RAYPA

Food analysis

# KJELDAHL DISTILLERS

## DNP SERIES

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

# Kjeldahl distillers

Our **DNP Series** distillers work according to the Kjeldahl method, universally recognized as the gold standard 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 the Kjeldahl method or the determination of volatile acidity, you can also determine alcohol, sorbic acid, $SO_2$, phenols, cyanide, ammonia and nitric nitrogen content.

## DIFFERENT OPTIONS TO ADAPT TO THE NEEDS OF EACH LABORATORY

Our range of Kjeldahl distillers is designed to meet the specific requirements of any laboratory, from semi-automatic models to automatic ones. All models ensure user safety with features such as automatic distillation interruption in case of overheating or overpressure and adjustable cooling water input as needed. Furthermore, our distillers work according to standardized procedures from international organizations such as **AOAC**, **ISO**, **EPA** and **DIN**. The **DNP Series** distillers are engineered to consistently deliver accurate and precise results, ensuring reliability of your assays.

## 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

### CONVENIENT MAINTENANCE

Our distillers are crafted with user-friendly maintenance in mind. They feature predefined programs for equipment preheating or executing a cleaning cycle. In addition, the equipment includes a calibration, priming, and cleaning system for all the dosing pumps, streamlining maintenance tasks.

### FLEXIBILITY FOR VARIOUS SAMPLE TYPES

They provide storage for a total of 100 programs, with three fixed, 18 user-editable, and the remainder completely customizable. Each program allows for tailored settings, including program name, steam generation intensity, reagent dosage volumes, delays, distillation times, and sample residue aspiration.

### ACCORDING TO STANDARDIZED METHODS

They facilitate nitrogen content determination and various other analyses in strict accordance with the official methods prescribed by internationally recognized entities, including AOAC, ISO, EPA, and DIN. This compliance ensures the accuracy and reliability of the results obtained.

### OPTIMIZATION OF RESOURCES

They are engineered with resource conservation in mind. The steam generator and cooling water system automatically halt water intake when the equipment is not in distillation mode, leading to significant water savings. Additionally, reagent volumes are carefully controlled to minimize waste.

## BENEFITS

- **Compatible with different methods and a wide variety of samples.**
- **Included technical support to develop application notes.**
- **Choose from 100 programs, with the ability to personalize the name.**
- **According to standardized analysis procedures.**
- **Accurate and reproducible results.**
- **Efficient and fast distillations.**
- **Automatic dispensing of reagents.**
- **Environmentally friendly.**
- **Pre-installed methods for common applications.**
- **Error messages indicate the fault and the corresponding remedy.**
- **Integrated preheating, cleaning, pumps calibration and verification programs.**
- **Easy to use.**

### ENHANCED USER PROTECTION

User safety is guaranteed through its design that protects the electrical and mechanical components, and its resistance to chemical agents. Key safety features are a thermostat and a pressure switch, a water level controller in the steam generator, and tube and open door sensors that stop the assay in case of detecting irregularities.

### 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.

# Kjeldahl distillers

## RAYPAnet: A NEW ONLINE PLATFORM

Equipped with Wi-Fi connectivity.

The results of each assay are accessible either directly on the platform or by consulting the assay history log.

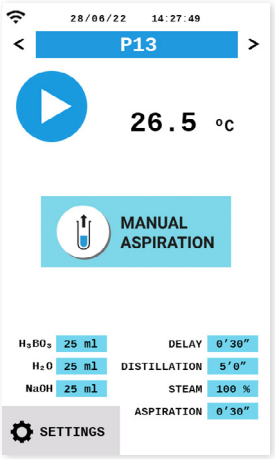
Utilize Wi-Fi to effortlessly connect to the online platform RAYPAnet on your PC. Visualize and export assay information in a user-friendly graphical format, and generate comprehensive reports.

All relevant information can be exported in both .CSV and .PDF formats for further review, study and archival purposes.

RAYPAnet is compatible with most web browsers.

Multiple devices can be connected and controlled simultaneously.

## NEW TOUCHSCREEN MICROPROCESSOR




- Intuitive user interface with a colour LCD touchscreen that displays all relevant parameters of each assay in real time.
- Intuitive icons indicate the status and progress of each assay.
- Compatible with Celsius and Fahrenheit scales with a resolution of 0,1°C/°F.
- Advanced capability for programming assays.
- Language selection: ENG, FR, ESP, CAT. Other languages available on request.
- Audiovisual safety alarms.
- Up to 100 programs can be stored in the program library.
- An acoustic signal indicates the end of the assay.
- It features a restricted-access section intended for authorized technicians.

## COMPLETE KJELDAHL SOLUTION

Enhance your laboratory's productivity with our comprehensive solution for executing the Kjeldahl method that includes a digester, a fumes neutralization system, a distiller and a titrator. Every component of our Kjeldahl suite is crafted for optimal productivity, minimizing costs, and emphasizing user-friendliness and safety. It offers a seamless, hassle-free solution that not only streamlines your workflow but also enhances the quality of your assays.

### COMPACT BLOCK DIGESTION SYSTEM

Efficient, versatile and scalable block digestion for safe Kjeldahl digestions and much more.

### FUMES NEUTRALIZATION SYSTEM

Closed fumes neutralization system with active aspiration, for use in conjunction with our compact block digestion system.

### KJELDAHL DISTILLERS

Steam distillation system optimised to perform distillations according to the Kjeldahl method.

### KIT FOR AUTOMATIC TITRATION

Potentiometric titrator with colour display validated for use with DNP Series distillers.

### EXTERNAL TITRATOR SOFTWARE

Communication software between the titrator and a PC that enables real-time data display, management, and export capabilities directly from the workstation.

# Kjeldahl distillers

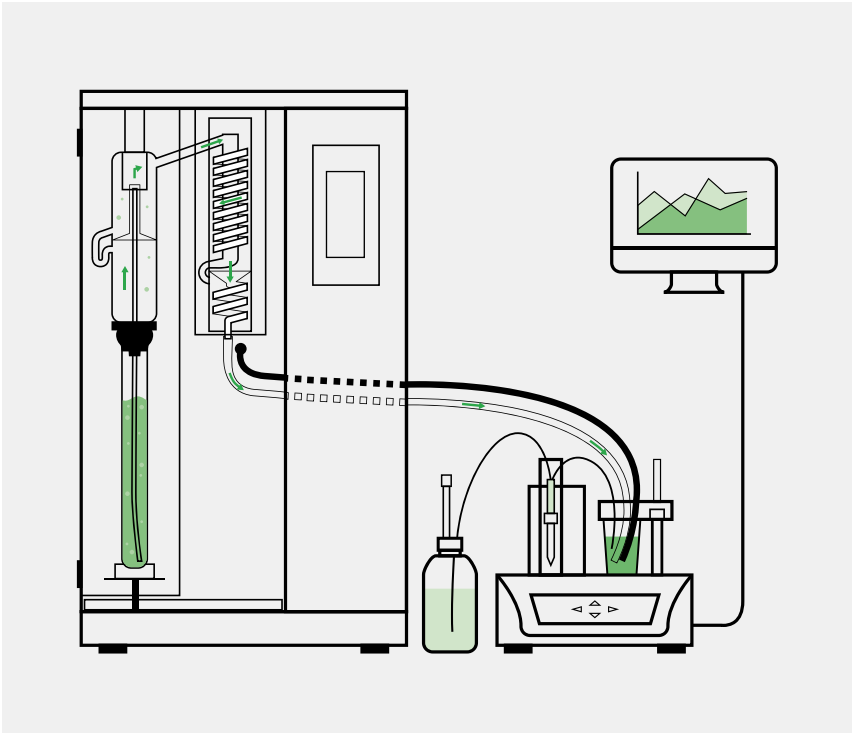
## OPERATION

Once the sample is digested and ready for distillation, load it into the distiller and choose the required program. The equipment adds the selected reagents 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 TS** distiller with the **KIT-TITRA-RAY** external titrator offers an 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

5" Touchscreen and Wi-Fi connection

Specific menus for:
- Selection of distillation programs
- Pump priming, calibration and cleaning
- Language selection

Resistant safety door

More than 100 programs available

External building made of stainless steel of high durability

Open door sensor

Automatic sample residue aspiration after distillation is finished*

Optional automatic distillation with external titrator*

Optional adapter to use Büchi® tubes

Automatic dispensing of reagents

Sample tube detection

* Only available for DNP-2000 TS

# Kjeldahl distillers

## DNP-1500 TS

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

- 100 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 and pumps cleaning by end user.
- Language selection (ENG, ESP, FR, CAT).
- 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.
- Steam generator water level detector.

### PROGRAMMABLE PARAMETERS AND VALUES

- Dilution water: 0-255mL
- NaOH solution: 0-255mL
- Reaction time (delay): 0-30 minutes.
- Distillation time: 0-90 minutes.
- Steam power regulation: 30-100%

### SUPPLIED WITH THE FOLLOWING COMPONENTS

- 1 macro sample tube of Ø42x300mm
- 2 tanks of 10L 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: 1800W
- Water consumption (during distillation only): 2L/min at 20ºC
- Ambient temperature: 5 to 40ºC
- Ambient humidity: 30 to 80%
- Weight: 30Kg
- Dimensions (LxDxH): 440x340x790mm

## DNP-2000 TS + KIT-TITRA-RAY

The combination of the DNP-2000 TS and KIT-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 minutes you will get your result in terms of the nitrogen and/or protein percentage on your computer.

### FEATURES

- 100 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 and pumps cleaning by end user.
- Automatic sample residue aspiration pump.
- Language selection (ENG, ESP, FR, CAT).
- 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.
- Sample tube detection.
- Overtemperature thermostat.
- Overpressure switch.
- Cooling water inlet pressure regulator.
- Steam generator water level detector.

### PROGRAMMABLE PARAMETERS AND VALUES

- Dilution water: 0-255mL
- NaOH solution: 0-255mL
- $H_3BO_3$ solution: 0-255mL
- Reaction time (delay): 0-30 minutes.
- Distillation time: 0-90 minutes.
- Steam power regulation: 30-100%
- Sample residue aspiration: Yes/No

### SUPPLIED WITH THE FOLLOWING COMPONENTS

- 1 macro sample tube of Ø42x300mm
- 3 tanks of 10L for sample residue, $H_2O$ and NaOH
- 1 tank of 5L for $H_3BO_3$
- 1 anti-drip tray.
- Several connection hoses.

### INSTALLATION REQUIREMENTS

**For DNP**

- Power supply: 230V 50/60Hz (or 115V 50/60Hz).
- Power consumption: 1800W
- Water consumption (during distillation only): 2L/min at 20ºC
- Ambient temperature: 5 to 40ºC
- Ambient humidity: 30 to 80%
- Weight: 30Kg
- Dimensions (LxDxH): 440x340x790mm

**For KIT-TITRA-RAY (optional accessory)**

- Power supply: 230V 50/60Hz
- Power consumption: 80W
- Ambient temperature: 15 to 35ºC
- Ambient humidity: 20 to 80%
- Weight: 4Kg
- Dimensions (LxDxH): 220x400x360mm

# Kjeldahl distillers

## TECHNICAL SUMMARY OF DNP SERIES

| | References | DNP-1500 TS | DNP-2000 TS |
|---|---|---|---|
| **General information** | Official standards compliance | AOAC, DIN, EPA, ISO | |
| | Dimensions L x D x H mm | 440 x 340 x 790 | |
| | Weight Kg | 31 | |
| | Power W | 1800 | |
| | Frequency Hz | 50/60 | |
| | Wi-Fi connection and RAYPAnet access | ✔ | |
| | USB port and printer connection | - | Through optional external titrator |
| **Main applications** | Nitrogen analysis according to the Kjeldahl method | + | |
| | Alcoholic strength by volume | + | |
| | Volatile acidity | + | |
| | Sulphur dioxide | + | |
| | Formaldehyde, Urea, Cyanide | + | |
| | Phenols | + | |
| **Materials** | Sample protection door | Transparent methacrylate | |
| | Parts made of glass | Borosilicate 3.3 | |
| | Tube stopper | Resistant rubber | |
| | Tubing | Silicone, Teflon® and fluorinated elastomer | |
| | External housing | AISI-304 stainless steel painted with epoxy resin | |
| **Display** | Screen type | LCD TS | |
| | Screen size | 5" | |
| | Values of steam power, distillation time, delay time, timer, reagents volumes | ✔ | |
| | Error messages | Open door, Insert test tube, High temperature, Low water, Voltage fault, Preheating fault | |
| | Available selection of languages | ESP, ENG, FR, CAT | |
| **Microprocessor and programs** | Type of microprocessor | PID digital | |
| | Total number of programs | 100 | |
| | Number of preset programs with customizable parameters | 18 | |
| | Number of preset programs with non-customizable parameters | 3 | |
| | Preheating, rinsing and process validation program included | ✔ | |
| | Specific instructions for cleaning and calibrating the pumps | ✔ | |
| **Process control** | Automatic steam generation | ✔ | |
| | Automatic control of water level of the steam generator | ✔ | |
| | Automatic control of cooling water consumption | ✔ | |
| | Automatic addition of alkaline solution (NaOH) | ✔ | |
| | Automatic addition of dilution water | ✔ | |
| | Automatic addition of receiver solution ($H_3BO_3$) | - | ✔ |
| | Automatic sample residue elimination after distillation phase | - | ✔ |
| | Automatic titration with external titrator | - | O |
| **Adjustable program parameters** | Name of program | ✔ | |
| | Steam generator power % | 30 - 100 | |
| | $H_2O$ addition mL | 0 - 255 | |
| | NaOH addition mL | 0 - 255 | |
| | $H_3BO_3$ addition mL | - | 0 - 255 |
| | Reaction delay time min | 0 - 30 | |
| | Distillation time min | 0 - 90 | |
| | Aspiration of sample residue | - | Activated / Deactivated |

+: Recommended ✔: Included O : Optional

continued on next page

## TECHNICAL SUMMARY OF DNP SERIES (continued from)

| | References | DNP-1500 TS | DNP-2000 TS |
|---|---|---|---|
| **Performance for Kjeldahl analysis** | Distillation speed at 100% steam addition at 230V mL/min | 30 | |
| | Nitrogen recovery % | ≥ 99,5 | |
| | Measuring range mg N | 0,1 - 200 | |
| | Reproducibility % | ± 1 | |
| | Resolution mL | 1 | |
| | Precision of NaOH, $H_2O$ and $H_3BO_3$ dispensing pumps % | ± 2 | |
| | Steam generator water consumption during distillation phase L/min | 0,03 | |
| | Cooling circuit water consumption during distillation phase L/min | 2,4 | |
| **Sample tube placement** | Tube stopper material | Resistant rubber | |
| | Max. - Min. Height mm | 320 - 280 | |
| | Max. - Min. Width Ø mm | 35 - 22 | |
| | Adapter for Büchi® tubes | O | |
| | Removable tray to collect eventual drops | ✔ | |
| **Reagents and residues management** | NaOH pump | ✔ | |
| | NaOH tank volume L | 10 | |
| | $H_3BO_3$ pump | - | ✔ |
| | $H_3BO_3$ tank volume L | - | 5 |
| | $H_2O$ pump | ✔ | |
| | $H_2O$ tank volume L | 10 | |
| | Aspiration of sample residue | - | ✔ |
| | Pumps calibration system | ✔ | |
| | Sample residues tank L | 10 | |
| | Reagent resistant drag guard and tubes | ✔ | |
| | System for saving cooling water | ✔ | |
| **Sensors and alarms** | Audiovisual 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

# Kjeldahl distillers

## Complete batch handling items included

| | |
|---|---|
| 1 POLYETHYLENE TANK OF 10 LITERS FOR NAOH SOLUTION | ✔ |
| 1 POLYETHYLENE TANK OF 10 LITERS FOR $H_2O$ SOLUTION | ✔ |
| 1 POLYETHYLENE TANK OF 5 LITERS FOR SAMPLE RESIDUE* | ✔ |
| 1 POLYETHYLENE TANK OF 5 LITERS FOR $H_3BO_3$ SOLUTION* | ✔ |
| 1 ANTI-DRIP TRAY | ✔ |
| 1 DISTILLATION GLASS TUBE | ✔ |
| CONNECTING HOSES | ✔ |

*Only for DNP-2000 TS.

# Accessories

## KIT FOR AUTOMATIC TITRATION

| Reference | | KIT-TITRA-RAY |
|---|---|---|
| Performance data | Resolution pH; mV | 0,001; 0,1 |
| | Reproducibility pH | ±0,001 |
| Installation requirements | Dimensions L x D x H mm | 220 x 400 x 360 |
| | Weight Kg | 4 |
| | Power W | 80 |
| | Voltage* V | 230 |
| | Frequency Hz | 50/60 |
| | Ambient temperature °C | 15 - 35 |
| | Ambient humidity % | 20 - 80 |

*Other voltages and electrical configurations available on request.

### Features

- Potentiometric titrator with colour display validated for use with Kjeldahl distillers.
- Features several titration programs and comes pre-installed with the most common distillation programs specific to DNP Series distillers.
- Results expressed as total nitrogen and protein percentage.
- Specific menus for maintenance, pH calibration, titrator calibration and automatic calibration of burettes.
- Equipped with two USB ports for copying analysis tests, extracting data and connecting a printer, keyboard or mouse.
- Equipped with user admin control and Ethernet port for optional software connection.
- Temperature compensation with probe Cat. Pt100.

### Components

- Reaction vessels (5x50mL and 5x150mL).
- 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.

## 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

# Kjeldahl distillers

## Accessories

### DISTILLATION TUBES

| References | TB-100DNP | TB-250DNP | TB-250DNP-R* | TB-400DNP |
|---|---|---|---|---|
| **Recommended sample volume** mL | 100 | 250 | 250 | 400 |
| **Material** | glass | glass | glass reinforced | glass |
| **Dimensions** Ø x H mm | 26 x 300 | 42 x 300 | 42 x 300 | 80 x 300 |

*Reinforced distillation tube for analysis of waste water and slurry.

TB-100DNP TB-250DNP TB-250DNP-R TB-400DNP

### RACK FOR DISTILLATION TUBES

| References | GRA-1220 | GRA-640 | GRA-680 |
|---|---|---|---|
| **Dimensions** L x D x H mm | 122 x 177 x 150 | 122 x 177 x 150 | 209 x 308 x 172 |
| **Positions** | 12 | 6 | 6 |
| **Compatible distillation tubes** | TB-100DNP | TB-250DNP & TB-250DNP-R | TB-400DNP |

- Rack for distillation tubes.
- Material: AISI-304 stainless steel.

### REACTION BEAKER

| Reference | VR-75300 |
|---|---|
| **Dimensions** Ø x H mm | 80 x 95 |
| **Material** | glass |

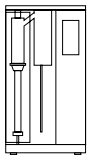
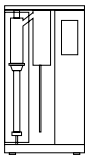
- Glass reaction beaker for collecting distillates.

### ADAPTATION FOR BÜCHI® TUBES

- Adapters to use Büchi® tubes on DNP Series Kjeldahl distillers.

Reference: ADAP-BU


26.5 °C
MANUAL ASPIRATION
PROTEIN NITROGEN DISTILLER
RAYPA


## Specifications

| References | | DNP-1500 TS | DNP-2000 TS | KIT-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 |
| Reagent tank capacity | $H_2O$ L | 10 | 10 | - |
| | NaOH L | 10 | 10 | - |
| | $H_3BO_3$ L | - | 5 | - |
| Automatic addition of receiver solution $H_3BO_3$ | | - | ✔ | - |
| Automatic removal of sample residue after distillation | | - | ✔ | - |
| Automatic titration with external titrator | | - | O | - |

✔: Included O: Optional
*Other voltages and electrical configurations available on request.

## Safety

- Sample tube and open door sensors.
- Multiple audiovisual alarms and error messages.
- Resistant sample door to protect the user.
- Anti-drip tray for eventual splashes.
- Corrosion-resistant easy-to-clean external frame made of stainless steel.

## Regulations

Our 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.

## International standardized methods

Our Kjedahl distillers have different automation levels to adapt to each user specific requirements and they are designed to guarantee compliance with a variety of international standards such as AOAC, ISO, EPA and DIN.

## Main fields of application


FOOD INDUSTRY


BEVERAGES


ENVIRONMENTAL ANALYSIS


ANIMAL FEED


AGRICULTURAL ANALYSIS


PHARMACEUTICALS


COSMETICS

+ info


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

Installation guide available for download on our website.

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