828 Series

Elemental Analysis by Combustion

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828 Series: Elemental Analysis by Combustion

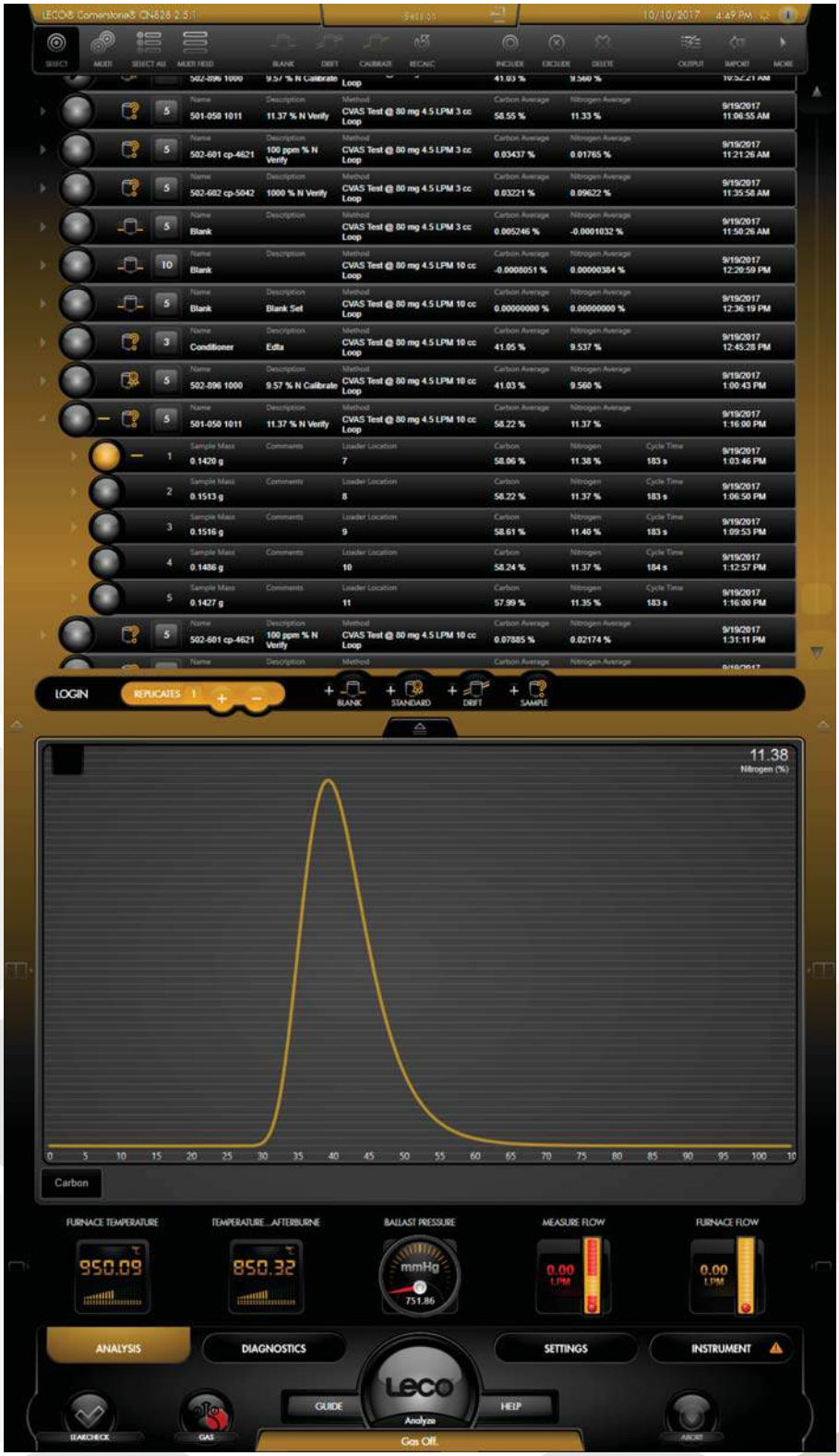
By incorporating state-of-the-art hardware and an on-board, touch-screen software platform, the 828 Series allows you to easily handle a wide range of sample applications while significantly increasing your productivity. Available in carbon/nitrogen, nitrogen/protein, and carbon/hydrogen/nitrogen configurations, the core capabilities and performance of previous generations of LECO macro combustion instruments have been maintained, while key improvements have been made in throughput, uptime, and reliability. All 828 Series models are compatible with the S832 add-on providing independent sulfur determination. Macro sample mass capability paired with cycle times as fast as 2.8 minutes make the 828 an ideal instrument for a diverse applications base, while delivering unparalleled sample analysis throughput.

Maximize lab efficiency and productivity with unmatched sample throughput coupled with superior instrument uptime.

- Rapid cycle time of 2.8 minutes for FP/CN models
- Extended reagent lifetimes, including a reduction reagent tube lifetime of over 4,000 samples
- Rugged 30-sample position autoloader with optional expanded capacity for up to 120 samples

User-Friendly Cornerstone® Brand Software

LECO's exclusive *Cornerstone* brand software with touch-screen interface enables complete access to analysis control, method settings, diagnostics, reporting, and more in a highly organized, intuitive, and immersive environment. Designed through a collaboration of customer feedback and innovative engineering, *Cornerstone* features all of the routine day-to-day operations within a single Analysis screen designed for speed and ease-of-use. Our innovative grouping of sample data into sets and replicates simplifies the data output and automatically calculates relevant statistics, alleviating the need for additional data processing.



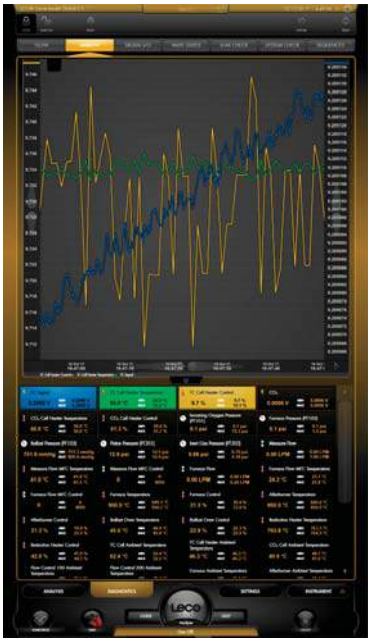
Analysis

Software Features & Benefits

The software is divided into four main sections—Analysis, Diagnostics, Settings, and Instrument— for simplified navigation and organization. Toolbars, sliders, and drop-down menus make it easy to set parameters for calibration and data processing. The software also includes real-time monitoring of ambient parameters, with fully animated system diagrams and onboard training videos.

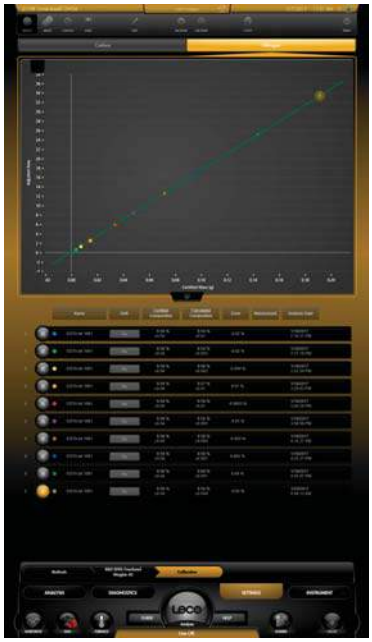
Advanced interactive diagnostic features include a thorough digital on-board manual, maintenance animations, photo illustrations, and screen captures that quickly provide the direction needed without having to refer to multiple manuals.

Cornerstone also supports a multilingual interface, user permissions, extended data archiving and filtering, compatibility with various Laboratory Information Management Systems (LIMS), and flexible reporting capabilities. Compliance to FDA regulations 21 CFR Part 11 for a closed analytical system is also supported.



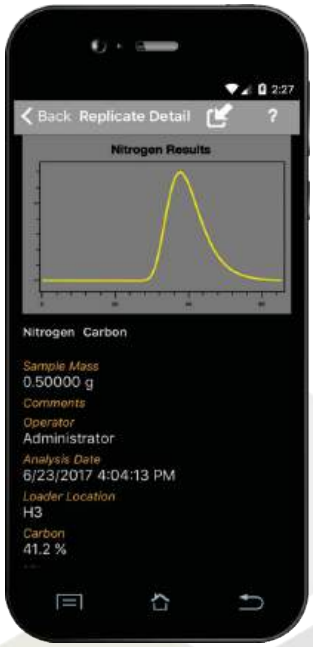
Diagnostics ▶ Ambients

Instrument ▶ Furnace



Settings ▶ Calibration

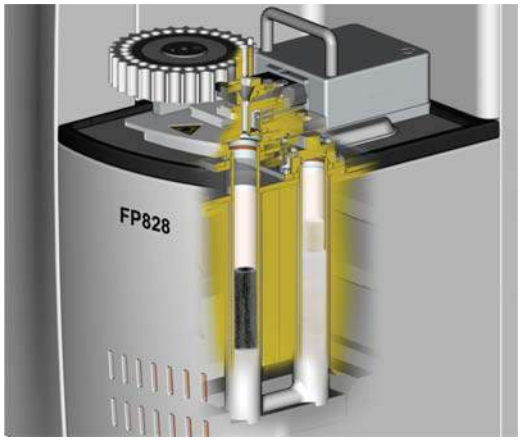
An optional *Cornerstone* Mobile application feature enables remote viewing of the instrument software from a smartphone, tablet, or PC. It can also be programmed to set automatic notifications from the instrument against predefined software conditions using e-mail, text message, or the *Cornerstone* Mobile application.



Instrument Highlights and Features

Application Versatility with Superior Uptime

- Quartz dual-stage furnace with exclusive oxygen environment ensures complete combustion of macro samples with maximum temperature up to 1050 °C
- Thermal conductivity cell supports the flexibility of using either helium or argon as a carrier gas without a hardware change
- Dual-loop aliquot doser (available in FP828 performance, CN, and CHN model), provides the flexibility to optimize methods based upon sample element concentration (low/high), or analysis cost and uptime
- S832 add-on provides independent sulfur determination of macro samples



Low Operating Cost

- Reagent-free primary and secondary furnace eliminates the cost and downtime of furnace reagent replenishment in FP/CN models
- Thermoelectric cooler eliminates the use of chemical desiccant reagents for the removal of combustion gas moisture in FP/CN models
- Combustion gas aliquot system provides an extended and consistent reagent lifetime regardless of sample mass, matrix, or carbon content, including a 4000 sample reduction tube reagent lifetime

Operator-Centered Design

- Boom-mounted touch-screen user interface promotes an ergonomic workspace and optimized workflow while reducing system bench space requirements
- Open access to all reagent tubes and common maintenance areas with quick-release features speeds and simplifies preventive maintenance routines, ensuring a robust and reliable instrument with superior uptime
- *Cornerstone* Mobile remote software keeps the user updated from their smartphone on the instrument's analysis batch progress, performance, and status while away

Reliability with Trusted Service and Support

- Knowledgeable sales force with a customer-centered focus dedicated to helping you understand and identify the best instrumentation fit for your application
- State-of-the-art Technical Service Laboratory with experienced technical application chemists to assist in method development and other application-related requests
- Global and regional LECO service network comprised of regional support centers and over 25 international LECO subsidiaries, dedicated to providing service and support offerings, including field service visits over the lifetime of the instrument

Model Availability

Available in various models, the 828 Series is ideal for a diverse applications base and is compliant with ISO, AOAC, AACC, AOCS, and ASBC approved methods of analysis.

FP828

The FP828 delivers fast, accurate, and precise detection of nitrogen/protein in a wide range of food, feed, and other organic matrices, with an analysis cycle time of 2.8 minutes.

- Feeds
- Petfood
- Milled products

CN828

The CN828 delivers fast, accurate, and precise detection of carbon and nitrogen analysis in environmental and agricultural samples with an analysis cycle time of 2.8 minutes.

- Soil
- Plant tissue
- Sediments

CHN828

Determination of carbon, hydrogen and nitrogen in energy, fuels, and specialty materials performed quickly and conveniently using the versatile CHN828.

- Coal
- Coke
- Oils

Organic Consumables

Get the best results from your LECO instrument by using genuine LECO consumables. Visit www.leco.com for featured items, specials, and ordering information (Form number 203-828).

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828 Series

Nitrogen, Hydrogen, Carbon Determinator

Specification Sheet

Instrument Range*	**Helium Carrier Gas**		**Argon Carrier Gas**	
	10 cm^3 Aliquot Loop	**3 cm^3 Aliquot Loop**	**10 cm^3 Aliquot Loop**	**3 cm^3 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/CHN828	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/CHN828	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	1050 °C (1922 °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	58 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, 12 A max, 2400 Btu/h§			
Dimensions‡ Instrument with touch-screen	31.5 in H x 25.3 in W x 31 in D (80 cm H x 59 cm W x 79 cm D) *Distance from instrument back panel to front foot is 22 in (56 cm)*			
Weight (approx.)	250 lb (113 kg)			

Part Numbers

FP828-MC	FP828 base model with single loop aliquot (3 cm^3), software, PC, and touch-screen display
FP828P-MC	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 2 σ 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 place of the standard 3 cm^3 aliquot loop*

†Calculated as 1 σ 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)

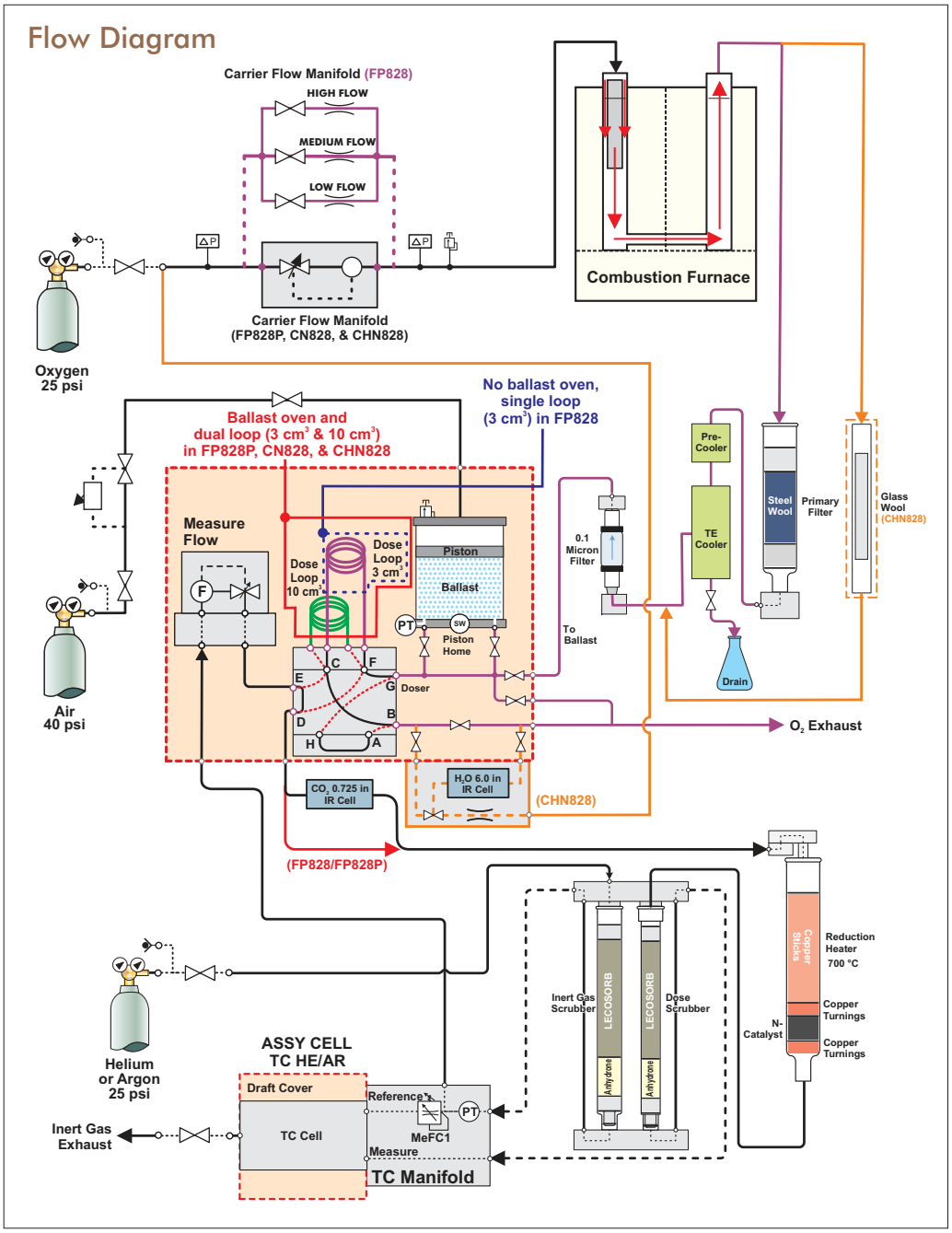
The 828 Series determines nitrogen/protein, carbon/nitrogen and carbon/hydrogen/nitrogen in a multitude of organic matrices from food/feeds and soils to fuels. The system utilizes a combustion technique with a vertical quartz furnace designed to handle diverse sample matrices with rapid cycle times and 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 non-specific, 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



Specifications and part numbers may change.
Consult LECO for latest information.
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