

EN

PHOSPHATE

1 Reagent R1: 984366, 984367 (large kit)
2 Reagent R2: 984368

INTENDED USE

For determination of reactive phosphorus (P), generally in the form of orthophosphate in drinking, ground, surface and waste water on Thermo Scientific™ Aquakem™ or Gallery™ analyzers.

METHOD

Colorimetric method.

PRINCIPLE OF THE PROCEDURE

The orthophosphate ion reacts with ammonium molybdate and antimony potassium tartrate (catalyst) under acidic conditions to form a 12-molybdophosphoric acid complex. The complex is then reduced with ascorbic acid to form a blue heteropoly compound. The absorbance of this compound is measured spectrophotometrically at wavelength 880 nm (or 660 nm) and is related to the phosphate concentration by means of a calibration curve.

REAGENT INFORMATION

All reagents need to be ordered separately.
For this method, both R1 and R2 are needed.

Ready-to-use reagents		Barcode id
984366 Phosphate R1	4 x 20 ml	A04
984367 Phosphate R1 L	20 x 20 ml	A04
984368 Phosphate R2	4 x 20 ml	A05

Concentrations

R1		
	Sulphuric acid	16.5 %
	Antimony potassium tartrate	≤ 1 %
	Ammonium molybdate	≤ 1 %
R2		
	Ascorbic acid	≤ 2 %

Precautions

Phosphate R1 is hazardous.

See separate sheet inside the kit for Hazardous- and Precautions-phrases: H290, H314, P280, P303 + P361 + P353, P305 + P351 + P338.

Exercise the normal precautions required for handling all laboratory reagents.

The products has to be disposed of as laboratory chemical in accordance with local regulations.

Reagent preparation

The reagents are ready-to-use.

Note: Check that there are no bubbles on the surface of reagent when you insert vials in the analyzer.

Storage and Stability

Reagents in unopened vials are stable at 2...8 °C until the expiry date printed on the label.

Refer to reagent definitions in the factory delivered analyzer for the on-board stability.

SAMPLES

Sample type

Drinking, ground, surface and waste water.

Sample preparation

Sample material should be homogenous and representative.

TEST PROCEDURE

See a separate Application note for Aquakem or Gallery analyzer. Application note is suggestive and should be tailored to sample matrix and concentration in use.

Materials required but not provided

Deionized water (aseptic and free of heavy metals) and general laboratory equipment.

Standard solutions available:

984726 Phosphate (as PO₄) Std, 1000 mg/l

984729 Phosphate (as P) Std, 1000 mg/l

Calibration

Calibration is linear.

For Aquakem Application Phosphate, 25 mg/l as P calibration standard was used.

For Gallery Application Phosphate Low, a 1000 µg/l as P calibration standard was used.

For Gallery Application Phosphate High, a 10 mg/l as P calibration standard was used.

Quality Control

Use quality control samples at least once a day. Run the quality control sample always after each calibration, and before the daily sample load to verify the reagent on board stability and every time a new reagent vial is used. It is also recommended to use two levels of controls. The control intervals and limits must be adapted to the individual laboratory requirements. The results of the quality control sample(s) should fall within the limits pre-set by the laboratory.

CALCULATION OF RESULTS

The results are calculated automatically by the analyzer using a calibration curve.

Lot dependent calibration curve can be found from Certificate of Analysis. Please see section Additional Material for instructions.

LIMITATIONS OF THE PROCEDURE

Interference

Silica forms a pale blue complex which absorbs at 880 nm. This interference is insignificant as to produce a positive 1 mg/l error in orthophosphate would require a silica concentration of approximately 4000 mg/l. The determination is sensitive to variations in acid concentrations, the higher the acidity, the lower the sensitivity.

PERFORMANCE CHARACTERISTICS

The results obtained in individual laboratories may differ from the performance data given.

MEASURING RANGE

Analyzer	Name of the application and range as Phosphorus (P)	Extended measuring range
Aquakem	Phosphate * - 2 mg/l P	Up to 10 mg/l P
Gallery	Phosphate Low * - 200 µg/l P	Up to 1000 µg/l P
Gallery	Phosphate High * - 2 mg/l P	Up to 10 mg/l P

Quantitation Limit

The quantitation limit is the lowest amount of analyte in a sample which can be quantitatively determined with suitable precision and accuracy. The quantitation limit can be estimated for example by multiplying 5 to 10 times the SD of a blank sample.

Method Detection Limit (MDL)

The minimum concentration of an analyte that can be identified, measured and reported with 99% confidence that the analyte concentration is greater than zero.

Application	Sample	n	Average (µg/l P)	SD	MDL (µg/l P)
Phos Low	blank	7	0.19	0.130	0.4 *
	blank	40	0.82	0.921	3.6 **

MDL was determined using Gallery analyzer.

*MDL = 3.14 x SD (blank sample, n = 7)

**MDL = 3 x SD + average (blank sample, 4 batches, n = 40)

Precision**Gallery analyzer**

	Pond Water (µg/l P)		Spiked Lake Water (µg/l P)		Spiked Tap Water (µg/l P)	
	N	40	N	40	N	40
	Mean	9.5	Mean	59.0	Mean	167.6
	SD	CV %	SD	CV %	SD	CV %
Within run	0.362	3.8 %	0.991	1.7 %	2.667	1.6 %
Between run	0.103	1.1 %	3.554	6.0 %	2.746	1.6 %
Total	0.376	4.0 %	3.690	6.3 %	3.828	2.3 %

OTHER REMARKS

The results obtained in individual laboratories may differ from the given performance data due to e.g. sample matrix, concentrations or analysis environment. Each laboratory is responsible to verify the method to prove the analysis performance.

WASTE MANAGEMENT

Please refer to local legal requirements. It is recommended to empty the analyzer cuvette waste bin and waste water daily. Emptying should be done immediately after the analysis when using hazardous reagents/solutions.

Note: If using reagents/solutions that react with each other, cuvette waste bin and waste water should be emptied and washed between use of these reagents.

BIBLIOGRAPHY

- 1) ISBN 0117515825
- 2) EPA Method 365.1
- 3) SM 4500-P E.
- 4) EN ISO 6878
- 5) ISO 15923-1

ADDITIONAL MATERIAL

Certificate of analysis and SDS are available at www.e-labeling.eu/TSF

Applications for Gallery and Aquakem automated analyzers are available upon request from the local sales representative. Information in the Application note can change without prior notice.

MANUFACTURER

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CONTACT INFORMATION

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Changes from previous version

Precautions updated.

General updates.