

FIA

List of Methods

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Method		<i>Analytical principle</i>					<i>Relation to standards</i>
Quantification limit		Calibration ranges					Applicable to <Remarks>
Total Aluminium		<i>Pyrocatechol violet</i>					<i>APHA 3500 Al modified</i>
0.01	mg/l	0.05	...	0.5	mg/l	Al-T	Water / Wastewater
		0.2	...	2	mg/l	Al-T	
Ammonium (Ammonia)		<i>Gas diffusion/ pH-indicator</i>					<i>DIN EN ISO 11732</i>
0.03	mg/l	0.1	...	1	mg/l	NH ₄ -N	Water / Wastewater / Soil extract <also UM N/P>
		0.5	...	10	mg/l	NH ₄ -N	
		2	...	50	mg/l	NH ₄ -N	
< 0.01	mg/l	0.02	...	1	mg/l	NH ₄ -N	Water / Wastewater / Soil extract <wide-range GD cell> <also UM N/P>
		0.2	...	5	mg/l	NH ₄ -N	
		2	...	20	mg/l	NH ₄ -N	
0.05	mg/l	0.2	...	5	mg/l	NH ₄ -N	Kjeldahl digest <combination manifold Kjeldahl / Water ...>
		0.5	...	10	mg/l	NH ₄ -N	
		2	...	50	mg/l	NH ₄ -N	
0.05	mg/l	0.2	...	5	mg/l	NH ₄ -N	Kjeldahl digest <wide-range GD cell> <combination manifold Kjeldahl / Water ...>
		2	...	20	mg/l	NH ₄ -N	
Borate		<i>Azomethine H</i>					
< 0.1	mg/l	0.2	...	5	mg/l	B	Water /Soil extract
		0.5	...	10	mg/l	B	
Calcium		<i>o-Cresolphthalein-Komplexon</i>					
< 0.05	mg/l	0.2	...	10	mg/l	Ca	Water / Wastewater
		5	...	100	mg/l	Ca	
		10	...	200	mg/l	Ca	
		25	...	500	mg/l	Ca	
Chloride		<i>Hg-thiocyanate / Fe(III)</i>					<i>ISO 15682</i>
< 0.5	mg/l	1	...	7	mg/l	Cl ⁻	Water / Wastewater / Soil extract
		3	...	30	mg/l	Cl ⁻	
		10	...	100	mg/l	Cl ⁻	
		100	...	1000	mg/l	Cl ⁻	

Method	<i>Analytical principle</i>					<i>Relation to standards</i>
Quantification limit	Calibration ranges					Applicable to <Remarks>
Chloride	<i>Normal dialysis for matrix removal; Hg-thiocyanate / Fe(III)</i>					<i>ISO 15682</i>
5 mg/l	10	...	100	mg/l	Cl ⁻	Water / Wastewater /
	20	...	200	mg/l	Cl ⁻	Soil extract /
	50	...	500	mg/l	Cl ⁻	Food extract
	100	...	1000	mg/l	Cl ⁻	
Chloride	<i>High sensitivity dialysis for matrix removal; Hg-thiocyanate / Fe(III)</i>					<i>DIN EN ISO 15682</i>
0.5 mg/l	1	...	10	mg/l	Cl ⁻	Water / Wastewater /
	5	...	50	mg/l	Cl ⁻	Soil extract /
						Food extract
Chlorine, free	N,N-Diethyl-1,4-phenylenediamine					<i>DIN EN ISO 7393</i>
0.1 mg/l	0.2	...	5	mg/l	Cl ₂	Water
Chlorine, total	Potassium iodide / N,N-Diethyl-1,4-phenylenediamine					<i>DIN EN ISO 7393</i>
0,1 mg/l	0.2	...	5	mg/l	Cl ₂	Water
Chromium(VI)	<i>Diphenylcarbazide</i>					<i>ISO 23913</i>
0.005 mg/l	0.02	...	0.5	mg/l	Cr(VI)	Water
	0.05	...	2	mg/l	Cr(VI)	
	0.2	...	10	mg/l	Cr(VI)	
0.002 mg/l	0.005	...	0.1	mg/l	Cr(VI) (20 mm cuvette)	
Cyanide	<i>Pyridine-4-carbonic acid / 1.3-Dimethylbarbituric acid</i>					<i>ISO 14403</i>
0.003 mg/l	0.01	...	0.5	mg/l	CN ⁻	Water / Wastewater /
	0.1	...	5	mg/l	CN ⁻	Soil extract <distilled samples>

Method	<i>Analytical principle</i>						<i>Relation to standards</i>
Quantification limit	Calibration ranges						Applicable to <Remarks>
Free Cyanide	<i>Digestion at pH = 3.8; Gas transfer with enrichment; Pyridine-4-carbonic acid / 1,3-Dimethylbarbituric acid</i>						ISO 14403
0.0005 mg/l	0.001 ... 0.1 mg/l 0.005 ... 0.2 mg/l 0.02 ... 1 mg/l	...		FCN FCN FCN		Water / Wastewater / Soil extract	
Total Cyanide	<i>UV- + hydrolyt. digestion; Gas transfer with enrichment; Pyridine-4-carbonic acid / 1,3-Dimethylbarbituric acid</i>						ISO 14403
0.0005 mg/l	0.001 ... 0.1 mg/l 0.005 ... 0.2 mg/l 0.02 ... 1 mg/l	...		TCN TCN TCN		Water / Wastewater / Soil extract	
Formaldehyde	<i>Acetylacetone</i>						<i>anal. DIN EN 120</i>
0.02 mg/l	0.05 ... 5 mg/l 0.5 ... 25 mg/l	...		HCHO HCHO		Water / Absorption liquid	
Hydrazine	<i>Dimethylaminobenzaldehyde</i>						<i>anal. DIN 38413 Part 1</i>
0.003 mg/l	0.01 ... 0.5 mg/l 0.02 ... 1 mg/l	...		Hy. Hy.		Water / Process liquid of power plants	
Total Iron	<i>Ascorbic acid / FerroZine</i>						<i>anal. DIN 38406 Part 1</i>
0.014 mg/l	0.05 ... 2 mg/l 0.5 ... 20 mg/l	...		Fe _t Fe _t		Water / Wastewater	
Iron(II)	<i>FerroZine</i>						<i>anal. DIN 38406 Part 1</i>
0.007 mg/l	0.05 ... 2 mg/l 0.5 ... 20 mg/l	...		Fe ²⁺ Fe ²⁺		Water / Wastewater	
Magnesium	<i>Xylidyl blue 1</i>						
0.015 mg/l	0.05 ... 1 mg/l 0.5 ... 10 mg/l 5 ... 100 mg/l 20 ... 400 mg/l	...		Mg Mg Mg Mg		Water / Wastewater / Soil extract	
Manganese	<i>Pyridyl-azo-Naphthol (PAN)</i>						
0.01 mg/l	0.025 ... 2 mg/l 0.2 ... 10 mg/l	...		Mn ²⁺ Mn ²⁺		Water	

Method	<i>Analytical principle</i>					<i>Relation to standards</i>	
Quantification limit	Calibration ranges					Applicable to <Remarks>	
Nitrate	<i>Cd / Sulfanilamide / NED</i>					<i>ISO 13395</i>	
0.005 mg/l	0.02	...	1	mg/l	NO ₃ -N	Water / Wastewater /	
	0.2	...	10	mg/l	NO ₃ -N	Soil extract	
	0.5	...	20	mg/l	NO ₃ -N	<also UM N/P>	
Nitrate	<i>Normal dialysis for matrix removal; Cd / Sulfanilamide / NED</i>					<i>ISO 13395</i>	
0.04 mg/l	0.2	...	5	mg/l	NO ₃ -N	Water / Wastewater /	
	0.5	...	20	mg/l	NO ₃ -N	Soil extract /	
	2	...	100	mg/l	NO ₃ -N	Food extract	
Nitrate	<i>High-sensitivity dialysis for matrix removal; Cd / Sulfanilamide / NED</i>					<i>ISO 13395</i>	
0.01 mg/l	0.05	...	2	mg/l	NO ₃ -N	Water / Wastewater /	
	0.2	...	10	mg/l	NO ₃ -N	Soil extract	
Nitrite	<i>Sulfanilamide / NED</i>					<i>ISO 13395</i>	
0.002 mg/l	0.01	...	1	mg/l	NO ₂ -N	Water / Wastewater /	
	0.1	...	5	mg/l	NO ₂ -N	Soil extract	
	0.2	...	10	mg/l	NO ₂ -N	<also UM N/P>	
Nitrite	<i>Normal dialysis for matrix removal; Sulfanilamide / NED</i>					<i>ISO 13395</i>	
0.025 mg/l	0.2	...	5	mg/l	NO ₂ -N	Water / Wastewater /	
	0.5	...	20	mg/l	NO ₂ -N	Soil extract /	
	2	...	100	mg/l	NO ₂ -N	Food extract	
Nitrite	<i>High-sensitivity dialysis for matrix removal; Sulfanilamide / NED</i>					<i>ISO 13395</i>	
0.002 mg/l	0.05	...	2	mg/l	NO ₂ -N	Water / Wastewater /	
	0.2	...	10	mg/l	NO ₂ -N	Soil extract	
Total Nitrogen	<i>Two-stage oxidative digestion to nitrate</i>					<i>EN ISO 29441</i>	
0.05 mg/l	0.05	...	1	mg/l	TN	Water / Wastewater /	
	0.5	...	20	mg/l	TN	Soil extract	
Organic acids	<i>Hydroxamate after esterification</i>						
3 mg/l	0.2	...	1	g/l	Acetic acid	Water / Wastewater	
	0.5	...	10	g/l	Acetic acid		

Method	<i>Analytical principle</i>					<i>Relation to standards</i>
Quantification limit	Calibration ranges					Applicable to <Remarks>
Orthophosphate	<i>Phosphomolybdenum blue</i>					<i>ISO 15681</i>
0.005 mg/l	0.02	...	2	mg/l	o-PO ₄ -P	Water / Wastewater / Soil extract <also UM N/P>
	0.2	...	10	mg/l	o-PO ₄ -P	
	0.5	...	20	mg/l	o-PO ₄ -P	
0.003 mg/l	0.02	...	1	mg/l	o-PO ₄ -P	Water / Wastewater / <combination with total phosphorus>
	0.2	...	10	mg/l	o-PO ₄ -P	
0.005 mg/l	0.01	...	0.5	mg/l	o-PO ₄ -P	Water / Wastewater <reduction with ascorbic acid at 60 °C>
	0.2	...	10	mg/l	o-PO ₄ -P	
	0.5	...	50	mg/l	o-PO ₄ -P	
0.01 mg/l	0.05	...	2	mg/l	o-PO ₄ -P	Water / Wastewater / <combination with total phosphorus> ascorbic acid method>
	0.5	...	10	mg/l	o-PO ₄ -P	
Orthophosphate	<i>Phosphomolybd. blue (PMB) with solid-phase enrichment of PMB</i>					<i>DIN EN ISO 15681</i>
0.0005 mg/l	0.001	...	0.02	mg/l	o-PO ₄ -P	Drinking water / Surface water
	0.005	...	0.10	mg/l	o-PO ₄ -P	
Phenol Index	<i>Polymethine dye with liquid/liquid extraction</i>					<i>DIN EN ISO 14402</i>
0.005 mg/l	0.01	...	0.5	mg/l	Phenol	Water / Wastewater
	0.2	...	10	mg/l	Phenol	
	<i>Without liquid/liquid extraction</i>					
0.01 mg/l	0.05	...	5	mg/l	Phenol	Destillates
	1	...	25	mg/l	Phenol	
Total Phosphor	<i>Oxidative + hydrolytic digestion to orthophosphate phosphomolybdenum blue</i>					<i>ISO 15681</i>
0.05 mg/l	0.1	...	5	mg/l	TP	Water / Wastewater / Soil extract
	1	...	20	mg/l	TP	
Total Phosphor	<i>Oxidative + hydrolytic digestion to orthophosphate with solid-phase enrichment of phosphomolybdenum blue</i>					<i>ISO 15681</i>
0.005 mg/l	0.01	...	0.2	mg/l	TP	Drinking water / Surface water
	0.05	...	0.5	mg/l	TP	

Method	<i>Analytical principle</i>					<i>Relation to standards</i>
Quantification limit	Calibration ranges					Applicable to <Remarks>
Silicate	<i>Silicomolybdenum blue</i>					<i>ISO 16264</i>
0.02 mg/l	0.2	...	10	mg/l	SiO ₂	Water / Wastewater
	1	...	50	mg/l	SiO ₂	
Silicate	<i>Silicomolybdenum blue with thermoreactor (37 / 60 °C)</i>					<i>ISO 16264</i>
0.08 mg/l (37°C)	0.025	...	1	mg/l	SiO ₂	Water / Wastewater
0.007 mg/l (60°C)	0.2	...	10	mg/l	SiO ₂	
	0.5	...	20	mg/l	SiO ₂	
	1	...	50	mg/l	SiO ₂	
Sulfate	<i>Methylthymol blue</i>					<i>ISO 22743</i>
3 mg/l	5	...	50	mg/l	SO ₄	Water / Wastewater
	20	...	200	mg/l	SO ₄	
Sulfate	<i>Turbidimetric (BaSO₄)</i>					
2 mg/l	5	...	100	mg/l	SO ₄	Water / Wastewater / Soil extract
	20	...	200	mg/l	SO ₄	
Sulfide	<i>Methylene blue</i>					<i>anal. DIN 38405 Part 26</i>
0.02 mg/l	0.1	...	2	mg/l	S ²⁻	Water / Wastewater / <without H ₂ S gas transfer>
	0.5	...	10	mg/l	S ²⁻	
Sulfide	<i>Methylene blue</i>					<i>anal. DIN 38405 Part 26</i>
0,02 mg/l	0.05	...	2	mg/l	S ²⁻	Water / Wastewater / <samples processed using LACHAT Micro Dist>
	0.2	...	10	mg/l	S ²⁻	
Dissolved Sulfide	<i>Gas transfer with enrichment; Methylene blue</i>					<i>analog DIN 38405 Part 26</i>
0.008 mg/l	0.02	...	1	mg/l	S ²⁻	Water / Wastewater / Landfill leachate
	0.05	...	2	mg/l	S ²⁻	
	0.1	...	5	mg/l	S ²⁻	
	0.2	...	10	mg/l	S ²⁻	
Free Sulfite	<i>DTNB with gas transfer of SO₂</i>					
1 mg/l	2	...	50	mg/l	FSO ₂	Beverages
	10	...	150	mg/l	FSO ₂	

Method	<i>Analytical principle</i>	<i>Relation to standards</i>
Quantification limit	Calibration ranges	Applicable to <Remarks>

Total Sulfit

*DTNB
with dialysis of the
detection product*

1	mg/l	10 ... 250 20 ... 500	mg/l mg/l	TSO ₂ TSO ₂	Beverages
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Tensides anion.

*Methylene blue
liquid/liquid extraction*

DIN EN ISO 16265

< 0.02	mg/l	0.02 ... 1 0.2 ... 5	mg/l mg/l	MBAS MBAS	Water / Wastewater
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Urea

Dimethylaminobenzaldehyde

0,005	g/l	0.01 ... 0.5 0.1 ... 5 0.2 ... 10	g/l g/l g/l	N N N	Fertilizer
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Remarks

In general, two adjacent measurement ranges can be installed without need modifications on the analyser.

The limit of quantitation (Limit of determination) corresponds to C.V. = 10 % (IUPAC Recommendation 1995).

Universal Manifold **N/P** for Water and Soil Analysis