



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CHEMICAL

Valid To: November 30, 2023

Certificate Number: 1873.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests on tobacco, tobacco smoke, and electronic cigarettes:

Mainstream (MS) and Sidestream (SS) Smoke Analysis:

<u>Test Description</u>	<u>Method</u>	<u>Test Procedure(s)</u>
Aflatoxin B1 in Tobacco and MS Smoke by LC-MS/MS	AM-177	-----
Ammonia (MS/SS) by HPLC	AM-011	HC T-101, HC T-201
Benzo(a)pyrene (MS) by HPLC	AM-207	HC T-103
Caffeic Acid in MS Smoke and Tobacco by LC-MS/MS	AM-069	-----
Carbon Monoxide (MS/SS) by NDIR	AM-007	HC T-115, HC T-214, FR11178, FR46483, ISO 8454, CRM No. 68
Carbonyls (MS) by UHPLC with UV Detection Acetaldehyde, Acetone, Acrolein, Butryaldehyde, Crotonaldehyde, Formaldehyde, Methylethylketone, Propionaldehyde	AM-254	CRM No. 74, HC T-104
Carbonyls (MS Cigars) by UPLC Acetaldehyde, Acetone, Acrolein, Butryaldehyde, Crotonaldehyde, Formaldehyde, Methylethylketone, Propionaldehyde	AM-076	-----
Carbonyls (SS) by HPLC Acetaldehyde, Acetone, Acrolein, Butryaldehyde, Crotonaldehyde, Formaldehyde, Methylethylketone, Propionaldehyde	AM-005	HC T-204
Coumarin in Tobacco and MS Smoke by UHPLC-MS/MS	AM-179	-----
Ethyl Carbamate by GC/MS	AM-175	-----
Filter Efficiency (MS Nicotine) by GC	AM-026	CRM No. 9

<u>Test Description</u>	<u>Method</u>	<u>Test Procedure(s)</u>
Glycidol in ENDS Aerosol and MS Smoke by GC/MS	AM-274	-----
Humectants (MS) by GC-FID Diethylene Glycol (DEG), Ethylene Glycol (EG), Glycerol, Propylene Glycol, Triethylene Glycol (TEG)	AM-090	-----
Hydrogen Cyanide (MS/SS) by CFA	AM-111	HC T-107, HC T-205
Mercury (MS) by CVAA	AM-036	HC T-108
Mercury (SS) by CVAA	AM-041	HC T-206
Metals (MS) by ICP-MS Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Nickel, Palladium, Selenium	AM-021	HC T-109
Metals (SS) by ICP-MS Arsenic, Cadmium, Chromium, Lead, Nickel, Selenium	AM-043	HC T-207
Nicotine, Water, and Menthol (MS) by GC	AM-001	HC T-115, FR11178, FR46483 ISO 10315, ISO 10362-1, ISO 4387, CRM No. 65, No. 66, No. 67
Nicotine in Aqueous Media and Saliva by GC/MS	AM-228	-----
Nicotine in Salt Media by UPLC-MS/MS	AM-242	-----
Nitric Oxide (MS) by Chemiluminescence	AM-216	HC T-110
Nitric Oxide (SS) by Chemiluminescence	AM-217	HC T-208
N-Nitrososarcosine by GC/MS	AM-120	-----
pH (MS) by pH Meter	AM-237	-----
pH (MS) by pH Meter	AM-093	HC T-113
Phenolics (MS) by HPLC Catechol, Hydroquinone, m-Cresol, o-Cresol, p-Cresol, Phenol, Resorcinol	AM-027	HC T-114, CRM No. 78
Phenolics (SS) by HPLC Catechol, Hydroquinone, m-Cresol, o-Cresol, p-Cresol, Phenol, Resorcinol	AM-048	HC T-211
Polycyclic Aromatic Hydrocarbons (MS/SS) by GC/MS MS Cigar Smoke Benzo[a]pyrene (BaP) MS Cigarette Smoke Anthracene, Benz[a]anthracene (BaA), Benzo[a]pyrene (BaP), Benzo[e]pyrene (BeP), Chrysene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene (IcdP), Naphthalene, Phenanthrene, Pyrene SS Cigarette Smoke Benz[a]anthracene (BaA), Benzo[a]pyrene (BaP)	AM-044	HC T-203B

Test Description	Method	Test Procedure(s)
Primary Aromatic Amines (MS) by GC/MS 1-Aminonaphthalene (1-naphthylamine), 2-Aminonaphthalene (2-naphthylamine), 3-Aminobiphenyl, 4-Aminobiphenyl, o-Anisidine (2-methoxyaniline), 2,6-Dimethylaniline, o-Toluidine (2-methylaniline)	AM-199	-----
Primary Aromatic Amines (MS/SS) by GC/MS 1-Naphthylamine, 2-Naphthylamine, 3- Aminobiphenyl, 4-Aminobiphenyl	AM-030	HC T-102, HC T-202
Selected Alkaloids in Tobacco and MS Smoke by GC/MS Anabasine, Nornicotine	AM-100	-----
Semi-Volatiles (MS/SS) by GC/MS MS Smoke 3-vinylpyridine, Pyridine, Quinoline SS Smoke Pyridine, Quinoline	AM-006	HC T-112, HC T-210
Tar and Nicotine (SS) by GC	AM-008	HC T-212
Tobacco Specific N-Nitrosamines (MS) by LC-MS/MS 4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1- butanone (NNK), N-Nitrosoanabasine (NAB), N-Nitrosoanatabine (NAT), N-Nitrosornicotine (NNN)	AM-020	HC T-111B, CRM No. 75, ISO 19290
Tobacco Specific N-Nitrosamines (SS) by GC 4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1- butanone (NNK), N-Nitrosoanabasine (NAB), N-Nitrosoanatabine (NAT), N-Nitrosornicotine (NNN)	AM-211	HC T-209A
Volatile Organics (MS/SS) by GC/MS 1,3-Butadiene, Acrylonitrile, Benzene, Isoprene, Styrene, Toluene	AM-015	HC T-116, HC T-213, CRM No. 70
Volatile Organics I in MS Smoke and Tobacco Products by GC/MS 1,3-Butadiene, Ethylene Oxide, Isoprene, Propylene Oxide, Vinyl Acetate, Vinyl Chloride	AM-180	-----
Volatile Organics II in MS Smoke and Tobacco Products by GC/MS Acrylonitrile, Benzene, 2,3-Benzofuran, Ethylbenzene, Furan, Naphthalene, Nitrobenzene, Nitromethane, 2-Nitropropane, Styrene, Toluene	AM-193	-----

Tobacco:

Test Description	Method	Test Procedure(s)
Acetamide and Acrylamide by GC/MS	AM-129	-----
Aflatoxin B1 in Tobacco and MS Smoke by LC-MS/MS	AM-177	-----
Ammonia by HPLC	AM-115	HC T-302, CRM No. 79
Anions by HPLC Chloride (Cl ⁻), Nitrate (NO ₃ ⁻), Nitrite (NO ₂ ⁻), Phosphate (PO ₄ ³⁻)	AM-110	-----
Benzo(a)pyrene by UPLC	AM-125	HC T-307
Caffeic Acid in MS Smoke and Tobacco by LC-MS/MS	AM-069	-----
Carbonyls in Tobacco by UPLC-MS/MS Cigarette Filler Acetaldehyde, Acetone, Acrolein, Crotonaldehyde, Formaldehyde, Methyl Ethyl Ketone, Propionaldehyde Hookah Acetaldehyde, Acetone, Acrolein, Crotonaldehyde, Formaldehyde, Methyl Ethyl Ketone Smokeless Tobacco Acetaldehyde, Acetone, Crotonaldehyde, Formaldehyde	AM-240	CRM No. 86
CDC Nicotine by GC-FID	AM-072	FR Volume 74, No. 4 CRM No. 62
CDC Oven Volatiles and pH by pH Meter Moisture Content	AM-071	FR Volume 74, No. 4 AOAC 966.02 (Modified)
Coumarin in Tobacco, E-Liquid, and MS Smoke by UHPLC-MS/MS	AM-179	-----
Ethyl Carbamate (Urethane) by GC/MS	AM-174	-----
Eugenol by HPLC	AM-088	HC T-314
Humectants by GC-FID Diethylene Glycol (DEG), Ethylene Glycol (EG), Glycerol, Propylene Glycol, Triethylene Glycol (TEG)	AM-090	HC T-304
Menthol by GC-FID	AM-070	
Mercury in Tobacco Products and E-Liquids by CVAA	AM-095	HC T-306
Metals by ICP/MS Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Nickel, Selenium	AM-052	HC T-306
Methyl Salicylate (Wintergreen) and Ethyl Salicylate by GC/MS	AM-078	-----
N-Nitrosodiethanolamine by GC-TEA	AM-172	-----
N-Nitrososarcosine by GC/MS	AM-120	-----



Test Description	Method	Test Procedure(s)
Nicotine and Minor Alkaloids by GC/MS Anabasine, Anatabine, Myosmine, Nicotine, Nornicotine	AM-100	CRM No. 87
Nicotine and Minor Alkaloids by GC-NPD Anabasine, Anatabine, Myosmine, Nicotine, Nornicotine	AM-206	HC T-301
Nicotine in Salt Media by UPLC-MS/MS	AM-242	-----
Nitrate by CFA	AM-218	HC T-308
Nitrite by CFA	AM-182	-----
pH by pH Meter	AM-053	HC T-310
Polycyclic Aromatic Hydrocarbons in Tobacco and Tobacco Products by GC/MS Benz[j]aceanthrylene/benz[e]aceanthrylene*, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[c]fluorene, Benzo[c]phenanthrene, Benzo[g,h,i]perylene, Benzo[j]fluoranthene, Benzo[k]fluoranthene, Chrysene, Cyclopenta[c,d]pyrene, Dibenzo[a,e]pyrene, Dibenzo[a,h]anthracene, Dibenzo[a,h]pyrene, Dibenzo[a,i]pyrene, Dibenzo[a,l]pyrene, Indeno[1,2,3-c,d]pyrene <i>*these two analytes co-elute and are quantified together as the sum</i>	AM-248	-----
Quinoline by GC/MS	AM-243	-----
Reducing Sugars by CFA Glucose	AM-074	CRM No. 38
Sodium Propionate by GC-FID	AM-089	HC T-312
Sodium Propionate by GC-MS	AM-170	-----
Sorbic Acid by HPLC	AM-098	HC T-313
Tobacco Specific N-Nitrosamines by LC-MS/MS	AM-031	HC T-309 B, CRM No. 72
Total Alkaloids by CFA Nicotine	AM-114	ISO 15152
Total Sugars by CFA Glucose	AM-073	CRM No. 38
Total Sugars (as Reducing Sugars) by CFA Fructose and Glucose (sum)	AM-113	FR Notice No 66, Volume 71
Triacetin by GC/MS	AM-099	HC T-311
Volatile Organics I in MS Smoke and Tobacco Products by GC/MS 1,3-Butadiene, Ethylene Oxide, Isoprene, Propylene Oxide, Vinyl Acetate, Vinyl Chloride	AM-180	-----

<u>Test Description</u>	<u>Method</u>	<u>Test Procedure(s)</u>
Volatile Organics II in MS Smoke and Tobacco Products by GC/MS Acrylonitrile, Benzene, 2,3-Benzofuran, Ethylbenzene, Furan, Naphthalene, Nitrobenzene, Nitromethane, 2-Nitropropane, Styrene, Toluene	AM-193	-----
Water Activity in Smokeless Tobacco and E-Liquid	AM-233	-----

Electronic Cigarettes:

<u>Test Description</u>	<u>Method</u>	<u>Test Procedure(s)</u>
Amides in Electronic Nicotine Delivery Systems (ENDS) and Heated Tobacco Products by GC/MS Acetamide, Acrylamide, and Ethyl Carbamate	AM-245	-----
Ammonia in Aerosol and E-Liquid by HPLC with Non-Suppressed Conductivity Detection	AM-250	-----
Carbonyls in E-Cigarette Aerosol by HPLC-UV Acetaldehyde, Acetoin, Acrolein, Crotonaldehyde, Diacetyl, Formaldehyde, 2,3-Pentanedione	AM-236	-----
Carbonyls in E-Liquid and Aerosol by LC-MS/MS Acetaldehyde, Acetoin, Acrolein, Butyraldehyde (butanal), Crotonaldehyde, Diacetyl, Formaldehyde, Furfural, Heptanedione, Hexanedione, Hydroxyacetone (acetol), Methyl Ethyl Ketone, 2,3-Pentanedione	AM-244	-----
Carbonyls in Heated Tobacco Product Aerosol by LC-MS/MS Acetaldehyde, Acetoin, Acetone, Acrolein, 2,3-Butanedione (diacetyl), Butyraldehyde, Crotonaldehyde, Formaldehyde, Furfural, Hydroxyacetone (acetol), Methyl Ethyl Ketone (2-butanone), 2,3-Pentanedione, Propionaldehyde (propanal)	AM-262	-----
Determination of Electrical Resistance of Cartomizer Heaters	AM-267	-----
E-Vapor Condensate Collection and Characterization in Aerosol and E-Liquid by GC-FID and GC-TCD DEG, EG, Ethanol, Menthol, Nicotine, PG, VG, Water	AM-224	-----
Glycidol in ENDS Aerosol and MS Smoke by GC/MS	AM-274	-----
Mercury in ENDS Aerosol by Cold Vapor Atomic Absorption (CVAA)	AM-251	-----
Mercury in HTP Aerosol by ICP-MS	AM-265	-----
Mercury in Tobacco Products and E-Liquids by CVAA	AM-095	-----

Test Description	Method	Test Procedure(s)
Metals in ENDS and HTP Aerosol by ICP-MS Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Nickel, Selenium, Silver, Tin, and Zinc	AM-249	-----
N-Nitrosodiethanolamine by GC-TEA	AM-172	-----
N-Nitrososarcosine by GC/MS	AM-120	-----
Nicotine Degradants in E-Liquid and E-Cigarette Aerosol by LC/MS Anabasine, Anatabine, Cotinine, Myosmine, Nicotine-N-oxide, β -nicotyrine, Normicotine	AM-238	-----
Nicotine, Menthol, Humectants and Contaminants in E-Cigarette Aerosol and E-Liquid by GC-FID	AM-201	CRM No. 84
NO/NOX by Chemiluminescence Detector	AM-216	-----
Non-Target Analytes in Aerosol and E-Liquid by GC- MS	AM-272	-----
pH in Smoke and E-Cigarette Aerosol	AM-237	-----
pH of E-Liquid	AM-232	-----
Polycyclic Aromatic Hydrocarbons in E-Liquid and Aerosol by GC/MS 5-Methylchrysene, Benz[<i>j</i>]aceanthrylene/benz[<i>e</i>]aceanthrylene*, Benzo[<i>a</i>]anthracene, Benzo[<i>a</i>]pyrene, Benzo[<i>b</i>]fluoranthene, Benzo[<i>c</i>]fluorene, Benzo[<i>c</i>]phenanthrene, Benzo[<i>g,h,i</i>]perylene, Benzo[<i>j</i>]fluoranthene, Benzo[<i>k</i>]fluoranthene, Chrysene, Cyclopenta[<i>c,d</i>]pyrene, Dibenzo[<i>a,h</i>]anthracene, Dibenzo[<i>a,e</i>]pyrene, Dibenzo[<i>a,h</i>]pyrene, Dibenzo[<i>a,i</i>]pyrene, Dibenzo[<i>a,l</i>]pyrene, Indeno[1,2,3- <i>c,d</i>]pyrene, Pyrene	AM-253	-----
Selected Metals in E-Liquid and Trapped Aerosol by ICP/MS Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Nickel, Selenium, Silver, Tin, Zinc	AM-235	-----
Selected Primary Aromatic Amines (PAAs) in E-Cigarette Aerosol and E-Liquid by GC/MS 1-Aminonaphthalene, 2-Aminonaphthalene, 3-Aminobiphenyl, 4-Aminobiphenyl, o-Toluidine	AM-221	-----
Semi-Volatiles in Aerosol and E-Liquid by GC-MS 2-Nitropropane, 2,3-Benzofuran, Ethylbenzene, Naphthalene, Nitrobenzene, Pyridine, Quinoline, and Styrene	AM-257	-----
Tobacco-Specific <i>N</i> -Nitrosamines (TSNAs) in Aerosol and E-Liquid by LC-MS/MS N-Nitrosoanabasine (NAB), N-Nitrosoanatabine (NAT), 4-(N-Nitrosomethylamino)-1-(3-pyridyl)- 1-butanone (NNK), N-Nitrosornicotine (NNN)	AM-220	-----

<u>Test Description</u>	<u>Method</u>	<u>Test Procedure(s)</u>
Triacetin by GC/MS	AM-099	-----
Water in E-Liquid by GC-TCD	AM-222	-----

MECHANICAL

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests on tobacco, tobacco smoke, and electronic cigarettes:

<u>Test Description</u>	<u>Method</u>	<u>Test Procedure(s)</u>
Aerosol Collection	SOP EQU-100	CRM No. 81
Ignition Propensity	AM-050	ASTM E2187-04, ASTM E2187-09, ISO 12863:2010
Physical Properties:	AM-009	-----
Circumference	AM-009	-----
Diameter	AM-009	ISO 2971
Length (Cigar, Cigarette, Tipping, Filter, Column, Vent)	AM-009	-----
Permeability	AM-009	ISO 2965
Pressure Drop	AM-009	ISO 6565
Tobacco Weight	AM-009	-----
Ventilation	AM-009	ISO 9512
Weight of Cigars/Cigarettes per Thousand	AM-186	-----
Smoke Collection	SOP EQU-037	HC T-115, FR11178, FR45483, ISO 20778, ISO 3308, ISO 3402, ISO 4387, CRM No. 64

Key:

CRM = CORESTA Recommended Method

FR = Federal Register

HC = Health Canada

ISO = International Standards Organization



Accredited Laboratory

A2LA has accredited

ENTHALPY ANALYTICAL, INC.

Richmond, VA

for technical competence in the field of

Chemical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 12th day of January 2022.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1873.01
Valid to November 30, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Chemical Scope of Accreditation.