

AQUANAL®

 **Fluka**
Riedel-deHaën®

Complete Solutions for **Professional
Water Analysis**

AQUANAL®-Photometer

AQUANAL®-professional

AQUANAL®-plus

AQUANAL®-Compact Labs

QUANTOFIX®-Test Sticks
and Test Kits



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Content

- 04 **AQUANAL®-Product Lines**
- 05 **AQUANAL® and QUANTOFIX®**
Products Quick Look-up Table
- 08 **Water Quality Parameters and
Water-Born Substances**
- 09 **Photometers**
AQUANAL®-professional SPECTRO 1000
AQUANAL®-plus SPECTRO 2
AQUANAL®-SPECTRO 3
- 12 **AQUANAL®-professional**
AQUANAL®-professional Reagents
AQUANAL®-professional Vario H
Reagents and Powder Packs
AQUANAL®-professional Tube Tests
- 18 **AQUANAL®-plus**
AQUANAL®-plus Tests Kits
AQUANAL®-plus Vario Case
- 20 **AQUANAL®-plus Photometer for
Special Applications**
AQUANAL®-plus SPECTRO Turbidity
AQUANAL®-plus SPECTRO Hazen
(yellow coloration)
AQUANAL®-plus SPECTRO COD
(organic pollutants)
- 22 **AQUANAL®-Compact Labs**
AQUANAL®-Ökotest Water Laboratory
AQUANAL®-Fishwaterlab
AQUANAL®-plus Compact Lab
AQUANAL®-EduCase
AQUANAL®-Pool Tester
AQUANAL®-plus Analytical Case
for Building Restoration
- 27 **QUANTOFIX®-Test Sticks and Test Kits**



Water purity is important to many manufacturing and environmental processes. AQUANAL® products were developed to provide reliable, fast water purity analysis.

You can rely on Sigma-Aldrich for Technical Assistance in choosing and using your AQUANAL® or QUANTOFIX® product. For Technical Assistance, please E-mail us at aquanal@sial.com or contact:

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AQUANAL® Sigma-Aldrich's premiere line of kits and reagents designed for fast and easy analysis of many different substances in water.

About AQUANAL®

The AQUANAL® family comprises ready-to-use test kits (photometric, colorimetric or titrimetric), as well as compact labs and photometers for the rapid analysis of natural, drinking, feed, process and waste waters. Detailed instructions make it simple to use for both laboratory and field applications. AQUANAL® products are backed by Sigma-Aldrich's reputation for quality, service and support.

What are the principles behind AQUANAL®?

AQUANAL® tests rely on simple, well characterized chemical reactions that form colored compounds as products. If any of the reactants are missing, the color change does not occur. Because the color change is stoichiometric, the intensity of the color correlates to the concentration of the reactants. The test procedure behind AQUANAL® is also straightforward:

1. Measure a defined volume of your water sample (some samples may require dilution)
2. Add the AQUANAL® reagents that are specified for the substances you want to measure
3. A rapid color change occurs if the targeted substances are present
4. Determine the concentration of the target substance using a color chart or photometer

Because the intensity of the color change correlates to the concentration of the target substances, AQUANAL® permits reliable quantification of the targeted substances over a wide range of concentrations in the water sample.

What types of substances in water can be analyzed using AQUANAL®?

Water has been called a universal solvent, and as a result can contain a vast array of substances. AQUANAL® can be used to analyze:

- Anorganic cations and anions, including nitrate, nitrite, orthophosphate and more
- Total-P, Total-N
- Ammonia
- Metals
- Certain organic substances
- Hardness
- Acid and basic capacity and pH
- COD (chemical oxygen demand)

What types of water samples can be analyzed?

AQUANAL® is compatible with nearly all types of water samples, including:

- Drinking water
- Aquarium water
- Pool water
- Waste water
- Spring water
- Mineral (bottled) water
- Natural waters in lakes, ponds and rivers
- Water from industrial processes

What types of water samples are difficult to analyze with AQUANAL®?

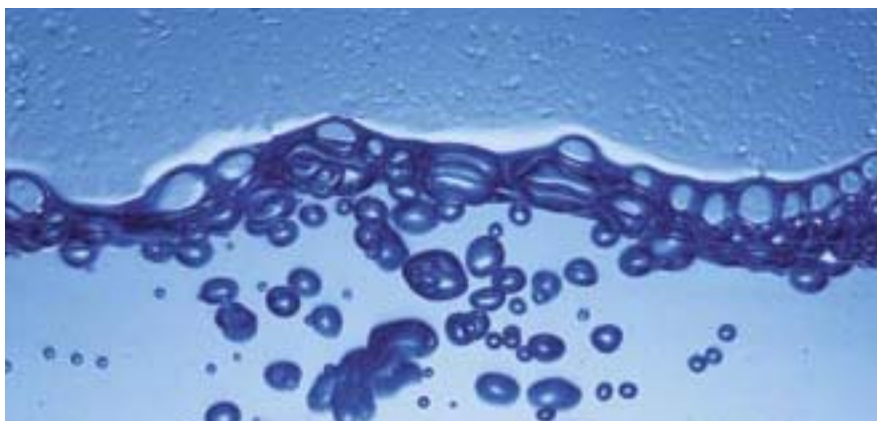
AQUANAL® may not give reliable results for water samples with high ionic strength (e.g. sea water), very high or low pH values (<pH4 or >pH 11) and strongly colored water. Samples with suspended particles need to be filtered.

Who currently uses AQUANAL®?

Water purity is important to nearly every manufacturing, environmental, industrial, government and research organization. AQUANAL® was designed to meet the demands of professional and educational water analysis in many different application areas, including:

- Chemical companies
- Waste water treatment plants
- Bottled water suppliers
- Fire companies and other emergency responders
- Government
- Aquaculture
- Food and Beverage companies
- Environmental organizations
- Schools and Universities
- Pharmaceutical companies
- Electrical utilities
- Hobbyists interested in water analysis

AQUANAL®-Product Lines Each of the AQUANAL® product lines was designed specifically for the analysis of a particular substance, substances or water quality parameter, source water, application, or to be used with a particular brand or model of photometer.



AQUANAL® products are backed by sound analytical chemistry following methods developed by national and international agencies, like ASTM, APHA, EPA, DIN and others.

AQUANAL®-plus: Versatility

The AQUANAL®-plus product line consists of tube test kits with the corresponding refill packs, liquid and powder reagents, standard (check) solutions and accessories for on-the-spot analysis of nearly forty different substances in water samples. The analysis can be done by using the color chart included in the test kit, or the SPECTRO 2 or SPECTRO 3 Photometers. Combine frequently-used analyses with the AQUANAL®-plus Vario Case that comes with your choice of four or five different test kits.

AQUANAL®-plus Photometer: Special applications

These three AQUANAL®-plus tests utilize photometric methods to evaluate levels of turbidity, yellowness or organic pollutants in water samples.

- AQUANAL®-plus SPECTRO Turbidity: Measures light scattering as an indication of turbidity.
- AQUANAL®-plus SPECTRO Hazen: Used for the visual measurement of the color of essentially clear to light yellow liquids using the platinum-cobalt color scale.
- AQUANAL®-plus SPECTRO COD: Oxidation by dichromate ion provides a rapid indication of organic pollutants in water.

AQUANAL®-Compact Labs: Convenience

Compact Labs are collections of test kits, reagents, photometers and other accessories that provide all you need to perform detailed analysis of specific types of water samples.

- AQUANAL®-plus Compact Lab – For measurement of seventeen pollutants in drinking water.
- AQUANAL®-Ökotest Water Laboratory – For six common water measurements useful for scouting and educational purposes.
- AQUANAL®-Fishwater Lab – Measures water quality parameters important to aquariums and aquaculture.
- AQUANAL®-EduCase – A titration kit that teaches how to measure important water quality parameters.
- AQUANAL®-Pool Tester – Measures both pH and chlorine levels.
- AQUANAL®-plus Analytical Case for Building Restoration – Measures the presence of minerals that can cause or indicate damage to masonry buildings.

AQUANAL®-professional:

Ease of handling in Tablet or Powder formats

The new AQUANAL®-professional product line of kits, reagents and instruments offers many choices for the determination of impurities in water. Most are tablet tests (as opposed to tube tests) that guarantee easy handling. They are especially useful for routine laboratory use, as in a waste water treatment plant. They speed up work in the laboratory, providing safe and clean working at the same time. Optimal results can be achieved with the SPECTRO 3 or SPECTRO 1000 Photometers.

QUANTOFIX®-Test Sticks and Test Kits: Speed

While AQUANAL® products provide quantitative analytical measurements, QUANTOFIX® Test Sticks are for fast, semi-quantitative determination of substances in water samples. A quick dip of the QUANTOFIX® Test Stick in the water sample provides almost instant reading without additional reagents or equipment.

AQUANAL® and QUANTOFIX® Products Quick Look-up Table

Parameter	Group	Name	Measuring range	Cat. No.	Color chart	Spectro 2	Spectro 3	Spectro 1000	Titration	Photo-meter	Test sticks
Alkalinity	Prof	Alkalinity-m (mg/L CaCO ₃)	5-200 mg/L	70054	-	-	+	+	-	-	-
	Prof	Alkalinity-p (mg/L CaCO ₃)	5-300 mg/L	70056	-	-	+	+	-	-	-
	Plus	Basic capacity	0.1 mL = 1 mmol/L	37414	-	-	-	-	+	-	-
	Plus	Acid capacity	0.1 mL = 1 mmol/L	37415	-	-	-	-	+	-	-
Aluminum	Plus	Aluminum	0.02-0.2 mg/L	37425	+	+	+	-	-	-	-
	Vario	Aluminum (Set) 10 mL	0-0.22 mg/L	70436	-	-	+	-	-	-	-
	QUANTOFIX®	Aluminum	5-500 mg/L	37207	-	-	-	-	-	-	+
Ammonium	Prof	Ammonium	0.02-1 mg/L	70057 70059	-	-	+	+	-	-	-
	Plus	Ammonium	0.2-8.0 mg/L	37400	+	+	+	-	-	-	-
	Prof	Ammonium tube test	0.01-50 mg/L	37739	-	+	+	+	-	-	-
	Vario	Ammonium low (Set) 10 mL	0-0.50 mg/L	70226	-	-	+	-	-	-	-
	Vario	Ammonium low (Set) (tube test) 5 mL	0-2.5 mg/L	70434	-	-	+	-	-	-	-
	Vario	Ammonium high (Set) (tube test) 5 mL	0-50 mg/L	70423	-	-	+	-	-	-	-
	QUANTOFIX®	Ammonium	10-400 mg/L	37212	-	-	-	-	-	-	+
APHA	Plus	Hazen/APHA	0-500 mg/L Pt	70109	-	-	-	-	-	+	-
Arsenic	QUANTOFIX®	Arsenic	0.010-0.5 mg/L	37927	-	-	-	-	-	-	+
Ascorbic acid	QUANTOFIX®	Ascorbic acid	50-2000 mg/L	37203	-	-	-	-	-	-	+
Bromine	Prof	Bromine	0.1-3 mg/L	70061 70062	-	-	+	+	-	-	-
	Prof	Bromine	0.1-4.5 mg/L	70063 70066	-	-	+	+	-	-	-
	Plus	Bromine	0.02-1.0 mg/L	37432	+	+	+	-	-	-	-
Chloride	Plus	Chloride	5-300 mg/L	37401	+	+	+	-	-	-	-
	Prof	Chloride	5.0-60 mg/L	70071	-	-	+	+	-	-	-
Chlorine	Prof	Chlorine	0.05-1.5 mg/L	70061 70062 70064	-	-	+	+	-	-	-
	Prof	Chlorine	0.05-5 mg/L	70063 70066 70067	-	-	+	+	-	-	-
	Plus	Chlorine	0.01-0.30 mg/L	37419	+	+	+	-	-	-	-
	Vario	Chlorine 10 mL	0.01-2 mg/L	70112	-	-	-	+	-	-	-
	Vario	Chlorine 25 mL	0-5 mg/L	70113	-	-	-	+	-	-	-
	Vario	Chlorine total 10 mL	0.01-2 mg/L	70200	-	-	+	-	-	-	-
	Vario	Chlorine total 25 mL	0-5 mg/L	70202	-	-	+	-	-	-	-
Chromium	Prof	Chlorine high	5-200 mg/L	70068 70070	-	-	+	+	-	-	-
	QUANTOFIX®	Chlorine	1 -100 mg/L	37208	-	-	-	-	-	-	+
	Plus	Chromium	0.005-0.10 mg/L	37402	+	+	+	-	-	-	-
Chromium	Prof	Chromium	0.005-0.5 mg/L	70454 70455	-	-	+	+	-	-	-
	QUANTOFIX®	Chromate	3-100 mg/L	37209	-	-	-	-	-	-	+

Parameter	Group	Name	Measuring range	Cat. No.	Color chart	Spectro 2	Spectro 3	Spectro 1000	Titration	Photo-meter	Test sticks	
Cobalt	QUANTOFIX®	Cobalt	10-1000 mg/L	37199	-	-	-	-	-	-	+	
COD	Plus	Spectro COD		37570	-	-	-	-	-	+	-	
	Prof	COD tube test	2-40mg/L	37735	-	+	+	-	-	-	-	
	Prof	COD tube test	10-150 mg/L	37736	-	+	+	+	-	-	-	
	Prof	COD tube test	100-1500 mg/L	37737	-	+	+	+	-	-	-	
	Prof	COD tube test	1000-15000 mg/L	37738	-	+	+	+	-	-	-	
Copper	QUANTOFIX®	Copper	10-1000 mg/L	37198	-	-	-	-	-	-	+	
	Vario	Copper 10 mL	0-5 mg/L	70203	-	-	+	-	-	-	-	
	Plus	Copper	0.05-4.5 mg/L	37424	+	+	+	-	-	-	-	
	Prof	Copper	0.5-5 mg/L	70085 70086	-	-	+	+	-	-	-	
Cyanide	Plus	Cyanide	0.03-0.7mg/L	37403	+	+	+	-	-	-	-	
Cyanide/ Thiocyanate	Plus	Cyanide/ Thiocyanate	0.03-0.7 mg/L	37420	+	+	+	-	-	-	-	
DEHA (N,N-Diethyl hydroxylamine)	Prof	DEHA	0.02-0.5 mg/L	70104 70073	-	-	+	+	-	-	-	
	Fluoride	Prof	Fluoride	0.02-1.5 mg/L	70081 70083	-	-	+	+	-	-	-
QUANTOFIX®		Fluoride	2-100 mg/L	37211	-	-	-	-	-	-	+	
Gold	Plus	Gold	0.1-3.0 mg/L	37537	-	+	+	-	-	-	-	
Hazen	Plus	Hazen/APHA	0-500 mg/L Pt	70109	-	-	-	-	-	+	-	
Hydrazine	Plus	Hydrazine	0.02-1.0 mg/L	37433	+	+	+	-	-	-	-	
Iron	Plus	Iron	0.2-15 mg/L	37404	+	+	+	-	-	-	-	
	Plus	Iron	0.02-0.2 mg/L	37421	+	+	+	-	-	-	-	
	Prof	Iron	0.1-1 mg/L	70076 70077	-	-	+	+	-	-	-	-
		Vario	Iron (Phenanthro- line) 10 mL	0-3 mg/L	70205	-	-	+	-	-	-	-
	Vario	Iron (TPTZ)	0.1-8 mg/L	70204	-	-	+	-	-	-	-	
Magnesium	Plus	Magnesium	100-1500 mg/L	37426	+	+	+	-	-	-	-	
Manganese	Plus	Manganese	0.03-0.5 mg/L	37406	+	+	+	-	-	-	-	
	Prof	Manganese	0.05-4 mg/L	70087 70088	-	-	+	+	-	-	-	
		Vario	Manganese (Set) high 10 mL	0 -20 mg/L	70206	-	-	+	-	-	-	-
	Vario	Manganese (Set) low 10 mL	0-0.7 mg/L	70441	-	-	+	-	-	-	-	
Molybdate	Vario	Molybdate high (Set) 10 mL	0-35 mg/L	70209	-	-	+	-	-	-	-	
	Vario	Molybdate high (Set) 25 mL	0-35 mg/L	70426	-	-	+	-	-	-	-	
	Prof	Molybdate	0.5-30 mg/L	70089 70091	-	-	+	+	-	-	-	
Nickel	Plus	Nickel	0.02-0.5 mg/L	37407	+	+	+	-	-	-	-	
	Prof	Nickel	0.2-7 mg/L	70106	-	-	+	+	-	-	-	
	QUANTOFIX®	Nickel	10-1000 mg/L	37197	-	-	-	-	-	-	+	
Nitrate	Plus	Nitrate	5-140 mg/L	37408	+	+	+	-	-	-	-	
	Plus	Nitrate	1-50 mg/L	37409	+	+	+	-	-	-	-	
	Prof	Nitrate tube test	0.5-14 mg/L	70107	-	-	+	+	-	-	-	
	Vario	Nitrate tube test	0-30 mg/L	70431	-	-	+	-	-	-	-	
	QUANTOFIX®	Nitrate/Nitrite	10-500 mg/L NO ₃ ⁻ 1-80 mg/L NO ₂ ⁻	37204	-	-	-	-	-	-	+	
	Nitrite	Plus	Nitrite	0.005-0.1 mg/L	37410	+	+	+	-	-	-	-
Vario		Nitrite 10 mL	0-0.3 mg/L	70219	-	-	+	-	-	-	-	
Vario		Nitrite 25 mL	0-0.3 mg/L	70218	-	-	+	-	-	-	-	
Prof		Nitrite tube test	0.03-3 mg/L	37741	-	+	+	+	-	-	-	
QUANTOFIX®		Nitrate / Nitrite	10-500 mg/L NO ₃ ⁻ 1-80 mg/L NO ₂ ⁻	37204	-	-	-	-	-	-	+	
QUANTOFIX®		Nitrite	0-80 mg/L	37205	-	-	-	-	-	-	+	

Parameter	Group	Name	Measuring range	Cat. No.	Color chart	Spectro 2	Spectro 3	Spectro 1000	Titration	Photo-meter	Test sticks
Nitrogen	Vario	Nitrogen (Set) high (tube test)	0-50.0 mg/L	70423	-	-	+	-	-	-	-
	Vario	Nitrogen total high (tube test)	10-150 mg/L	70412	-	-	+	-	-	-	-
	Vario	Nitrogen total low (tube test)	0-25 mg/L	70411	-	-	+	-	-	-	-
	Prof	Nitrogen tube test	0.5-140 mg/L	70108	-	-	+	+	-	-	-
Oxygen	Plus	Oxygen	1-12 mg/L	37428	+	+	+	-	-	-	-
Oxygen Scavenger	Plus	Oxygen Scavenger (DEHA)	0.2-3.0 mg/L	37418	-	-	+	-	-	-	-
Ozone	Prof	Ozone	0.1-1 mg/L	70061	-	-	+	+	-	-	-
				70062							
				70064							
				70093							
Peroxide	Plus	Peroxide	1-30 mg/L	37434	+	+	+	-	-	-	-
	Prof	Peroxide	0.5-1.5 mg/L	70102	-	-	+	+	-	-	-
	QUANTOFIX®	Peroxide	1-100 mg/L	37206	-	-	-	-	-	-	+
Phenols	Plus	Phenols	0.1-3.0 mg/L	37427	+	+	+	-	-	-	-
Phosphate	Plus	Phosphate	0.02-0.4 mg/L	37411	+	+	+	-	-	-	-
	Plus	Phosphate	3-120 mg/L	37423	+	+	+	-	-	-	-
	Prof	Phosphate tube test	0.07-3 mg/L	37743	-	+	+	+	-	-	-
	Prof	Phosphate tube test	5.0-60 mg/L	37744	-	+	+	+	-	-	-
	Vario	Phosphate ortho 10 mL	0.2-5 mg/L	70229	-	-	+	-	-	-	-
	Prof	Phosphate ortho	0.05-4 mg/L	70245 70095	-	+	+	+	-	-	-
Prof	Phosphate ortho tube test	3.0-60 mg/L	37745	-	+	+	+	-	-	-	
QUANTOFIX®	Phosphate	3-100 mg/L	37210	-	-	-	-	-	-	+	
pH-value/ Chlorine	QUANTOFIX®	Pooltester	0.1-6.0 mg/L Cl ₂ 6.8-8.2 pH	37546	+	-	-	-	-	-	-
Potassium	QUANTOFIX®	Potassium	200-1500 mg/L	37202	-	-	-	-	-	-	+
	Prof	Potassium	0.5-12 mg/L	70456	-	-	+	+	-	-	-
Residual hardness	Plus	Residual hardness	1 drop = 0.01°dH	37417	-	-	-	-	+	-	-
Silica	Plus	Silicon	0.02-0.25 mg/L	37412	+	+	+	-	-	-	-
	Prof	Silica (as SiO ₂)	0.05-3 mg/L	70096	-	-	+	+	-	-	-
				70097							
				70453							
	Vario	Silica high 10 mL	0-100 mg/L	70232	-	-	+	-	-	-	-
	Vario	Silica low 10 mL	0-1.6 mg/L	70417	-	-	+	-	-	-	-
Vario	Silica ultra high 25 mL	0-200 mg/L	70239	-	-	+	-	-	-	-	
Silver	Plus	Silver	0.1-1.0 mg/L	37538	-	+	+	-	-	-	-
	Ag-Fix®	Silver/ pH-value	0-10 g/L Ag ⁺ 6-8 pH	37196	-	-	-	-	-	-	+
Sulfate	Plus	Sulfate	40-500 mg/L	37429	+	+	+	-	-	-	-
	Vario	Sulfate 10 mL	0-70 mg/L	70421	-	-	+	-	-	-	-
	Vario	Sulfate 25 mL	0-70 mg/L	70244	-	-	+	-	-	-	-
	QUANTOFIX®	Sulfate	200-1600 mg/L	37213	-	-	-	-	-	-	+
Sulfide	Plus	Sulfide	0.03-0.8 mg/L	37430	+	+	+	-	-	-	-
	Prof	Sulfide	0.04-0.5 mg/L	70098 70101	-	-	+	+	-	-	-
Sulfite	Plus	Sulfite	0.1 mL = 10 mg/L	37435	-	-	-	-	+	-	-
	Prof	Sulfite	0.1-10 mg/L	70457	-	-	+	+	-	-	+
	QUANTOFIX®	Sulfite	10-1000 mg/L	37201	-	-	-	-	-	-	+
Tin	Plus	Tin	0.1-1.2 mg/L	37436	+	+	+	-	-	-	-
	QUANTOFIX®	Tin	10-500 mg/L	37195	-	-	-	-	-	-	+

Parameter	Group	Name	Measuring range	Cat. No.	Color chart	Spectro 2	Spectro 3	Spectro 1000	Titration	Photo-meter	Test sticks
Total hardness	AQUADUR®	Total hardness	3-21°dH	37194	-	-	-	-	-	-	+
	Prof	Total hardness (mg/L CaCO ₃)	2.0-50 mg/L	70084	-	-	+	+	-	-	-
	Plus	Total hardness (°dH)	1 drop = 1°dH	37416	-	-	-	-	+	-	-
Turbidity	Plus	Spectro Turbidity	0.1-2000 NTU	70034	-	-	-	-	-	+	-
	Plus	2 secondary standards	1, 10 NTU	70036	-	-	+	-	-	-	-
	Plus	2 secondary standards	100, 1000 NTU	70037	-	-	+	-	-	-	-
	Plus	4 secondary standards	1, 10, 100, 1000 NTU	70110	-	-	+	-	-	-	-
Zinc	Plus	Zinc	0.02-0.2 mg/L	37539	-	+	+	-	-	-	-
	Plus	Zinc	0.1-5.0 mg/L	37413	+	-	-	-	-	-	-
	Prof	Zinc	0.02-1 mg/L	70103 70105 70104	-	-	+	+	-	-	-

Some Water Quality Parameters and Water-Born Substances

Ammonia / Ammonium (NH₃⁺ / NH₄OH)

are produced in the decomposition of substances containing nitrogen (manure, humus) in low-oxygen conditions. The two compounds exist in a pH-dependent aqueous equilibrium. Nitrogen is an indicator of water quality. Too much nitrogen can lead to rapid growth of microorganisms and an imbalance in the water source. While ammonia at low concentrations is not dangerous for people and is a fertilizer for plants, it is toxic to fish.

Calcium (Ca²⁺) is the main hardness constituent; its concentration is about four to five times as high as that of magnesium. Calcium determination is by titration with EDTA. Subtracting calcium concentration from total hardness yields magnesium concentration.

Carbonate hardness is part of total hardness; it denotes the proportion of calcium and magnesium ions which is present in solution as carbonate and hydrogen carbonate. Carbonate hardness is also known as temporary hardness. It is determined by titration with hydrochloric acid; the end point of titration is indicated by the Cooper's

indicator. Carbonate hardness is a measure of the sensitivity of the water to pH variations and is especially important in aquarium management and aquaculture.

Chloride (Cl⁻) enters ground and surface waters by washing out of salts in soil and rocks. It is determined by means of a precipitation titration with silver nitrate.

Hardness is a measure of the inorganic cations (mostly from calcium and magnesium) dissolved in the water. It is often measured in units of degrees of hardness (°dH) or in mg/L CaCO₃. Total hardness is determined by titration with EDTA. Total hardness is important in assessment of water for aquarium and fish breeding purposes as well as for dosing of detergents. Hard water is evident in the white, scaly deposit seen in pipes and other equipment that are exposed to it. Even very hard water generally poses little threat to biological life, but it can interfere with chemical processes and cause clogging of pipes and tubing. Some units of hardness and their relationships are:

$$1^{\circ}\text{dH} = 1.25^{\circ}\text{e} = 1.78^{\circ}\text{f} = 17.8^{\circ}\text{US} = 17.8 \text{ mg/L CaCO}_3$$

Iron (Fe²⁺, Fe³⁺) is an important substance for many biological processes. It is required for the production of hemoglobin, the primary oxygen-carrying protein in vertebrates. But it can be dangerous for the entire fish population if it precipitates out in oxygen-depleted water. If this occurs, the gills become blocked impairing oxygen uptake leading to suffocation. Young fish are particularly vulnerable.

Nitrogen is mainly found as nitrite, nitrate and ammonia. These compounds are important in terms of water treatment and waste water technology. Depending on the prevailing conditions (i.e., low or high oxygen values), their concentrations fluctuate. Total Nitrogen is also determined to check the influence of the pH-value or the oxygen concentration.

Nitrate (NO₃⁻) is a naturally occurring ion derived from both animal (manure) and green plant sources. As rain water flows over the earth, nitrate enters surface and ground waters. Algae thrives on high nitrate levels, and a high nitrate concentration can lead to over-fertilization and eutrophication, oxygen depletion and finally to the "death" of a body of water.

Nitrite (NO₂⁻) is an indicator of serious water pollution. In pure, healthy water, nitrite is never present. Nitrite exists as an intermediate of natural decomposition and conversion processes of ammonium and nitrate. It indicates insufficient quality in the water necessary for fish. In large quantities, nitrite can pose a danger to humans, particularly infants, since it impedes oxygen uptake in the blood (cyanosis).

Oxygen (O₂) dissolved in water is essential for respiration in marine animals. The amount dissolved oxygen depends on the temperature and the presence of organisms in the water, among other factors. Oxygen enters the water by way of diffusion from the air and through photosynthesis of green aquatic plants. Oxygen concentration is determined by titration with sodium thiosulphate solution against starch solution.

Phosphate (PO₄³⁻) can enter the ground water from fertilizers and phosphate-containing cleaning agents. Like nitrates, phosphate promotes the growth of plants and, in high concentrations, can lead to an imbalance in a body of water and eutrophication. Total phosphate includes both organic and inorganic phosphate compounds. This determination requires the use of a decomposition reaction. All of these forms should be included in the study of process water. The tests yield the concentrations of phosphate, then a factor is used to calculate the concentration of phosphorus.

pH value is a measure of the alkalinity or acidity of water and is influenced by many of the substances dissolved in the water. On the pH scale where a pH of 0 is strongly acidic, a pH of 7 is neutral and a pH of 14 is strongly alkaline, drinking water should have a pH value between 6.5 and 8.5. A pH-value of 6.0 to 8.0 is normal for fish-sustaining waters. Values outside this range can result in diminished growth, skeletal deformities, skin and gill damage, and possibly the death of the entire fish population.

AQUANAL® Photometer

For quantitative photometric detection, the quality of the photometer is critical to the accuracy and reliability of the analytical results. Since the level of the substances to be measured in the water often forms the basis for important decisions, it is necessary to use a photometer that is designed specifically for water analysis. Sigma-

Aldrich's AQUANAL® Photometers were designed for this purpose alone. Choose the AQUANAL® Photometer based on the requirements of the AQUANAL® test you are performing.

AQUANAL®-professional SPECTRO 1000 Photometer

SPECTRO 1000 is a modern single-beam spectrophotometer with an excellent price/performance ratio that was specially designed for water testing. It is ideal for use in water and waste water analysis and can also be used with a wide range of other applications. The unit is equipped with a wide spectrum of pre-programmed methods based on the proven range of tablet reagents and liquid reagents. Besides all AQUANAL®-professional Tests, routine analysis made in rectangular cuvettes (from 1 cm to 5 cm) or in tubes (16 mm or 24 mm diameter) can be performed using the SPECTRO 1000. All results can be exported to your PC.



Picture AQUANAL®-professional
SPECTRO 1000 Photometer

Technical Support: aquanal@sial.com

How it works

The SPECTRO 1000 light source is a tungsten halogen lamp with flash function. The lamp is switched on only momentarily for the duration of the measurement process and there is therefore no need for a warm-up period. The light passes through an entry slot onto the mono-chromator, where it is split into spectral ranges. The monochromator is a holographically produced, transparent grating. A movable mirror ensures that light of the desired wavelength is automatically focused in such a way that it passes through the exit slot into the sample chamber. The light that is not absorbed by the sample travels to the detector of a silicon photodiode, evaluated by a microprocessor and shown as a result in the display.

Multifunctional Sample Chamber

Round vials measuring 16 mm and 24 mm in diameter and rectangular cells with path lengths from 10 to 50 mm may be used without an adapter.

Choice of Language

You can choose English, German or French.

Printer or PC connections

The SPECTRO 1000 has an RS232 interface with a 9-pin D-Sub connector for connection to a PC or printer with serial interface.

Power options

The required input voltage is 10 V. The SPECTRO 1000 is connected to an external power pack as standard. Battery operation is also possible through an adapter. Adapter required for US voltage use.

Data storage: SPECTRO 1000 allows storage of programmed and user-specific methods (polynomes) in a memory with a capacity of 760 data sets. Alongside the result, the data sets contain information on method, date and time of the test. Maintenance: The only maintenance that is required is replacement of the light source, situated on the rear of the photometer in an easily accessible position. Replacement is fast and simple and does not require any tools. The positioning of the assembly ensures optimum focusing of the halogen lamp.

Features of SPECTRO 1000 Photometer

- Wavelength scan from 330 to 900 nm
- For the determination of more than 50 water analyses parameters
- High accuracy and reproducibility
- Large graphic display
- Multiple measurement capabilities
- Easy use and maintenance

Table AQUANAL®-professional Spectro 1000

Cat. No.	Product
70012	AQUANAL®-professional Spectro 1000 Photometer
70016	AQUANAL®-professional Spectro 1000 light source preadjusted light source, replacement for Spectro 1000
70024	AQUANAL®-professional Spectro 1000 cable connection RS232 C, D9F-D25M for Spectro 1000
70026	AQUANAL®-professional Spectro 1000 cable for PC RS232 C, D9F-D25F for Spectro 1000
70027	AQUANAL®-professional Cylindric cell 24 mm 12 cylindric tubes diameter 24 mm, for Spectro 1000
70028	AQUANAL®-professional cylindric cell 16 mm 5 cylindric tubes diameter 16 mm, for Spectro 1000
70029	AQUANAL®-professional rectangular cell 10 mm optic glas for Spectro 1000, 2 pcs/pack
70032	AQUANAL®-professional rectangular cell 50 mm optic glas for Spectro 1000, 2 pcs/pack
70033	AQUANAL®-professional rectangular cell 10 mm QUARTZ-UV Glas for Spectro 1000, 2 pcs/pack

AQUANAL®-plus SPECTRO 2 Photometer



Picture AQUANAL®-SPECTRO 2 Photometer

The microprocessor-controlled LED hand-held AQUANAL®-plus SPECTRO 2 Photometer for rapid water analysis was specially designed to be used with AQUANAL®-plus Test Kits. It has 40 preinstalled calibration curves with capacity for 80 additional user-defined calibration curves. It is not suitable for AQUANAL®-professional tests and reagents.

The AC or battery-powered photometer has four light sources (480 nm, 565 nm, 585 nm and 635 nm) and is suitable for field use.

The SPECTRO 2 Photometer comes in two different package options and five different language options.

Table AQUANAL®-plus Spectro 2 Photometer
Product information

Cat. No.	Product	Description
37781	Spectro 2 for AQUANAL®-plus reagents	German menu (Package 1)
37782	Spectro 2 for AQUANAL®-plus reagents	English menu (Package 1)
37783	Spectro 2 for AQUANAL®-plus reagents	French menu (Package 1)
37784	Spectro 2 for AQUANAL®-plus reagents	Italian menu (Package 1)
37785	Spectro 2 for AQUANAL®-plus reagents	Spanish menu (Package 1)
37786	Spectro 2 for AQUANAL®-plus reagents	German menu (Package 2)
37787	Spectro 2 for AQUANAL®-plus reagents	English menu (Package 2)
37788	Spectro 2 for AQUANAL®-plus reagents	French menu (Package 2)
37789	Spectro 2 for AQUANAL®-plus reagents	Italian menu (Package 2)
37790	Spectro 2 for AQUANAL®-plus reagents	Spanish menu (Package 2)
37561	Spectro 2 tubes (5 pcs.)	Tube replacements

Package 1 (Cat. Numbers 37781-37785) comprises:

- SPECTRO 2 Photometer
- Two 20 mL sample tubes
- Two photometer tubes
- Small funnel
- Batteries (9V) 4x 1.5 V Mignon LR6
- Electrical mains adapter (230V); requires adapter for US voltage use
- Plastic box
- English, German, French, Spanish or Italian language menu display

Package 2 (Cat. Numbers 37786-37790) contains the same items as Package 1, but it also contains:

- Six photometer tubes
- Six 20 mL sample tubes
- Interface cable
- Software
- Blue plastic case

Features of SPECTRO 2 Photometer

- For use with AQUANAL®-plus kits and reagents
- Four light sources (480 nm, 565 nm, 585 nm and 635 nm)
- Extinction range: 0.000-2.000 Abs
- Electro-optical precision: 1% ± 2 digits for extinction range 0.100-1.000 Abs
- Test chamber for 16 mm tubes
- Test result displayed in mg/L or in extinction mode
- Automatic selection of the wavelength
- Automatic blank setting
- Comprehensive recognition of measurement faults
- Power-saving function, automatic power off
- Memory capacity for 120 calibration curves each with 11 calibration points
- Data memory for 50 readings/test results with data protection

AQUANAL®-plus SPECTRO 3 Photometer

A sophisticated solution for your water analysis. AQUANAL®-SPECTRO 3 Photometer can be used with both AQUANAL®-plus and AQUANAL®-professional reagents. Operations in UV and infrared spectral range are possible.

Features of SPECTRO 3 Photometer

- Built-in calibration curves for 100 determinations
- Combined LED and fibre-optic technology
- Spectral range: 380/430/470/500/520/560/610/700/810 nm
- Electro-optical accuracy: $\pm 1.5\%$
- Absorbance range: -0.500 to 3.500 Abs
- Test chamber for 16 mm tubes
- Software: operates with Windows 98 and higher versions

Picture

AQUANAL®-plus
SPECTRO 3 Photometer



- Data memory for 1000 results, with data protection
- History view – list of the latest 50 results
- GLP compliant (results given with time/date/place)
- Automatic blank setting
- Comprehensive recognition of measurement faults
- Power-saving function, automatic power off
- Test result displayed in mg/L or in extinction mode
- Automatic selection of the wavelength

For your convenience

Built-in user prompt in different languages (10 steps instructions) favourites – selection of the most frequently used curves language-selection (choice of six languages)

The SPECTRO 3 Photometer comes in this package:

- Spectro 3 photometer with software
- External power pack
- Four rechargeable batteries (1.5 V)
- Infrared interface
- Instruction manual
- Small funnel
- Six 16 mm diameter tubes
- Four 20 ml sample tubes
- Packed in one case

Table AQUANAL®-SPECTRO 3 Photometer Product List

Cat. No.	Product
70403	AQUANAL® Spectro 3 Photometer
37561	Refill 16 mm tubes, 5 pcs.

AQUANAL®-professional Reagent Tests

These products offer many choices for the determination of impurities in water. Although some reagents are solutions in liquid (tube tests), most are tablet tests for improved precision and easy handling. Optimal results can be achieved with the AQUANAL®-SPECTRO 3 or AQUANAL®-professional SPECTRO 1000 Photometers.

Advantages of AQUANAL®-professional:

- Easy to use
- Easy dosage tablet tests

- No sample preparation necessary
- Low sample volumes
- Little consumption of reagents
- Specific reactions
- Reproducible results

Liquid vs. Tablet reagents

Liquid reagents

Most tests that use liquid reagents use multiple solutions that need to be added to the sample in a particular sequence. The end-point of the reaction is easily overshoot if too many drops are added, or if the drop size (volume) is not consistent. Therefore,

extreme care must be taken to ensure the correct number of consistent-size drops is added. Solutions are also susceptible to degradation by oxygen and sunlight, evaporation, and have a generally shorter shelf-life than solids.

Tablets

Reagents in tablet form have none of the limitations of the liquid reagents described above. Each tablet contains a precise amount of the required substances (indicator, buffer, complexing agent, etc.). Tablets are spill-proof and provide a convenient way to eliminate the risk of incorrect dosage from the start. Most of the AQUANAL®-professional reagents are provided in tablet form.



Picture AQUANAL®-professional Liquid Reagents



Picture AQUANAL®-professional Tablet Reagents

Table AQUANAL®-professional Reagent Tests Product List

Determination of	AQUANAL®-professional reagents	Cat. No.	Method	Cuvette	Range	Reagent form
Alkalinity-m	Alka-m-Photometer	70054	Acid/Indicator	24 mm Ø	5-200 mg/L	Tablet/100
Alkalinity-p	Alka-p-Photometer	70056	Acid/Indicator	24 mm Ø	5-300 mg/L	Tablet/100
Ammonium	Ammonia No.1	70057	Salicylate	24 mm Ø	0.02-1 mg/L	Tablet/100
	Ammonia No. 2	70059				Tablet/100
Bromine	DPD No. 1	70061	DPD	50 mm Δ	0.05-1 mg/L	Tablet/100
	DPD No. 1 High Calcium	70062	(N,N-Diethyl-1,4-phenylenediamine)	10 mm Δ	0.1-3 mg/L	Tablet/100
				24 mm Ø	0.1-6.5 mg/L	
Bromine	DPD 1 buffer-solution	70063	DPD	24 mm Ø	0.1-4.5 mg/L	Liquid reagent/ 15 mL
	DPD 1 reagent-solution	70066	(N,N-Diethyl-1,4-phenylenediamine)			Liquid reagent/ 15 mL
Chlorine	DPD No. 1	70061	DPD	50 mm Δ	0.02-0.5 mg/L	Tablet/100
	DPD No. 1 High Calcium	70062	(N,N-Diethyl-1,4-phenylenediamine)	10 mm Δ	0.05-1.5 mg/L	Tablet/100
	DPD No. 3	70064		24 mm Ø	0.05-3 mg/L	Tablet/100
Chlorine	DPD 1 buffer-solution	70063	DPD	24 mm Ø	0.05-2 mg/L	Liquid reagent/ 15 mL
	DPD 1 reagent-solution	70066	(N,N-Diethyl-1,4-phenylenediamine)			Liquid reagent/ 15 mL
	DPD 3 solution	70067				Liquid reagent/ 15 mL
Chlorine high	Chlorine HR	70068	Potassium Iodide	16 mm Ø	5-200 mg/L	Tablet/100
	Acidifying GP	70070				tablet/ 100
Chlorine dioxide	DPD No. 1	70061	DPD	50 mm Δ	0.04-1 mg/L	Tablet/100
	DPD No. 1 High Calcium	70062	(N,N-Diethyl-1,4-phenylenediamine)	24 mm Ø	0.5-2.5 mg/L	Tablet/100
Chlorine dioxide	DPD 1 buffer-solution	70063	DPD	24 mm Ø	0.5-2.5 mg/L	Liquid reagent/ 15 mL
	DPD 1 reagent-solution	70066	(N,N-Diethyl-1,4-phenylenediamine)			Liquid reagent/ 15 mL
Chloride	Reagent Test	70071	Iron (III)-thiocyanate	24 mm Ø	5-60 mg/L	Liquid reagents/ 100 tests
Chromium	Persulfate reagent	70454	1,5-Diphenilcarbazine	50 mm Δ	0.005-0.5 mg/L	Powder pillows/100 tests
Chromium hexavalent	Persulfate reagent	70455		24 mm Ø	0.02-2 mg/L	Powder pillows/100 tests
COD	Tube test	37735	Dichromate/H ₂ SO ₄	16 mm Ø	2-40 mg/L	Tube test/150
COD	Tube test	37736	Dichromate/H ₂ SO ₄	16 mm Ø	10-150 mg/L	Tube test/25, 100 tests
COD	Tube test	37737	Dichromate/H ₂ SO ₄	16 mm Ø	100-1500 mg/L	Tube test/25, 100 tests
COD	Tube test	37738	Dichromate/H ₂ SO ₄	16 mm Ø	1000-15000 mg/L	Tube test/25, 100 tests
Copper	Copper No. 1	70085	Biquinoline	50 mm Δ	0.05-1 mg/L	Tablet/100
	Copper No. 2	70086		24 mm Ø	0.5-5 mg/L	Tablet/100
DEHA (N,N-Diethylhydroxylamine)	DEHA solution	70104	PPST	24 mm Ø	0.02-0.5 mg/L	Liquid reagent/ 100 mL
	DEHA	70073				Tablet/100
Iron (II, III)	Iron LR	70076	PPST	50 mm Δ	0.01-0.5 mg/L	Tablet/100
	Iron (II) LR	70077		10 mm Δ	0.1-1 mg/L	Tablet/100
				24 mm Ø	0.1-1 mg/L	

Determination of	AQUANAL®-professional reagents	Cat. No.	Method	Cuvette	Range	Reagent form
Fluoride	SPADNS-reagent	70081	SPADNS	24 mm Ø	0.02-1.5 mg/L	Liquid reagent/250 mL
	Fluoride – Standard	70083				Liquid reagent/30 mL
Hardness – Total	Hardcheck P	70084	Metal phtalein	24 mm Ø	2-50 mg/L	Tablet/100
Hazen (Pt-Co-scale; APHA)		70109	Direct Determination	50 mm Δ	0-500 mg/L	Photometer
Hydrogen Peroxide	Hydrogen Peroxide	70102	DPD (N,N-Diethyl-phenylenediamine)/ Catalizator	50 mm Δ	0.01-0.5 mg/L	Tablet/100
				24 mm Ø	0.5-1.5 mg/L	
Manganese	Manganese LR 1	70087	Formaloxime	24 mm Ø	0.05-4 mg/L	Tablet/100
	Manganese LR 2	70088				Tablet/100
Molybdate	Molybdate No. 1	70089	Thioglycolate	24 mm Ø	0.5-30 mg/L	Tablet/100
	Molybdate No. 2	70091				Tablet/100
Nickel	Reagent test	70106	Dimethylglyoxime	50 mm Δ	0.02-1 mg/L	Liquid reagent/50 tests
				24 mm Ø	0.2-7 mg/L	
Nitrate	Tube test	70107	2,6-Dimethylphenol	16 mm Ø	0.5-14 mg/L	Liquid reagent/25 tests
Nitrite	Tube test	37741	Sulfanil/Naphthylamine	16 mm Ø	0.3-3 mg/L	25 tests
Ozone	DPD No. 1	70061	DPD	50 mm Δ	0.02-0.5 mg/L	Tablet/100
	DPD No. 1 High Calcium	70062	(N,N-Diethyl-phenylenediamine)/	24 mm Ø	0.1-1 mg/L	Tablet/100
	DPD No. 3	70064	Glycine			Tablet/100
	DPD Glycine	70093				Tablet/100
Phosphate – Total	Tube test	37743	Phosphomolybdenum Blue/ Ascorbic Acid	16 mm Ø	0.07-3 mg/L	25 tests
Phosphate – Total	Tube test	37744	Phosphomolybdenum Blue/ Ascorbic Acid	16 mm Ø	1.5-20 mg/L	25 tests
Phosphate – Ortho	Phosphate No. 1	70245	Phosphomolybdenum Blue/ Ascorbic Acid	24 mm Ø	0.05-4 mg/L	Tablet/100
	Phosphate No. 2	70095				Tablet/100
Phosphate – Ortho	Tube test	37745	Vanadate-molybdate	16 mm Ø	3-60 mg/L	Tube test/25
pH-value	Phenol red/Photometer	70094	Phenol Red	24 mm Ø	6.5-8.4	Tablet/100
Silica	Silica No. 1	70096	Silica Molybdate Blue	24 mm Ø	0.05-3 mg/L	Tablet/100
	Silica No. 2	70097				Tablet/100
	Silica PR	70453				Tablet/100
Nitrogen – Total	Tube test	70108	2,6-Dimethylphenol	16 mm Ø	0.5-14 mg/L	25 tests
					14-140 mg/L	
Sulfide	Sulfide No. 1	70098	Methyleneblue	24 mm Ø	0.04-0.5 mg/L	Tablet/100
	Sulfide No. 2	70101				Tablet/100
Zinc	Copper/Zinc LR	70103	Zincon	24 mm Ø	0.02-1 mg/L	Tablet/100
	EDTA	70105				Tablet/100
	Dechlor	70104				Tablet/100

Ø = Round cuvette, diameter

Δ = Rectangular cuvette, path length

AQUANAL®-professional Vario H Reagents and Powder Packs

The convenient and easy-to-use AQUANAL®-professional Vario H Powder Pack products are very popular for water testing in many countries throughout the world. The Vario H Powder Packs also provide experienced users with an alternative to existing measuring systems. Each unit comes with 100 powder packs. The tests work with AQUANAL®-SPECTRO 3, AQUANAL®-professional SPECTRO 1000 and HACH DR/4000, Odyssey DR/2500, DR/820, DR/850, DR/890 and other HACH Photometers.

AQUANAL®-professional Vario H reagents are provided in Powder Packs that make handling as convenient and exact as possible. AQUANAL®-professional Vario H Powder Packs were specially designed to be a replacement for HACH powder pillows. The use of dry powdered reagents minimizes the problems associated with leakage and deterioration. The powdered product is packed in individual, pre-measured foil packs (see Figure next page).

A few AQUANAL®-professional tests:

Free and Total Chlorine Test

Free Chlorine

Free chlorine (hypochlorous acid and hypochlorite ion) oxidizes DPD, a reaction that is pH dependent. Between pH 6.3-6.5, the reaction between DPD and free chlorine forms a magenta-colored compound. Both AQUANAL®-professional Vario H Powder and HACH Powder are able to handle high levels of hardness without precipitation.

Total Chlorine

Potassium iodide is used to determine combined chlorine forms. Chloramines oxidize the iodide to iodine; the liberated iodine reacts with DPD. Both AQUANAL®-professional Vario H Powder and HACH Powder contain DPD, potassium iodide and a buffer system.

How to use the Vario H Powder Packs

1. Tap the pack on a hard surface to collect the powdered reagent in the bottom.
2. Tear (or cut with scissors) across from A to B pointing the opening of the pack away from you.
3. Using both hands, push both sides of the open pack toward each other to form a spout.
4. Pour the contents into the sample cell and continue the procedure according to the HACH instructions.



Picture AQUANAL®-professional Vario H Reagents



Table AQUANAL®-professional Vario H Powder Packs Product List

Parameter	Range	Cat. No.	Sigma-Aldrich Product Name	HACH® Prod. No.
Aluminium	0-0.22 mg/L Al	70436	AQUANAL®-professional Vario H Aluminium Set	NEW! 26037-00
		70447	AQUANAL®-professional Vario H Aluminium ECR, refill pack for Cat. No. 70436	NEW! 26038-49
		70449	AQUANAL®-professional Vario H Aluminium Hexamethylenetetramine buffer, refill pack for Cat. No. 70436	NEW! 26039-99
		70451	AQUANAL®-professional Vario H Aluminium ECR Masking Reagent, refill pack for Cat. No. 70436	NEW! 23801-23
Chlorine, free	0.01-2 mg/L Cl ₂	70112	AQUANAL®-professional Vario H Chlorine Free (DPD) for 10mL sample	21055-69
		70113	AQUANAL®-professional Vario H Chlorine Free (DPD) for 25mL sample	14070-99
Chlorine, total	0.01-2 mg/L Cl ₂	70200	AQUANAL®-professional Vario H Chlorine Total (DPD) for 10mL sample	21056-69
		70202	AQUANAL®-professional Vario H Chlorine Total (DPD) for 25mL sample	14064-99
Copper	0-5 mg/L Cu	70203	AQUANAL®-professional Vario H Copper I	21058-69
Iron, total	0-1.8 mg/L Fe _{tot}	70204	AQUANAL®-professional Vario H Iron (TPTZ)	26087-99
		70205	AQUANAL®-professional Vario H Iron (Phenantroline)	21057-69
Manganese LR	0-0.7 mg/L Mn	70441	AQUANAL®-professional Vario H Manganese Set, low range	NEW! 26517-00
		70443	AQUANAL®-professional Vario H Manganese Alkaline-Cyanide, refill pack for Cat. No. 70441	NEW! 21223-26
		70445	AQUANAL®-professional Vario H Manganese Ascorbic Acid, refill pack for Cat. No. 70441	NEW! 14577-99
		70446	AQUANAL®-professional Vario H Manganese PAN, refill pack for Cat. No. 70441	NEW! 21224-26
Manganese HR	0-20 mg/L Mn	70206	AQUANAL®-professional Vario H Manganese Set, high range	NEW! 24300-00
		70208	AQUANAL®-professional Vario H Manganese Citrate Buffer, refill pack for Cat. No. 70206	21076-69
		70207	AQUANAL®-professional Vario H Manganese Sodium periodate, refill pack for Cat. No. 70206	21077-69

Parameter	Range	Cat. No.	Sigma-Aldrich Product Name	HACH® Prod. No.
Molybdate HR	0-35 mg/L Mo	70209	AQUANAL®-professional Vario H Molybdate Set, high range	NEW! 26041-00
		70212	AQUANAL®-professional Vario H Moly 1, refill pack for Cat. No. 70209	26042-99
		70213	AQUANAL®-professional Vario H Moly 2, refill pack for Cat. No. 70209	26043-99
		70217	AQUANAL®-professional Vario H Moly 3, refill pack for Cat. No. 70209	26044-99
		70426	AQUANAL®-professional Vario H Molybdate Set, high range	NEW! 22434-00
		70427	AQUANAL®-professional Vario H Molybdate 1, refill pack for Cat. No. 70426	NEW! 14146-69
		70428	AQUANAL®-professional Vario H Molybdate 2, refill pack for Cat. No. 70426	NEW! 14148-69
		70429	AQUANAL®-professional Vario H Molybdate 3, refill pack for Cat. No. 70426	NEW! 14178-69
		Nitrate	0-30 mg/LNO ₃ -N	70431
Nitrite LR	0-0.3 mg/L NO ₂ -N	70219	AQUANAL®-professional Vario H Nitrite for 25 mL sample	14065-99
		70218	AQUANAL®-professional Vario H Nitrite for 10 mL sample	21071-69
Nitrogen, Ammonia LR	0-2.5 mg/L NH ₃ -N	70434	AQUANAL®-professional Vario H Ammonia Set, low range	2604545
		70222	AQUANAL®-professional Vario H Ammonia Cyanurate, refill pack for Cat. No. 70434 and 70423	23954-66
		70223	AQUANAL®-professional Vario H Ammonia Salicylate, refill pack for Cat. No. 70434 and 70423	23952-66
		70435	AQUANAL®-professional Vario H Ammonia Diluent Reagent, refill pack for Cat. No. 70434	NEW! n.a.
		70226	AQUANAL®-professional Vario H Ammonia Set, low range	NEW! 26680-00
		70227	AQUANAL®-professional Vario H Ammonia Cyanurate, refill pack for Cat. No. 70226	NEW! 26531-99
		70228	AQUANAL®-professional Vario H Ammonia Salicylate, refill pack for Cat. No. 70226	NEW! 26532-99
		70423	AQUANAL®-professional Vario H Ammonia Set, high range	NEW! 2606945
		Nitrogen, Ammonia HR	0-0.5 mg/L NH ₃ -N	70222
70223	AQUANAL®-professional Vario H Ammonia Salicylate, refill pack for Cat. No. 70434 and 70423			23952-66
70424	AQUANAL®-professional Vario H Ammonia Diluent Reagent, refill pack for Cat. No. 70423			NEW! n.a.
70411	AQUANAL®-professional Vario H Total Nitrogen Set, low range			NEW! 26722-45
Nitrogen, Total HR	10-150 mg/L N	70412	AQUANAL®-professional Vario H Total Nitrogen Set, high range	NEW! 27141-00
o-Phosphate	0-2.5 mg/L PO ₄	70229	AQUANAL®-professional Vario H Phosphate for 10mL sample	21060-69
Silica LR	0-1.6 mg/L SiO ₂	70417	AQUANAL®-professional Vario H Silica Set, low range	NEW! 24593-00
		70418	AQUANAL®-professional Vario H Silica Amino Acid F, refill pack for Cat. No. 70417	NEW! 22540-69
		70236	AQUANAL®-professional Vario H Silica Citric Acid, refill pack for Cat. No. 70232 and 70417	21062-69
		NEW! 70419	AQUANAL®-professional Vario H Silica Molybdate 3, refill pack for Cat. No. 70417	NEW! 1995-26
		70232	AQUANAL®-professional Vario H Silica Set, high range	NEW! 24296-00
Silica HR	0-100 mg/L SiO ₂	70235	AQUANAL®-professional Vario H Silica Acid RGT, refill pack for Cat. No. 70232	21074-69
		70236	AQUANAL®-professional Vario H Silica Citric Acid, refill pack for Cat. No. 70232 and 70417	21062-69
		70237	AQUANAL®-professional Vario H Silica Molybdate, refill pack for Cat. No. 70232	NEW! 21073-69
		70239	AQUANAL®-professional Vario H Silica Set, ultra high range	22443-00
Silica, UHR	0-200 mg/L SiO ₂	70241	AQUANAL®-professional Vario H Silica Acid RGT, refill pack for Cat. No. 70239	1042-99
		70242	AQUANAL®-professional Vario H Silica Citric Acid, refill pack for Cat. No. 70239	14548-99
		70243	AQUANAL®-professional Vario H Silica Molybdate, refill pack for Cat. No. 70239	1041-99
		70244	AQUANAL®-professional Vario H Sulfate for 25mL sample	NEW! 12065-99
Sulfate	0-70 mg/L SO ₄	NEW! 70421	AQUANAL®-professional Vario H Sulfate for 10 mL sample	21067-69

AQUANAL®-professional Tube Tests

AQUANAL®-professional Tube Tests were developed to provide a fast safe and clean method to perform water analysis in sewage treatment plants. The sample is pipetted into a tube that contains the test reagent. For some tests, an additional reagent is required that has to be added manually. The COD test comes in ready to use solutions.

After a specified reaction time, the result can be determined with any of our photometers, AQUANAL®-plus SPECTRO 2, AQUANAL®-SPECTRO 3, SPECTRO CSB/COD (only for COD tube tests) or AQUANAL®-professional SPECTRO 1000.

As with all of the AQUANAL® products, complete, easy-to-follow instructions are provided with every test.

How it works

A pipette is used to dispense the sample into the tube containing the test reagent. For some tests, an additional reagent has to be added. Once the reaction is over, the results may be obtained by comparison to a color chart or with one of the AQUANAL® Photometers.



Cat. No.	Product	Description
70107	Nitrate tube test	Range: 0.5-60 mg/L, 25 tests
70108	Total Nitrogen tube test	Range: 0.5-140 mg/L, 25 tests
37739	Ammonium tube test	Range: 0.01 - 50 mg/L, 25, 150 tests
37735	COD tube test	Range: 2-40 mg / L, 150 tests
37736	COD tube test	Range: 10-150 mg/L, 25, 150 tests
37737	COD tube test	Range: 100-1500 mg/L, 25, 150 tests
37738	COD tube test	Range: 1000-15000 mg/L, 25 tests
37741	Nitrite tube test	Range: 0.1-10 mg/L, 25 tests
37743	Total Phosphate tube test	Range: 0.2-10 mg/L, 25 tests
37744	Total Phosphate tube test	Range: 5.0-60 mg/L, 25 tests
37745	Ortho-Phosphate tube test	Range: 3.0-60 mg/L, 25 tests
37570	Spectro COD	For COD tube tests
37571	Heating unit	For AQUANAL®-professional tube tests

Table AQUANAL®-professional Tube Tests Product List

Reagent Composition

Mercuric sulfate solution in sulfuric acid / potassium dichromate

20 g/L mercury sulfate, 1.5 g/L potassium dichromate (Cat. No 34621)
 80 g/L mercury sulfate, 5.9 g/L potassium dichromate (Cat. No 34632)
 200 g/L mercury sulfate, 14.8 g/L potassium dichromate (Cat. No 34624)

Silver sulfate solution in sulfuric acid

10 g/L (Cat. No 34629), 26.6 g/L (Cat. No. 34634), 60 g/L (Cat. No 34635) or 80 g/L silver sulfate (Cat. No. 34631)

Potassium dichromate solution

0.02 M potassium dichromate (Cat. No. 34631)

Ready-to-use Solutions for Waste Water Analysis

Ready to use solutions for waste water analysis according to German Standard Methods are listed by chemical name in the alphabetical part of our catalog (e.g., mercury(II) sulfate solution, Cat. No. 31014).

AQUANAL®-plus Test Kits



Picture AQUANAL®-plus test kits, refill packs and check solutions

The AQUANAL®-plus product line consists of nearly forty test kits with the corresponding refill packs and check solutions for on-the-spot or laboratory water analysis. They provide fast results under safe and clean operating conditions. The results can be obtained using the color chart included in the test kit, or the AQUANAL®-plus SPECTRO 2 or AQUANAL®-SPECTRO 3 Photometers. AQUANAL®-plus Vario Case allows you to combine four or five different test kits into one case.

AQUANAL®-plus tests are

- Fast: results obtained within a few minutes
- Easy to use: measuring range can be increased by use of dilution water
- Refillable: reagents, check solutions, dilution water and accessories can be ordered separately
- Economical: cost effective

AQUANAL®-plus product include

- Test kits – With reagents, color chart, accessories, water for dilution and check solution in a plastic box for 100-500 tests per kit
- Refill packs – Contain only reagents in a plastic bag
- Check solution – A standard solution of defined concentration in a sealed bottle

A complete list of the AQUANAL®-plus test kits appears in the following table. For Technical Assistance in choosing an AQUANAL® product, please e-mail us at aquanal@sial.com or contact:

Petra Haubold

AQUANAL® Laboratory
Seelze, Germany
Tel.: ++49 5137 8238 - 643
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phaubold@europe.sial.com

AQUANAL®-plus Tube Tests cover many substances in water, including

Acid Capacity	Copper	Magnesium	Phenols
Aluminum	Cyanide	Manganese	Phosphate
Ammonium	Cyanide/Thiocyanate	Nickel	Phosphorous, Total-P
Basic Capacity	Gold	Nitrate	and Orthophosphate
Cadmium	Hardness, Carbonate	Nitrite	Silica
Chloride	Hardness, Residual	Nitrogen, Total	Silver
Chlorine	Hardness, Total	Oxygen	Sulfate
Chlorine, Free	Hydrazine	Oxygen Scavenger	Sulfite
Chromium	Iron	Peroxide	Tin
			Zinc

Table AQUANAL®-plus Test Kits, Refill Packs and Check Solutions Product Information

Cat. No.	Test		Measuring range	Cat. No.	Test		Measuring range
37415	Acid Capacity	Test kit	0.1 mL = 1 mmol/L	37407	Nickel	Test kit	0.02-0.5 mg/L
37455	Acid Capacity	Refill pack	0.1 mL = 1 mmol/L	37447	Nickel	Refill pack	0.02-0.5 mg/L
37798	Acid Capacity	Check solution	10 mmol/L	37487	Nickel	Check solution	0.02 mg/mL Nickel
37425	Aluminium	Test kit	0.02-0.2 mg/L	37408	Nitrate	Test kit	5-140 mg/L
37465	Aluminium	Refill pack	0.02-0.2 mg/L	37409	Nitrate	Test kit	1-50 mg/L
37505	Aluminium	Check solution	0.007 mg/mL Aluminium	37448	Nitrate	Refill pack for Cat. No. 37408	5-140 mg/L
37400	Ammonium	Test kit	0.2-8.0 mg/L	37449	Nitrate	Refill pack for Cat. No. 37409	1-50 mg/L
37440	Ammonium	Refill pack	0.2-8.0 mg/L	37488	Nitrate	Check sol. for Cat. No. 37408/37448	2 mg/mL Nitrate
37480	Ammonium	Check solution	0.1 mg/mL Ammonium	37489	Nitrate	Check sol. for Cat. No. 37409/37449	0.5 mg/mL Nitrate
37414	Basic capacity	Test kit	0.1 mL = 1 mmol/L	37410	Nitrite	Test kit	0.005-0.1 mg/L
37454	Basic capacity	Refill pack	0.1 mL = 1 mmol/L	37450	Nitrite	Refill pack	0.005-0.1 mg/L
37797	Basic capacity	Check solution	10 mmol/L	37428	Oxygen	Test kit	1-12 mg/L
37432	Cadmium	Test kit	0.02-1.2 mg/L	37468	Oxygen	Refill pack	1-12 mg/L
37472	Cadmium	Refill pack	0.02-1.2 mg/L	37418	Oxygen Scavenger	Test kit	0.2-3.0 mg/L
37512	Cadmium	Check solution	0.015 mg/mL Cadmium	37458	Oxygen Scavenger	refill pack	0.2-3.0 mg/L
37437	Carbonate hardness	Test kit	1 drop = 1°KH	37434	Peroxide	Test kit	1.0-30 mg/L
37544	Carbonate hardness	Refill pack	1 drop = 1°KH	37474	Peroxide	Refill pack	1.0-30 mg/L
37791	Carbonate hardness	Check solution	5°KH	37427	Phenols	Test kit	0.1-3.0 mg/L
37792	Carbonate hardness	Check solution	10°KH	37467	Phenols	Refill pack	0.1-3.0 mg/L
37401	Chloride	Test kit	5-300 mg/L	37411	Phosphate	Test kit	0.02-0.4 mg/L
37441	Chloride	Refill pack	5-300 mg/L	37423	Phosphate	Test kit	3-120 mg/L
37481	Chloride	Check solution	2.5 mg/mL Chloride	37451	Phosphate	Refill pack for Cat. No. 37411	0.02-0.4 mg/L
37419	Chlorine	Test kit	0.01-0.3 mg/L	37463	Phosphate	Refill pack for Cat. No. 37423	3-120 mg/L
37459	Chlorine	Refill pack	0.01-0.3 mg/L	37491	Phosphate	Check sol. for Cat. No. 37411/37451	0.02 mg/mL Phosphate
37422	Chlorine Free	Refill Pack	0.01-0.3 mg/L	37503	Phosphate	Check sol. for Cat. No. 37423/37463	1.8 mg/mL Phosphate
37499	Chlorine	Check solution	0.02 mg/mL Chloride	37417	Residual Hardness	Test kit	1 drop = 0.01°dH
37402	Chromium	Test kit	0.005-0.1 mg/L	37457	Residual Hardness	Refill pack	1 drop = 0.01°dH
37442	Chromium	Refill pack	0.005-0.1 mg/L	37795	Residual Hardness	Check solution	0.05° dH
37482	Chromium	Check solution	0.01 mg/mL Chromium	37796	Residual Hardness	Check solution	0.10° dH
37424	Copper	Test kit	0.05-4.5 mg/L	37412	Silica	Test kit	0.01-0.25 mg/L
37464	Copper	Refill pack	0.05-4.5 mg/L	37452	Silica	Refill pack	0.01-0.25 mg/L
37504	Copper	Check solution	0.04 mg/mL Copper	37492	Silica	Check solution	0.02 mg/mL Silica
37403	Cyanide	Test kit	0.03-0.7 mg/L	37538	Silver	Test kit	0.1-1.0 mg/L
37443	Cyanide	Refill pack	0.03-0.7 mg/L	37429	Sulfate	Test kit	50-330 mg/L
37420	Cyanide/Thiocyanate	Test kit	0.03-0.7 mg/L	37469	Sulfate	Refill pack	50-330 mg/L
37460	Cyanide/Thiocyanate	Refill pack	0.03-0.7 mg/L	37509	Sulfate	Check solution	11 mg/mL Sulfate
37500	Cyanide/Thiocyanate	Check solution	0.005 mg/mL Thiocyanate	37430	Sulfide	Test kit	0.02-0.3 mg/L
37537	Gold	Test kit	0.1-3.0 mg/L	37470	Sulfide	Refill pack	0.02-0.3 mg/L
37433	Hydrazine	Test kit	0.02-1.0 mg/L	37435	Sulfite	Test kit	0.1 mL = 10 mg/L
37473	Hydrazine	Refill pack	0.02-1.0 mg/L	37475	Sulfite	Refill pack	0.1 mL = 10 mg/L
37404	Iron	Test kit	0.2-15 mg/L	37436	Tin	Test kit	0.1-1.2 mg/L
37404	Iron	Test kit	0.2-15 mg/L	37476	Tin	Refill pack	0.1-1.2 mg/L
37421	Iron	Test kit	0.02-0.2 mg/L	37416	Total Hardness	Test kit	1 drop = 1°dH
37444	Iron	Refill pack for Cat. No. 37404	0.2-15 mg/L	37456	Total Hardness	Refill pack	1 drop = 1°dH
37461	Iron	Refill pack for Cat. No. 37421	0.02-0.2 mg/L	37793	Total Hardness	Check solution	5°dH
37484	Iron	Check sol. for Cat. No. 37404/37444	0.2 mg/mL Iron	37794	Total Hardness	Check solution	10°dH
37501	Iron	Check sol. for Cat. No. 37421/37461	0.02 mg/mL Iron	37413	Zinc	Test kit	0.1-5.0 mg/L
37426	Magnesium	Test kit	100-1500 mg/L	37453	Zinc	Refill pack for Cat. No. 37413	0.1-5.0 mg/L
37466	Magnesium	Refill pack	100-1500 mg/L	37493	Zinc	Check sol. for Cat. No. 37413/37453	0.025 mg/mL Zinc
37506	Magnesium	Check solution	0.3 mg/mL Magnesium	37539	Zinc	Test kit	0.02-0.2 mg/L
37406	Manganese	Test kit	0.03-0.5 mg/L				
37446	Manganese	Refill pack	0.03-0.5 mg/L				
37486	Manganese	Check solution	0.03 mg/mL Manganese				

Technical Support: aquanal@sial.com

AQUANAL®-plus Vario Case

Picture

AQUANAL®-plus Spectro
turbidity



Cat. No.

Product

37553

AQUANAL®-plus Vario Case*

*Specify if you want the total hardness reagent as well as pH-indicator sticks (free of charge) with your order

Table AQUANAL®-plus Vario Case

Many analysts find themselves performing a few of the water quality tests routinely. To simplify their work, we have developed the AQUANAL®-plus Vario Case that allows you to select only your most commonly-used analyses.

AQUANAL®-plus Vario Case gives you the choice of two package options:

- Five AQUANAL®-plus test sets
- Four AQUANAL®-plus test sets plus an AQUANAL®-plus SPECTRO 2 Photometer

The tests can be chosen from the entire AQUANAL®-plus product range. The case, a total hardness reagent and pH-indicator sticks are supplied free of charge, but have to be requested when ordering. The full price depends on the chosen tests.

AQUANAL®-plus SPECTRO Turbidity

The AQUANAL®-plus SPECTRO Turbidity was designed as a compact, easy to use instrument for the fast and accurate determination of turbidity. Turbidity measures the scattering of light through water caused by materials in suspension or solution.

Picture

AQUANAL®-plus Case
containing five tests



Cat. No.

Product

70034

AQUANAL®-plus Spectro Turbidity

70036

AQUANAL®-plus Turbidity standards
2 secondary standards – 1, 10 NTU

70037

AQUANAL®-plus Turbidity standards
2 secondary standards – 100, 1000 NTU

70110

AQUANAL®-plus Turbidity standards
4 secondary standards – 1, 10, 100, 1000 NTU

70044

AQUANAL®-plus Sample chamber lid
for Spectro Turbidity and Spectro Hazen

Table AQUANAL®-plus SPECTRO
Turbidity Photometer Product List

How it works

A light emitting diode (LED) is used as a light source. The photodetector is positioned to detect light scattered by the sample at 90° to the incident beam. The LED is characterized by maximum long-term stability and monochromatic light emission with minimum power input. The sample chamber, which is the most critical part of any photometer, is fully sealed so no water can penetrate into the electronic components. The size of the sample chamber ensures easy cleaning of the light entry surfaces. Battery operation makes the unit suitable for both mobile use and laboratory applications. It is supplied in a handy case as a fully functional unit, complete with accessories and calibration standards.

Three different turbidity standard sets are available:

- 1 and 10 NTU (nephelometric turbidity units)
- 100 and 1000 NTU
- 1, 10, 100 and 1000 NTU

Kit Content

AQUANAL®-plus SPECTRO Turbidity is supplied in a plastic case with round vials, calibration solutions (1,10,100 and 1000 NTU), accessories, instruction manual, warranty sheet and 9 V battery.

Measuring range: 0.1-2000 TEF / NTU (TEF stand for Trübungseinheit Formazin: Turbidity Unit Formazine)

AQUANAL®-plus SPECTRO COD

Picture
AQUANAL®-plus
Spectro COD



AQUANAL®-plus SPECTRO COD (chemical oxygen demand) is designed to measure the quantity of organic pollutants present in water

How it works

In the reaction the dichromate ion ($\text{Cr}_2\text{O}_7^{2-}$) oxidizes the organic pollutant and is reduced to the chromic ion (Cr^{3+}). The reaction is followed by monitoring the absorbance at the wavelengths where the two ions absorb (430 and 605 nm). The quantity of oxidant (organic pollutant) consumed is expressed in terms of its oxygen equivalence. COD is expressed in mg/L O_2 .

Three different AQUANAL®-plus SPECTRO COD tests are available to detect these organic pollutant concentration ranges:

- 2-40 mg/L
- 10-150 mg/L
- 100-1500 mg/L
- 1000-15000 mg/L

Results can be obtained by using the AQUANAL®-plus SPECTRO 2, AQUANAL®-SPECTRO 3, AQUANAL®-plus

SPECTRO CSB/COD or the AQUANAL®-professional SPECTRO 1000 Photometers. We also supply the heating unit required for this test, the AQUANAL®-plus Thermoblock, to provide reliable heating of the chemical reaction.

Technical Data of AQUANAL®-plus SPECTRO CSB/COD Photometer

- LED photometer (LED = light emitting diode)
- Optics: Low range: LED λ = 430 nm, medium and high range: LED λ = 605 nm
- 9 V block battery (life approx. 600 tests), AC operation not possible
- Ambient conditions: Temperature 5-40°C, relative humidity 30-90%, non-condensing
- Dimensions: D x W x H = 180 x 110 x 100 mm, supplied in a case

Technical Data of AQUANAL®-plus Thermoblock

- Temperature: 100°C and 148°C fixed, can be selected via a membrane keyboard
- Tolerance: $\pm 10^\circ\text{C}$
- Heating: 300 W, electronically regulated, with protection against overheating
- Heating block: Eight wells for tubes of 16 mm diameter, 1 well in the center for tubes of 22 mm diameter
- Time input: 30, 60, 120 minutes or continuous operation at the selected temperature, automatically switched off at the end of the selected reaction time, acoustic signal
- Electrical connection: 230 V, 50 Hz (350 W) or 110 V, 60 Hz (on request)
- Plug: Euroformat can be switched from 230 to 110 V
- Safety: CE marking, transparent covering hood

Cat. No.	Product	Measuring range
37735	AQUANAL®-professional COD tube test	2-40 mg/L
37736	AQUANAL®-professional COD tube test	10-150 mg/L
37737	AQUANAL®-professional COD tube test	100-1500 mg/L
37738	AQUANAL®-professional COD tube test	1000-15000 mg/L
37570	Spectro CSB/COD für AQUANAL®-reagents	
37571	AQUANAL®-plus Thermoblock	
37782	Spectro 2 Photometer for AQUANAL®-reagents (English version)	
70012	AQUANAL®-professional Spectro 1000	
70403	AQUANAL®-Spectro 3 Photometer	

Table AQUANAL®-plus SPECTRO COD Product Information

AQUANAL®-plus SPECTRO Hazen

AQUANAL®-plus SPECTRO Hazen was developed to determine the degree of yellowness of a water sample. One of the standard methods recommended by the ASTM to determine the color of clear or light yellow liquids is the platinum-cobalt scale. The preparation of these platinum-cobalt color standards was first described by Dr. A. Hazen in 1892 in the American Chemical Journal, hence the common name for the test "Hazen".

Picture

Close-up of AQUANAL®-plus SPECTRO Hazen Photometer



Table AQUANAL®-plus SPECTRO Hazen Photometer Product List

Cat. No.	Product
70109	AQUANAL®-plus Spectro Hazen
70044	AQUANAL®-plus Sample chamber lid for Spectro Turbidity and Spectro Hazen
70027	Tubes, 24 mm diameter (pack of 12)
77147	APHA color reference solutions (20 standard solutions)

It is also called the "APHA color test" because the same test method is described in Part 2120 of Standard Methods for the Examination of Water and Waste Water by the American Public Health Association (APHA). Although it is used extensively in the water industry it is also used for clear oils, chemicals and petrochemicals such as glycerine, plasticizers, solvents, carbon tetrachloride and petroleum spirits.

How it works

A colorimetric comparison is made between the sample and the standard platinum-cobalt solutions.

Kit Content

AQUANAL®-plus SPECTRO Hazen is specially designed for the determination of a large number of APHA color tests. The product is supplied with a SPECTRO Hazen Photometer, with two sample tubes, one 9V battery, all in a plastic case. An optional Sample chamber lid is available that protects the shaft of the photometer from ambient light which could disturb the measurement.

The working concentration range is 0-500 Pt.

A set of APHA Standard solutions to be used as controls or to test the function of the AQUANAL®-plus SPECTRO Hazen are available. The set consists of twenty different standard solutions ranging from 5 to 500 mg/L Pt.

AQUANAL®-Compact Labs AQUANAL®-Compact Labs are collections of test kits, reagents, photometers and other accessories that provide all you need to perform detailed analysis of specific types of water samples

Picture

AQUANAL®-Ökotest Water Laboratory



AQUANAL®-Ökotest Water Laboratory

AQUANAL®-Ökotest Water Laboratory contains tests for six water parameters: hardness, nitrate, nitrite, phosphate, pH and ammonia. Complete, easy to follow instructions and color-coding make the tests fast and simple for anyone to use. The reagents for each test are color-coded, the color corresponding to the color produced in the particular test. The level of each substance is determined by comparison with an included color chart. The individual reagents are environmentally safe, posing no risk to the user or to the environment. It does not require any hazardous labeling.

AQUANAL®-Ökotest Water Laboratory has many applications, but is particularly well suited for the private user or hobbyist, or for schools, where it can be used as part of a project to monitor water quality in local bodies of water.

The following substances in water can be determined by the AQUANAL®-Ökotest Water Laboratory:

Parameter	Measuring range
Ammonium	0.05-10 mg/L
Nitrate (NO ₃ ⁻)	0-80 mg/L
Nitrite (NO ₂ ²⁻)	0.02-1.0 mg/L
Phosphate (PO ₄ ³⁻)	0.5-6.0 mg/L
pH	pH 5.0-9.0
Total Hardness	1 drop = 7.19 mg/L CaCO ₃

Table AQUANAL® Ökotest Water Laboratory Product Information

Cat. No.	Test	Product	Measuring
37557	Ökotest Water Laboratory	Original case	Case with tests for Ammonium, Nitrate, Nitrite, Phosphate, pH-value and Total Hardness, colour chart and reaction tubes 50-60 tests/parameter
37558	Ökotest Water Laboratory	Refill pack for Cat. No. 37557	Reagents for Ammonium, Nitrate, Nitrite, Phosphate, pH-value and Total Hardness testing
37541	Ökotest reaction tubes	Refill pack tubes for Cat. No. 37557	1 pc/parameter of 37557
37598	Ökotest Total Hardness	Single parameter refill for Cat. No. 37557	Suitable for 50-60 tests
37599	Ökotest Nitrate	Refill pack for Cat. No. 37557	Suitable for 50-60 tests
37606	Ökotest Nitrite	Refill pack for Cat. No. 37557	Suitable for 50-60 tests
37607	Ökotest Phosphate	Refill pack for Cat. No. 37557	Suitable for 50-60 tests
37608	Ökotest pH-value	Refill pack for Cat. No. 37557	Suitable for 50-60 tests
37595	Ökotest Ammonium	Refill pack for Cat. No. 37557	Suitable for 50-60 tests
37574	Ökotest Total Hardness	Refill pack for Cat. No. 37557	250 mL reagent
37555	Ökotest pH-value	Refill pack for Cat. No. 37557	100 mL reagent

AQUANAL®-Compact Labs EduCase

AQUANAL®-EduCase was designed as an instructional tool to teach water titration techniques in the classroom. The EduCase contains reagents for titrimetric determination of five typical water parameters using four different types of titration:

- Complexometric Titration – for Calcium and Total Hardness
- Argentometric Titration – for Chloride
- Acid-Base Titration – for Carbonate Hardness
- Redox Titration – for Oxygen

Students and their educators can use the AQUANAL®-EduCase to sample water from a wide range of sources – rivers, aquariums, tap water, bottled water, etc. Experiments can be designed to show the importance of water quality (at what chloride level do plants show optimum growth?), compare levels of impurities as a function of source (is tap water or bottled water purer?),

Table AQUANAL®-plus Educase Product Information

Cat. No.	Product
37518	AQUANAL®-EduCase
37519	Refill pack for EduCase



Picture AQUANAL®-plus Educase

make consumer decisions (are there differences between brands of bottled water?) or show effects of environmental conditions (does increased rainfall increase or decrease hardness of river water?). Many such experiments can be designed to teach important aspects both environmental and analytical chemistry. The case comes complete with the entire equipment required for the determinations. Titrations are carried out on a micro scale (5 mL-10 mL test solution) so that both the amounts of reagents consumed and the volume of waste produced are kept small.

AQUANAL®-Compact Labs Fishwater Lab

Nine parameters that signify the quality of an aqueous living environment can be determined directly in aquaculture, lakes, rivers, ponds or in home aquariums using AQUANAL®-Fishwater Lab. This Compact Lab contains six colorimetric and two titrimetric tests. The pH-value is determined using pH-paper. The evaluation is made

by direct comparison of the color of the solution to a color card provided.

The following substances in water can be determined by the AQUANAL®-Fishwater Lab:



Parameter	Measuring range
Ammonium	0.05-10 mg/L
Iron	<0.05-1.0 mg/L
Nitrate (NO ₃)	0-80 mg/L
Nitrite (NO ₂)	0.02-1.0 mg/L
Phosphate (PO ₄)	0.5-6.0 mg/L
pH-value	pH 4.5-10.0
Carbonate Hardness	≥1°dH (1 drop = 1°dH)
Total Hardness	≥1°dH (1 drop = 1°dH)
Oxygen	0-10.0 mg/L

Picture AQUANAL®-plus Fishwaterlab

Cat. No.	Test	Product	Measuring
37566	Fishwater Lab	Original case	Case with tests for Ammonium, Carbonate Hardness, Iron, Nitrate, Nitrite, Oxygen, Phosphate, pH-value and Total Hardness. With colour chart and reaction tubes. 50-60 tests/parameter
37550	Fishwater Lab	Refill pack for Cat. No. 37566	Reagents for Ammonium, Carbonate Hardness, Iron, Nitrate, Nitrite, Oxygen, Phosphate, pH-value and total hardness testing
37542	Fishwater Lab reaction tubes	Refill pack tubes for Cat. No. 37566	1 pc/parameter of 37566
37574	Ökotest Total Hardness	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37595	Fishwater Lab Ammonium	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37596	Fishwater Lab carbonate hardness	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37597	Fishwater Lab Iron	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37598	Fishwater Lab Total Hardness	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37599	Fishwater Lab Nitrate	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37606	Fishwater Lab Nitrite	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37607	Fishwater Lab Phosphate	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37609	Fishwater Lab Oxygen	Single param. ref. for Cat. No. 37566	Suitable for 50-60 tests
37028	Fishwater Lab pH Value	Single param. ref. for Cat. No. 37566	100 Test sticks measuring range, measuring range 4.5-10.0

Table AQUANAL®-Fishwater Lab Product Information

AQUANAL®-Compact Labs Compact Lab



Picture AQUANAL®-plus Compact Lab

AQUANAL®-plus Compact Lab allows rapid, reliable water analysis in the field, right at the site where samples are taken. The AQUANAL®-plus Compact Lab is ideally suited to meet the requirements of emergency responders, like fire brigades, police, environmental protection officers and local authorities. It is also useful for educational purposes.

Cat. No.	Product
37562	AQUANAL®-plus Compact Lab
37781-37785	Spectro 2 Photometer for AQUANAL®-plus-Reagents

Table AQUANAL®-plus Compact Lab Product Information

Cat. No.	Substances	Product	Measuring range	Number of tests
37440	Ammonium	AQUANAL®-plus Ammonium	0.2-8.0 mg/L	125
37459	Chlorine	AQUANAL®-plus Chlorine	0.01-0.3 mg/L	300
37441	Chloride	AQUANAL®-plus Chloride	5-300 mg/L	150
37442	Chromium	AQUANAL®-plus Chromium	0.005-0.1 mg/L	100
37443	Cyanid (gesamt)	AQUANAL®-plus Cyanide	0.03-0.7 mg/L	200
37444	Iron	AQUANAL®-plus Iron	0.2-15 mg/L	500
37574	Total hardness	AQUANAL®-plus Total hardness (250 mL)	1 drop = 1°dH = 0.178 mmol/L Ca	75
37464	Copper	AQUANAL®-plus Copper	0.05-4.5 mg/L	75
37447	Nickel	AQUANAL®-plus Nickel	0.02-0.5 mg/L	60
37449	Nitrate	AQUANAL®-plus Nitrate	1-50 mg/L	200
37450	Nitrite	AQUANAL®-plus Nitrite	0.005-0.1 mg/L	200
37467	Phenol	AQUANAL®-plus Phenols	0.1-3.0 mg/L	300
37451	Phosphate	AQUANAL®-plus Phosphate	0.02-0.4 mg/L	100
37028	pH-value	pH-indicator sticks	4.5-9 mg/L	100
37468	Oxygen	AQUANAL®-plus Oxygen	1-12 mg/L	30
37469	Sulfate	AQUANAL®-plus Sulfate	50-330 mg/L	100
37470	Sulfide	AQUANAL®-plus Sulfide	0.03-0.6 mg/L	100

Table AQUANAL®-plus Compact Lab Product Information

Technical Support: aquanal@sial.com

Kit Content

The Compact Lab contains all the reagents needed to carry out trace analysis for each of the water parameters listed below. It also contains small laboratory equipment such as cuvettes, syringes, funnels, filters and collecting bottles. When the individual test reagents have been used up, refill packs can be ordered from the AQUANAL®-plus range.

A space in the case is provided for the AQUANAL®-plus SPECTRO 2 Photometer which is required for these tests and must be ordered separately.

How it works

The water sample is mixed with the selected reagent in the supplied cuvette. The name of the parameter (substance) for which the reagent is specified is entered into the SPECTRO 2 Photometer which already contains the necessary calibration curves. The concentration of the test substance in the water sample is read directly from the photometer display. After each test, the waste solution (water plus reagent) is collected in the supplied collecting bottle. When testing is completed, the contents of the bottle can be disposed of according to local environmental regulations.

The Compact Lab can also be operated with Spectro 3 Photometer.

AQUANAL®-plus Compact Lab Refill Packs Product Information – these products are supplied with the Compact Lab, or they can be purchased separately as refills.

AQUANAL®-Compact Labs Pooltester

The two main chemical parameters important to maintaining a crystal clear and inviting swimming pool are chlorine and pH. AQUANAL®-Pool Tester is a high grade test kit with a wide measuring range for determination of both free chlorine and pH-value. It is supplied in a convenient hinged box that allows it to be hung near the pool for easy access.

AQUANAL®-Pool Tester is easy to use. Simply drop the tablets into a defined volume of the pool water and compare the color change to the included color comparator chart to determine the pH and chlorine levels. The tablets are individually packed in aluminum foil. The kit comes with tablets for twenty tests of pH and chlorine and a color comparator chart. A refill pack provides tablets for thirty tests.



Picture AQUANAL®-plus Pooltester

Cat. No.	Product
37546	AQUANAL®-Pooltester Test kit (20 determinations each)
37547	AQUANAL®-Pooltester Refill Pack (30 determinations)

Table AQUANAL®-plus Pooltester Product Information

AQUANAL®-Compact Labs Analytical Case for Building Restoration

The AQUANAL®-Analytical Case for Building Restoration is designed for investigating the efflorescing of masonry, for aiding decontamination and redevelopment work, and for analyzing water and substances in soil for their potential harm to buildings.

The case contains tests for the determination of chloride, total hardness, magnesium, nitrate, sulfate and sulfide. The instruction manual clearly guides you on how to prepare the samples and calculate the results.

The evaluation of the results can be done using AQUANAL®-plus SPECTRO 2, Photometer must be ordered separately.



Picture AQUANAL®-Analytical Case for Building Restoration

Cat. No.	Product
37563	AQUANAL®-plus analytical case for building restoration
37781-85	Spectro 2 photometer for AQUANAL®-plus reagents
37441	Refill pack chloride reagents
37456	Refill pack total hardness reagents
37466	Refill pack magnesium reagents
37449	Refill pack nitrate reagents
37469	Refill pack sulfate reagents
37470	Refill pack sulfide reagents

Table AQUANAL®-Analytical Case Product Information

QUANTOFIX® Test Sticks and Test Kits

QUANTOFIX®-Test Sticks are ideal for semi-quantitative determination of certain ions and other substances in water.

Advantages of QUANTOFIX®-Test Sticks

- **Quick** – Simply dip the test stick and read the result
- **Easy** – No further equipment or reagents are needed
- **Safe and hygienic** – No exposure to sample or reagents
- **Specific** – One strip per test
- **Long shelf life** – 2.5 years under normal conditions
- **Economical** – 100 test per pack

What are QUANTOFIX®-Test Sticks and Kits?

QUANTOFIX®-Test Sticks are ~0.2 mm thick plastic strips, which have a test paper attached to the lower end. This test area guarantees satisfactory comparisons with the same field area on the color scale which is located on the box side. The length of the test sticks makes the testing of corrosive/aggressive or irritating liquids safe and hygienic. The box stopper contains a drying agent to improve the shelf-life of the sticks. In addition, QUANTOFIX®-Test Kits contain all the required test reagents.

How does it work?

The appropriate QUANTOFIX®-Test Stick is inserted into the water sample. In a few seconds the color of the QUANTOFIX®-Test Stick is compared to a color chart to ascertain the concentration range of the target substance. Concentrated solutions are diluted until the color intensity of the test paper can be satisfactorily determined within the detection range. The respective dilution factor is included in the contents specifications.

A number of determinations require the use of additional reagents which are enclosed with the test sticks in a single kit. Instructions for use are enclosed as well. Each pack allows 100 tests.



Picture QUANTOFIX®-Test Sticks and Kits

Cat. No.	Product	Measuring range
37207	Aluminium test kit QUANTOFIX®	5-500 mg/L Al ³⁺
37212	Ammonium test kit QUANTOFIX®	10-400 mg/L NH ₄ ⁺
37927	Arsenic test kit QUANTOFIX®	10-500 mg/l As ^{3+/5+}
37203	Ascorbic acid test sticks QUANTOFIX®	50-2000 mg/L Vitamin C
37208	Chlorine test kit QUANTOFIX®	10-100 mg/L Cl ₂
37209	Chromate test kit QUANTOFIX®	30-100 mg/L CrO ₄ ²⁻
37199	Cobalt test sticks QUANTOFIX®	10-1000 mg/L Co ²⁺
37198	Copper test sticks QUANTOFIX®	10-300 mg/L Cu ²⁺
37211	Fluoride test kit for 30 determinations	2-100 mg/L F ⁻
37197	Nickel test sticks QUANTOFIX®	10-1000 mg/L Ni ²⁺
37204	Nitrate/Nitrite test sticks QUANTOFIX®	10-500 mg/L NO ₃ ⁻ , 1-80 mg/L NO ₂ ⁻
37205	Nitrite test sticks QUANTOFIX®	1-80 mg/L NO ₂ ⁻
37206	Peroxide test sticks QUANTOFIX®	10-100 mg/L H ₂ O ₂
37210	Phosphate test kit QUANTOFIX®	30-100 mg/L PO ₄ ³⁻
37202	Potassium test kit QUANTOFIX®	200-1500 mg/L K ⁺
37196	Silver test sticks QUANTOFIX®	0.5-10 g/l Ag ⁺
37213	Sulfat test sticks QUANTOFIX®	200-1600 mg/L SO ₄ ²⁻
37201	Sulfite test sticks QUANTOFIX®	10-1000 mg/L SO ₃ ²⁻
37195	Tin test sticks QUANTOFIX®	10-500 mg/L Sn ²⁺
37194	Water hardness (total) test sticks AQUADUR®	3-21°dH

Table QUANTOFIX® Product Information

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