

# Approved Methodologies

## To Which LECO Instruments Conform

### AACC (AMERICAN ASSOCIATION OF CEREAL CHEMISTS)

Method	Instruments	Constituents	Materials
46-30	FP928, FP828, FP628	Protein	Cereal and Cereal Products

### AOAC (ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS)

Method	Instruments	Constituents	Materials
990.03	FP928, FP828, FP628	Crude Protein	Animal Feed
992.15	FP928, FP828, FP628	Crude Protein	Meat/Meat Products and Petfoods
992.23	FP928, FP828, FP628	Crude Protein	Cereal Grain and Oil Seed Products
993.13	FP928, FP828, FP628,	Nitrogen	Fertilizer
997.09	FP928, FP828, FP628	Nitrogen/Protein	Beer, Wort and Brewing Grains (Total Protein by Calculation)
2017.08	S832, 628 S Module	Sulfur	Fertilizer

### AOCS (AMERICAN OIL CHEMISTS SOCIETY)

Method	Instruments	Constituents	Materials
BA4E-93	FP928, FP828, FP628	Protein	Oil Seeds
BA4F-00	FP928, FP828, FP628	Protein	Soybean Meal

### ASBC (AMERICAN SOCIETY OF BREWING CHEMISTS)

Method	Instruments	Constituents	Materials
Combustion	FP928, FP828, FP628	Protein	Adjunct Materials and Cereals
Combustion	FP928, FP828, FP628	Protein	Barley
Combustion	FP928, FP828, FP628	Protein	Beer
Combustion	FP928, FP828, FP628	Protein	Brewers' Grains
Combustion	FP928, FP828, FP628	Protein	Malt
Combustion	FP928, FP828, FP628	Protein	Wort

## ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

### Carbon Black

Method	Instruments	Constituents	Materials
D1619	832 Series	S	Carbon Black
D7633	832 Series	C	Carbon Black
D7662	832 Series	C	Carbon Black Feedstock Oils
D7679	832 Series	S	Carbon Black Feedstock Oils

### Ceramics

Method	Instruments	Constituents	Materials
C1494	CS844/744, ONH836/ON736	C, O, N	Silicon Nitride Powder

### Energy

Method	Instruments	Constituents	Materials
C1408	CS844/744	Carbon (Total)	Uranium Oxide Powders and Pellets
C1457	RHEN602	Hydrogen	Uranium Oxide Powders and Pellets
D240	AC500	Calorific Value	Hydrocarbon Fuels
D1552	S832, CHN628 S	S	Oils and Petroleum Products
D1619	S832, CHN628 S	S	Carbon Black
D1857	AF700	Ash Fusion	Coal and Coke Ash
D4239/Mth A	S832, CHN628 S	S	Coal and Coke
D4809	AC500	Calorific Value	Hydrocarbon Fuels
D5016	S832, CHN628 S	S	Coal and Coke Ash
D5291	CHN628	C, H, N	Oil
D5373/Mth A	CHN628	C, H, N	Coal
D5373/Mth B	SC/C832	C	Coal and Coke
D5769	Pegasus BT	Total Aromatics	Finished Gasoline
D5865	AC500, AC600	Calorific Value	Coal and Coke
D7348	TGA801, TGA701	Loss on Ignition (LOI)	Combustion Residues
D7582	TGA801, TGA701	Proximate	Coal and Coke
D7582, Sec 13.2.2	TGM800	Moisture	Coal and Coke

### Hardness Testing

Method	Instruments	Title
E10	LCB3100	Standard Test Method for Brinell Hardness of Metallic Materials
E18	LR, LCR	Standard Test Methods for Rockwell Hardness of Metallic Materials
E92	LM, LV, LMV, AMH43, AMH55, Test Blocks	Standard Test Method for Knoop and Vickers Hardness of Materials
E140	LM, LV, LR, LCR, LMV, LCB3100	Standard Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, and Scleroscope Hardness

## ASTM (continued)

### Metals

Method	Instruments	Constituents	Materials
E1019	CS844/744, ONH836/ON736	C, S, N, O	Steel, Iron*, Nickel/Cobalt Alloys
E1409	ONH836/ON736	O, N	Titanium and Titanium Alloys
E1447	ONH836, RHEN602	H	Titanium and Titanium Alloys
E1569	ONH836/ON736	O	Tantalum
E1587	CS844/744, ONH836/ON736	C, S, N, O	Refined Nickel
E1915	CS844/744, SC832 Series	C, S	Metal Bearing Ores and Related Materials (i.e. tailings, waste rock)
E1941	CS844/744	C	Refractory and Reactive Metals
E2050	C844/744	C	Mold Powders
E2575	ONH836/ON736	O	Copper
E2792	RHEN602	H	Aluminum and Aluminum Alloys
E2994	GD-AES	Multiple	Titanium and Titanium Alloys

\*ISO 4935 - Sulfur Method; ISO 9556 - Carbon Method

### Microscopy

Method	Instruments	Title
E1951	BX, GX, SZ, SZX	Standard Guide for Calibrating Reticles and Light Microscope Magnifications

## AWS (AMERICAN WELDING SOCIETY)

Method	Instruments	Constituents	Materials
A4.4M:2001	RC Series (H <sub>2</sub> O)	Moisture	Welding Fluxes and Electrode Flux Coverings

## EPA (ENVIRONMENTAL PROTECTION AGENCY)

Method	Instruments	Constituents	Materials
525.2	Pegasus BT	Organic Compounds	Drinking Water
8270	Pegasus BT	SVOC	Solids, Soils, and Water

## ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

### Energy

Method	Instruments	Constituents	Materials
1928	AC500, AC600	Calorific Value	Solid Mineral Fuels
18611-2	CHN628, FP828, FP928	N	Catalyst
19579	CHN628 S, S832	S	Solid Mineral Fuels
29541	CHN628	C, H, N	Solid Mineral Fuels

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## ISO (continued)

### Food

Method	Instruments	Constituents	Materials
14891	FP928, FP828, FP628	Total Nitrogen/Protein	Milk and Milk Products
16634	FP928, FP828, FP628	Total Nitrogen/Protein	Food Products, Oilseed, and Animal Feeds

### Hardness Testing

Method	Instruments	Title
4545-2	LM, LMV	Metallic materials -- Knoop hardness test -- Part 2: Verification and calibration of testing machines
6506-2	LCB3100	Metallic materials -- Brinell hardness test -- Part 2: Verification and calibration of testing machines
6507-2	LM, LMV, LV	Metallic materials -- Vickers hardness test -- Part 2: Verification and calibration of testing machines
6508-2	LR, LCR	Metallic materials -- Rockwell hardness test -- Part 2: Verification and calibration of testing machines

### Metals

Method	Instruments	Constituents	Materials
3690	DH603	H	Ferritic Steel Arc Weld Metal
4689-2/3	S844/744	S	Iron Ores
4935	S844/744	S	Steel and Iron
7524	C844/744	C	Nickel, Ferronickel, and Nickel Alloys
7526	S844/744	S	Nickel, Ferronickel, and Nickel Alloys
9556	C844/744	C	Steel and Iron
9686	CS844/744	C, S	Direct Reduced Iron
9891	C844/744	C	UO <sub>2</sub>
10694	C844/744	C	Soil
10719	C844/744	C	Cast Irons
10720	ONH836/ON736	N	Steel and Iron
11873	CS844/744	C, S	Cobalt Metal Powders
13902	S844/744	S	Steel and Iron
15349-2	C844/744	C	Unalloyed Steel
15350	CS844/744	C, S	Steel and Iron
15351	ONH836/ON736	N	Steel and Iron
17053	ONH836/ON736	O	Steel and Iron
19272	GDS	C, Si, Mn, P, S, Cr, Ni, Al, Ti, and Cu	Low Alloyed Steel
21614	C844/744	C	UO <sub>2</sub> , (U, Gd)O <sub>2</sub> , and (U, Pu)O <sub>2</sub>
22963	ONH836/ON736	O	Titanium and Titanium Alloys

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## ISO (continued)

### Soils

Method	Instruments	Constituents	Materials
10694	SC832	C	Soil
13878	FP928, FP828, FP628	N	Soil
15178	CHN628 S, S832, CNS/NS928	S	Soil

### Surface Chemical Analysis

Method	Instruments	Constituents	Materials
11505	GDS	Multiple	General Procedures
14707	GDS	Multiple	Introduction to Use
16962	GDS	Zn/Al Coatings	Ferrous or Other Metal Base Materials
25138	GDS	Metal Oxide Films	Multiple Base Materials

## UOP (UNIVERSAL OIL PRODUCTS)

Method	Instruments	Constituents	Materials
703	C844/744	C	Catalysts
864	S832DR	S	Organic and Inorganic Materials
990	GCxGC FID	Molecular type classification	Petroleum Samples

### COMMENTS

- The USDA accepts the AOAC Method of crude protein in meats and meat products by combustion.