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## **EZ1022 Parameter**

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 .....	6
4.2 DI-water overview and consumption .....	6
4.3 Storage and quality of chemicals.....	7
4.4 Buffer solution .....	8
4.5 Colour solution .....	8
4.6 Calibration solution .....	9
4.7 Cleaning solution (facultative).....	10

## 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.

Hydrogen Peroxide - All specifications				
Analysis method	Colorimetric measurement using DPD colour solution			
Parameter	Hydrogen Peroxide			
Cycle time	Standard measurement cycle time: 10 minutes Internal dilution: + 5 min. External dilution: + 5 – 10 min.			
Limit of detection (LOD)	≤ 0.002 mg/L			
Precision/Repeatability	Better than 2 % full scale range for standard test solutions			
Cleaning	Automatic)			
Calibration	Automatic, 2-point; frequency freely programmable			
Validation	Automatic; frequency freely programmable			
Interferences	Oxidants like Bromine [Br <sub>2</sub> ], Bromamine, Chlorine [Cl <sub>2</sub> ], Copper (II) [(Cu) <sup>2+</sup> ] > 8 mg/l, Chromate [(CrO <sub>4</sub> ) <sup>2-</sup> ], Iodine [I <sub>2</sub> ], Iodoamines, Iron (III) [(Fe) <sup>3+</sup> ] > 20 mg/l, Nitrite [(NO <sub>2</sub> ) <sup>-</sup> ], Ozone [O <sub>3</sub> ] and Manganese may oxidize the DPD colour solution. Large amounts of colour and turbidity interferes. Fats, oil, proteins, surfactants and tar.			
Measuring range	<b>% of range - Dilution</b>		<b>Low range (mg/L)</b>	<b>High range (mg/L)</b>
	B	25% of standard range	0.002 mg/L	0.125 mg/L
	C	50% of standard range	0.002 mg/L	0.25 mg/L
	<b>0</b>	<b>standard range</b>	<b>0.005 mg/L</b>	<b>0.5 mg/L</b>
	1	internal MP dilution (factor 4)	0.04 mg/L	2 mg/L
	2	internal MP dilution (factor 8)	0.08 mg/L	4 mg/L
	V	internal dispenser dilution (factor 5)	0.025 mg/L	2.5 mg/L
	W	internal dispenser dilution (factor 10)	0.05 mg/L	5 mg/L
	X	internal dispenser dilution (factor 25)	0.125 mg/L	12.5 mg/L
	Y	internal dispenser dilution (factor 50)	0.25 mg/L	25 mg/L
	Z	internal dispenser dilution (factor 75)	0.375 mg/L	37.5 mg/L
	5	internal dispenser dilution (factor 100)	0.5 mg/L	50 mg/L
	6	Dual Range: Range_1	0.005 mg/L	0.5 mg/L
		Dual Range: Range_2	0.2 mg/L	20 mg/L

### 3. Analysis method

#### Summary

Hydrogen peroxide oxidizes the DPD colour solution to form a magenta coloured complex. The absorption is measured at a wavelength of 510 nm.

#### Analysis steps

The analysis vessel is cleaned and filled with fresh sample. After sampling, the initial absorbance value is measured at 510 nm. Next, the buffer and colour solution is added and after respecting a stirring period – performed to obtain complete colour development – the final absorbance value is determined. With the obtained absorbance values, the peroxide concentration can be calculated according to Beer's law.

#### Calibration

The calibration procedure measures a REF1 H<sub>2</sub>O<sub>2</sub> solution (channel 9, REF1 valve) and a REF2 H<sub>2</sub>O<sub>2</sub> 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
Buffer solution	~ 0.5 mL / analysis	~ 2.02 L	Brown bottle – 2.5 L
Colour solution	~ 0.5 mL / analysis	~ 2.02 L	Brown bottle – 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 1	Dilution water (mL/analysis) Type 1	Total (mL/analysis)	Consumption/28 days A rata 1 analysis / 10 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.
1		60 mL	15 mL	75 mL	302 L
2		60 mL	15 mL	75 mL	302 L
V		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
6	Dual Range: Range_1	N.A.	N.A.	N.A.	N.A.
	Dual Range: Range_2	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<sup>®</sup>, TraceCERT<sup>®</sup>, Suprapur<sup>®</sup>, Ultrapur<sup>®</sup>, 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 ambient temperature conditions as stated 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
Disodium hydrogen phosphate dihydrate	Na <sub>2</sub> HPO <sub>4</sub> * 2H <sub>2</sub> O	177.99	10028-24-7	7.5 g
Potassium iodide	KI	166.0	7681-11-0	40 g
Ammonium molybdate tetrahydrate	(NH <sub>4</sub> ) <sub>6</sub> Mo <sub>7</sub> O <sub>24</sub> * 4H <sub>2</sub> O	1235.86	12054-85-2	4 g
EDTA*	C <sub>10</sub> H <sub>14</sub> N <sub>2</sub> O <sub>8</sub> Na <sub>2</sub> * 2H <sub>2</sub> O	372.24	6381-92-6	0.4 g

\*Ethylenediaminetetraacetic acid disodium salt dihydrate

### Preparation

Dissolve 7.5 g disodium hydrogen phosphate dihydrate (Na<sub>2</sub>HPO<sub>4</sub> \* 2H<sub>2</sub>O), 40 g potassium iodide (KI) and 4 g ammonium molybdate tetrahydrate [(NH<sub>4</sub>)<sub>6</sub>Mo<sub>7</sub>O<sub>24</sub> \* 4H<sub>2</sub>O] in 500 mL de-ionized water. Next, dissolve 0.4 g EDTA (C<sub>10</sub>H<sub>14</sub>N<sub>2</sub>O<sub>8</sub>Na<sub>2</sub> \* 2H<sub>2</sub>O) in 100 mL de-ionized water. Combine the two solutions and fill up to 1 litre with de-ionized water.

## 4.5 Colour solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
N,N-diethyl-p-phenylenediamine sulfate	(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> NC <sub>6</sub> H <sub>4</sub> NH <sub>2</sub> * H <sub>2</sub> SO <sub>4</sub>	262.33	6283-63-2	2 g
Phosphoric acid 85%	H <sub>3</sub> PO <sub>4</sub>	98.00	7664-38-2	2 mL
Potassium dihydrogen phosphate	KH <sub>2</sub> PO <sub>4</sub>	136.09	7778-77-0	16.9
EDTA*	C <sub>10</sub> H <sub>14</sub> N <sub>2</sub> O <sub>8</sub> Na <sub>2</sub> * 2H <sub>2</sub> O	372.24	6381-92-6	0.4 g

### Preparation

Dissolve 2 g N,N-diethyl-p-phenylenediamine sulfate ((C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> \* H<sub>2</sub>SO<sub>4</sub>) in 500 mL de-ionized water. Next, add 2 mL of the phosphoric acid solution (H<sub>3</sub>PO<sub>4</sub> 85%), 0.4 g EDTA (C<sub>10</sub>H<sub>14</sub>N<sub>2</sub>O<sub>8</sub>Na<sub>2</sub> \* 2H<sub>2</sub>O) and 16.9 g potassium dihydrogen phosphate (KH<sub>2</sub>PO<sub>4</sub>), mix and fill up to 1 litre with de-ionized water.

**This solution is stable for maximum 2 weeks. Store the reagent in a closed (brown) bottle and in a fridge during operation to prolong stability up to one month. Avoid contact of the colour solution with ambient air. The colour solution should be colourless. If the colour solution turns brownish, please replace to guarantee good results.**

We recommend to use N,N-diethyl-p-phenylenediamine sulfate with following specifications:

Product	Brand	Product No.	Specification
N,N-diethyl-p-phenylenediamine sulfate	Fluka	07670	Puriss. p.a. for spectrophotometric detection of S <sub>2</sub> , Cl <sub>2</sub>



## 4.6 Calibration solution

Products	Formula	MW (g/mol)	CAS No.	1 litre solution
Hydrogen Peroxide 30%	H <sub>2</sub> O <sub>2</sub>	392.14	7722-84-1	3.33 mL

### Preparation

#### 1000 mg/L H<sub>2</sub>O<sub>2</sub> stock solution

Prepare a stock solution of 1000 mg/L H<sub>2</sub>O<sub>2</sub>: Dissolve accurately 3.33 mL hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) in 300 mL de-ionized water using a volumetric flask of 1000 mL. Add de-ionized water up to the mark grade.

#### H<sub>2</sub>O<sub>2</sub> standard solution – REF2

Prepare a standard solution for calibration according to the following table: take accurately x mL of the 1000 mg/L H<sub>2</sub>O<sub>2</sub> 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
B	0.125 mg/L H <sub>2</sub> O <sub>2</sub>	0.125 mg/L H <sub>2</sub> O <sub>2</sub>	0.125 mL
C	0.25 mg/L H <sub>2</sub> O <sub>2</sub>	0.25 mg/L H <sub>2</sub> O <sub>2</sub>	0.25 mL
<b>0</b>	<b>0.5 mg/L H<sub>2</sub>O<sub>2</sub></b>	<b>0.5 mg/L H<sub>2</sub>O<sub>2</sub></b>	<b>0.5 mL</b>
1	2 mg/L H <sub>2</sub> O <sub>2</sub>	2 mg/L H <sub>2</sub> O <sub>2</sub>	2.0 mL
2	4 mg/L H <sub>2</sub> O <sub>2</sub>	4 mg/L H <sub>2</sub> O <sub>2</sub>	4.0 mL
W	5 mg/L H <sub>2</sub> O <sub>2</sub>	5 mg/L H <sub>2</sub> O <sub>2</sub>	5.0 mL
X	12.5 mg/L H <sub>2</sub> O <sub>2</sub>	12.5 mg/L H <sub>2</sub> O <sub>2</sub>	12.5 mL
Y	25 mg/L H <sub>2</sub> O <sub>2</sub>	25 mg/L H <sub>2</sub> O <sub>2</sub>	25.0 mL
Z	37.5 mg/L H <sub>2</sub> O <sub>2</sub>	37.5 mg/L H <sub>2</sub> O <sub>2</sub>	37.5 mL
5	50 mg/L H <sub>2</sub> O <sub>2</sub>	50 mg/L H <sub>2</sub> O <sub>2</sub>	50.0 mL
6	<b>Range_1: 0.5 mg/L H<sub>2</sub>O<sub>2</sub></b>	<b>Range_1: 0.5 mg/L H<sub>2</sub>O<sub>2</sub></b>	0.5 mL
	<b>Range_2: 20 mg/L H<sub>2</sub>O<sub>2</sub></b>	<b>Range_2: 20 mg/L H<sub>2</sub>O<sub>2</sub></b>	20.0 mL

#### H<sub>2</sub>O<sub>2</sub> standard solution – REF1

Prepare a standard solution of 0 µg/L H<sub>2</sub>O<sub>2</sub>. 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.

<b>Change Information</b>	
Date: 03/03/2022	Previous version: Edition 1.01 to Edition 1.10
<b>Reason for Change</b>	
- Correction product specifications in Buffer solution	
<b>Description of Change</b>	
- Correction of product name Disodium hydrogen phosphate to Disodium hydrogen phosphate dihydrate. Correction of molecular weight from 288.20 g/mol to 177.99 g/mol. (chapter 4.4)	