



AIR/EMISSION

Product Catalogue ALS
EUROPE



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150

YEARS IN OPERATION

13k+

STAFF

350+

LOCATIONS

65+

COUNTRIES

As one of the world's largest and most diversified testing services providers, ALS has sites strategically located around the world to provide accurate and timely services. We have operations in more than 350 locations, in 55 countries, and on six continents. We have teams of experts around the world available to provide specialised business solutions that align with client needs. Major hub laboratories are located in Australia, Asia, North America, South America, Europe, the Middle East and Africa.

ALS Life Sciences in Europe employs over 1300 professional laboratory and support personnel represented in 13 countries at 31 locations. The European network consists of modern, analytical, ISO 17025 accredited laboratories and national service centres. Main laboratories are located in the Czech Republic, Sweden, Portugal, United Kingdom & Ireland, Turkey and Denmark. National service centres and smaller laboratories are located in Norway, Finland, Poland, Slovakia, Romania and Spain.

While varying in size and capabilities, the network performs an extensive range of physical, chemical, microbiological, biological, radiological and ecotoxicological analysis to meet the needs of local and regional clients.

Inter-office support and courier arrangements facilitate timely access to the full range of services and on-time delivery of results.

ALS Life Sciences Europe has also a number of centres of excellence dedicated to specialty services and industrial applications. These laboratories utilise the latest high-resolution technology in order to meet very stringent demands from clients worldwide:

ALS operates the best equipped laboratory globally for determination of metals (elements). Examples of analyses include chemical composition, impurities, and stable as well as radiogenic isotopes.

ALS carries out analyses of ultra-trace level organic compounds (dioxins, PCBs, PBDE and other flame retardants) and runs radiochemical testing.

Both laboratories have vast experience from matrices including environmental, food, and pharmaceuticals in addition to clinical, specialized industrial and research applications.



**WATER FRAMEWORK
DIRECTIVE**



ISOTOPE ANALYSIS

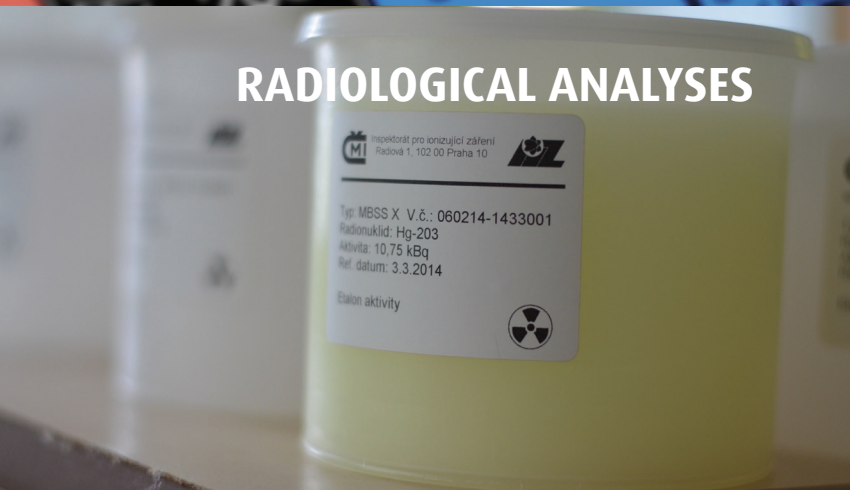
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ELEMENT SPECIATION



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DIOXINS



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PREMIUM ANALYSES



This logo indicates: ✓ Premium Metal Analysis
✓ Premium Radiometric Testing
✓ Premium Ultra-trace Level Organic Analysis

These analyses are performed in custom facilities using state-of-the-art analytical instrumentation by teams with more than 20 years of expertise in the field.

Analytical Services

This catalogue does represent a mere fragment of the full range of parameters, matrices, LOQ and other analytical capabilities, which ALS can provide. Contact your local sales representative to discover more and get the parameters you really need, with the associated quote, logistics services and reporting features.

ALS Quick

Many projects and manufacturing processes require quick information. The most common reason is to take quick decisions.

The reliability of laboratory results and the possibility to use express services for results delivery when needed, is a key factor for choosing a laboratory.

By using the express service **ALS Quick**, the possibility to deliver results for routine parameters in 1 to 3 days from the receipt of samples in the laboratory is a reality for all our clients. For a defined list of parameters, we are able to propose to our clients delivery of results on the the same day as the samples were received in the laboratory. All the data are routinely available just after the quality validation on our on-line portal – Webtrieve.

Samples for **ALS Quick** service and the same-day report of results should be delivered by a specific time to our laboratory. For any information related to the express services, please contact your sales representative.



LOQ

Limits of quantification (LOQ) mentioned in this catalogue are orientative only. They may vary depending on sample composition or may differ based on new technological considerations. Contact your local sales representative for a quote with actual LOQ.

Enjoy our product catalogue and feel free to contact us to let us provide you with the Right solutions!



Overview of pollutants determined in ALS, according to the Regulation 166/2006 of The European Parliament and of the Council – Release to air (annex II)

Parameter
ammonia (NH ₃)
sulphur dioxide (SO _x /SO ₂)
arsenic and compounds (as As)
cadmium and compounds (as Cd)
chromium and compounds (as Cr)
copper and compounds (as Cu)
mercury and compounds (as Hg)
nickel and compounds (as Ni)
lead and compounds (as Pb)
zinc and compounds (as Zn)
1,2-dichlorethane
dichloromethane
hexachlorobenzene (HCB)
PCDD+PCDF (dioxins + furans) (as TEQ)
polychlorinated biphenyls (PCBs)
tetrachlorethylene
tetrachlormethane
trichlorbenzenes (all isomers)
1,1,1-trichlorethane
1,1,2,2-tetrachlorethane
trichloroethylene
trichlormethane
vinyl chloride
anthracene
benzene
naphtalene
polycyclic aromatic hydrocarbons (PAHs)
chlorine and inorganic compounds (as HCl)
asbestos
fluorine inorganic compounds (as HF)
hydrogen cyanide (HCN)
particulate matter (PM10)

**E-PRTR REQUIREMENTS
TO FULFIL?
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AMBIENT AIR

Inorganic parameters

Sulphur dioxide in absorption solution

Parameter	LOQ (mg/sample)	Minimum sample amount
sulphur dioxide (SO ₂) by IC - absorption solution	0.02 mg/sample	plastic, glass, 50 ml

Sulphur dioxide from Radiello* sampling tube

Parameter	LOQ (unit)	Parameter	LOQ (unit)
sulphur dioxide (SO ₂) by IC	349 ng/sample	exposition time	(15 min)
sulphur dioxide (SO ₂) by IC	0.29 µg/m ³	temperature precision	0.1 °C
sulphur dioxide (SO ₂) by IC	0.7 ppbV		

Note: Mentioned LOQs are valid for a 7 days sampling period and a temperature of 25°C.

Nitrogen dioxide from Radiello* tube

Parameter	LOQ (unit)	Parameter	LOQ (unit)
nitrogen dioxide (NO ₂) by IC	1300 ng/sample	exposition time	(15 min)
nitrogen dioxide (NO ₂) by IC	1.71 µg/m ³	temperature precision	0.1 °C
nitrogen dioxide (NO ₂) by IC	0.91 ppbV		

Note: Mentioned LOQs are valid for a 7 days sampling period and a temperature of 25°C.

Inorganic acids

Parameter	LOQ (mg/m ³)
hydrofluoric acid; hydrogen fluoride	0.048
hydrochloric acid; hydrogen chloride	0.061
phosphoric acid; ortho-phosphoric acid; meta-phosphoric acid	0.44
hydrobromic acid; hydrogen bromide	0.03
nitric acid; aqua fortis	0.037
sulfuric acid; oil of vitriol	0.039

Minimum sample amount: cartridge representing one ambient air sampling
Method: NIOSH 7903 (ion chromatography)

Alpha quartz

Parameter	LOQ (µg/filter)
SiO ₂ - respirable quartz	5

Minimum sample amount: filter representing one ambient air sampling
Method: NIOSH 7602 (FTIR)

Asbestos

Parameter
fiber counting in filter samples by polarization microscopy (PLM) with phase contrast
asbestos in air by Scanning electron microscopy (SEM)
asbestos in dust by Scanning electron microscopy (SEM)

For sampling guidance, please contact your local sales representative.

Mercury

Parameter	LOQ (mg/sample)	Minimum sample amount
mercury - quartz filter or external amalgator	0.05	filter or external amalgator representing one ambient air sampling
mercury from atmospherical precipitation	2.5	glass, 50 ml

Method: AAS-AMA

Hexavalent chromium - Cr (VI)

Parameter	LOQ (µg/sample)	Minimum sample amount
chromium (VI) - leach of filter	0.1	filter representing 1 ambient air sampling

Method: ion chromatography

*Radiello is a patented diffusive sampler.

Metals on filters

Parameter	LOQ* (µg/sample)	LOQ** (µg/sample)	Parameter	LOQ* (µg/sample)	LOQ** (µg/sample)
Ag	0.1	-	Mo	0.5	-
Al	1	-	Mn	0.1	0.025
As	0.5	0.05	Ni	0.5	0.25
B	5	-	Na	0.5	-
Ba	0.5	-	Pb	0.5	0.025
Be	0.01	0.01	Sb	0.5	0.025
Ca	5	-	Se	0.5	0.25
Cd	0.05	0.025	Sn	0.5	0.25
Co	0.1	0.025	Te	0.5	0.25
Cr	0.25	0.15	Ti	0.5	-
Cu	0.1	0.05	Tl		0.025
Fe	5	-	U	-	0.01
K	5	-	V	0,5	0.05
Li	0.5	-	Zn	1	0.25
Mg	5	-			

Method: * ICP-OES, **ICP-MS

Analysis by scanning electron microscope (SEM)

Parameter
identification and number of fibers on filter
identification of fibers in dust/material
asbestos in material (semi-quantitative analysis)
number of spores/mould on filter
qualitative and quantitative analysis of particles on filter

RADIOMETRIC ANALYSIS
PLEASE CONTACT US FOR
FURTHER INFORMATION

Volatile Organic Compounds (VOC)

VOC from SKC Charcoal tube and Radiello*

Parameter	LOR (µg/sample)	Parameter	LOR (µg/sample)	Parameter	LOR (µg/sample)
vinyl acetate	0.2	trichloroethene	0.2	bromoform	0.2
2-ethylhexanol	0.2	1.1.2-trichloroethane	0.2	bromodichloromethane	0.2
isobutyl acetate	0.4	1.1.2.2-tetrachloroethane	0.2	1.1-dichloroethane	0.2
2-butanol	0.4	1.2.3-trichlorobenzene	0.2	cis-1.2-dichloroethene	0.2
2-propanol	0.2	dichloromethane	0.2	cyclohexane	0.2
n-butanol	0.3	vinyl chloride	0.2	tetrahydrofurane	0.2
n-butyl acetate	0.4	1.2-dichlorobenzene	0.2	1.4-dioxane	0.2
n-propanol	0.2	1.2.3-trichloropropane	0.2	2-methylhexane	0.2
ethyl acetate	0.4	1.2-dibromo-3-chloropropane	0.2	methylcyclopentane	0.2
tert-butyl acetate	0.2	1.1.1.2-tetrachloroethane	0.2	ethyl tert-butyl ether (ETBE)	0.2
ethanol	2	2-chlorotoluene	0.2	methylcyclohexane	0.2
2-methyl-1-butanol	0.2	1.2-dichloropropane	0.2	methyl tert-butyl ether (MTBE)	0.2
isobutanol	0.2	hexachlorobutadiene	0.2	isooctane	0.2
2-butanone (MEK)	0.4	trichlorofluoromethane	0.2	4-phenylcyclohexene	0.2
acetone	0.2	dichlorodifluoromethane	0.2	n-hexadecane	0.2
hexanal	1.2	chlorobenzene	0.2	aliphates >C10-C12	10
cyclohexanone	0.4	1.2-dichloroethane	0.2	aliphates >C8-C10	10
methyl iso-butyl ketone	0.4	1.2-dibromoethane (EDB)	0.2	aliphates >C6-C8	10
1.2.4.5-tetramethylbenzene	0.2	1.4-dichlorobenzene	0.2	n-nonane	0.2
p-isopropyltoluene	0.2	4-chlorotoluene	0.2	n-octane	0.2
isopropylbenzene	0.2	trans-1.3-dichloropropylene	0.2	n-pentane	1
tert-butylbenzene	0.2	1.2.4-trichlorobenzene	0.2	n-dodecane	0.2
1.2.4-trimethylbenzene	0.2	dibromochloromethane	0.2	n-decane	0.2
3-ethyltoluene	0.2	tetrachloroethene	0.2	n-undecane	0.2
sec-butylbenzene	0.2	1.3-dichloropropane	0.2	n-heptane	0.2
1.2.3-trimethylbenzene	0.2	cis-1.3-dichloropropylene	0.2	n-tetradecane	0.2
1.3.5-trimethylbenzene	0.2	1.1-dichloroethene	0.2	C12 - C13 fraction	2
4-ethyltoluene	0.2	tetrachloromethane	0.2	C11 - C12 fraction	2
n-butylbenzene	0.2	bromobenzene	0.2	C10 - C11 fraction	2
n-propylbenzene	0.2	1.3.5-trichlorobenzene	0.2	C9 - C10 fraction	2
2-ethyltoluene	0.2	trans-1.2-dichloroethene	0.2	C8 - C9 fraction	2
styrene	0.2	1.3-dichlorobenzene	0.2	C7 - C8 fraction	2
aromatics >C8-C10	10	1.1-dichloropropylene	0.2	C6 - C7 fraction	2
benzene	0.1	2.2-dichloropropane	0.2	n-tridecane	0.2
toluene	0.1	chloroform	0.2	n-hexane	0.4
ethylbenzene	0.1	1.1.1-trichloroethane	0.2	naphthalene	2
meta- & para-xylenes	0.1	bromomethane	0.2	3-carene	0.2
ortho-xylene	0.1	chloromethane	0.2	limonene	0.4
sum of BTEX	0.5	dibromomethane	0.2	alpha-pinene	0.2
sum of TEX	0.4	bromochloromethane	0.2	beta-pinene	0.2
sum of Xylenes	0.2	chloroethane	0.2	alpha-terpinene	0.2

Method: GC-MS
Note: LOQ are valid for SKC 226-01 tube or Radiello RAD130.

*Radiello is a patented diffusive sampler.

**NEED FOR SAMPLING CARTRIDGES?
 LOOK AT PAGE 24 OR CONTACT US!**



Formaldehyde

Parameter	LOR (µg/sample)
formaldehyde	5

Method: photometry
Minimum sample amount: absorption solution representing one ambient air sampling

Semivolatile Organic Compounds, POPs

Polycyclic aromatic hydrocarbons (PAH) by HPLC

Parameter	LOQ (ng/sample)	Parameter	LOQ (ng/sample)
benzo(a)pyrene	70	benzo(k)fluorantene	70
benzo(a)anthracene	70	indeno(1,2,3-cd)pyrene	70
benzo(b)fluorantene	70	dibenzo(a,h)anthracene	70

Minimum sample amount: components (sorbent PUF, filter) representing one ambient air sampling
Method: HPLC/UV-FLD

Polycyclic aromatic hydrocarbons (PAH) by GC-HRMS

Parameter	LOQ (ng/sample)	Parameter	LOQ (ng/sample)
benzo(a)pyrene	10	benzo(k)fluorantene	20
benzo(a)anthracene	20	indeno(1,2,3-cd)pyrene	20
benzo(b)fluorantene	20	dibenzo(a,h)anthracene	20
benzo(j)fluorantene	20		

Minimum sample amount: components (sorbent PUF, filter) representing one ambient air sampling
Method: HRGC-HRMS
Note: With a 100 m³ air sampling, LOQ for benzo(a)pyrene is 0.1 ng/m³ and 0.2 ng/m³ for the other compounds.

Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F)

Parameter				
2,3,7,8-PCDD/F congeners			Other congeners	
2,3,7,8-TCDD	OCDD	1,2,3,7,8,9-HxCDF	tetra-CDD	hexa-CDF
1,2,3,7,8-PeCDD	2,3,7,8-TCDF	2,3,4,6,7,8-HxCDF	penta-CDD	hepta-CDF
1,2,3,4,7,8-HxCDD	1,2,3,7,8-PeCDF	1,2,3,4,6,7,8-HpCDF	hexa-CDD	
1,2,3,6,7,8-HxCDD	2,3,4,7,8-PeCDF	1,2,3,4,7,8,9-HpCDF	hepta-CDD	
1,2,3,7,8,9-HxCDD	1,2,3,4,7,8-HxCDF	OCDF	tetra-CDF	
1,2,3,4,6,7,8-HpCDD	1,2,3,6,7,8-HxCDF	I-TEQ	penta-CDF	

Minimum sample amount: components (sorbent PUF, filter) representing one ambient air sampling, minimum 100 m³, optimum 325 m³ (recommended by EPA TO-9A)
 US EPA TO-9A (HRGC-HRMS)

Method:

Note:

- LOQ for I-TEQ is 0,2 pg 2,3,7,8-TCDD/m³ (sampling of 100 m³), results can be expressed in toxicity equivalent according to WHO
- Calculation parameter TEQ is mentioned at the levels of „lowerbound“ and „upperbound“.

STACK MONITORING, SOURCE TESTING, EMISSION OF AIR POLLUTANTS

 **Polychlorinated biphenyls (PCB) – Coplanar PCB (dioxin-like PCB) and indicator PCB**

Parameter	Parameter	Parameter
NON-ORTHO PCB		MONO-ORTHO PCB
PCB 77	PCB 105	PCB 156
PCB 81	PCB 114	PCB 157
PCB 126	PCB 118	PCB 167
PCB 169	PCB 123	PCB 189
DI-ORTHO PCB		INDICATOR PCB
PCB 170	PCB 28	PCB 138
PCB 180	PCB 52	PCB 153
	PCB 101	PCB 180
	PCB 118	

Minimum sample amount: components (sorbent PUF, filter) representing one ambient air sampling, minimum 100 m³, optimum 325 m³
EN 1948-4 (HRGC-HRMS)

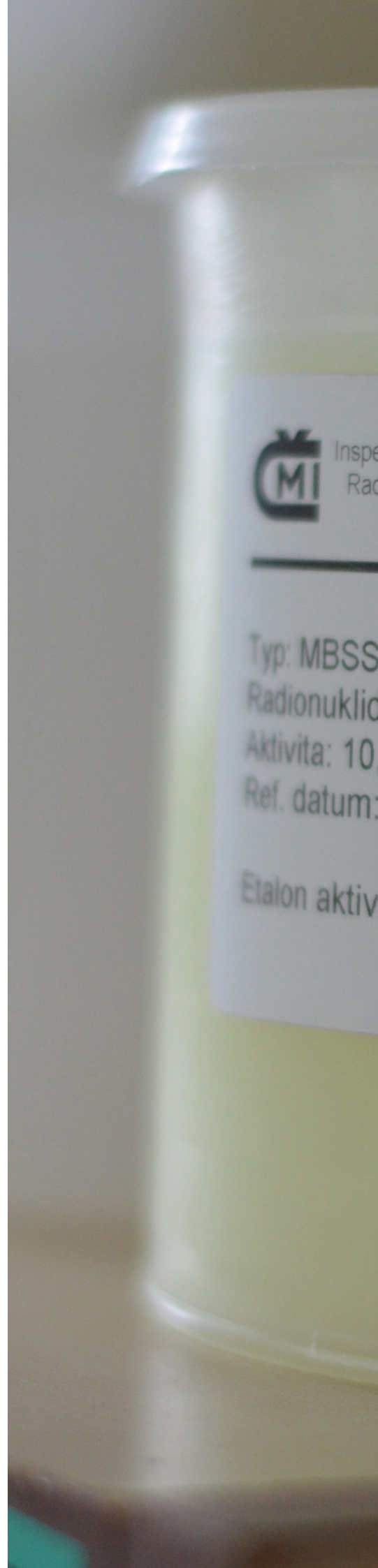
Method:

Note:

- LOQ for coplanar PCB expressed by WHO-TEQ is 0,07 pg 2,3,7,8-TCDD/m³, for the sum of PCB – 7 congeners, the LOQ is 0,34 ng/m³ (sampling of 100 m³)
- Calculation parameter TEQ is mentioned at the levels of „lowerbound“ and „upperbound“

**AMBIENT AIR,
INDUSTRIAL HYGIENE,
AIRBORNE POLLUTANTS,
EMMISSIONS**

**PCDD/F, COPLANAR
PCB, INDICATOR PCB,
COPLANAR PCBS AND
PAH CAN BE DETERMINED
TOGETHER. PLEASE
CONTACT YOUR LOCAL
SALES REPRESENTATIVE FOR
FURTHER INFORMATION**



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EMISSIONS

Inorganic parameters

Parameter	LOQ (mg/sample)	Minimum sample amount
SO ₂	0.02	plastic, 50 ml
NH ₃	0.1	plastic, 50 ml
H ₂ S	0.01	plastic, 50 ml
Cl ⁻ , HCl	0.01	plastic, 50 ml
F ⁻ , HF (ion chromatography)	0.01	plastic, 50 ml
F ⁻ , HF (ion selective electrode)	0.1	plastic, 50 ml
formaldehyde	0.005	glass, 100 ml
phenol index	0.001	plastic, 50 ml
cyanides, HCN	0.001	plastic, 50 ml
H ⁺	0.0005	plastic, 50 ml

Minimum sample amount: absorption solution representing 1 emission sampling

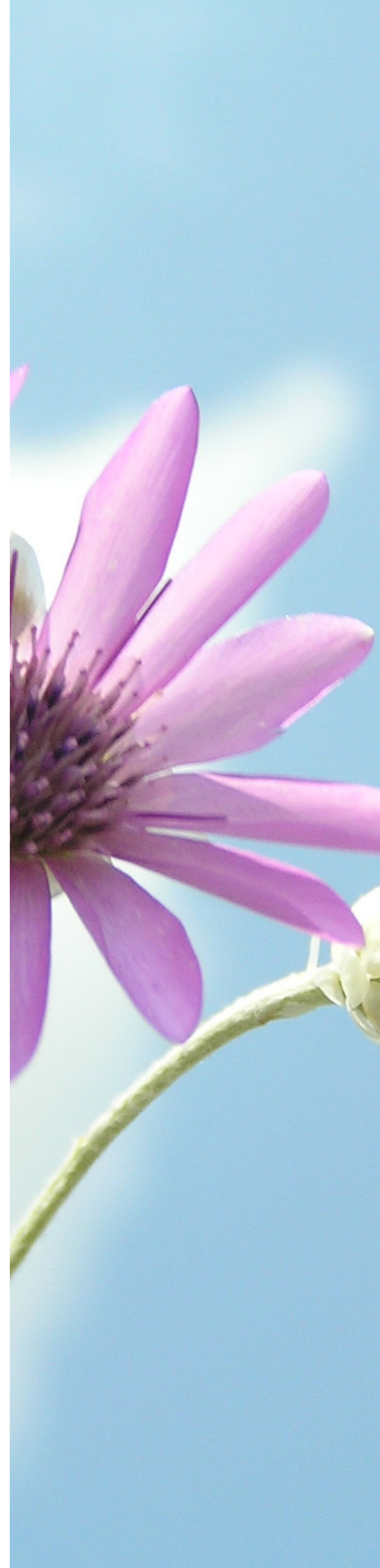
Metals

Parameter	LOQ* (µg/sample)	LOQ** (µg/sample)	Parameter	LOQ* (µg/sample)	LOQ** (µg/sample)
COMMONLY REQUESTED METALS					
Cd	0.05	0.025	Co	0.1	0.025
Tl	-	0.025	Cu	0.1	0.05
Sb	0.5	0.025	Mn	0.1	0.025
As	0.5	0.05	Ni	0.5	0.25
Pb	0.5	0.025	V	0.5	0.05
Cr	0.25	0.15			
ADDITIONAL METALS					
Ag	0.1	-	Mg	5	-
Al	1	-	Mo	0.5	-
B	5	-	Na	20	-
Ba	0.5	-	Se	0.5	0.25
Be	0.01	0.01	Sn	0.5	0.25
Ca	5	-	Te	0.5	0.25
Fe	5	0.15	Ti	0.5	-
K	5	-	U	-	0.01
Li	0.5	-	Zn	1	0.25

Minimum sample amount: glass, 50 ml of absorption solution representing one emission sampling or 1 filter representing one emission sampling

Method: *ICP-OES, **ICP-MS

**LOWER LIMITS REQUIRED
FOR METALS?
CONTACT US!**





Mercury

Parameter	LOQ (µg/sample)	Minimum sample amount
mercury in absorption solution and condensate	0.001	glass, 50 ml of absorption solution, condensate representing 1 emission sampling
mercury in solid sorbent or filter	0.001	filter representing 1 emission sampling

Method: atomic fluorescence spectrometry (AFS)

Hexavalent chromium Cr(VI)

Parameter	LOQ (µg/sample)	Minimum sample amount
chromium (VI) in absorption solution (NaOH) and condensate	0.1	glass, 50 ml of absorption solution, condensate representing 1 emission sampling
chromium (VI) in filter leachate	0.1	filter representing 1 emission sampling

Method: ion chromatography

Volatile Organic Compounds (VOC)

VOC from SKC Charcoal tube and Radiello

Parameter	LOR (µg/sample)	Parameter	LOR (µg/sample)
vinyl acetate	0.2	1,2,4-trichlorobenzene	0.2
2-ethylhexanol	0.2	dibromochloromethane	0.2
isobutyl acetate	0.4	tetrachloroethene	0.2
2-butanol	0.4	1,3-dichloropropane	0.2
2-propanol	0.2	cis-1,3-dichloropropylene	0.2
n-butanol	0.3	1,1-dichloroethene	0.2
n-butyl acetate	0.4	tetrachloromethane	0.2
n-propanol	0.2	bromobenzene	0.2
ethyl acetate	0.4	1,3,5-trichlorobenzene	0.2
tert-butyl acetate	0.2	trans-1,2-dichloroethene	0.2
ethanol	2	1,3-dichlorobenzene	0.2
2-methyl-1-butanol	0.2	1,1-dichloropropylene	0.2
isobutanol	0.2	2,2-dichloropropane	0.2
2-butanone (MEK)	0.4	chloroform	0.2
acetone	0.2	1,1,1-trichloroethane	0.2
hexanal	1.2	bromomethane	0.2
cyclohexanone	0.4	chloromethane	0.2
methyl iso-butyl ketone	0.4	dibromomethane	0.2
1,2,4,5-tetramethylbenzene	0.2	bromochloromethane	0.2
p-isopropyltoluene	0.2	chloroethane	0.2
isopropylbenzene	0.2	dimethyl sulfide	0.1
tert-butylbenzene	0.2	bromoform	0.2
1,2,4-trimethylbenzene	0.2	bromodichloromethane	0.2
3-ethyltoluene	0.2	1,1-dichloroethane	0.2
sec-butylbenzene	0.2	cis-1,2-dichloroethene	0.2
1,2,3-trimethylbenzene	0.2	cyclohexane	0.2
1,3,5-trimethylbenzene	0.2	tetrahydrofuran	0.2
4-ethyltoluene	0.2	1,4-dioxane	0.2
n-butylbenzene	0.2	2-methylhexane	0.2
n-propylbenzene	0.2	methylcyclopentane	0.2
2-ethyltoluene	0.2	ethyl tert-butyl ether (ETBE)	0.2
styrene	0.2	methylcyclohexane	0.2

Parameter	LOR (µg/sample)	Parameter	LOR (µg/sample)
aromatics >C8-C10	10	methyl tert-butyl ether (MTBE)	0.2
benzene	0.1	isooctane	0.2
toluene	0.1	4-phenylcyclohexene	0.2
ethylbenzene	0.1	n-hexadecane	0.2
meta- & para-xylenes	0.1	aliphates >C10-C12	10
ortho-xylene	0.1	aliphates >C8-C10	10
sum of BTEX	0.5	aliphates >C6-C8	10
sum of TEX	0.4	n-nonane	0.2
sum of Xylenes	0.2	n-octane	0.2
methanthiol	0.5	n-pentane	1
trichloroethene	0.2	n-dodecane	0.2
1.1.2-trichloroethane	0.2	n-decane	0.2
1.1.2.2-tetrachloroethane	0.2	n-undecane	0.2
1.2.3-trichlorobenzene	0.2	n-heptane	0.2
dichloromethane	0.2	n-tetradecane	0.2
vinyl chloride	0.2	C12 - C13 fraction	2
1.2-dichlorobenzene	0.2	C11 - C12 fraction	2
1.2.3-trichloropropane	0.2	C10 - C11 fraction	2
1.2-dibromo-3-chloropropane	0.2	C9 - C10 fraction	2
1.1.1.2-tetrachloroethane	0.2	C8 - C9 fraction	2
2-chlorotoluene	0.2	C7 - C8 fraction	2
1.2-dichloropropane	0.2	C6 - C7 fraction	2
hexachlorobutadiene	0.2	n-tridecane	0.2
trichlorofluoromethane	0.2	n-hexane	0.4
dichlorodifluoromethane	0.2	naphthalene	2
chlorobenzene	0.2	3-carene	0.2
1.2-dichloroethane	0.2	limonene	0.4
1.2-dibromoethane (EDB)	0.2	alpha-pinene	0.2
1.4-dichlorobenzene	0.2	beta-pinene	0.2
4-chlorotoluene	0.2	alpha-terpinene	0.2
trans-1.3-dichloropropylene	0.2		

Method:
Note:

GC-MS
LOQ are valid for SKC 226-01 tube or Radiello RAD130.

DIOXIN TESTING

www.dioxin-laboratory.com

VOC from multibed tube – Thermal desorption

Parameter	LOR (ng/sample)	Parameter	LOR (ng/sample)
1.1.1-trichloroethane	2	dichloromethane	10
1.1.2.2-tetrachloroethane	2	ethanol	10
1.1.2-trichloro-1.2.2-trifluoroethane	2	ethylbenzene	4
1.1.2-trichloroethane	2	hexachlorobutadiene	4
1.1-dichloroethane	4	chlorobenzene	4
1.1-dichloroethene	4	chloroethane	2
1.2.3-trichlorobenzene	4	chloroform	2
1.2.4-trichlorobenzene	4	chloromethane	15
1.2.4-trimethylbenzene	4	isooctane	4
1.2-dichloro-1.1.2.2-tetrafluoroethane	2	ethanol	10
1.2-dichlorobenzene	4	ethylbenzene	4
1.2-dichloroethane	2	isopropylbenzene	4
1.2-dichloropropane	2	meta- & para-xylene	4
1.3.5-trichlorobenzene	4	methyl iso-butyl ketone	10
1.3.5-trimethylbenzene	4	methylcyclohexane	2
1.3-butadiene	2	n-heptane	2
1.3-dichlorobenzene	4	n-hexane	10
1.4-dichlorobenzene	4	n-propylbenzene	4
1.4-dioxane	4	ortho-xylene	4
2-butanone (MEK)	4	styrene	4
2-hexanone (MBK)	4	tetrahydrofuran	2
2-propanol	10	tetrachloroethene	4
4-ethyltoluene	4	tetrachloromethane	2
acetone	20	toluene	4
benzene	4	trans-1.2-dichloroethene	4
bromomethane	2	trichloroethene	4
carbon disulfide (CS ₂)	4	trichlorofluoromethane	4
cis-1.2-dichloroethene	4	vinyl chloride	2
cyclohexane	2		

Minimum sample amount:

1 tube for blank analysis, 2 tubes for one real sample analysis

Method:

US EPA TO-14, EN ISO 16017

Note:

A specific kit for sampling is available at ALS. Look at page 25 for more information.

Screening of VOC

Parameter
Volatile Organic Compounds screening - Most intense signals are reported

Persistent Organic Pollutants (POPs)

Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F)

Parameter				
2,3,7,8-PCDD/F congeners			Other congeners	
2,3,7,8-TCDD	OCDD	1,2,3,7,8,9-HxCDF	tetra-CDD	hexa-CDF
1,2,3,7,8-PeCDD	2,3,7,8-TCDF	2,3,4,6,7,8-HxCDF	penta-CDD	hepta-CDF
1,2,3,4,7,8-HxCDD	1,2,3,7,8-PeCDF	1,2,3,4,6,7,8-HpCDF	hexa-CDD	
1,2,3,6,7,8-HxCDD	2,3,4,7,8-PeCDF	1,2,3,4,7,8,9-HpCDF	hepta-CDD	
1,2,3,7,8,9-HxCDD	1,2,3,4,7,8-HxCDF	OCDF	tetra-CDF	
1,2,3,4,6,7,8-HpCDD	1,2,3,6,7,8-HxCDF	I-TEQ	penta-CDF	

Minimum sample amount: components (sorberent PUF/XAD, filter, condensate, rinsate, wipes) representing one emission sampling, minimum 4 m³, optimum 10 m³
EN 1948-2,3 (HRGC-HRMS), US EPA 23 (HRGC-HRMS)

Method:

Note:

- LOQ for I-TEQ is 2 pg 2,3,7,8-TCDD/m³ (sampling of 10 m³), results can be expressed in toxicity equivalent according to WHO
- Calculation parameter TEQ is mentioned at the levels of „lowerbound“ and „upperbound“

Polychlorinated biphenyls (PCB) – Coplanar PCB (dioxin-like PCB) and indicator PCB

Parameter	Parameter	Parameter
NON-ORTHO PCB		MONO-ORTHO PCB
PCB 77	PCB 105	PCB 156
PCB 81	PCB 114	PCB 157
PCB 126	PCB 118	PCB 167
PCB 169	PCB 123	PCB 189
DI-ORTHO PCB		INDICATOR PCB
PCB 170	PCB 28	PCB 138
PCB 180	PCB 52	PCB 153
WHO-TEQ	PCB 101	PCB 180
	PCB 118	sum of PCB – 7 congeners

Minimum sample amount: components (sorberent PUF/XAD, filter, condensate, rinsate, wipes) representing one emission sampling, minimum 4 m³, optimum 10 m³
EN 1948-4 (HRGC-HRMS)

Method:

Note:

- LOQ for coplanar PCB expressed by WHO-TEQ is 0.07 pg 2,3,7,8-TCDD/m³, for the sum of PCB – 7 congeners, the LOQ is 0.34 ng/m³ (sampling of 100 m³)
- Calculation parameter TEQ is mentioned at the levels of „lowerbound“ and „upperbound“

Polycyclic aromatic hydrocarbons (PAH) by HPLC

Parameter	Parameter	Parameter
benzo(b)fluorantene*	benzo(a)pyrene*	Sum of 4* PAH
indeno(1,2,3-cd)pyrene*	benzo(k)fluorantene*	
OTHER PAH		
pyrene	acenaphtylene	fluorene
benzo(a)anthracene	acenaphtene	phenantrene
chrysene	dibenzo(a,h)anthracene	anthracene
naphtalene	benzo(g,h,i)perylene	fluorantene

Minimum sample amount: components (sorberent PUF/XAD, filter) representing one emission sampling, minimum 4 m³, optimum 20 m³

Method:

Note:

HPLC/UV-FLD
LOQ for sum of 4* PAH is (sampling of 20 m³) 14 ng/m³





 Polycyclic aromatic hydrocarbons (PAH) by GC/HRMS

Parameter	Parameter	Parameter
benzo(b)fluorantene*	benzo(a)pyrene*	Sum of 4* PAH
indeno(1,2,3-cd)pyrene*	benzo(k)fluorantene*	
OTHER PAH		
pyrene	acenaphtylene	fluorene
benzo(a)anthracene	acenaphtene	phenantrene
chrysene	dibenzo(a,h)anthracene	anthracene
naphthalene	benzo(g,h,i)perylene	fluorantene

Minimum sample amount: components (sorbent PUF/XAD, filter, condensate, rinsate, wipes) representing one emission sampling, minimum 4 m³, optimum 10 m³ US EPA 429, ISO 11338 (HRGC-HRMS)

Method:

Note:

- LOQ for the sum of 4* PAH is sampling of 10 m³ 60 ng/m³
- Calculation parameter TEQ is mentioned at the levels of „lowerbound“ and „upperbound“

**SORPTION COMPONENTS
AVAILABLE! SEE PAGE 24
OR CONTACT US**

**PERSISTENT ORGANIC
POLLUTANTS**

www.dioxin-laboratory.com

Incinerator Residue Monitoring parameters

Parameter	LOQ (µg/sample)	Minimum sample amount
dry matter	0.1 %	plastic, 10 g
TOC (total organic carbon)	100 mg/kg dw	glass, 50 g
TC (total carbon)	100 mg/kg dw	glass, 50 g
total soluble fraction	0.5 %	plastic, 50 g
chloride	40 mg/kg dw	plastic, 20 g
fluorine, total	300 mg/kg DW	plastic, 50 g
sulfate	0.1 % DW	plastic, 50 g
sulfur (total)	0.1 % DW	plastic, 50 g
heavy metals	See separate tables	
PCDD/F	See separate table	
coplanar PCBs	See separate table	
polycyclic aromatic hydrocarbons (PAH)	See separate table	

Waste classification criteria for ash landfill

Waste acceptance criteria (WAC) - non-hazardous waste (water leaching)

Parameter	Limit value (mg/l)			ALS LOQ (mg/l)
	Single step (L/S=10)	Two stage* (L/S=2, L/S=8)	Percolation test (usually L/S=0.1)	
As	0.2	0.2	0.3	0.05
Ba	10	15	20	0.003
Cd	0.1	0.3	0.3	0.005
Cr total	1	2	2.5	0.001
Cu	5	12.5	30	0.01
Hg	0.02	0.025	0.03	0.001
Mo	1	2.5	3.5	0.02
Ni	1	2.5	3	0.02
Pb	1	2.5	3	0.05
Sb	0.07	0.1	0.15	0.05
Se	0.05	0.15	0.2	0.025
Zn	5	12.5	15	0.01
chloride	1500	5000	8500	1
fluoride	15	30	40	0.2
sulphate	2000	5000	7000	5
DOC	80	190	250	0.5
TDS	6000	20000	-	10
pH	>6	>6	-	1

* Value mentioned for L/S=2 L/kg.

Minimum sample amount: 0.5 kg dry waste

Waste acceptance criteria (WAC) - non-hazardous waste (dry matter)

Parameter	LOQ	Sample amount	Limit value
TOC* (coulometry)	0.01% DW	glass, 50 g	5%
ANC** (potentiometric titration)	0.05 mmol/l	plastic, 200 ml	-

* Total dissolved carbon

** Acid neutralization capacity at pH 4.5



Waste acceptance criteria (WAC) - hazardous waste (water leaching)

Parameter	Limit value (mg/l)			ALS LOQ (mg/l)
	Single step (L/S=10)	Two stage* (L/S=2, L/S=8)	Percolation test (usually L/S=0.1)	
As	2.5	3	3	0.05
Ba	30	50	60	0.003
Cd	0.5	1.5	1.7	0.005
Cr total	7	12.5	15	0.001
Cu	10	25	60	0.01
Hg	0.2	0.25	0.3	0.001
Mo	3	10	10	0.02
Ni	4	10	12	0.02
Pb	5	12.5	15	0.05
Sb	0.5	1	1	0.05
Se	0.7	2	3	0.025
Zn	20	45	60	0.01
chloride	2500	8500	15000	1
fluoride	50	100	120	0.2
sulphate	5000	12500	17000	5
DOC	100	240	320	0.5
TDS	10000	35000	-	10

* Value mentioned for L/S=2 L/kg.

Minimum sample amount: 0.5 kg dry waste

Waste acceptance criteria (WAC) - hazardous waste (dry matter)

Parameter	LOQ (unit)	Sample amount	Limit value
TOC	0.01 % DW	glass, 50 g	6 %
loss on ignition	0.1 % DW	glass, 50 g	10 %

FLY ASH, BOTTOM ASH AND SLAG MATERIALS

ASK YOUR ALS REPRESENTATIVE FOR A QUOTE SPECIFICALLY FOR YOUR NEEDS

Metals

Mercury

Parameter	LOQ (mg/kg DW)	Sample amount
mercury total digestion	0.01	plastic, 50 g
mercury - low limit total digestion	0.001	plastic, 50 g

Minimum sample amount: plastic, 50 g
Method: atomic fluorescence spectrometry

Metals (group 1)

Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)
Sb	0.5	Fe	10	Ag	0.5
As	0.5	Pb	1	Sr	0.1
Ba	0.2	Li	1	Tl	0.5
Be	0.01	Mn	0.5	Sn	1
Cd	0.4	Hg	0.2	V	0.1
Cr	0.5	Mo	0.4	Zn	3
Co	0.2	Ni	1		
Cu	1	P	5		

Minimum sample amount: plastic, 50 g
Method: ICP-OES

Metals (group 2)

Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)
Al	1	K	5	Te	1
Bi	1	Se	2	Ti	0.2
B	1	Si	50	Zr	5
Ca	50	Na	15		
Mg	5	S	30		

Minimum sample amount: plastic, 50 g
Method: ICP-OES

PCDD/F, COPLANAR PCB, INDICATOR PCB, COPLANAR PCBS AND PAH CAN BE DETERMINED TOGETHER. PLEASE CONTACT YOUR LOCAL SALES REPRESENTATIVE FOR FURTHER INFORMATION



Persistent Organic Pollutants (POPs)

Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F)

Parameter				
2,3,7,8-PCDD/F congeners			Other congeners	
2,3,7,8-TCDD	OCDD	1,2,3,7,8,9-HxCDF	tetra-CDD	hexa-CDF
1,2,3,7,8-PeCDD	2,3,7,8-TCDF	2,3,4,6,7,8-HxCDF	penta-CDD	hepta-CDF
1,2,3,4,7,8-HxCDD	1,2,3,7,8-PeCDF	1,2,3,4,6,7,8-HpCDF	hexa-CDD	
1,2,3,6,7,8-HxCDD	2,3,4,7,8-PeCDF	1,2,3,4,7,8,9-HpCDF	hepta-CDD	
1,2,3,7,8,9-HxCDD	1,2,3,4,7,8-HxCDF	OCDF	tetra-CDF	
1,2,3,4,6,7,8-HpCDD	1,2,3,6,7,8-HxCDF	I-TEQ	penta-CDF	

Minimum sample amount: glass, 10 g dry sample
Method: EN 1948-2,3 (HRGC-HRMS), US EPA 1613 (HRGC-HRMS)

Note:

- LOQ for I-TEQ is 10 pg 2,3,7,8-TCDD/kg dry matter, results can be expressed in toxicity equivalent according to WHO
- Calculation parameter TEQ is mentioned at the levels of „lowerbound“ and „upperbound“

Polychlorinated biphenyls (PCB) – Coplanar PCB (dioxin-like PCB) and indicator PCB

Parameter	Parameter	Parameter
NON-ORTHO PCB		MONO-ORTHO PCB
PCB 77	PCB 105	PCB 156
PCB 81	PCB 114	PCB 157
PCB 126	PCB 118	PCB 167
PCB 169	PCB 123	PCB 189
DI-ORTHO PCB		INDICATOR PCB
PCB 170	PCB 28	PCB 138
PCB 180	PCB 52	PCB 153
WHO-TEQ	PCB 101	PCB 180
	PCB 118	sum of PCB – 7 congeners

Minimum sample amount: glass, 10 g dry sample
Method: US EPA 1668 (HRGC-HRMS)

Note:

- LOQ for coplanar PCB expressed by WHO-TEQ is 0.008 ng 2,3,7,8-TCDD/g dry matter, for the sum of PCB – 7 congeners, the LOQ is 38 ng/g dry matter.
- Calculation parameter TEQ is mentioned at the levels of „lowerbound“ and „upperbound“

Polycyclic aromatic hydrocarbons (PAH)

Parameter	Parameter	Parameter
naphtalene*	fluorantene*	benzo(a)pyrene*
acenaphtylene	pyrene*	dibenzo(a,h)anthracene
acenaphtene*	benzo(a)anthracene*	benzo(g,h,i)perylene*
fluorene	chrysene*	indeno(1,2,3-cd)pyrene*
phenantren*	benzo(b)fluorantene*	Sum of 12* PAH
anthracene	benzo(k)fluorantene*	

Minimum sample amount: glass, 20 g dry sample
Method: US EPA 429 (HRGC-HRMS)

Note:

- LOQ for sum of 12* PAH is 1400 ng/g dry matter.
- Calculation parameter TEQ is mentioned at the levels of „lowerbound“ and „upperbound“

Screening of SVOC

Parameter
Semi-volatile Organic Compounds screening - Most intense signals are reported

TECHNICAL SUPPORT

FOR AIR SAMPLING

Preparation of sorption modules and sorbents

Parameter	Use
2 chambers glass cartridge with XAD-2	PAH, PCDD/F, PCBs in emission
Glass cartridge with PUF	PAH, PCDD/F, PCBs in emission
Glass cartridge with PUF	PAH, PCDD/F, PCBs in air samples
TECORA glass cartridge with PUF	PAH, PCDD/F, PCBs in emission
TECORA glass cartridge with XAD-2	PAH, PCDD/F, PCBs in emission
Glass cartridge with XAD-2	PAH, PCDD/F, PCBs in emission
Multitubed tube for air sampling	VOC sampling
Tube Tenax TA for air sampling	VOC sampling

Ready to use cartridges

Parameter	Use
Glass cartridge with PUF	SVOC sampling
Tube SKC 226-30-04 with XAD-2	PAH for air sampling
Tube SKC 226-01	VOC for air sampling
Tube SKC 226-09	VOC, Dimethyl sulfid for air sampling
Cartridge filter	Methanethiol in work environment

Preparation of sorption modules and sorbents

Parameter	Use
Cartridge Adsorbent Radiello (RAD166)	NO ₂ , SO ₂ sampling
Blue Diffusive Body Radiello (RAD1201)	NO ₂ , SO ₂ sampling
Cartridge Adsorbent Radiello (RAD130)	VOC sampling
White Diffusive Body Radiello (RAD120)	VOC sampling
Outdoor Shelter Radiello (RAD196)	Supporting material
Triangular Support Plate Radiello (RAD121)	Supporting material

Preparation of absorption solutions

Parameter	Use
Ag ₂ SO ₄ in 5% KHSO ₄	H ₂ S sampling
demineralized water - ultrapure water UPW	cleaning
H ₂ O ₂ (not stabilized)	SOx sampling
H ₂ SO ₄	NH ₃ sampling
HNO ₃ + H ₂ O ₂	metals sampling
4% K ₂ Cr ₂ O ₇ + 20% HNO ₃	mercury (Hg) sampling
NaOH	hexavalent chromium(CR(VI)) sampling
NaOH	HF, HCN sampling
chromic acid	cleaning of absorption solution containers
Na ₂ CO ₃	phenols sampling
methoxyethanol	PCDD/F, PCB, PAH sampling



Preparation of filters

Parameter	Use
filter (PVC/acryl pocolymer, 47 mm, 3 µm- PALL)	Cr(VI) sampling
PTFE filter (250x200 mm)	High volume sampling system
PTFE filter (47 mm)	Low volume sampling system

Radiello* sampling kit

Parameter	Use
diffusive body Radiello (RAD120) – white	VOC sampling
diffusive body Radiello (RAD120-1) – blue - NO ₂ , SO ₂	NO ₂ , SO ₂ sampling
triangular supporting plate Radiello (RAD121)	close and support diffusive body
adsorbing cartridge Radiello (RAD130)	VOC sampling
adsorbing cartridge Radiello (RAD166)	NO ₂ , SO ₂ sampling
Outdoor shelter Radiello (RAD196)	protection against weather conditions

*Radiello is a patented diffusive sampler.

ON-LINE ORDERING SYSTEM FOR POPs SAMPLING MODULES

<http://sampling.alsglobal.eu>

T0-15

ALS laboratories are proud to offer a range of sampling options for gas sampling using Silonite® coated canisters based on USEPA T0-15 is accredited in accordance with ISO 17025.

The versatility of Silonite® coated canisters allows a broad range of sampling options, including: soil gas, sub-slab monitoring and ambient air monitoring with Time Weighted Averages (TWA's). Silonite® coated canisters offer significant advantages when compared to traditional sampling media including:

- Simplicity of use on site.
- No sampling pumps are required and no need to record time of sampling.
- A whole gas sample is captured, meaning there is no need to choose the correct sample media before going to site.
- Multiple and repeat analyses can be undertaken from a single canister sample as only a portion is used at a time in the laboratory.
- Canisters have a fused silica lining called Silonite®, which provides an extremely inert receiving vessel to collect gas samples.
- The Silonite® coating aids sampling of more reactive compounds which are difficult to capture on other media.
- Holding times for canister samples are 28 days – far in excess of other whole gas methods.

Analyses available includes:

- **VOCs Trace** gases target list (based on USEPA T0-15) with or without Tentatively Identified Compounds (TICs)
- **TPH Aliphatic split** (>C4-C6, >C6-C8, >C8-C10,>C10-C12) and Aromatic split (>C6-C8, >C8-C10, >C10-C12)
- **Bulk Gas Screen** (Hydrogen, Oxygen, Nitrogen, Carbon monoxide, Methane, & Carbon dioxide)
- **Helium** available as confirmation of sample integrity when helium has been used on site as a tracer. Helium is available as additional analysis when ordering TPH and/or VOC





AUSTRIA

Wien

Ledererhof 2/4
1010 Wien (Vienna)
T: +43 (0)676 754 5509
E: info.at@alsglobal.com

CZECH REPUBLIC

Prague

Na Harfě 336/9
190 00 Prague 9
T: +420 226 226 228
E: customer.support@alsglobal.com

Česká Lípa

Bendlova 1687/7
470 01 Česká Lípa
T: +420 226 226 228
E: support.ceskalipa@alsglobal.com

Pardubice

V Ráji 906
530 02 Pardubice
T: +420 226 226 228
E: support.pardubice@alsglobal.com

DENMARK

Humblebæk

Bakkegårdsvej 406 A
3050 Humlebæk
T: +45 49 25 07 70
E: info.hmb@alsglobal.com

FINLAND

Helsinki

Ruosilankuja 3 E
FIN-00390 Helsinki
T: +358 10 470 1200
E: info.hel@alsglobal.com

ITALY

Zoppola

Via Viatta 1,
33080 Zoppola (PN)
T: +043463820
E: info@leochimica.it

NORWAY

Oslo

Postboks 643 Skøyen
Drammensvein 173, 0277 Oslo
T: +47 22 13 18 00
E: info.on@alsglobal.com

Sarpsborg

Yvenveien 17
1715 Yven
T: +47 22 13 18 00
E: info.on@alsglobal.com

POLAND

Cieszyn

Ul.Katowicka 157
43-400 Cieszyn
T: +48 33 853 00 18
E: info.pl@alsglobal.com

PORTUGAL

Barcarena

Rua Ferrarias del Rei, nº 21F
2730-269 Barcarena
T: +351 214 222 017
E: info.pt@alsglobal.com

ROMANIA

Ploiesti

str. Golesti nr. 5, et. I
Ploiesti 100032,
T: +40 244 59 61 93
E: info.ro@alsglobal.com

SLOVAKIA

Bratislava

Mokrán Záhon 4
821 04 Bratislava
T: +421 903 218 422
E: info.sk@alsglobal.com

SPAIN

Madrid

C/Cardenal Herrera Oria, 51 1º
28034, Madrid, España
T: +34 91 729 21 47
E: info.es@alsglobal.com

SWEDEN

Stockholm

Rinkebyvägen 19c, Box 700
SE - 182 36 Danderyd
T: +46 852 775 200
E: info.ta@alsglobal.com

Luleå

Aurorum 10
SE - 977 75 Luleå
T: +46 920 289 900
E: info.lu@alsglobal.com

TURKEY

Istanbul

Mehmet Akif Mah. Elalmis Cad. Tarik
Bugra Sok. No: 15, 34774 Istanbul
T: +90 216 499 02 49
E: destek@alsglobal.com

UK & IRELAND

Coventry

Torrington Avenue
Coventry CV4 9GU
T: +44 (0)24 7642 1213
E: info.ukenviro@alsglobal.com

Wakefield

Unit 11 Silkwood Park, Janes Hill
Off Albert Drive, Wakefield WF5 9TP
T: +44 (0)1924 818 100
E: info.ukenviro@alsglobal.com

Otterbourne

Sparrowgrove,
Waterworks Road,
Otterbourne,
Hampshire, SO21 2SW
T: +44 (0)24 7642 1213
E: info.ukenviro@alsglobal.com

Dublin

Unit D12,
North City Enterprise Park,
North Road, Dublin 11
T: +353 (0)1 864 3854
E: info.ieenviro@alsglobal.com

Hawarden

Hawarden Business Park
Manor Road
Flintshire, CH5 3US UK
T: +44 (0)12 4452 8777
E: hawardensales@alsglobal.com

OTHER COUNTRIES

T: +420 226 226 228
E: customer.support@alsglobal.com