DOC313.53.94174

EZ1005 Chloride Analyser

Method and reagent sheets

10/2022, Edition 1.11

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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.

Chloride - All specifications				
Analysis method	Colorimetric measurement of turbidity at 480 nm after silver chloride (AgCl) precipitation, based on standard method APHA 4500-Cl (B)			
Parameter	Cl^-			
Cycle time	Standard measurement cycle time: 10 minutes Internal dilution: + 5 min. External dilution: + 5 – 10 min.			
Limit of detection (LOD)	≤ 1 mg/L			
Precision/Repeatability	Better than 2% 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	Substances in amounts normally found in potable waters will likely not interfere. Bromide [(Br)-], iodide [(I)-] and cyanide [(CN)] register as equivalent chloride concentrations. Sulfide [$(S)_{2}$-], thiosulphate [$(S_2O_4)_{2}$-] and sulphite [(SO_3)-] interfere. Orthophosphate [$(PO_4)_{3}$-] > 25 mg/L interferes by precipitating as silver phosphate. Iron [Fe] > 10 mg/L interferes. Large amounts of colour and turbidity interfere. Fats, oil, proteins, surfactants and tar.			
Measuring ranges	**% of range - Dilution**		**Low range (mg/L)**	**High range (mg/L)**
	0	**standard range**	**1**	**10**
	1	internal MP dilution (factor 4)	4	40
	2	internal MP dilution (factor 8)	8	80
	W	internal dispenser dilution (factor 10)	10	100
	X	internal dispenser dilution (factor 25)	25	250
	Y	internal dispenser dilution (factor 50)	50	500
	Z	internal dispenser dilution (factor 75)	75	750
	5	internal dispenser dilution (factor 100)	100	1000

3. Analysis method

Summary

The chloride (Cl^-) ions are precipitated in an acidified medium with silver nitrate ($AgNO_3$) to form a (white) silver chloride precipitation. The absorption of the AgCl suspension is measured at a wavelength of 480 nm.

Analysis steps

The analysis vessel is cleaned and filled with fresh sample. After sampling and addition of the acid solution, the initial absorbance value is measured at 480 nm. Next, the silver nitrate solution is added whereupon silver chloride is precipitated. After respecting a stirring periode the final absorbance value is determined. With the obtained absorbance values, the chloride concentration can be calculated according to Beer's law.

Calibration

The calibration procedure measures a REF1 Cl^- solution (channel 9, REF1 valve) and a REF2 Cl^- 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 liter 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
Acid solution	~ 0.5 mL / analysis	~ 1.5 L	Plastic – 2.5 L
$AgNO_3$ solution	~ 1.0 mL / analysis	~ 3.0 L	Glass – 2.5 L
NH_3 solution	~ 0.5 mL / analysis	~ 1.5 L	Plastic – 2.5 L
REF1 solution	~ 0.5 L / calibration	/	Plastic – 1 L
REF2 solution	~ 0.5 L / calibration	/	Plastic – 1 L

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
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
U	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 Acid solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Nitric acid 65%	HNO_3	63.01	7697-37-2	128 mL

Preparation

Add approximately 128 mL nitric acid (HNO_3, 65%) to 500 mL de-ionized water. Mix and fill up to 1 litre with de-ionized water. The final concentration of this solution is 2 N.

4.5 $AgNO_3$ solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Silver nitrate	$AgNO_3$	169.87	7761-88-8	33.97 g

Preparation

Dissolve 33.97 g of silver nitrate ($AgNO_3$) in 500 mL de-ionized water. Dissolve completely and fill up to 1 litre with de-ionized water. The final concentration of this solution is 0.2 N.

4.6 NH_3-solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Ammonium hydroxide 25%	NH_4OH	35.05	1336-21-6	200 mL

Preparation

Add approximately 200 mL ammonium hydroxide solution (NH_4OH, 25%) to 500 mL de-ionized water. Mix and fill up to 1 litre with de-ionized water. The final concentration of this solution is about 5%.

4.7 Calibration solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Sodium Chloride	NaCl	58.44	7647-14-5	16.485 g

Preparation

10000 mg/L Cl^- stock solution

Prepare a stock solution of 10000 mg/L Cl^-: Dissolve accurately 16.485 g sodium chloride (NaCl) 500 mL de-ionized water using a plastic volumetric flask of 1000 mL. Dissolve completely and fill up to 1 litre with de-ionized water.

Cl^- standard solution – REF2

Prepare a standard solution for calibration according to the following table: take accurately x mL of the 10000 mg/L Cl^- stock solution and transfer into a plastic 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
0	**10 mg/L Cl^-**	**10 mg/L Cl^-**	**1.0 mL**
1	40 mg/L Cl^-	40 mg/L Cl^-	4.0 mL
2	80 mg/L Cl^-	80 mg/L Cl^-	8.0 mL
W	100 mg/L Cl^-	100 mg/L Cl^-	10 mL
X	250 mg/L Cl^-	250 mg/L Cl^-	25 mL
Y	500 mg/L Cl^-	500 mg/L Cl^-	50 mL
Z	750 mg/L Cl^-	750 mg/L Cl^-	75 mL
5	1000 mg/L Cl^-	1000 mg/L Cl^-	100 mL

Cl^- standard solution – REF1

Prepare a standard solution for calibration according to the following table: take accurately x mL of the 10000 mg/L Cl^- stock solution and transfer into a plastic volumetric flask of 1000 mL. Add de-ionized water up to the mark grade.

	Measuring range	Concentration REF1	Amount of stock solution to add to 1 litre
0	**10 mg/L Cl^-**	**2.5 mg/L Cl^-**	**0.25 mL**
1	40 mg/L Cl^-	10 mg/L Cl^-	1.0 mL
2	80 mg/L Cl^-	20 mg/L Cl^-	2.0 mL
W	100 mg/L Cl^-	25 mg/L Cl^-	2.5 mL
X	250 mg/L Cl^-	60 mg/L Cl^-	6.0 mL
Y	500 mg/L Cl^-	125 mg/L Cl^-	12.5 mL
Z	750 mg/L Cl^-	185 mg/L Cl^-	18.5 mL
5	1000 mg/L Cl^-	250 mg/L Cl^-	25 mL

4.8 Cleaning solution

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.

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Ammonium hydroxide 25%	NH_4OH	35.05	1336-21-6	200 mL

Preparation

Add approximately 200 mL ammonium hydroxide solution (NH_4OH, 25%) to 500 mL de-ionized water. Mix and fill up to 1 litre with de-ionized water. The final concentration of this solution is about 5%.

Change Information	
Date: 17/09/2021	Previous version: Edition 5 to Edition 1.01

Reason for Change

- Addition of extra ranges to the portfolio of EZ1005
- Addition of water consumption
- Addition of information reagents

Description of Change

- Addition of extra ranges for internal dispenser dilution: 10x, 25x, 50x, 75x (chapter 4.7)
- 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)