# 828 Series

## Nitrogen, Hydrogen, Carbon Determinator

## Specification Sheet

| **Instrument Range*** | **Helium Carrier Gas** | | **Argon Carrier Gas** | |
|---|---|---|---|---|
| | **10 cm3 Aliquot Loop** | **3 cm3 Aliquot Loop** | **10 cm3 Aliquot Loop** | **3 cm3 Aliquot Loop** |
| Nitrogen, FP828** | 0.04 mg to 300 mg | 0.08 mg to 300 mg | 0.12 mg to 300 mg | 0.24 mg to 300 mg |
| Nitrogen, FP828P and CN/CNHN828 | 0.02 mg to 300 mg | 0.04 mg to 300 mg | 0.06 mg to 300 mg | 0.12 mg to 300 mg |
| Carbon, CN/CHN828 | 0.02 mg to 175 mg | 0.04 mg to 175 mg | 0.02 mg to 175 mg | 0.04 mg to 175 mg |
| Hydrogen, CHN828 | 0.02 mg to 17 mg | 0.02 mg to 17 mg | 0.02 mg to 17 mg | 0.02 mg to 17 mg |
| *Precision Range† (mg vs. RSD, whichever is greater)* | | | | |
| Nitrogen, FP828** | 0.02 mg or 0.6 % RSD | 0.04 mg or 1.2 % RSD | 0.06 mg or 1.2 % RSD | 0.12 mg or 2.4 % RSD |
| Nitrogen, FP828P and CN/CNHN828 | 0.01 mg or 0.3 % RSD | 0.02 mg or 0.6 % RSD | 0.03 mg or 0.6 % RSD | 0.06 mg or 1.2 % RSD |
| Carbon, CN/CHN828 | 0.01 mg or 0.4 % RSD | 0.02 mg or 0.8 % RSD | 0.01 mg or 0.4 % RSD | 0.02 mg or 0.8 % RSD |
| Hydrogen, CHN828 | 0.01 mg or 0.5 % RSD | 0.01 mg or 0.5 % RSD | 0.01 mg or 0.5 % RSD | 0.01 mg or 0.5 % RSD |
| **Sample Mass** | | | | |
| FP828 and FP828P | up to 1.0 g, 0.5 g nominal | | | |
| CN828 | up to 0.5 g, 0.25 g nominal | | | |
| CHN828 | up to 0.3 g, 0.1 g nominal | | | |
| **Cycle Time/Throughput†† (Analyzing EDTA at Nominal Mass)** | | | | |
| | **Helium Carrier Gas** | | **Argon Carrier Gas** | |
| FP828, FP828P, and CN828 | 2.8 min / 21 samples/h | | 3.0 min / 20 samples/h | |
| CHN828 | 4 min / 15 samples/h | | 4.5 min / 13 samples/h | |
| **Detection Method** | | | | |
| Nitrogen | Thermal Conductivity (TC Cell) Detector | | | |
| Carbon/Hydrogen | Non-Dispersive Infrared (NDIR) Absorption | | | |
| **Gases Required** | | | | |
| Carrier Gas | Helium or Argon (99.99 % purity) @ 25 psi (1.7 bar) ± 10 % | | | |
| Combustion Gas | Oxygen (99.99 % purity) @ 25 psi (1.7 bar) ± 10 % | | | |
| Pneumatic Gas | Compressed Air (oil and water free), 40 psi (2.8 bar) ± 10 % | | | |
| **Resistance Furnace** | 1,050 °C (1,922 °F) max (Primary and Secondary Furnace) | | | |
| **Autoloader** | 30-sample position (up to 120-sample position optional) | | | |
| **Operating Conditions** | **Temp:** 15 °C to 35 °C (59 °F to 95 °F) **Rel. Humidity:** 20 % to 80 %, non-condensing | | | |
| **Sound Pressure Level** | 55 dBa (max reading at operator's level per IEC/EN 61010-1) | | | |
| **Electrical Power** | 230 V~ (+10 %/-15 %; at max load), 50 / 60 Hz, single phase, 2,400 Btu/h§ | | | |
| **Dimensions‡** | 31.5 in H × 25.3 in W × 31 in D (80 cm H × 59 cm W × 79 cm D) | | | |
| Instrument with touch-screen | Distance from instrument back panel to front foot is 22 in (56 cm) | | | |
| **Weight (approximate)** | 250 lb (113 kg) | | | |

## Part Numbers

| | |
|---|---|
| FP828-MC | FP828 base model with single loop aliquot (3 $cm^3$), software, PC, and touch-screen display |
| FP828-PMC | FP828 performance model with dual loop aliquot (10 $cm^3$ and 3 $cm^3$), software, PC, and touch-screen display |
| CN828-MC | CN828 performance model with dual loop aliquot (10 $cm^3$ and 3 $cm^3$), software, PC, and touch-screen display |
| CHN828-MC | CHN828 performance model with dual loop aliquot (10 $cm^3$ and 3 $cm^3$), software, PC, and touch-screen display |


* *Lower range is calculated as 2σ instrument blank deviation. Method range may differ due to factors such as sample type and method parameters.*

** *3 $cm^3$ aliquot loop installed in the FP828 model, 10 $cm^3$ aliquot loop parts included with the instrument as an option for installation in 3 $cm^3$ place of the standard 3 $cm^3$ aliquot loop.*

† *Calculated as 1σ instrument blank deviation. Method precision may differ due to sample inhomogeneity or other external factors.*

†† *Cycle Time and Throughput represent the time between two sequential samples results being reported with portions of the Analysis time for the samples being interleaved.*

‡ *Allow for a 6 in (15 cm) minimum access area around all sides of the instrument.*

§ *Average output based on nominal operating parameters.*

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# Theory of Operation (828 Series FP/CN/CHN)

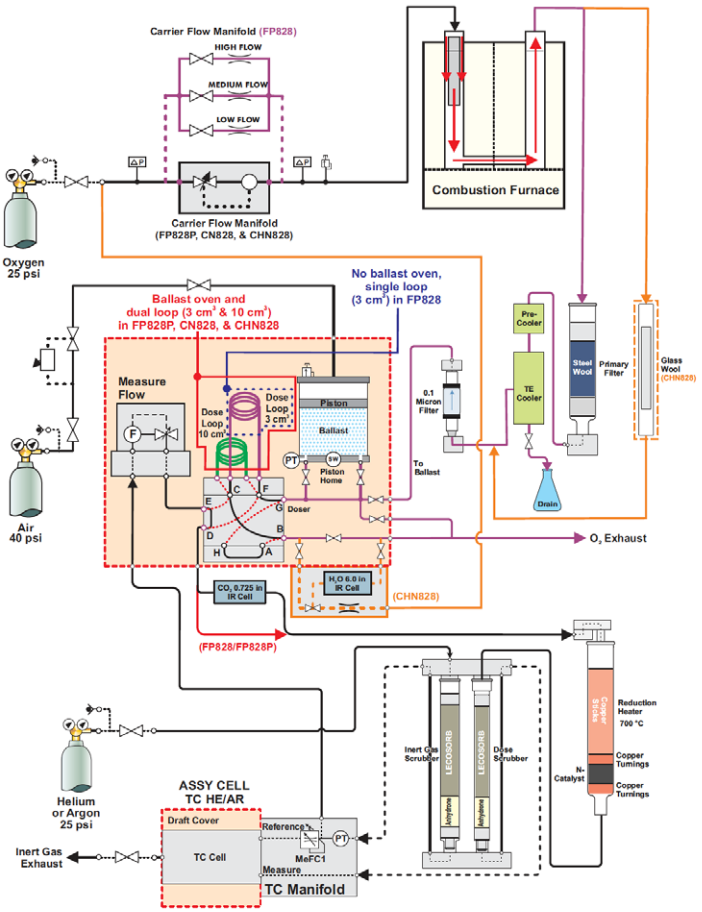
The 828 Series determines nitrogen/protein, carbon/nitrogen and carbon/hydrogen/nitrogen in a multitude of organic matrices from food/feeds and soils to fuels. The system utilizes a combustion technique with a vertical quartz furnace designed to handle diverse sample matrices with rapid cycle times and extended reagent lifetimes, delivering unsurpassed throughput coupled with superior instrument uptime.

To begin an analysis, the sample is weighed into a tin capsule or encapsulated within tin foil and placed into the loader. A fully automated analysis sequence transfers the sample to a sealed purge chamber, where atmospheric gas is removed. The purged sample is transferred automatically into a reticulated ceramic crucible within the furnace. To ensure complete and rapid combustion (oxidation) of the sample, the furnace environment is composed of pure oxygen with a secondary oxygen flow being directed to the sample within a reticulated crucible via a quartz lance. In the FP and CN828 models, the combustion gases are swept from the furnace through a thermoelectric cooler to remove moisture and are collected in a ballast volume. In the CHN828 model, combustion gases are swept from the furnace through an afterburner containing reagent to scrub sulfur compounds from the gas stream prior to collection in the ballast volume. The gases equilibrate and mix within the ballast before a representative aliquot of the gas is extracted and introduced into a flowing stream of inert gas for analysis. Depending upon the analyzer model, the aliquot gas is carried to a non-dispersive infrared (NDIR) cell for the detection of carbon (as carbon dioxide) and a thermal conductivity cell (TC) to detect nitrogen ($N_2$). In the CHN828 model, the ballast gas is also transferred to a $H_2O$ NDIR cell for the determination of hydrogen. Unlike NDIR cells, TC cells are chemically nonspecific, so a series of reagents and scrubbers are used to ensure quantitative detection of $N_2$ without chemical interference. A heated reduction tube, filled with copper, is used to convert nitrogen oxide species ($NO_x$) to $N_2$ and remove excess oxygen. Carbon dioxide ($CO_2$) is removed by LECOSORB and water vapor ($H_2O$) is removed by Anhydrone.

Careful sequencing of the analysis provides maximum sample throughput by interleaving the sample loading sequence with quantitation of the aliquot gases from the previous sample.

Many diagnostic sensing capabilities are included in the 828 Series analyzer. Multiple Pressure Transducers (PT) have been included to provide the ability to leak check individual segments of the flow path.

## Flow Diagram

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