WASTE

Product Catalogue ALS EUROPE

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CONTENTS

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.

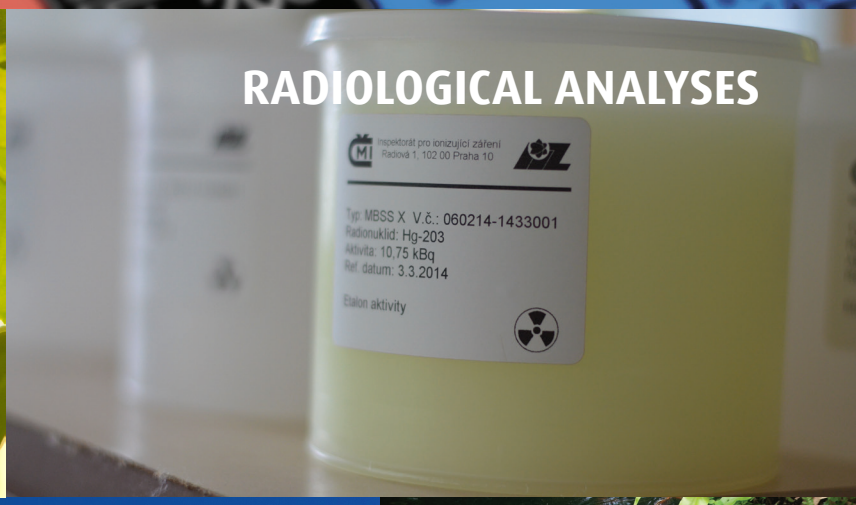
ALS Life Sciences in Europe employs over 1300 professional laboratory and support personnel represented in 13 countries at 31 locations. The European network consists of modern, analytical, ISO 17025 accredited laboratories and national service centres. Main laboratories are located in the Czech Republic, 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.

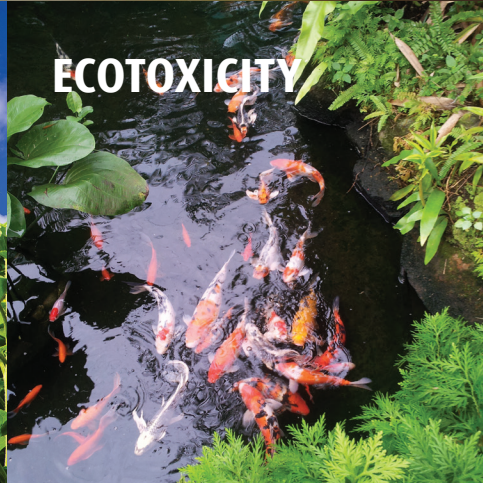
ALS Life Sciences Europe has also a number of centres of excellence dedicated to specialty services and industrial applications. These laboratories utilise the latest high-resolution technology in order to meet very stringent demands from clients worldwide:
ALS operates the best equipped laboratory globally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

FOR FURTHER **INFORMATION** ON **WATER ANALYSES,** CONSULT **www.alsglobal.eu**





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 proceeses 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!

SOLID WASTE AND LEACHATE

Waste at landfills

Criteria and procedures for the acceptability of waste at landfills are stated in EU Council Decision 2003/33/EC.
The procedures includes basic characterization and compliance testing.
Waste to be deposited at landfills is divided into three categories: inert waste, non-hazardous waste and hazardous waste. Specific limit values apply to these categories with respect to e.g. metals, anions, phenol index, DOC and TDS in the leachate as well as the total content of organic parameters.

ALS Life Sciences carry out **waste acceptance criteria** (WAC) testing by simulating leaching of contaminants from the waste by rainwater according to EN 12 457 and CEN/TS 14 405. To perform these leaching simulations, our laboratories employ:

- **single step leach**, a one part leach with a liquid to solid ratio **L/S=10**, the most common procedure for leaching of waste.
- **double stage leach**, a two parts leach, where the first leach is performed at **L/S=2** and then at **L/S=8**. It better mimics the natural conditions of leaching by rainwater for material with high solid content.
- **column leach test**, an upflow percolation test, which provides information on the leaching behavior at low L/S ratios prevailing in disposal scenario.

Waste acceptance criteria (WAC) - inert waste (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	0.05	0.05	0.06	0.05
Ba	2	3.5	4	0.003
Cd	0.004	0.015	0.02	0.0005
Cr total	0.05	0,1	0.1	0.001
Cu	0.2	0.45	0,6	0.01
Hg	0.001	0.0015	0.002	0.001
Mo	0.05	0.15	0.2	0.001
Ni	0.04	0.1	0.12	0.002
Pb	0.05	0.1	0.15	0.001
Sb	0.006	0.01	0.1	0.001
Se	0.01	0.03	0.04	0.005
Zn	0.4	1	1.2	0.001
chloride	80	275	460	1
fluoride	1	2	2.5	0.2
sulphate	100	280	1500	5
phenol index	0.1	0,25	0.3	0.005
DOC	50	120	160	0.5
TDS	400	1250	-	10

* Value mentioned for L/S=2 L/kg.
Minimum sample amount: 0.5 kg dry waste

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

Parameter	Limit value* (mg/kg)	LOQ (mg/kg DW)
BTEX (sum) benzene toluene ethylbenzene o-xylene m,p-xylene	6	0.5
Mineral oil (C10-C40)	500	20
PAH (sum of 12 parameters)** naphtalene phenanthrene anthracene fluoranthene pyrene benzo(a)anthracene chrysene benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene benzo(ghi)perylene indeno(123cd)pyrene	80	0.12
PCB (sum of 7 congeners) PCB 28 PCB 52 PCB 101 PCB 118 PCB 138 PCB 153 PCB 180	1	0.14
TOC (total organic carbon)	30 000	100

* Limit values from Council Decision 2003/33/EC.
** Number of parameters and limit value set by member state.
Minimum sample amount: 0.5 kg dry waste

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, 50g	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 %

Stabilised biowaste deposited at landfill - AT4

Parameter	LOQ (unit)	Sample amount
AT4 – respiration activity test	1 mg O2/g	plastic, 2000 g

Stabilised biowaste deposited at landfill - calorific value

Parameter	LOQ (unit)	Parameter	LOQ (unit)
heat of combustion - original (QV,gr,ar)	0.5 MJ/kg	water - analytical (Mad)	0.5 %
heat of combustion – without water (QV,gr,d)	0.5 MJ/kg DW	water - gross (Mex)	0.5 %
calorific value - original (QV,net,ar)	0.5 MJ/kg	water - total (Mar)	0.5 %
calorific value - without water (QV,net,d)	0.5 MJ/kg DW		

Minimum sample amount: 1 to 5 kg depending on homegeneity of sample

WASTE SPREAD
ON SOIL SURFACE

Several EU countries allow waste to be spread on land. The disposal of the waste is arranged in a manner that preserves the chemical, biological, and physical properties of the soil by limiting the accumulation of contaminants. Customised packages are available.

Waste on land package

Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)
As	1	benzo(a)pyrene	0.01
Cd	0.4	benzo(ghi)perylene	0.01
Cr	1	phenantrene	0.01
Hg	0.2	fluoranthene	0.01
Ni	1	chrysene	0.01
Pb	1	indeno(123cd)pyrene	0.01
V	1	naphtalene	0.01
BTEX	0.17	pyrene	0.01
benzene	0.02	EOX	1
toluene	0.1	petroleum hydrocarbons C10 – C40	20
ethylbenzene	0.02	PCB – sum of 7 congeners	0.14
o-xylene	0.01	PCB 28	0.02
p,m-xylenes	0.02	PCB 52	0.02
PAH - sum of 12 PAH	0.12	PCB 101	0.02
antracene	0.01	PCB 118	0.02
benzo(a)anthracene	0.01	PCB 138	0.02
benzo(b)fluoranthene	0.01	PCB 153	0.02
benzo(k)fluoranthene	0.01	PCB 180	0.02
homogenisation and dry matter at 105 °C			

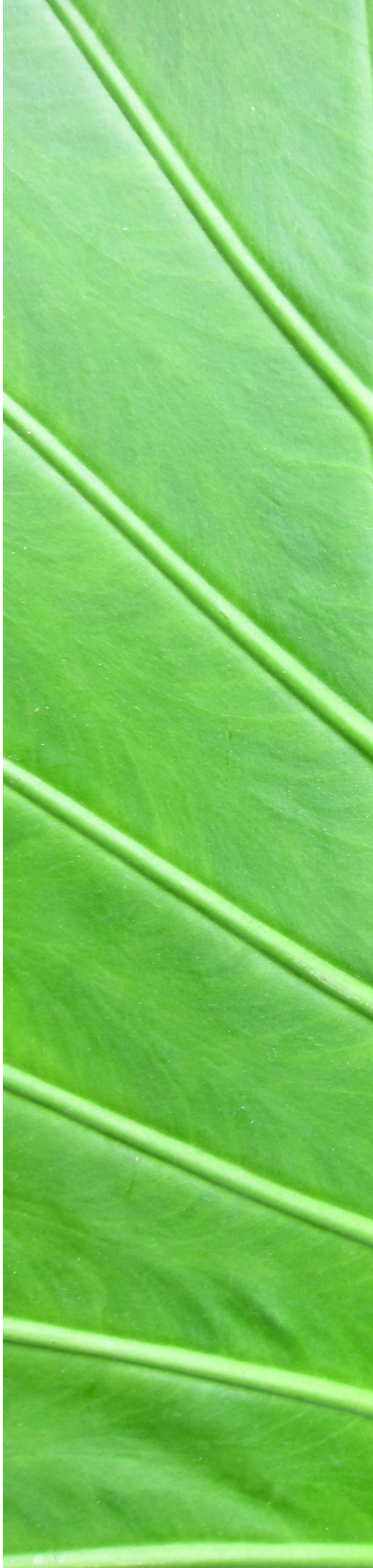
Minimum sample amount: plastic, 250 g
Note: ICP-OES, GC-FID, GC-ECD, GC-MS, coulometry

Waste on land - microbiology

Parameter	Parameter	Parameter
thermotolerant coliform bacteria	*Salmonella sp.*	enterococci

Minimum sample amount: sterile glass, 5x 200 g

ASK YOUR
REPRESENTATIVE FOR A
QUOTE SPECIFICALLY
FOR YOUR **NEEDS.**



BIOWASTE

Many packages are available for testing of biowaste, depending on the local legislation. Please ask us for a customised range.

Biowaste package

Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)
As	5	antracene	0.01
Cd	0.4	benzo(a)antracene	0.01
Cr	0.5	benzo(a)pyrene	0.01
Cu	0.5	benzo(b)fluoranthene	0.01
Hg	0.3	benzo(ghi)perylene	0.01
Ni	0.5	benzo(k)fluoranthene	0.01
Pb	5	fluoranthene	0.01
Zn	0.5	phenanthrene	0.01
PCB 28	0.02	chrysene	0.01
PCB 52	0.02	indeno(123cd)pyrene	0.01
PCB 101	0.02	naphtalene	0.01
PCB 118	0.02	pyrene	0.01
PCB 138	0.02	sum of 12 PAH	0.12
PCB 180	0.02	AT4 - respiration activity test	1 mg/g O_2
PCB 153	0.02		
sum of 7 PCB	0.14		
sample preparation, homogenization, dry matter determination			

Minimum sample amount: plastic, 1000 g + plastic, 2000 g (for AT4)
Method: ICP-OES, AAS-AMA, GC-ECD, GC-MS

Biowaste - quality characteristics of reclaimed compost

Parameter	LOQ (unit)	Parameter	LOQ (unit)
humidity	0.1 %	ratio C:N	0.1
combustible matters	0.1 % DW	pH	1
total nitrogen	0.005 % DW	indecomposable additives (>5 mm and >2 mm)	0.1 %
sample preparation, homogenization, dry matter determination			

Minimum sample amount: plastic, 1000 g

Biowaste - biological stability of compost

Parameter	Sample amount
seed germination index GI - Lepidium sativum + homogenization and leachate preparation	plastic, 500 g
relative seed germination G - Lepidium sativum + homogenization and leachate preparation	plastic, 500 g
degree of compost rotting - self-heating test	plastic, 500 g

Biowaste - microbiology

Parameter	Parameter	Parameter
thermotolerant coliform bacteria	Salmonella sp.	enterococci

Minimum sample amount: sterile glass, 5x 200 g

Stabilised biowaste deposited at landfill - AT4

Parameter	LOQ (unit)	Sample amount
AT4 - respiration activity test	1 mg O2/g	plastic, 2000 g

Stabilised biowaste deposited at landfill - calorific value

Parameter	LOQ (unit)	Parameter	LOQ (unit)
heat of combustion - original (QV,gr,ar)	0.5 MJ/kg	water - analytical (Mad)	0.5 %
heat of combustion - without water (QV,gr,d)	0.5 MJ/kg DW	water - gross (Mex)	0.5 %
calorific value - original (QV,net,ar)	0.5 MJ/kg	water - total (Mar)	0.5 %
calorific value - without water (QV,net,d)	0.5 MJ/kg DW		

Minimum sample amount: 1 to 5 kg depending on homegeneity of sample

ECOTOXICITY TESTS

Ecotoxicity test

Parameter
acute toxicity to fish *Poecilia reticulata* (LC_{50})
acute toxicity to aquatic arthropods *Daphnia magna* (EC_{50})
acute toxicity to green algae *Scenedesmus subspicatus* (*Desmodesmus Subspicatus*) (IC_{50})
acute toxicity to the seed crop plants *Sinapis alba* (IC_{50})
homogenisation and grinding, water leach preparation

Minimum sample amount: plastic, 1-2 kg

Fast ecotoxicological test - Microtox

The common application of Microtox is for testing of complex chemical mixtures such as effluents, waste leachates or even new chemical substances for assessing of their impacts or minimizing them.

Parameter
bacterial bioluminescent test on *Vibrio fischeri* + homogenisation + preparation of leach

Minimum sample amount: glass or plastic, 100 g

DO YOU NEED
A CUSTOMISED ECOTOXICOLOGICAL
PACKAGE? CONTACT US!

Ecotoxicity - basic test

Parameter	Sample amount
acute toxicity on fish *Poecilia reticulata* (LC_{50}) +homogenisation +preparation of leach 3 litres	glass or plastic, 1000 g
acute toxicity on aquatic arthropods *Daphnia magna* (EC_{50}) +homogenisation +preparation of leach 2 litres	glass or plastic, 200 g
acute toxicity on green algae *Scenedesmus subspicatus (Desmodemus Subspicatus)* (IC_{50}) +homogenisation +preparation of leach 1 litre	glass or plastic, 150 g
acute toxicity on the seed crop plants *Sinapis alba* (IC_{50}) +homogenisation +preparation of leach 1 litre	glass or plastic, 100 g
acute toxicity - growth inhibition of duckweed *(Lemna minor)* +homogenisation +preparation of leach 2 litres	glass or plastic, 500 - 1000 g

Ecotoxicity - limit test

Parameter	Sample amount
acute toxicity on fish *Poecilia reticulata* (LC_{50}) - limit test 10 ml/l +homogenisation +preparation of leach 3 litres	glass or plastic, 400 g
acute toxicity on aquatic arthropods *Daphnia magna* (EC_{50}) - limit test 10ml/l +homogenisation +preparation of leach 1 litre	glass or plastic, 100 g
acute toxicity on green algae *Scenedesmus subspicatus (Desmodemus Subspicatus)* (IC_{50}) - limit test 10ml/l +homogenisation +preparation of leach 1 litre	glass or plastic, 100 g
acute toxicity on the seed crop plants *Sinapis alba* (IC_{50}) - limit test 10ml/l +homogenisation +preparation of leach 1 litre	glass or plastic, 100 g

Ecotoxicity - verification test

Parameter	Sample amount
acute toxicity on fish *Poecilia reticulata* - verification test +homogenisation +preparation of leach 3 litres	glass or plastic, 400 g
acute toxicity on aquatic arthropods *Daphnia magna* - verification test +homogenisation +preparation of leach 1 litre	glass or plastic, 100 g
acute toxicity on green algae *Scenedesmus subspicatus (Desmodemus Subspicatus)* - verification test +homogenisation +preparation of leach 1 litre	glass or plastic, 100 g
acute toxicity on the seed crop plants *Sinapis alba* - verification test +homogenisation +preparation of leach 1 litre	glass or plastic, 100 g
acute toxicity - growth inhibition of duckweed *(Lemna minor)* - verification test +homogenisation +preparation of leach 1 litre	glass or plastic, 250 - 500 g

Note: depending on the combination of requested parameters, the total amount of sample necessary for analysis can be diminished. Please contact your local sales representative for further information.

Test on terrestrial species

Acute toxicity

Parameter	Sample amount
acute toxicity on enchytraeids *(Enchytraeus crypticus)* - sediment	glass or plastic, 1 kg
acute toxicity on springtails *(Folsomia candida)* - sediment	glass or plastic, 1 kg
acute toxicity on the growth of higher plants *(Lactuca sativa)* - sediment	glass or plastic, 2 kg

SUPPLEMENTARY
WASTE TESTING

Dioxins (PCDD/F) in waste leachate

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

LOQ is 5 pg I-TEQ/l for total 2,3,7,8-PCDD/F congeners.
Minimum sample amount: glass, 1000 ml or 200 g
Method: HRGC-HRMS
Note: Results can also be expressed according to WHO factors. Dioxins and dioxin-like PCBs can be determined together. Please contact the laboratory for further information.

Dioxins (PCDD/F) in solid waste

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

LOQ is 20 ng I-TEQ/kg for total 2,3,7,8-PCDD/F congeners.
Minimum sample amount: glass, 25 g
Method: HRGC-HRMS
Note: Results can also be expressed according to WHO factors. Dioxins and dioxin-like PCBs can be determined together. Please contact the Laboratory for further information.

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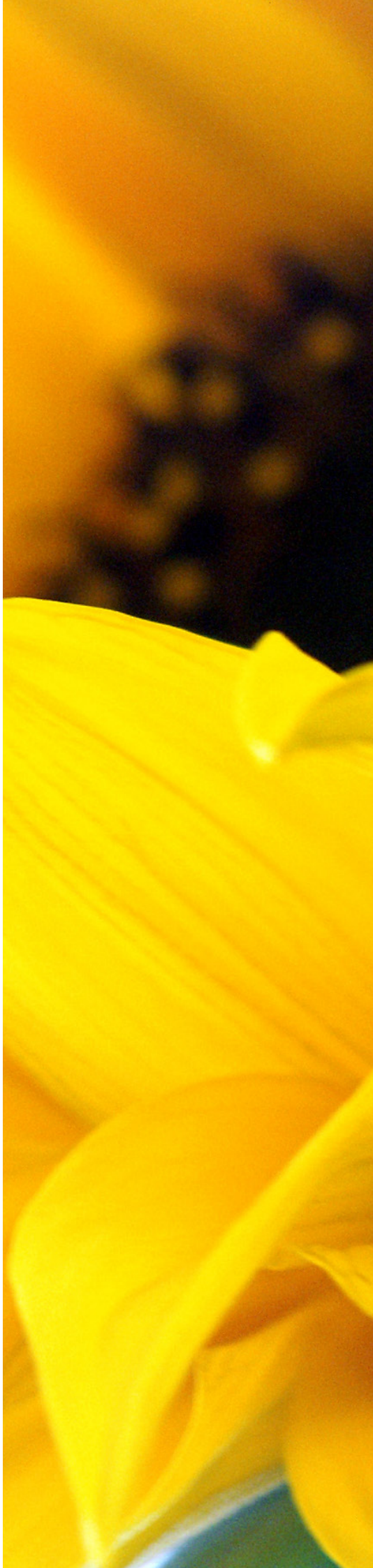

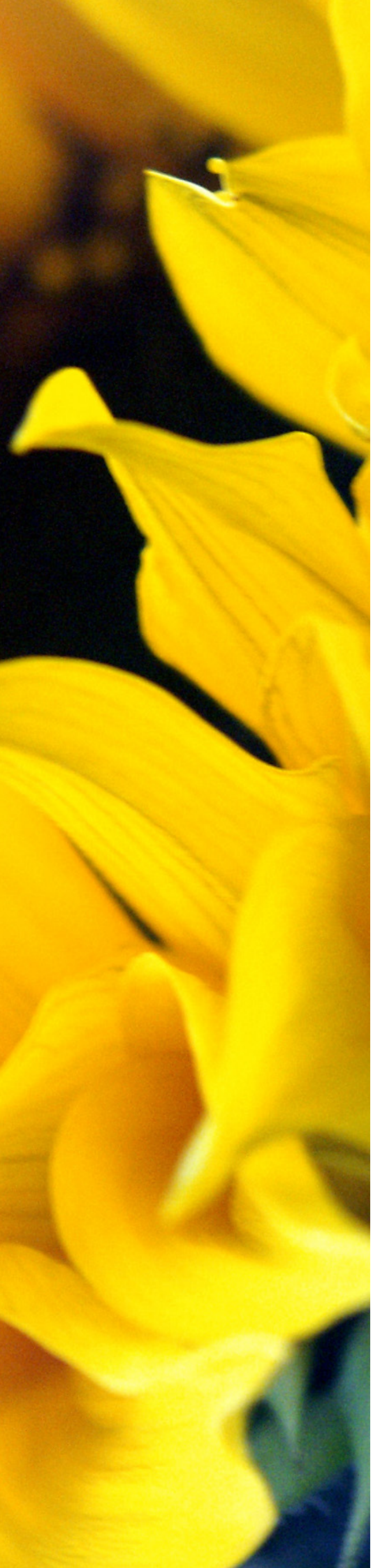

Polychlorinated biphenyls (PCB) - coplanar PCB (dioxin-like PCB) and indicator PCB in solid waste

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	

LOQ is 0.001 ng TEQ/g DW for total coplanar PCBs and 17 ng/g DW for sum of indicator PCBs.
Minimum sample amount: glass, 25 g
Method: HRGC-HRMS
Note: LOQ for coplanar PCB expressed by WHO-TEQ is 0,011 pg 2,3,7,8-TCDD/g DW, for the sum of PCB – 7 congeners, the LOQ is 17 ng/g DW. Calculation parameter TEQ is mentioned at the levels of „lowerbound" and „upperbound" PCDD/F, coplanar PCB, indicator PCB, sum of PCBs and PAH can be determined together. Please contact your local sales representative for further information.

Polybrominated diphenylethers (PBDE) in solid waste

Parameter	LOQ (ng/kg DW)	Parameter	LOQ (ng/kg DW)
sum of penta-BDE	920	deca-BDE	640
sum of octa-BDE	480	sum of penta-, octa- and deca-BDE	2040

Minimum sample amount: glass, 25 g
Method: HRGC - HRMS
Note: Calculation parameter TEQ is mentioned at the levels of „lowerbound" and „upperbound" PCDD/F, coplanar PCB, indicator PCB, sum of PCBs and PAH can be determined together. Please contact your local sales representative for further information.

Polychlorinated biphenyls (PCB 7) in solid waste

Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)
PCB 28	0.02	PCB 138	0.02	sum of PCBs	0.12
PCB 52	0.02	PCB 153	0.02		
PCB 101	0.02	PCB 180	0.02		

Minimum sample amount: glass jar, 50 g
Method: GC-ECD
Note: The range of PCBs an be modified according to national legislation.

Polycyclic aromatic hydrocarbons (PAH) in solid waste

Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)
naphthalene	0.01	benzo(b)fluoranthene	0.01
phenanthrene	0.01	benzo(k)fluoranthene	0.01
anthracene	0.01	benzo(a)pyrene	0.01
fluoranthene	0.01	benzo(ghi)perylene	0.01
pyrene	0.01	indeno(123cd)pyrene	0.01
benzo(a)anthracene	0.01	sum of 12 PAHs	0.12
chrysene	0.01		

Minimum sample amount: glass jar, 50 g
Method: GC-MS
Note: The range of PAHs an be modified according to national legislation.

Organic parameters in solid waste

Parameter	LOQ (mg/kg DW)	Sample amount
mineral oil, C10-C40	50	glass, 50 g
TOC (total organic carbon)	100	glass, 50 g

Note: LOQ may vary depending on sample composition.

Monoaromatic hydrocarbons in solid waste

Parameter	LOQ (mg/kg DW)	Parameter	LOQ (mg/kg DW)
sum of BTEX	0.17	ethylbenzene	0.02
benzene	0.02	o-xylene	0.01
toluene	0.1	p,m-xylenes	0.02

Minimum sample amount: plastic, 50 g
Method: GC-MS
Note: LOQ may vary depending on sample composition.

Asbestos in waste construction material - qualitative determination

Parameter	Parameter	Parameter
actinolite	anthophyllite	crocidolite
amosite	chrysotile	tremolite

Minimum sample amount: 1-10 g
Method: Qualitative determination by optical microscopy.

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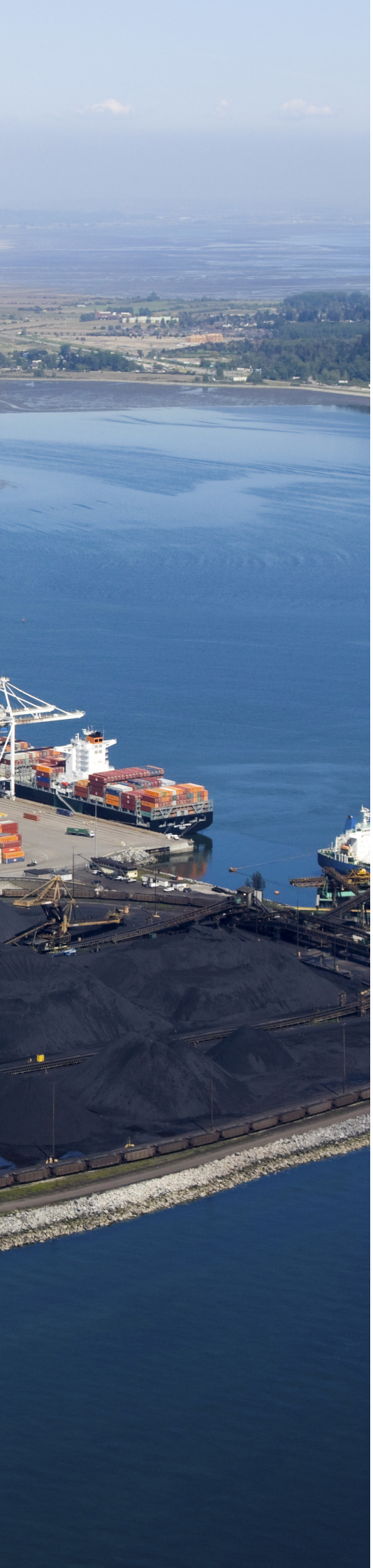

FUELS

Quality characteristics of fuels

Regardless of the the specific fuel type (wasteoils, waste derived fuels, alternative fuels, fossil or non fossil fuels), all good quality fuels share common characteristics:

Efficient burning. Of importance are the following parameters:

- Calorific value
- Moisture content

Consistency of characteristics, as these affect the performance of the combustion facility

- Chlorine (Cl) content
- Ash content
- Chemical properties

ALS Life Sciences carry out specific tests to check the burning efficiency and the characterisitcs of different classes of fuels, distinguished here as liquid, solid fossil and solid non fossil. Determinations are performed in the samples as received („ar", mentioned below as „original") and in the dry matter, in case of solid fuels/waste.

Liquid fuel, liquid waste, waste oil - analytical package

Parameter	LOQ (unit)	Parameter	LOQ (unit)
gross calorific value original (QV, gr, ar)	0.5 MJ/kg	nitrogen original (Nar)	0.2 %
net calorific value original (QV, net, ar)	0.5 MJ/kg	carbon original (Car)	0.1 %
ash original at 550°C (Aar)	0.1 %	hydrogen original (Har)	0.1 %
chlorine total original (Clar)	0.01 %	sulfur combustible original (Sar)	0.2 %
fluorine total original (Far)	0.01 %	oxygen original (Oar)	5 %

Minimum sample amount: glass, 250 g
Note: Gross calorific value and net calorific value are routinely determined at constant volume. If you need these parameters at constant pressure, please contact your Sales representative.

Liquid fuel, liquid waste, waste oil - individual parameters

Parameter	LOQ (unit)	Sample amount
gross calorific value original (QV,gr,ar)	0.5 MJ/kg	glass, 50 ml
net calorific value original (QV,net,ar)	0.5 MJ/kg	glass, 50 ml
ash original at 550°C (Aar)	0.1 %	glass, 100 ml
chlorine total original (Clar)	0.01 %	glass, 50 ml
fluorine total original (Far)	0.01 %	glass, 50 ml
nitrogen original (Nar)	0.2 %	glass, 50 ml
carbon original (Car)	0.1 %	glass, 50 ml
hydrogen original (Har)	0.1 %	glass, 50 ml
sulfur combustible original (Sar)	0.2 %	glass, 50 ml
oxygen original (Oar)	5 %	glass, 50 ml
sulfur combustible original (Sar) - calorimetry	0.01 %	glass, 50 ml
water	1000 mg/l	glass, 50 ml
density	0.01 g/ml	glass, 50 ml
alkali	0.005 %	glass, 200 ml
flash point	°C	glass, 200 ml
distillation curve	-	glass, 250 ml
mechanical impurities	0.02 %	glass, 200 ml
kinematic viscosity	-	glass, 250 ml

Liquid fuel, liquid waste, waste oil - emission factor

Parameter	LOQ (unit)	Parameter	LOQ (unit)
emission factor (CO_2)	1 t CO_2/TJ	gross calorific value original (QV, gr, ar)	0.5 MJ/kg
carbon original (Car)	0.1 %	net calorific value original (QV, net, ar)	0.5 MJ/kg

Minimum sample amount: glass, 250 g
Note: Gross calorific value and net calorific value are routinely determined at constant volume. If you need these parameters at constant pressure, please contact your sales representative.

SOLID WASTE
AND NON FOSSIL FUEL

Solid fuels are homogenized, grinded at 0.25 mm and pulverised under 0.07 mm if the tests required it. Dry matter is determined in each case. The sample amount reflects the quantity necessary to process all the homogenisation steps and dry matter determination.

Solid non fossil fuel and waste - analytical package

Parameter	LOQ (unit)	Parameter	LOQ (unit)
gross calorific value original (QV, gr, ar)	0.5 MJ/kg	nitrogen in dry matter (Nd)	0.1 % DW
gross calorific value in dry matter (QV, gr, d)	0.5 MJ/kg DW	carbon original (Car)	0.1 %
net calorific value original (QV, net, ar)	0.5 MJ/kg	carbon in dry matter (Cd)	0.1 % DW
net calorific value in dry matter (QV, net, d)	0.5 MJ/kg DW	hydrogen original (Har)	0.1 %
ash original at 550°C (Aar)	0.1 %	hydrogen in dry matter (Hd)	0.1 % DW
ash in dry matter at 550°C (Ad)	0.1 % DW	sulfur combustible original (Sar)	0.1 %
chlorine total original (Clar)	0.01 %	sulfur combustible in dry matter (Sd)	0.1 % DW
chlorine total in dry matter (Cld)	0.01 % DW	oxygen original (Oar)	5 %
fluorine total original (Far)	0.01 %	oxygen in dry matter (Od)	5 % DW
fluorine total in dry matter (Fd)	0.01 % DW	water analytical (Mad)	0.5 %
sulfur total original (Sar)	0.1 %	water gross (Mex)	0.5 %
sulfur total in dry matter (Sd)	0.1 % DW	water total (Mar)	0.5 %
nitrogen original (Nar)	0.1 %		

Minimum sample amount: plastic, 1-5 kg (the less homogeneous the sample is, the more sample material is needed)
Note: Gross calorific value and net calorific value are routinely determined at constant volume. If you need these parameters at constant pressure, please contact your sales representative.

Solid non fossil fuel and waste - emission factor

Parameter	LOQ (unit)	Parameter	LOQ (unit)
emission factor (CO2)	1 t CO2/TJ	carbon original (Car)	0.1 %
gross calorific value original (QV, gr, ar)	0.5 MJ/kg	carbon in dry matter (Cd)	0.1 % DW
gross calorific value in dry matter (QV, gr, d)	0.5 MJ/kg DW	water analytical (Mad)	0.5 %
net calorific value original (QV, net, ar)	0.5 MJ/kg	water gross (Mex)	0.5 %
net calorific value in dry matter (QV, net, d)	0.5 MJ/kg DW	water total (Mar)	0.5 %

Minimum sample amount: plastic, 1-5 kg (the less homogeneous the sample is, the more sample material is needed)

Note: Gross calorific value and net calorific value are routinely determined at constant volume. If you need these parameters at constant pressure, please contact your sales representative.

Solid non fossil fuel and waste - gross & net calorific values in flammable matter

Parameter	LOQ (unit)	Parameter	LOQ (unit)
gross calorific value original (QV, gr, ar)	0.5 MJ/kg	ash original at 550°C (Aar)	0.1 %
gross calorific value in dry matter (QV, gr, d)	0.5 MJ/kg DW	ash in dry matter at 550°C (Ad)	0.1 % DW
gross calorific value in flammable matter (QV, gr, daf)	0.5 MJ/kg	water analytical (Mad)	0.5 %
net calorific value original (QV, net, ar)	0.5 MJ/kg	water gross (Mex)	0.5 %
net calorific value in dry matter (QV, net, d)	0.5 MJ/kg DW	water total (Mar)	0.5 %
net calorific value in flammable matter (QV, net, daf)	0.5 MJ/kg		

Minimum sample amount: plastic, 1-5 kg (the less homogeneous the sample is, the more sample material is needed)

Note: Gross calorific value and net calorific value are routinely determined at constant volume. If you need these parameters at constant pressure, please contact your sales representative.

Solid non fossil fuel and waste - flammable material

Parameter	LOQ (unit)	Parameter	LOQ (unit)
ash original at 550°C (Aar)	0.1 %	water analytical (Mad)	0.5 %
ash in dry matter at 550°C (Ad)	0.1 % DW	water gross (Mex)	0.5 %
flammable material original (Har)	0.5 %	water total (Mar)	0.5 %
flammable material in dry matter (Hd)	0,5 % D.		

Minimum sample amount: plastic, 1 kg

Solid non fossil fuel and waste - volatile matter

Parameter	LOQ (unit)	Parameter	LOQ (unit)
volatile matter original (Var)	0.5 %	water gross (Mex)	0.5 %
volatile matter in dry matter (Vd)	0.5 % DW	water total (Mar)	0.5 %
water analytical (Mad)	0.5 %		

Minimum sample amount: plastic, 1 kg

Solid non fossil fuel and waste - elemental analysis in flammable material

Parameter	LOQ (unit)	Parameter	LOQ (unit)
nitrogen original (Nar)	0.1 %	sulfur combustible in dry matter (Sd)	0.1 % DW
nitrogen in dry matter (Nd)	0.1 % DW	sulfur combustible in flammable matter(Sdaf)	0.1 %
nitrogen in flammable matter (Ndaf)	0.1 %	oxygen original (Oar)	5 %
carbon original (Car)	0.1 %	oxygen in dry matter (Od)	5 % DW
carbon in dry matter (Cd)	0.1 % DW	oxygen in flammable matter (Odaf)	5 %
carbon in flammable matter (Cdaf)	0.1 %	ash original at 550°C (Aar)	0.1 %
hydrogen original (Har)	0.1 %	ash in dry matter at 550°C (Ad)	0.1 % DW
hydrogen in dry matter (Hd)	0.1 % DW	water analytical (Mad)	0.5 %
hydrogen in flammable matter (Hdaf)	0.1 %	water gross (Mex)	0.5 %
sulfur combustible original (Sar)	0.1 %	water total (Mar)	0.5 %

Minimum sample amount: plastic, 1-5 kg (the less homogeneous the sample is, the more sample material is needed)

Solid non fossil fuel and waste - total sulfur by calorimetry

Parameter	LOQ (unit)	Parameter	LOQ (unit)
sulfur total original (Sar)	0.01 %	water gross (Mex)	0.5 %
sulfur total in dry matter (Sd)	0.01 % DW	water total (Mar)	0.5 %
water analytical (Mad)	0.5 %		

Minimum sample amount: plastic, 1 kg

Solid non fossil fuel and waste - supplementary parameters

Parameter	LOQ (unit)	Sample amount
alkali	0.005 %	plastic, 100 g
flash point	-	plastic, 100 g

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SOLID FOSSIL FUEL

Solid fossil fuel - flammable material

Parameter	LOQ (unit)	Parameter	LOQ (unit)
ash original at 815°C (Aar)	0.1 %	water analytical (Mad)	0.5 %
ash in dry matter at 815°C (Ad)	0.1 % DW	water gross (Mex)	0.5 %
flammable material original (Har)	0.5 %	water total (Mar)	0.5 %
flammable material in dry matter (Hd)	0.5 % DW		

Minimum sample amount: plastic, 1 kg

Solid fossil fuel - volatile matter

Parameter	LOQ (unit)	Parameter	LOQ (unit)
volatile matter original (Var)	0.5 %	water gross (Mex)	0.5 %
volatile matter in dry matter (Vd)	0.5 % DW	water total (Mar)	0.5 %
water analytical (Mad)	0.5 %		

Minimum sample amount: plastic, 1 kg

Solid fossil fuel - elemental analysis in flammable material

Parameter	LOQ (unit)	Parameter	LOQ (unit)
nitrogen original (Nar)	0.1 %	sulfur combustible in dry matter (Sd)	0.1 % DW
nitrogen in dry matter (Nd)	0.1 % DW	sulfur combustible in flammable matter(Sdaf)	0.1 %
nitrogen in flammable matter (Ndaf)	0.1 %	oxygen original (Oar)	5 %
carbon original (Car)	0.1 %	oxygen in dry matter (Od)	5 % DW
carbon in dry matter (Cd)	0.1 % DW	oxygen in flammable matter (Odaf)	5 %
carbon in flammable matter (Cdaf)	0.1 %	ash original at 815°C (Aar)	0.1 %
hydrogen original (Har)	0.1 %	ash in dry matter at 815°C (Ad)	0.1 % DW
hydrogen in dry matter (Hd)	0.1 % DW	water analytical (Mad)	0.5 %
hydrogen in flammable matter (Hdaf)	0.1 %	water gross (Mex)	0.5 %
sulfur combustible original (Sar)	0.1 %	water total (Mar)	0.5 %

Minimum sample amount: plastic, 1 kg

Solid fossil fuel - supplementary parameters

Parameter	LOQ (unit)	Sample amount
alkali	0.005 %	plastic, 10 g
flash point	-	plastic, 10 g

Solid fossil fuel - analytical package

Parameter	LOQ (unit)	Parameter	LOQ (unit)
gross calorific value original (QV,gr,ar)	0.5 MJ/kg	nitrogen original (Nar)	0.1 %
gross calorific value in dry matter (QV, gr, d)	0.5 MJ/kg DW	nitrogen in dry matter (Nd)	0.1 % DW
net calorific value original (QV, net, ar)	0.5 MJ/kg	carbon original (Car)	0.1 %
net calorific value in dry matter (QV, net, d)	0.5 MJ/kg DW	carbon in dry matter (Cd)	0.1 % DW
ash original at 815°C (Aar)	0.1 %	hydrogen original (Har)	0.1 %
ash in dry matter at 815°C (Ad)	0.1 % DW	hydrogen in dry matter (Hd)	0.1 % SW
chlorine total original (Clar)	0.01 %	sulfur combustible original (Sar)	0.1 %
chlorine total in dry matter (Cld)	0.01 % DW	sulfur combustible in dry matter (Sd)	0.1 % DW
fluorine total original (Far)	0.01 %	oxygen original (Oar)	5 %
fluorine total in dry matter (Fd)	0.01 % DW	Oxygen in dry matter (Od)	5 % DW
sulfur total original (Sar)	0.01 %	water analytical (Mad)	0.5 %
sulfur total in dry matter (Sd)	0.01 % DW	water gross (Mex)	0.5 %
Sulfur total analytical (Sad)	0.01 %	water total (Mar)	0.5 %

Minimum sample amount: plastic, 1 kg
Note: Gross calorific value and net calorific value are routinely determined at constant need these parameters at constant pressure, please contact your sales representative.

Solid fossil fuel - emission factor

Parameter	LOQ (unit)	Parameter	LOQ (unit)
emission factor (CO_2)	1 t CO_2/TJ	carbon original (Car)	0.1 %
gross calorific value original (QV, gr, ar)	0.5 MJ/kg	carbon in dry matter (Cd)	0.1 % DW
gross calorific value in dry matter (QV, gr, d)	0.5 MJ/kg DW	water analytical (Mad)	0.5 %
net calorific value original (QV, net, ar)	0.5 MJ/kg	water gross (Mex)	0.5 %
net calorific value in dry matter (QV, net, d)	0.5 MJ/kg DW	water total (Mar)	0.5 %

Minimum sample amount: plastic, 1 kg
Note: Gross calorific value and net calorific value are routinely determined at constant volume. If you need these parameters at constant pressure, please contact your sales representative.

Solid fossil fuel - gross & net calorific values in flammable matter

Parameter	LOQ (unit)	Parameter	LOQ (unit)
gross calorific value original (QV, gr, ar)	0.5 MJ/kg	ash original at 815°C (Aar)	0.1 %
gross calorific value in dry matter (QV, gr, d)	0.5 MJ/kg DW	ash in dry matter at 815°C (Ad)	0.1 % DW
gross calorific value in flammable matter (QV, gr, daf)	0.5 MJ/kg	water analytical (Mad)	0.5 %
net calorific value original (QV, net, ar)	0.5 MJ/kg	water gross (Mex)	0.5 %
net calorific value in dry matter (QV, net, d)	0.5 MJ/kg DW	water total (Mar)	0.5 %
net calorific value in flammable matter (QV, net, daf)	0.5 MJ/kg		

Minimum sample amount: plastic, 1 kg
Note: Gross calorific value and net calorific value are routinely determined at constant volume. If you need these parameters at constant pressure, please contact your sales representative.

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