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EZ4006 Chloride Analyser

Method and reagent sheets

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1. Legal information.....	3
2. Analytical specifications.....	3
3. Analysis method	4
4. Reagents	5
4.1 Reagent overview and consumption	5
4.2 Storage and quality of chemicals.....	5
4.3 Buffer solution (2 N)	6
4.4 Silver nitrate solution	6
4.5 Ammonium hydroxide solution (5%) – Cleaning solution	7
4.6 Calibration solution	7
4.7 Cleaning solution (facultative).....	8

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	Potentiometric titration with silver nitrate (AgNO ₃), conform with standard method ASTM 4500-Cl (B)			
Parameter	Cl ⁻			
Cycle time	15 minutes			
Limit of detection (LOD)	≤ 5 mg/l			
Precision/Repeatability	Better than 2% full scale range for standard test solutions			
Cleaning	Automatic; frequency freely programmable			
Calibration	Automatic, 1-point; frequency freely programmable			
Validation	Automatic; frequency freely programmable			
Interferences	Bromide [(Br) ⁻], sulphide [(S) ²⁻], iodide [(I) ⁻] ions may interfere. Ferricyanide [Fe(CN) ₆] causes high results and must be removed. Chromate [(CrO ₄) ²⁻] and dichromate [(Cr ₂ O ₇) ²⁻] interfere and should be reduced to chromic state or removed. Ferric iron [Fe ³⁺] interferes if present in an amount substantially higher than the amount of chloride. Chromic ion [Cr ³⁺], ferrous ion [Fe ²⁺] and phosphate [(PO ₄) ³⁻] do not interfere. Fats, oil, proteins, surfactants and tar.			
Measuring ranges	% of range - Dilution		Low range (mg/L)	High range (mg/L)
	A	10% of standard range	5	50
	B	25% of standard range	5	125
	C	50% of standard range	5	250
	0	standard range	25	500
	V	Internal dispenser dilution factor 5	125	2500
	W	Internal dispenser dilution factor 10	250	5000
	X	Internal dispenser dilution factor 25	625	12500
	Y	Internal dispenser dilution factor 50	1250	25000
	Z	Internal dispenser dilution factor 75	1875	37500
5	Internal dispenser dilution factor 100	2500	50000	

3. Analysis method

Summary

The chloride (Cl⁻) concentration is determined by an argentometric titration using a platinum electrode.

Analysis steps

The analysis vessel is cleaned and filled with fresh sample. After sampling, a nitric acid (HNO₃) solution is added and the solution is titrated with silver nitrate that reacts readily with chloride. The silver cation reacts with chloride to form an insoluble silver chloride (AgCl) precipitate. After analysis, the analysis vessel is cleaned with an ammonium hydroxide solution.

Calibration


The calibration procedure measures a REF2 Cl solution (channel 10, Validation valve) to adapt the slope factor by means of a one 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/15 min	Recommended containers
Nitric acid solution (2N)	~ 2 mL / analysis	~ 5.3 L	Plastic – 10 L
Silver nitrate solution	Depending on chloride concentration	1L < Volume < 25 L	Dark Plastic – 10 L
Ammonium hydroxide solution (5%)	~ 10 mL / analysis	~ 34 L	Plastic – 10 L
REF2 Solution	~ 1 L / calibration	/	Plastic – 2.5 L

4.2 Storage and quality of chemicals

Quality of chemicals

All chemicals should be of ACS grade or better. We recommend the use of pro analysis chemicals.

Quality of water

Reagent grade, chloride-free de-ionized water must be used to prepare the chemical solutions and for rinse purposes.

Storage of Reagents

While operating the instrument, keep in mind the ambient temperature conditions as stated in the data sheet of the instrument.

Store the reagents cold; Store the reagents in the dark; Refresh the reagents after one month (unless stated differently in the chapters below).

4.3 Buffer solution (2 N)

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Nitric Acid (65%)	HNO ₃	63.01	7697-37-2	140 mL

Preparation

Add carefully 140 mL nitric acid (HNO₃ 65%) to 400 ml de-ionized water and dilute to 1 litre.

4.4 Silver nitrate solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Silver nitrate	AgNO ₃	169.87	7761-88-8	x g

Preparation

Prepare a x N silver nitrate (AgNO₃) solution. Dissolve accurately x g silver nitrate (AgNO₃) in 500 mL demineralized water. Fill up to 1 litre with de-ionized water. This solution is stable for 1 month.

Refer to the table below to prepare your solution according to the range of the analyzer. For samples with chloride concentrations above 500 mg/L, use the AgNO₃ concentration stated for the 500 mg/L Cl range.

	Measuring range	Concentration AgNO ₃ solution	Amount to add to 1 litre
A	50 mg/L Cl	0.01 N	1.6987 g
B	125 mg/L Cl	0.01 N	1.6987 g
C	250 mg/L Cl	0.01 N	1.6987 g
0	500 mg/L Cl	0.05 N	8.4435 g
V	2500 mg/L Cl	0.05 N	8.4435 g
W	5000 mg/L Cl	0.05 N	8.4435 g
X	12500 mg/L Cl	0.05 N	8.4435 g
Y	25000 mg/L Cl	0.05 N	8.4435 g
Z	37500 mg/L Cl	0.05 N	8.4435 g
5	50000 mg/L Cl	0.05 N	8.4435 g

4.5 Ammonium hydroxide solution (5%) – Cleaning solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Ammonium hydroxide	NH ₄ OH	35.05	1336-21-6	200 mL

Preparation

Add carefully 200 mL ammonium hydroxide (NH₄OH 25%) to 400 mL de-ionized water. Fill up to 1 litre with de-ionized water.

4.6 Calibration solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Sodium Chloride	NaCl	58.44	7647-14-5	164.86 g

Preparation

100000 mg/L Chloride stock solution

Prepare a stock solution of 100000 mg/L Chloride: Dissolve accurately 164.86 g sodium chloride (NaCl) in 600 mL de-ionized water using a volumetric flask of 1 litre. Fill up to 1 litre with de-ionized water.

Chloride standard solution – REF2

Prepare a standard solution for calibration according to the following table: take accurately x mL of the 100000 mg/L Cl stock solution and transfer into a volumetric flask of 1 litre. Add de-ionized water up to the mark grade.

	Measuring range	Concentration REF2 solution	Amount to add to 1 litre
A	50 mg/L Cl	50 mg/L Cl	0.5 mL
B	125 mg/L Cl	125 mg/L Cl	1.25 mL
C	250 mg/L Cl	250 mg/L Cl	2.5 mL
0	500 mg/L Cl	500 mg/L Cl	5 mL
V	2500 mg/L Cl	2500 mg/L Cl	25 mL
W	5000 mg/L Cl	5000 mg/L Cl	50 mL
X	12500 mg/L Cl	12500 mg/L Cl	125 mL
Y	25000 mg/L Cl	25000 mg/L Cl	250 mL
Z	37500 mg/L Cl	37500 mg/L Cl	375 mL
5	50000 mg/L Cl	50000 mg/L Cl	500 mL

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.