILLATION TUBES

Reference	TB-26300	TB-42300	TB-42300E*	TB-80300
Sample vol. ml	100	250	250	400
Material	glass	glass	reinforced glass	glass
Dimensions Ø x H mm	26 x 300	42 x 300	42 x 300	80 x 300

* Reinforced distillation tube for waste water or slurry analysis.

TB-26300 TB-42300 TB-42300E TB-80300

REACTION VESSEL

Reference	VR-75300
Sample vol. ml	200
Material	glass
Dimensions Ø x H mm	80 x 95

DNP ADAPTER FOR BÜCHI® TUBES

• Adapter to use Büchi® tubes in the DNP distiller.

Reference: **ADAP-BU**

Steam distillation system

TECHNICAL SUMMARY OF DNP SERIES

	Reference	DNP-1500-MP	DNP-2000-MP
General information	Official standards compliance	AOAC, DIN, EPA, ISO	AOAC, DIN, EPA, ISO
	Dimensions L x D x H mm	440 x 340 x 790	440 x 340 x 790
	Weight Kg	30	31
	Power W	1800	1800
	Frequency Hz	50/60	50/60
	USB port and printer connection	-	Through optional external titrator
Main applications	Nitrogen analysis according to Kjeldahl	✔	✔
	Alcoholic strength by volume	✔	✔
	Volatile acidity	✔	✔
	Sulphur dioxide	✔	✔
	Formaldehyde, Urea, Cyanide	✔	✔
	Phenols	✔	✔
Materials	Sample protection door	Transparent methacrylate	Transparent methacrylate
	Parts made of glass	Borosilicate 3.3	Borosilicate 3.3
	Tube stopper	Resistant rubber	Resistant rubber
	Tubing	Silicone, Teflon® and fluorinated elastomer	Silicone, Teflon® and fluorinated elastomer
	External housing	AISI-304 stainless steel painted with epoxy resin	AISI-304 stainless steel painted with epoxy resin
Display	Screen type	LCD	LCD
	Size pixels	64 x 128	64 x 128
	Values of steam power, distillation time, timer, reagents volumes	✔	✔
	Error messages	Open door, Insert test tube, High temperature, Steam inverted, Cold steam, Low water, Voltage fault, Preheating fault	
	Available selection of languages	ESP, ENG, FR	ESP, ENG, FR
Microprocessor and programs	Type of microprocessor	PID digital	PID digital
	Number of total customizable programs	21	21
	Preset customizable programs	8	8
	Preheating, rinsing and process validation program included	✔	✔
	Pumps calibration programs	✔	✔
Process control	Automatic steam generation	✔	✔
	Automatic water level control of steam generator	✔	✔
	Automatic cooling water control	✔	✔
	Automatic addition of alkaline solution (NaOH)	✔	✔
	Automatic addition of dilution water	✔	✔
	Automatic addition of receiver solution (H_3BO_3)	-	✔
	Automatic sample residues elimination after distillation phase	-	✔
	Automatic titration with external titrator	-	O
Adjustable program parameters	Name of program	✔	✔
	Steam generator power %	30 - 100	30 - 100
	H_2O addition ml	0 - 240	0 - 240
	NaOH addition ml	0 - 240	0 - 240
	H_3BO_3 addition ml	-	0 - 240
	Reaction delay time min	0 - 30	0 - 30
	Distillation time min	0 - 30	0 - 30
	Sample suction	-	Activated / Deactivated

✔: Included **O** : Optional

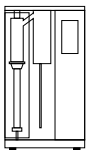
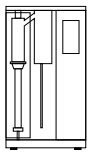
continued on next page

TECHNICAL SUMMARY OF DNP SERIES (continued from)

	Reference	DNP-1500-MP	DNP-2000-MP
Performance for Kjeldahl analysis	Distillation speed at 100% steam addition at 230V ml/min	30	30
	Nitrogen recovery %	≥ 99,5	≥ 99,5
	Measuring range mg N	0,1 - 200	0,1 - 200
	Reproducibility %	± 1	± 1
	Resolution ml	1	1
	Dispensing NaOH, H_2O and H_3BO_3 pumps precision %	± 2	± 2
	Steam generator water consumption during distillation phase l/min	0,03	0,03
	Cooling water consumption during distillation phase l/min	2,4	2,4
Sample tube placement	Tube stopper material	Resistant rubber	Resistant rubber
	Max. - Min. Height mm	320 - 280	320 - 280
	Max. - Min. Width Ø mm	35 - 22	35 - 22
	Adapter for Büchi® tubes	O	O
	Removable tray to collect eventual drops	✔	✔
Reagents and residues management	NaOH pump	✔	✔
	NaOH tank volume L	10	10
	H_3BO_3 pump	-	✔
	H_3BO_3 tank volume L	-	5
	H_2O pump	✔	✔
	H_2O tank volume L	10	10
	Residues aspiration pump	-	✔
	Pumps calibration system	✔	✔
	Reagent resistant drag guard and reagent resistant dispensing and/or aspiration tubes	✔	✔
	Water saving system	✔	✔
Sensors and alarms	Optical warning alarms	✔	✔
	Acoustic warning alarms	✔	✔
	Open door sensor	✔	✔
	Sample tube detection	✔	✔
	Safety thermostat	✔	✔
	Safety pressure switch	✔	✔
Functions gained with the external titrator accessory	Distilled sample titration	-	O
	USB port	-	O
	Connection to balance	-	O
	Connection to printer	-	O
	Ethernet port for PC connection with optional software for real-time data display	-	O
	Data logging and management	-	O
	Creation of different users	-	O
Functions gained with the titrator software accessory	Control the tritation unit with ability to start and stop analysis	-	O
	Display live data at run time in a stack while the titration device realizes the analyses	-	O
	Display data archived locally or on a server with search, compare, print, export & delete features	-	O
	Export results to formatted files (*.CVS...)	-	O

✔: Included O : Optional

THECHNICAL DATA


Dimensions and performance

Reference		DNP-1500-MP	DNP-2000-MP	TITRA-RAY
External dimensions L x D x H mm		440 x 340 x 790	440 x 340 x 790	220 x 400 x 360
Power W		1800	1800	80
Voltage* V		230	230	230
Weight Kg		30	31	4
Tank capacity	H_2O L	10	10	
	NaOH L	10	10	
	H_3BO_3 L	-	5	
External titrator		-	**O**	

* Also available with a voltage of 115 V. **O** : Optional

Safety

- Sample tube and open door sensors to protect the users.
- Several alarms and error messages for maximum safety.
- Resistant sample door to protect the user.
- Antidip tray for eventual splashes.
- Corrosion-resistant easy-to-clean external frame made of stainless steel.

International standardized methods

DNP Series Kjeldahl distillers have different automation levels to adapt to each user specific requirements and they are fabricated guaranteeing compliance with a variety of international standards such as AOAC, ISO, EPA and DIN.

Regulations

Our DNP Series Kjeldahl distillers are designed to comply with the strictest international directives and standards including the following regulations:

- **EN-61010-1** Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1: General requirements.
- **EN-61010-2-081** Part 2-081 Requirements for automatic and semi-automatic laboratory analyzers.
- **UNE-EN-ISO 9001:2015** Quality management system.
- **EN-61326** Electrical equipment for measurement, control and laboratory use. EMC Requirements.
- **2014/35/UE** Low voltage.
- **2014/30/UE** Electromagnetic compatibility.

Main fields of application


FOOD INDUSTRY


BEVERAGES


ENVIRONMENTAL ANALYSIS


ANIMAL FEED


AGRICULTURAL ANALYSIS


PHARMACEUTICALS


COSMETICS

+ info

CLICK! ACCESS THE DNP SERIES VIDEO

Find out more about our **DNP Series** on our **Youtube Channel**

Installation guide available, please contact us.

REV 06.2021

RAYPA

Avinguda del Vallès, 322
Pol. Ind. "Els Bellots"
08227 Terrassa (Barcelona) Spain

raypa@raypa.com
www.raypa.com

Tel. +34 937 830 720

R. ESPINAR, S.L.