D50/D200

Dumas Nitrogen/Protein Analyzer

The Dumas Nitrogen/Protein Analyzer determines the nitrogen/protein content of samples through combustion, purification, reduction, and thermal conductivity detection. It efficiently analyzes a single sample in 4 minutes without pretreatment and reacts in a nontoxic and harmless way to ensure safety and environmental friendliness.

- **Considerable**: a 1-disc 120-position autosampler (D200 only) is adopted to directly analyze a large number of samples

- **Quick**: the fast cooling function helps the device reach the shutdown temperature in 30 minutes

- **Premium**: core pneumatic components of SMC® and mass flow controllers of Bronkhorst® retain the reliability for a long time

- **Cost-effective**: new consumables and efficient metal condenser dewatering technologies extend the service life

Applications

The Dumas Nitrogen/Protein Analyzer is widely used to determine the total nitrogen content in diesel exhaust fluid, cereals (grain), seeds, meat, meat products, animal feed, dairy products, red wine, fertilizers and soil.

Diesel exhaust fluid, fertilizer

Cereal and oil
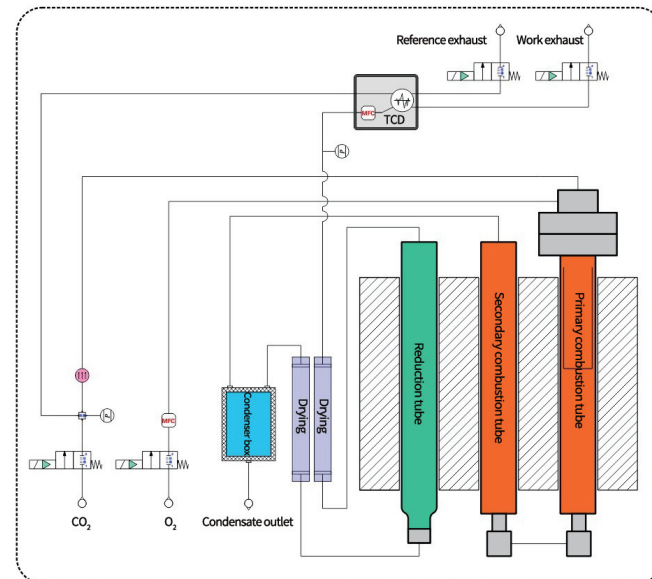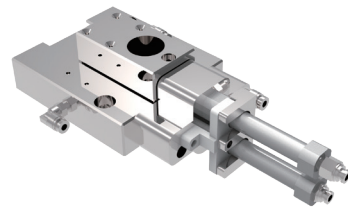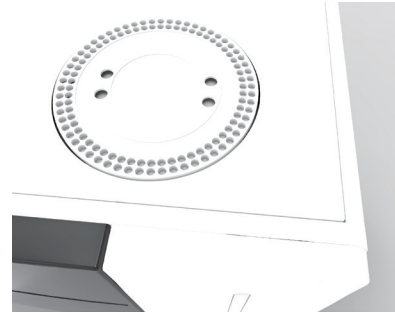

Food

feeding stuffs

Two-stage combustion and oxidation: pure oxygen combustion in the primary combustion tube facilitates preliminary oxidation and digestion of a sample; the remaining part slides through the secondary combustion tube, together with the carrier gas, and is completely digested after being oxidized by the mixture of Pt catalyst and copper oxide;

Three-stage dewatering: most of water is removed by an electronic condenser so that the desiccant can work; traces of water is removed by primary and secondary drying tubes;

Efficient reduction: an efficient reduction agent reduces nitrogen oxides to nitrogen gas and absorbs excess oxygen;

TCD detection: the thermal conductivity detector (TCD) can determine the nitrogen produced by reduction.

- AOAC uses the Dumas method as a standard method for the determination of crude protein content in grains and oilseeds, meat/meat products and animal feed.

- ISO uses the Dumas method for the quality assessment of cereals, pulses, ground cereal products, oilseeds and animal feed.

- AACC and ICC use this method to determine grain protein content.

- ISO and DIN (German Industrial Standards) also use this method for evaluating dairy products.

- AOAC and ISO/DIN use this method as the standard method for the determination of total nitrogen in fertilizers and soils.

- ISO, 2015, Natural raw rubber and natural latex Determination of nitrogen content by this method.

Product Features

Sampling System

- The 1-disc 120-position autosampler（D200 Only）can conduct a direct analysis of a large sample size

- SMC® pneumatic components can inject samples for 100,000 times, with low maintenance costs

- The contactless in-situ detection function provided by anti-interference infrared modules can interrupt self-test and pop up messages to avoid maloperation if the sampling disc is occupied (D200 Only)

- Users can add samples freely during preparation (either solid or liquid) to enhance experimental efficiency, without stopping the automatic analysis.

Combustion Furnace System

- High-temperature, pure oxygen, and the two-stage combustion process ensure thorough oxidation and digestion

- An efficient metal condenser and two-stage desiccants can completely remove water. The desiccants can be reused for 2,000 times.

- New consumables can reduce nitrogen oxide, absorb excess oxygen, and prolong the service life. Both combustion and reduction tubes can be reused for 1,000 times.

Pneumatic System

- A two-stage regulator eliminates the impact of external pressure fluctuations and combustion-induced pressure changes on the detector system to ensure stability
- PTFE fittings and SMC® quick couplers allow for clear observation of contaminants and toolless maintenance
- The combustion tube and joint of an original pneumatic connector (patent number: CN106443029B) support easy assembly and disassembly to eliminate air leakage caused by irreversible wear of ferrule compression fittings
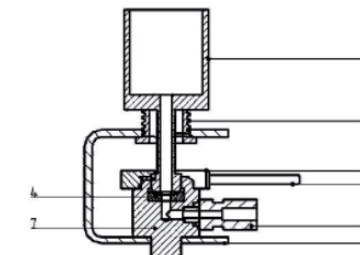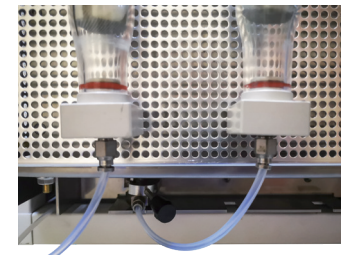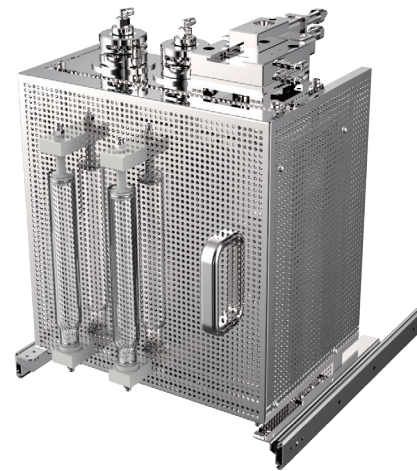
Software Function

Windows Chinese Version streamlines operation and improves efficiency. Click to configure parameters and conditions, and control the computer to gather, process, store and print out data.

- Wireless communication of balance data: an industrial wireless communication module automatically collects weight data, with the max distance of 100m. The data display window and voice authentication function can adjust value（D200 Only）
- Air leakage inspection: the gas path can be checked automatically or manually for the convenience of users
- Custom lab report: report format, company name and logo, etc. can be customized
- Standby/wake-up function: it reduces the on/off frequency and enhances the experimental efficiency. Carrier gas, power consumption and cost are lowered in standby mode
- Intelligent oxygenation function: the software adds oxygen subject to changes in conditions and samples to save reduction agents
- Solution library: a solution library is built in and there's no need to develop new approaches

- Periodic maintenance reminder: time and cycle of consumable replacement are determined based on sample features, quantity, oxygen consumption, etc., and reminders will be issued timely
- Self-diagnosis: if experimental conditions are not up to standard or not prepared, users can choose from 23 fault diagnosis methods to automatically raise a pop-up alarm
- Data processing: experimental results can be easily reached by RSD and mean value calculation
- Calibration method: accurate experimental data are output by one point or multiple points
- Audit trail: the software has developed user permission hierarchy rules for easy traceability in accordance with FDA 21 CFR Part 11(D200 Only)
- LIMS: the software share data with the laboratory information management system

Working Environment

Power supply	220V AC ±10% 50Hz
Computer	A laptop or a desktop operated with Windows 7 or above and equipped with USB or RS 232 interface
Temperature	5℃～30℃
Humidity	≤85%

Technical Parameters

Analysis efficiency	3-4 min each
Weighing accuracy	≤0.1mg
Detection range	0.1-500mg nitrogen
Detection recovery rate	≥99.5%
Relative standard deviation (RSD)	≤0.5% (150mg standard 10% nitrogen)
LOD	0.01mg nitrogen
Sample weight	Solid ≤1g, liquid ≤1mL
Operating system	Windows 7 and above
Sampler	D200:1 disc x 120 1 disc x 40 positions D50:1 disc x 60 positions
Detector	TCD
TCD accuracy	≤0.01℃
Carrier gas	CO_2
Furnace temperature	1200℃ (MAX)
Carrier gas purity	99.999%
Oxygen purity	99.999%
Internal module communication mode	RS-485 bus
Peripheral interface	RS232, USB
Correction method	Linear or nonlinear calibration, custom calibration curve degree
Rated power	2000W
Dimensions (L×W×H)	735mm×560mm×560mm
Net weight	80kg

Determination of crude protein in soybeans

Principles:

Under high temperature and oxygen enrichment, the sample is heated in a combustion tube and then interference elements are removed by absorbents. The elemental nitrogen is quantitatively converted to molecular nitrogen, the content of which can be detected by a TCD. The crude protein in soybeans is quantified by a Dumas Analyzer in accordance with NY/T 2007-2011 Determination of the crude protein content in cereals and pules seeds by combustion according to the Dumas principle.

Apparatus:

Hanon D200 Dumas Analyzer; analytical balance;40-mesh sieve crusher; tinfoil; pressing tool.

Reagents and Materials:

—O_2: purity > 99.999%
—CO_2: purity > 99.999%
—Standard L-Aspartic acid: purity > 99%
—Commercial soybeans

Sample Preparation:

Ground a sample with a 40-mesh sieve crusher and store in a sealed bag. Weigh 100mg-150mg of the sample (correct to 0.00001g) and put it on a tinfoil. Prepare tinfoil tablets with pressing tools and place in a sample box for detection.

Configuration:

1.Temperature/carrier gas flow: click "Configuration - Settings - System Parameters - Temperature/Carrier Gas Flow" in sequence

Combustion tube temperature	960℃
Secondary combustion tube temperature	900℃
Reducing tube temperature	800℃
CO_2 set value	69%

2.Oxygen: click "Configuration - Settings - System Parameters - Oxygen" in sequence

Oxygen delay	120s
Max oxygen release duration	300s

3.Experimental methods: click "Configuration - Settings - Experimental Methods - Create New" in sequence

Name	Determination of crude protein in soybeans
Oxygen release duration	240s
Oxygen flow	150mL/min
Auto zero	60s
Prospective peak	300s
Point restart delay	60s
Protein conversion factor	5.71

Note: Turn the pressed side up when sampling a tinfoil tablet. Make sure the tinfoil is completely covered, thus preventing autosampler malfunction.