DOC313.53.94215

EZ3508 Fluoride Analyser

Method and reagent sheets

01/2023, Edition 1.01

Table of Contents

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.

Fluoride - All specifications				
Analysis method	Discontinuous measurement by combined ion-selective electrode with standard addition			
Parameter	Fluoride			
Cycle time	Standard measurement cycle time: 5 minutes Internal dilution: + 5 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	Metal ions like aluminium $[(Al)^{3+}]$ > 72 mg/L, calcium $[(Ca)^{2+}]$ > 108 mg/L and iron $[(Fe)^{2+}/(Fe)^{3+}]$ > 150 mg/L. Fats, oil, proteins, surfactants and tar.			
Measuring ranges	**% of range - Dilution**		**Low range (mg/L)**	**High range (mg/L)**
	B	25% of standard range	1	25
	C	50% of standard range	2.5	50
	0	**Standard range**	**5**	**100**
	V	internal dispenser dilution (factor 5)	25	500
	W	internal dispenser dilution (factor 10)	50	1000

3. Analysis method

Summary

The Fluoride (F^-) concentration is determined by a standard addition using an ionselective electrode.

Analysis steps

The analysis vessel is drained and rinsed with fresh sample. A specific amount of sample is dosed into the analysis vessel. A ISA [T(otal) I(onic) S(trength) A(djustment) B(uffer)] solution is added to the sample to adjust the pH and to assure the total strength of the sample. The potential is measured using an ion selective electrode. Next a known volume of standard solution is added. The solutions are mixed and a second reading is taken. The analyzer calculates the initial ion concentration in the sample.

Calibration

The calibration procedure measures a REF1 Blank solution (channel 9, REF1 valve) to adapt the slope 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 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/5 min	Recommended containers
Buffer solution	~ 2.25 mL / analysis	< 19 L	Plastic – 10 L
Standard solution Fluoride (dispenser)	~ 0.5 mL / analysis ~ 2 mL / calibration	< 5 L	Plastic – 5 L
Blank solution (REF1)	~ 0.5 L / calibration	/	Plastic – 2.5 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 / 5 min
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.
V	50 mL	75 mL	125 mL	504 L
W	50 mL	75 mL	125 mL	504 L

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 Buffer solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Glacial acetic acid	$C_2H_4O_2$	60.05	64-19-7	58 mL
Sodium Hydroxide	NaOH	40.00	1310-73-2	37 g
Sodium Chloride	NaCl	58.44	7647-14-5	58.4 g
DCTA	$C_{14}H_{22}N_2O_8 * H_2O$	365.35	125572-95-4	5.0 g

2M NaOH solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Sodium Hydroxide	NaOH	40.00	1310-73-2	80 g

Preparation

Add carefully 58 mL glacial acetic acid ($C_2H_4O_2$ 100%) to 600 mL de-ionized water and dissolve. Add 37 g sodium hydroxide (NaOH) and after dissolving let the solution cool down. Add 58.4 g sodium chloride (NaCl) and 5.0 g DCTA (1,2 Diaminocyclohexane-N,N,N',N'-tetraacetic acid monohydrate) and dissolve.

The pH value of this solution should be 5.5 ± 0.1. If this is not the case, adjust the pH to 5.5± 0.1 with the sodium hydroxide (NaOH 2M) solution. The amount of 2M NaOH that needs to be added will not be exceeding 25 mL. Fill up to 1 litre with de-ionized water.

4.5 Standard solution Fluoride

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Sodium fluoride	NaF	41.98	7681-49-4	22.0947 g

Preparation

10000 mg/L Fluoride stock solution

Prepare a stock solution of 10000 mg/L Fluoride: Dissolve accurately 22.0947 g sodium fluoride in 300 mL de-ionized water using a volumetric flask of 1000 mL. Fill up to 1 litre with de-ionized water.

Fluoride standard solution (dispenser)

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

	Measuring range	Concentration Standard	Amount of stock solution to add to 1 litre
B	25 mg/L F	250 mg/L F	25 mL
C	50 mg/L F	500 mg/L F	50 mL
0	**100 mg/L F**	**1000 mg/L F**	**100 mL**
V	500 mg/L F	1000 mg/L F	100 mL
W	1000 mg/L F	1000 mg/L F	100 mL

4.6 Calibration solution

Blank solution - REF1

Use de-ionized water.

4.7 Validation solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Sodium fluoride	NaF	41.98	7681-49-4	22.0947 g

Preparation

10000 mg/L Fluoride stock solution

Prepare a stock solution of 10000 mg/L Fluoride: Dissolve accurately 22.0947 g sodium fluoride in 300 mL de-ionized water using a volumetric flask of 1000 mL. Fill up to 1 litre with de-ionized water.

Fluoride validation solution

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

	Measuring range	Concentration Standard	Amount of stock solution to add to 1 litre
B	25 mg/L F	25 mg/L F	2.5 mL
C	50 mg/L F	50 mg/L F	5.0 mL
0	**100 mg/L F**	**100 mg/L F**	**10.0 mL**
V	500 mg/L F	500 mg/L F	50.0 mL
W	1000 mg/L F	1000 mg/L F	100 mL

4.8 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: 09/01/2023	Previous version: Edition 2 to Edition 1.01

Reason for Change

- Addition of water consumption
- Addition of information reagents
- Change in preparation method of buffer

Description of Change

- 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 in preparation method Buffer solution, due to current complex preparation method (chapter 4.4)