

Approved Methodologies

To Which LECO Instruments Conform

AACC (AMERICAN ASSOCIATION OF CEREAL CHEMISTS)

Method	Instruments	Constituents	Materials
46-30	828/928 Series	Protein	Cereal and Cereal Products

AOAC (ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS)

Method	Instruments	Constituents	Materials
990.03	828/928 Series	Crude Protein	Animal Feed
992.15	828/928 Series	Crude Protein	Meat/Meat Products and Petfoods
992.23	828/928 Series	Crude Protein	Cereal Grain and Oil Seed Products
993.13	828/928 Series	Nitrogen	Fertilizer
997.09	828/928 Series	Nitrogen/Protein	Beer, Wort and Brewing Grains (Total Protein by Calculation)
2017.08	832 Series	Sulfur	Fertilizer

AOCS (AMERICAN OIL CHEMISTS SOCIETY)

Method	Instruments	Constituents	Materials
BA4E-93	828/928 Series	Protein	Oil Seeds
BA4F-00	828/928 Series	Protein	Soybean Meal

ASBC (AMERICAN SOCIETY OF BREWING CHEMISTS)

Method	Instruments	Constituents	Materials
Combustion	828/928 Series	Protein	Adjunct Materials and Cereals
Combustion	828/928 Series	Protein	Barley
Combustion	828/928 Series	Protein	Beer
Combustion	828/928 Series	Protein	Brewers' Grains
Combustion	828/928 Series	Protein	Malt
Combustion	828/928 Series	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

Cement

Method	Instruments	Constituents	Materials
C114, Sec 18.1	TGA801	Loss on Ignition (LOI)	Portland Cement
C114, Appendix X2.2.2	TGA801	Split, Loss on Ignition, Carbon Dioxide	Hydraulic Cement
C114, Appendix X2.2.5	844/744 Series	Total Carbon, Carbon Dioxide	Hydraulic Cement
C311/C311M, Sec 11	TGM800, TGA801	Moisture	Coal Ash & Natural Pozzolans
C311/C311M, Sec 13	TGA801	LOI	Coal Ash & Natural Pozzolans

Ceramics

Method	Instruments	Constituents	Materials
C1494	844/744 Series, 836/736 Series	C, O, N	Silicon Nitride Powder

Energy

Method	Instruments	Constituents	Materials
C1408	844/744 Series	Carbon (Total)	Uranium Oxide Powders and Pellets
C1457	H836EN	Hydrogen	Uranium Oxide Powders and Pellets
D240	AC500	Calorific Value	Hydrocarbon Fuels
D1552	832 Series	S	Oils and Petroleum Products
D1619	832 Series	S	Carbon Black
D1857	AF700	Ash Fusion	Coal and Coke Ash
D4239/Mth A	832 Series	S	Coal and Coke
D4809	AC500	Calorific Value	Hydrocarbon Fuels
D5016	832 Series	S	Coal and Coke Ash
D5291	828 Series	C, H, N	Oil
D5373/Mth A	828 Series	C, H, N	Coal
D5373/Mth A	828 Series	C	Coke
D5373/Mth B	832 Series	C	Coal and Coke
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
D8339	TGA801	Free Moisture, Gypsum, Calcium Sulfite Hemihydrate, Calcium Carbonate, Ash	Flue Gas Desulfurization Solids (FGD)
D8396	Paradigm GCxGC, BTX4D Paradigm/Shift	n-paraffins, i-paraffins, naphthenes, one-ring aromatics, 2+ ring aromatics	Hydrocarbon liquids with boiling points 36 to 343 Celsius

ASTM continued on next page...

ASTM (continued)

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, HX, AMH43, AMH55, AMH6, Test Blocks	Standard Test Method for Knoop and Vickers Hardness of Materials
E140	LM, LV, LR, LCR, LMV, LCB3100, HX, AMH55, AMH6	Standard Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, and Scleroscope Hardness

Lime and Limestone

Method	Instruments	Constituents	Materials
C25 Sec 35	832 Series	Carbon and Sulfur	Lime, Limestone, and Kiln Flue Dust

Metals

Method	Instruments	Constituents	Materials
E1019	844/744 Series, 836/736 Series	C, S, N, O	Steel, Iron*, Nickel/Cobalt Alloys
E1409	836/736 Series	O, N	Titanium and Titanium Alloys
E1447	836 Series, H836EN	H	Titanium and Titanium Alloys
E1569	836/736 Series	O	Tantalum
E1587	844/744 Series, 836/736 Series	C, S, N, O	Refined Nickel
E1915	844/744 Series, 832 Series	C, S	Metal Bearing Ores and Related Materials (i.e. tailings, waste rock)
E1941	844/744 Series	C	Refractory and Reactive Metals
E2050	844/744 Series	C	Mold Powders
E2575	836/736 Series	O	Copper
E2792	H836EN	H	Aluminum and Aluminum Alloys
E2994	GDS	Multiple	Titanium and Titanium Alloys

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

Microscopy

Method	Instruments	Title
E1951	BX, GX, SZ, SZX, VX3, VX4, VX5	Standard Guide for Calibrating Reticles and Light Microscope Magnifications

AWS (AMERICAN WELDING SOCIETY)

Method	Instruments	Constituents	Materials
A4.4M:2001	612 Series	Moisture	Welding Fluxes and Electrode Flux Coverings

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

Energy

Method	Instruments	Constituents	Materials
1928	AC500, AC600	Calorific Value	Solid Mineral Fuels
29541	828 Series	C, H, N	Solid Mineral Fuels
16948	828 Series	C, H, N	Solid Biofuels
18611-2	828/928 Series	N	Catalyst
18611-2, Annex B	828/928 Series	Total Nitrogen/Urea	Aqueous Urea Solution
19579	832 Series	S	Solid Mineral Fuels
22241-2 Annex B	828/928 Series	Total Nitrogen/Urea	Aqueous Urea Solution

Food

Method	Instruments	Constituents	Materials
14891	828/928 Series	Total Nitrogen/Protein	Milk and Milk Products
16634	828/928 Series	Total Nitrogen/Protein	Food Products, Oilseed, and Animal Feeds

Hardness Testing

Method	Instruments	Title
4545-2	LM, LMV, HX	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, HX	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	844/744 Series	S	Iron Ores
4935	844/744 Series	S	Steel and Iron
7524	844/744 Series	C	Nickel, Ferronickel, and Nickel Alloys
7526	844/744 Series	S	Nickel, Ferronickel, and Nickel Alloys
9556	844/744 Series	C	Steel and Iron
9686	844/744 Series	C, S	Direct Reduced Iron
9891	844/744 Series	C	UO ₂
10694	844/744 Series	C	Soil
10719	844/744 Series	C	Cast Irons
10720	836/736 Series	N	Steel and Iron
11873	844/744 Series	C, S	Cobalt Metal Powders
13902	844/744 Series	S	Steel and Iron
15349-2	844/744 Series	C	Unalloyed Steel
15350	844/744 Series	C, S	Steel and Iron
15351	836/736 Series	N	Steel and Iron
17053	836/736 Series	O	Steel and Iron
19272	GDS	C, Si, Mn, P, S, Cr, Ni, Al, Ti, and Cu	Low Alloyed Steel
21614	844/744 Series	C	UO ₂ , (U, Gd)O ₂ , and (U, Pu)O ₂
22963	836/736 Series	O	Titanium and Titanium Alloys

ISO continued on next page...

ISO (continued)

Plastics

Method	Instruments	Constituents	Materials
3451-1 Method D	TGA801	Ash	Plastics

Soils

Method	Instruments	Constituents	Materials
10694	832 Series, 828/928 Series, 844/744 Series, 612 Series	C	Soil
13878	828/928 Series	N	Soil
15178	928 Series, 832 Series	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

Ontario Ministry of the Environment

Method	Instruments	Constituents	Materials
E3487	QuadJet™ SD-ECD	OCPs, PCBs	Soil, Sediment

UOP (UNIVERSAL OIL PRODUCTS)

Method	Instruments	Constituents	Materials
703	844/744 Series	C	Catalysts
864	832 Series	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.