

## 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

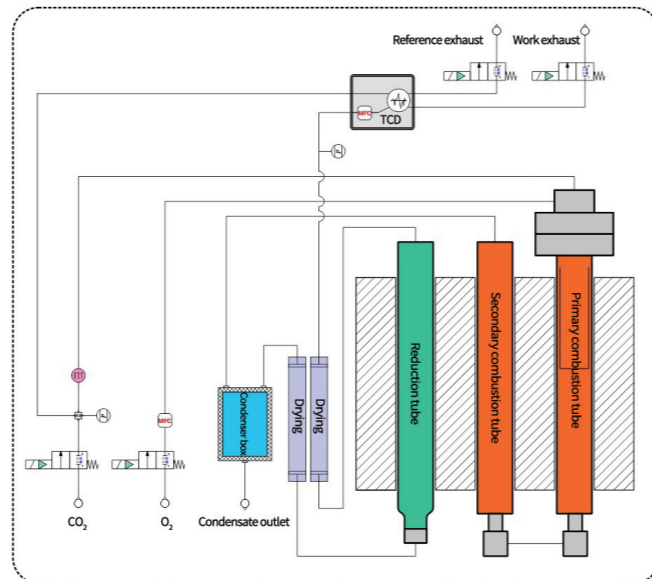


**Two-stage combustion and oxidation:** pure oxygen combustion in the primary combustion tube facilitates preliminary oxidation and digestion of a sample; the remaining part slides through the secondary combustion tube, together with the carrier gas, and is completely digested after being oxidized by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



### 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.

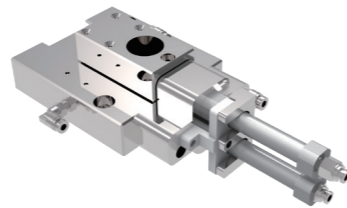
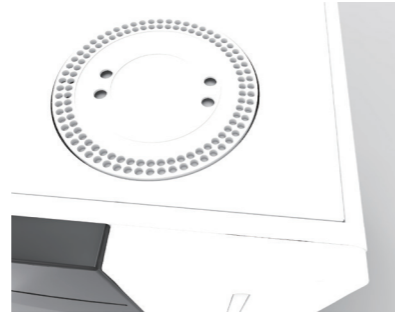


- AOAC uses the Dumas method as a standard method for the determination of crude protein content in grains and oilseeds, meat/meat products and animal feed.
- ISO uses the Dumas method for the quality assessment of cereals, pulses, ground cereal products, oilseeds and animal feed.
- AACC and ICC use 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

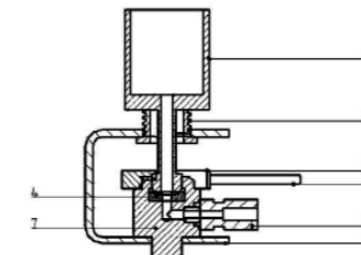
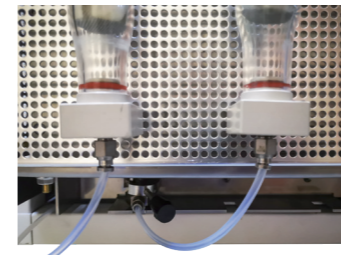
### Sampling System

- 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.



### 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

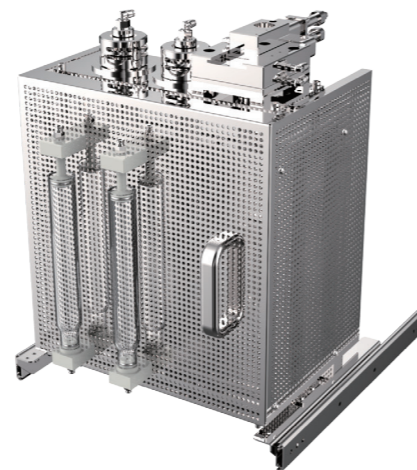


### Software Function

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.

### 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.



- 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

## 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 pulses 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<sub>2</sub>: purity > 99.999%
- CO<sub>2</sub>: purity > 99.999%
- Standard L-Aspartic acid: purity > 99%
- Commercial soybeans

### Sample Preparation:

Grind 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°C
Secondary combustion tube temperature	900°C
Reducing tube temperature	800°C
CO <sub>2</sub> 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.

### 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°C~30°C
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°C
Carrier gas	CO <sub>2</sub>
Furnace temperature	1200°C (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