



DOC313.53.94185

EZ1032 Phosphate Analyser

Method and reagent sheets

09/2021, Edition 1.01

1. Legal information.....	3
2. Analytical specifications.....	3
3. Analysis method	4
4. Reagents	5
4.1 Reagent overview and consumption	6
4.2 DI-water overview and consumption	6
4.3 Storage and quality of chemicals.....	7
4.4 Colour solution	8
4.5 Reducing reagent.....	8
4.6 Calibration solution	9
4.7 Cleaning solution (facultative)	9

1. Legal information

Manufacturer: AppliTek NV/SA

Distributor: Hach Lange GmbH

The translation of the manual is approved by the manufacturer.

2. Analytical specifications

Please refer also to the respective technical datasheet at Hach Support Online.

Phosphate - All specifications				
Analysis method	Colorimetric measurement using molybdate blue method (630 nm) conform with APHA 4500-P			
Parameter	PO ₄ -P			
Cycle time	Standard measurement cycle time: 10 minutes Internal dilution: + 5 min. External dilution: + 5 – 10 min.			
Limit of detection (LOD)	≤ 1 µg/L			
Precision/Repeatability	Better than 3% full scale range for standard test solutions			
Cleaning	Automatic; frequency freely programmable			
Calibration	Automatic, 2-point; frequency freely programmable			
Validation	Automatic; frequency freely programmable			
Interferences	Arsenic (V) [(As) ⁵⁺], chromium (VI) [(Cr) ⁶⁺], Copper (II) [(Cu) ²⁺] > 10 mg/L, iron (III) [(Fe) ³⁺] > 10 mg/L, sulphide [(S) ²⁻] > 2 mg/L and vanadium [(V) ⁵⁺], silica [(Si) ⁴⁺] > 60 mg/L. Large amounts of colour and turbidity interferes. Fats, oil, proteins, surfactants and tar.			
Measuring ranges	% of range - Dilution		Low range (mg/L)	High range (mg/L)
	A	10% of standard range	0.001	0.1
	B	25% of standard range	0.0025	0.25
	C	50% of standard range	0.0025	0.5
	0	standard range	0.005	1
	1	internal MP dilution (factor 4)	0.040	4
	2	Internal MP dilution (factor 8)	0.080	8
	W	internal dispenser dilution (factor 10)	0.05	10
	X	internal dispenser dilution (factor 25)	0.125	25
	Y	internal dispenser dilution (factor 50)	0.25	50
	Z	internal dispenser dilution (factor 75)	0.375	75
	5	internal dispenser dilution (factor 100)	0.500	100

3. Analysis method

Summary

The determination of the Ortho-Phosphate (PO_4^{3-}) concentration in water is based on molybdate method or blue method. The ortho-phosphate ions react with ammonium molybdate to form phosphomolybdic acid. This acid is reduced to an intensely coloured molybdenum blue complex by means of a reducing reagent which is measured at 630 nm.

Analysis steps

The analysis vessel is cleaned and filled with fresh sample. After sampling the initial absorbance value is measured at 630 nm. This measurement is performed to correct for any colour contribution of the sample itself. Next, the colour solution and reducing reagent are added to the sample solution and after respecting a stirring period, the final absorbance value is measured. With the obtained absorbance values, the Ortho-Phosphate (PO_4^{3-}) concentration is calculated according to Beer's Law.

Calibration

The calibration procedure measures a REF1 $\text{PO}_4\text{-P}$ solution (channel 9, REF1 valve) and a REF2 $\text{PO}_4\text{-P}$ solution (channel 10, REF2 valve) to adapt the slope and offset factors by means of a two-point calibration.

The calibration is performed in the MAIN method.

Remark

The methods cannot be started at the same time.

4. Reagents

⚠ CAUTION	
	Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Read the safety data sheet from the supplier before bottles are filled or reagents are prepared. For laboratory use only. Make the hazard information known in accordance with the local regulations of the user.

⚠ CAUTION	
	Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

4.1 Reagent overview and consumption

In the tables below, the products that are needed to prepare the reagents are listed. The product name, the formula, the molecular weight, the CAS No. and the amount needed to prepare 1 litre of the reagents is given. Check the consumption of the reagents (28 days) to adapt the volumes needed.

Product	Consumption	Consumption/28 days A rata 1 analysis/10 min	Recommended containers
Colour solution	~ 1 mL / analysis	~ 4.0 L	Plastic – 5 L
Reducing reagent	~ 1 mL / analysis	~ 4.0 L * (~2.0 L / 14 days)	Glass – 2.5 L
REF1 solution	~ 0.5 L / calibration	/	Plastic – 1 L
REF2 solution	~ 0.5 L / calibration	/	Plastic – 1 L

*This solution is stable for maximum 2 weeks

4.2 DI-water overview and consumption

	Rinse water (mL/analysis) Type I	Dilution water (mL/analysis) Type I	Total (mL/analysis)	Consumption/28 days A rata 1 analysis / 10 min
A	N.A.	N.A.	N.A.	N.A.
B	N.A.	N.A.	N.A.	N.A.
C	N.A.	N.A.	N.A.	N.A.
0	N.A.	N.A.	N.A.	N.A.
1	60 mL	15 mL	75 mL	302 L
2	60 mL	15 mL	75 mL	302 L
W	60 mL	15 mL	75 mL	302 L
X	60 mL	15 mL	75 mL	302 L
Y	60 mL	15 mL	75 mL	302 L
Z	60 mL	15 mL	75 mL	302 L
5	60 mL	15 mL	75 mL	302 L

Remark

The indicated volumes are an estimation of the consumption for rinse and dilution water, based on a standard operating procedure, as defined in the specifications of the EZ analyser. Please be aware that, depending on the sample matrix, the rinse water volumes might increase.

4.3 Storage and quality of chemicals

Quality of chemicals

All chemicals should be of Reagent grade, ACS grade or better (*). The use of pro analysis chemicals is recommended. Poor quality of the reagents can affect the analyser performance.

(*) Analytical Reagent (AR), Guaranteed Reagent (GR), UNIVAR, AnalaR, Premium Reagent (PR), ReagentCertified ACS reagent, ACS Plus reagent, puriss p.a. ACS reagent, ReagentPlus®, TraceCERT®, Suprapur®, Ultrapur®, or better are also possible.

Quality of DI-water

All EZ analysers are tested with standard solutions, reagents and dilution water prepared using type I water or better as defined by ASTM D1193-91.

To achieve the specifications as stated on the data sheet, method and reagents sheet and acceptance test reports, the same water quality (or better) must be used for the preparation of the standard solutions, reagents and dilution water.

Additionally the water used for the preparation of the standard solutions for an EZ analyser must be free of the parameter or any of the interferences for the method of that EZ analyser.

Storage of Reagents

While operating the instrument, keep in mind the reagent requirements as stated in the reagent overview, the chapters below and/or in the data sheet of the instrument.

⚠ CAUTION	
	For longer-term storage: Store the reagents cold; Store the reagents in the dark; If applicable: Store the reagents in a fridge during operation

⚠ CAUTION	
	Refresh the reagents after one month (unless stated differently in the chapters below). Do not mix old reagents with freshly prepared reagents. Remove old reagents from the container before adding freshly prepared reagents.

4.4 Colour solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Ammonium-hepta- molybdate-tetrahydrate	$(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$	1235.86	12054-85-2	10 g
Potassium antimony tartrate trihydrate	$\text{C}_8\text{H}_4\text{K}_2\text{O}_{12}\text{Sb}_2 \cdot 3\text{H}_2\text{O}$	667.87	28300-74-5	0.5 g
Sulfuric acid 96%	H_2SO_4	98.08	7664-93-9	75 mL

Preparation

Dissolve 10 g of ammonium molybdate ($(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$) in 400 mL of de-ionized water and dissolve completely. Add 0.5 g potassium antimony tartrate trihydrate ($\text{C}_8\text{H}_4\text{K}_2\text{O}_{12}\text{Sb}_2 \cdot 3\text{H}_2\text{O}$) and dissolve completely. Add 75 mL sulfuric acid (H_2SO_4 95-97 %) and dilute the solution to 1 litre with de-ionized water. Cool down before use.

The colour reagent should be colourless. If the colour of the solution is green or yellow, it can't be used.

4.5 Reducing reagent

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Ascorbic acid	$\text{C}_6\text{H}_8\text{O}_6$	176.12	50-81-7	20 g

Preparation

Dissolve 20 g of ascorbic acid ($\text{C}_6\text{H}_8\text{O}_6$) in 500 mL de-ionized water using a volumetric flask of 1000 mL. Dissolve completely and dilute to 1 litre with de-ionized water.

This solution is stable for maximum 2 weeks. Store the reagent in a fridge during operation to prolong stability.

4.6 Calibration solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Potassium dihydrogen phosphate	H ₂ KO ₄ P	136.09	7778-77-0	4.394 g

Preparation

1000 mg/L PO₄-P stock solution

Prepare a stock solution of 1000 mg/L PO₄-P. Dissolve 4.394 g of potassium dihydrogen phosphate (H₂KO₄P) in 900 mL water and dilute to 1 litre with de-ionized water

PO₄-P standard solution – REF2

Prepare a standard solution for calibration according to the following table: take accurately x mL of the 1000 mg/L PO₄-P. stock solution and transfer into a volumetric flask of 1000 mL. Add de-ionized water up to the mark grade.

	Measuring range	Concentration REF2	Amount of stock solution to add to 1 litre
A	0.1 mg/L PO ₄ -P	0.1 mg/L PO ₄ -P	0.1 mL
B	0.25 mg/L PO ₄ -P	0.25 mg/L PO ₄ -P	0.25 mL
C	0.5 mg/L PO ₄ -P	0.5 mg/L PO ₄ -P	0.5 mL
0	1 mg/L PO ₄ -P	1 mg/L PO ₄ -P	1 mL
1	4 mg/L PO ₄ -P	4 mg/L PO ₄ -P	4 mL
2	8 mg/L PO ₄ -P	8 mg/L PO ₄ -P	8 mL
W	10 mg/L PO ₄ -P	10 mg/L PO ₄ -P	10 mL
X	25 mg/L PO ₄ -P	25 mg/L PO ₄ -P	25 mL
Y	50 mg/L PO ₄ -P	50 mg/L PO ₄ -P	50 mL
Z	75 mg/L PO ₄ -P	75 mg/L PO ₄ -P	75 mL
5	100 mg/L PO ₄ -P	100 mg/L PO ₄ -P	100 mL

PO₄-P standard solution – REF1

Prepare a standard solution of 0 mg/L PO₄-P. Use de-ionized water.

4.7 Cleaning solution (facultative)

The cleaning procedure should prevent any build-up of chemicals in the analyser. To obtain an effective cleaning procedure one has to test the cleaning solution and the cleaning interval for each application. Perform the selected cleaning solution and interval for a trial period, check then the effectiveness of the procedure and change if necessary.

Change Information	
Date: 22/09/2021	Previous version: Edition 5 to Edition 1.01
Reason for Change	
- Addition of extra ranges to the portfolio of EZ1032 - Addition of water consumption - Addition of information reagents - Change in description of parameter conform Hach regulations	
Description of Change	
- Addition of extra ranges for internal dispenser dilution: 10x, 25x, 50x, 75x (chapter 4.6) - Addition of estimated consumption of water for rinse and dilution (chapter 4.2) - Addition of extra information regarding storage and quality of reagents (chapter 4.3) - Change of description of parameter from P-PO₄ to PO₄-P	