



DUMATHERM
NITROGEN/PROTEIN ANALYSER

DUMATHERM - SETTING A NEW STANDARD IN THE



RAPID NITROGEN DETERMINATION ACCORDING TO DUMAS

This combustion method has already been developed in the beginning of the 19th century by Dumas*. In the Dumas method, a sample is burned in an oxygen rich atmosphere at high temperatures and the resulting gases are analyzed. Now, C. Gerhardt, being the market leader for the Kjeldahl analysis, can also offer a highly efficient instrument with the DUMATHERM. By using the Dumas method, this new technique offers a fast and comfortable alternative to the classic system.

The new DUMATHERM comprises all advantages of the Dumas-method: It is fast, precise, cost efficient as well as saving resources! The clever design of the furnace chamber in combination with the direct analysis of all resulting gases provides the user with results within 2-3 minutes. Thanks to the construction of the instrument, the DUMATHERM has hardly any wear- and tear parts, which reduces costs for service significantly.

*Dumas, J.-B. (1831), Ann. Chim. Phys. (Paris), 47, 198.

THE NITROGEN DETERMINATION



COSTS OF THE ANALYSIS

- ▶ The combustion gas oxygen is added stoichiometrically controlled by software, which means only the amount of oxygen which is needed for the total combustion is added.
- ▶ The simple separation of the combustion products water and carbon dioxide reduce the after sales service and the costs per analysis.
- ▶ Low maintenance costs, fast analysis and a high precision guarantee a very short period of amortisation.

SPEED OF THE ANALYSIS

- ▶ The evolved gases are analyzed directly which reduces the amount of time needed for the entire process. The automatic adjustment of the time for the analysis is done via software
- ▶ The DUMATHERM needs only about 180 seconds for a standard analysis with 200 mg EDTA. This saves time and thus money!

PRECISION OF ANALYSIS

- ▶ The sample chambers of the autosampler are rinsed with helium and thus no atmospheric gas can enter the combustion chamber. The usage of helium as a carrier gas offers the optimal conditions for the detection of oxygen by the Thermal Conductivity Detector.
- ▶ The relative standard deviation is lower than 0.5 % (absolut) for EDTA as a test substance and an initial sample weight of 200 mg.
- ▶ During each measurement the total amount of nitrogen is analysed. Thus, the detection limit is 0.01 mg N absolute. The maximum detectable amount of nitrogen is 50 mg N in 1 g sample.

SAMPLE SIZE

- ▶ The usual amount of sample is between 50 to 300 mg; depending on the carbon content and the homogeneity of the sample material initial sample weights of 0.5 mg to 1 g are possible.

AUTOSAMPLER

- ▶ The capacity of the autosampler can be easily expanded from 40 to 120 positions.
- ▶ Loading is also possible during an analysis in process.



Jean Baptiste Dumas,
the inventor of the
combustion method

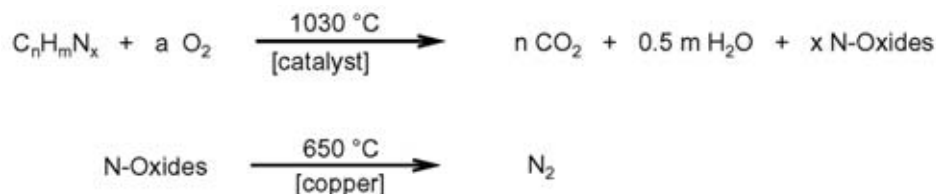


Duma,
the Kiswahili name for a
cheeta – symbol for speed
and efficiency

DUMATHERM - PRINCIPLE

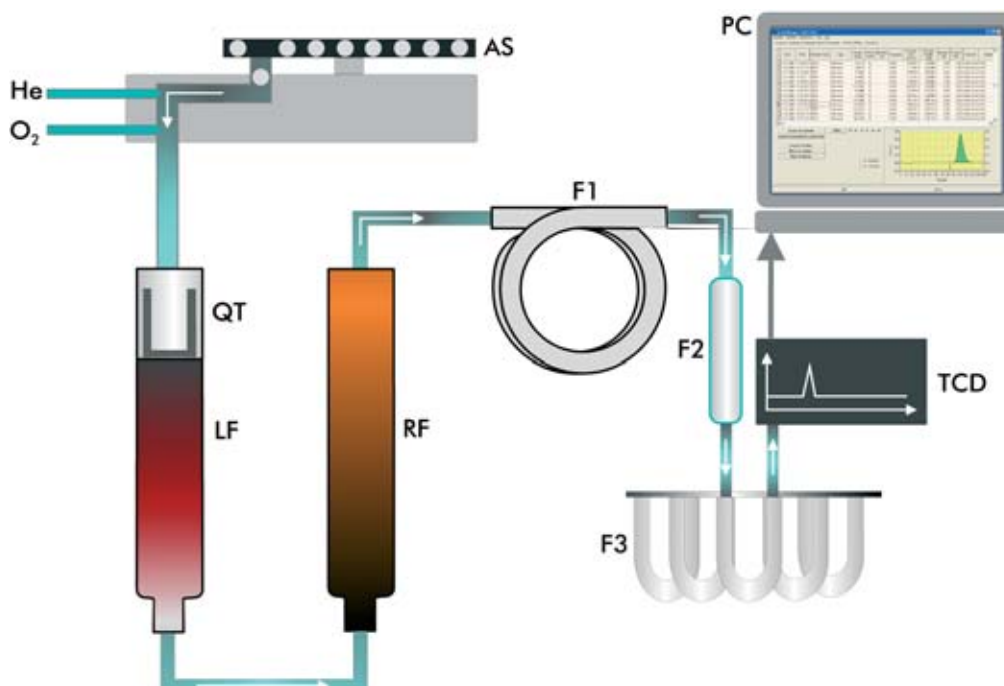
PRINCIPLE OF ANALYSIS

Solid or liquid samples are combusted at high temperatures in the presence of catalysts into oxides. With the help of copper, the resulting nitrogen oxides (NO_x) are reduced to elemental nitrogen while the by-products water and carbon dioxide are separated completely. The remaining nitrogen is analyzed using a single filament detector.



ANALYSIS PROCEDURE

The samples drops from the autosampler (AS) into a purge chamber, which is constantly purged with helium (Zero-blank autosampler). The combustion is initiated by switching the gas flow to oxygen and the transport into the 1000 °C hot, upright combustion furnace (LF). The ashes are collected in a quartz tube (QE) insert, which can be easily taken out and exchanged – even when the unit has reached operating temperature. Among all resulting combustion products (CO_2 , H_2O and N-oxides), the nitrogen oxides react in the reduction furnace (RF) to elemental nitrogen (N_2). The majority of the water is separated using an intelligent Nafion® tube membrane system (F1), which works using a semipermeable wall in the counter flow. Any remaining amounts are caught in an absorption trap (F2), where the separation of CO_2 is done in self-regenerating adsorption traps (F3). Elemental nitrogen remains, which is measured in a thermal conductivity detector (TCD) without any reference gasflow. Data management (input / output) is done via PC.



AS Autosampler, QT Quartz tube insert, LF Combustion furnace, RF Reduction furnace, F1 Membrane system (Nafion®), F2 Absorption trap, F3 Self regenerating adsorption trap, TCD Thermal conductivity detector

EASY OPERATION

DUMATHERM MANAGER

Dumatherm is entirely controlled and operated using the controlling software Dumatherm Manager. This software issues error warnings and should any serious problem occur, the analysis is aborted. This reduces the time the operator has to actually be present thus saving labor costs. Furthermore, the software is also capable of an efficient diagnosis and documentation function, which facilitates the handling of all parameters of the instrument and analysis.

1. SAMPLE PREPARATION

A smaller sample size means saving costs per analysis since the basic throughput of consumables is reduced thanks to the stoichiometrically combustion. A careful sample preparation, which means homogenizing of the sample material with grinding and milling facilitates the work tremendously.

2. WEIGHING OF SAMPLE

The homogenized sample is weighted-in in tin foil, packed air-tight and then put into an empty sample chamber in the autosampler. The communication between the balance (Satorius CP 64) and the PC reduces the work load for the sample input. The balance can send the weighing data of the sample directly to the PC using the data interface. Thus, these data are entered directly into the sample input template.* The recommended initial sample weight is between 50 to 250 mg sample, depending on the homogeneity of the material.

*It is also planned to be able to import sample data from a LIMS system..

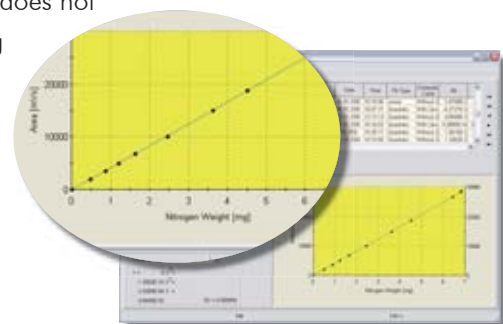
3. ANALYSIS AND RESULTS

All parameter of the analysis are set and controlled by the PC. The software will calculate the analysis parameter, which are needed by the various sample types like e.g. the dosing of the gas, combustion times etc. and these parameters will then be stored in the analysis programs. By entering the oxygen factor, the amount of combustion gas needed can be controlled by the user. Thus, only the exact amount of oxygen which is really needed for an analysis will be added. For the general types of samples, these combustion categories are already preset.

4. DETECTOR AND CALIBRATION

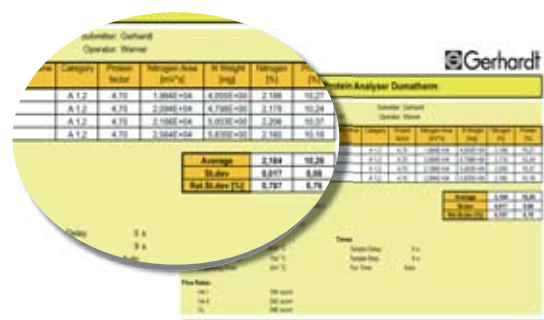
The innovative thermal conductivity detector is calibrated with the help of standard substances with known nitrogen content, as e.g. EDTA. Without the need for a reference gas flow, the detector offers the possibility to provide an individual calibration for various nitrogen contents. Entirely diverse sample material can be measured using the optimum calibration for any content range.

A standard adjustment does not have to be done during the daily routine analysis.



5. INTERPRETATION OF THE RESULTS

All analysis data and the measuring results obtained, are stored in a course data base (history) and can be copied from this table into excel data files for interpretation purposes. For a series of samples or a single sample, a detailed print out of the analysis parameter and the results, including an error calculation can be obtained. The course databases can be stored so that a data library can be set up. This ensure a safe handling of the sensitive analysis data.



VERSATILITY

DUMATHERM observes international norms and analysis standards, like e.g. AOAC, AOCS, ASBC, AACC, ASTM, §35 LMBG, DIN, etc. and thus, meets the requested analysis qualities. Dumatherm can be used for all analytical areas. Application notes for various determinations are available on request..

APPLICATIONS

Examples:

- ▶ DIN EN ISO 14891, Determination of N in milk and dairy products
- ▶ DIN 11512-20, Determination of nitrogen in soil conditioners and culture media
- ▶ DIN EN ISO 16634, N-determination in oilseeds and feeds
- ▶ AOAC 997.09, Crude protein in cereal grain and oilseeds
- ▶ AOAC 992.15, Crude protein in meat and meat products
- ▶ AOAC 990.03, Crude protein in animal feed



ACCESSORIES AND CONSUMABLES

For the daily operation with Dumatherm you need the following accessories and consumables (all including the delivery):

- ▶ HT oxydation catalyst, Order No.: 7711
- ▶ LT oxydation catalyst, Order No.: 7714
- ▶ Copper reduced wires, Order No.: 7710
- ▶ Tin foil cups (conditioned), Order No.: 7718
- ▶ Pressed tin capsules (9 x 10 mm), Order No.: 7717
- ▶ Ash finger insert, Order No.: 7725
- ▶ Capsule forming and closing device, Order No.: 77013
- ▶ Quartz wool, Order No.: 7712



DUMATHERM - AT A GLANCE

Sample Size:	0.5 mg - 1 g depending on the type of sample
Sample capacity:	Autosampler with 40, 80, or 120 positions
Duration of analysis:	2-4 min., depending on the sample type and sample size
Amount of Oxygen:	stoichiometric
Percentage recovery:	> 99,5 %
Detection limit:	< 0,01 mg N
Standard deviation:	< 0,5 %
Operation:	via PC using the control software Dumatherm Manager
	- Sample input
	- Individual analysis methods can be programmed.
	- Statistics and diagnostic functions
	- Individual and serial print outs of the results
	- Extensive possibilities for documentation and many more...
	- Individual calibration possible
Temperature range:	Combustion furnace 400 - 1100 °C
	Reduction furnace 400 - 1100 °C
	Desorption furnace 50 - 350 °C
Required gases and quality:	- Helium quality grade 5.0 (99,999 %)
	- Oxygen quality grade 5.0 (99,999 %)
	- Compressed air or nitrogen (99,6 %, free of oil / water)
Inlet pressure helium:	3 - 6 bar
Inlet pressure oxygen:	3 - 6 bar
Inlet pressure compr. air or nitrogen:	4 bar
Ambient temperature:	15 °C < t < 35 °C
Nominal voltage:	230 V AC, 50 / 60 Hz
Dimensions (W x D x H):	800 x 370 x 500 mm (625 with autosampler)
Weight:	65 kg
Current:	max. 6 Ampere
Order No.:	7700
Type:	DT
Digital scale:	optional (Sartorius CP 64)

Requirements for PC:

Minimum Pentium III Prozessor (400 MHz), 32 MB RAM, 20 MB hard disc capacity, two free COM Ports, or a USB and a COM Port for the communication between Dumatherm, scale and PC, Operating system Windows 98, 2000 or XP, Microsoft Excel.

Delivery

The Dumatherm comes complete including all consumables and accessories for about 1.000 samples.

OTHER PRODUCTS

On request we will be happy to supply you with further brochures regarding our other products.

DIGESTION UNITS

KJELDATHERM

TURBOTHERM

TRACE METAL SMA

The extensive Kjeldatherm digestion program produced by Gerhardt offers many options. Thanks to the infrared heating units the programmable Turbotherm rapid digestion unit has very short and reliable heating up and cooling down periods. The Kjeldatherm block digestion unit makes use of an aluminum block, where the sample tubes are heated up to exactly the temperature needed.



DISTILLATION SYSTEMS

VAPODEST

Gerhardt has set new standards worldwide with the Vapodest steam distillation system. Whenever, highly precise analysis results are needed - Gerhardt has the answer. The Vapodest product range is available in various levels of automation, from the Vapodest 10 semi-automatic distillation system to the Vapodest 50 distillation and titration system with carousel autosampler.



RAPID EXTRACTION

SOXTHERM

Based on the experiences of customers and partners worldwide, Gerhardt has improved the successful Soxtherm range. Depending on the demands and sample through-put of the laboratory, the customer can now choose between a 2, 4, and 6 place, programmable units.



SHAKER

LABOSHAKE

THERMOSHAKE

ROTOSHAKE

Hotplates, single and serial hotplates as well as sand baths, are standard requirements in any laboratory. They have always been an important part of the product range at Gerhardt. The thermo program also includes classic distillation systems, digestion instruments, and extraction units.



HOTPLATES

HOTPLATES HC

SERIAL HEATING UNITS

SERIAL FLASK HEATERS

Gerhardt shakers LS 500 and RO 500 can be programmed with 9 different shaking programs each with 9 different program steps for time and speed. Laboshake meets the highest demands of the chemical, biological, and microbiological research.



All stages from research & development to shipment have undergone a constant quality control under EN ISO 9001:2000.

EN ISO
9001:2000



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