

Palintest

Water Analysis Technologies

Kemio Test Instructions



Kemio

A Palintest Product

Palintest

Water Analysis Technologies

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Palintest is headquartered in the United Kingdom, with regional offices in Australia, China, and the United States of America.

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Kemio is a multiparameter instrument with three variants.

Kemio Disinfection can test for chlorine, chlorine dioxide, chlorite and peracetic acid. Kemio Heavy Metals can test for lead, cadmium and copper. Kemio Multi can test for all of these.

These instructions explain the methodology and care points in detail for each of these test types.

General Guidelines

- Do not touch the sensor surface.
- Keep the instrument clean and dry during use.
- Keep the instrument on a level surface free from vibrations.
- Sensors perform within a specified temperature range. If the sample temperature is outside of the specified temperature range for the sensor, the measurement will proceed as normal but a note will be attached to the test result.
- For optimum performance we recommend sensors are stored at $< 4^{\circ}\text{C}$ (39°F) for over one year and $< 20^{\circ}\text{C}$ (68°F) for less than one year.

Every test on Kemio begins with the same steps. These are used to enrich test results with application information, enable decision-making with pass/fail results, and ensure traceability.

1



On the home page, press **PERFORM TEST** or open the lid.

2



Scan the sensor barcode using the barcode scanner. Hold the barcode about 12cm (5 inches) from the instrument. Align the red dot with the center of the barcode. When the scan is complete, the instrument proceeds to the next screen.

Scanning Errors

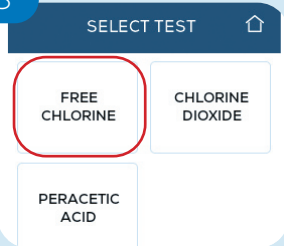
If the barcode is out of date, a warning will flag. Choose to scan a different sensor or continue anyway. The warning flag will be attached to the test results.

If the barcode refers to a new batch that has not yet been entered into the system, the instrument will prompt the user to add that batch using the QR code, see p.20 of the Kemio Manual. After the batch is added, restart the test from the home screen.

If the barcode is from the wrong sensor type or is not a sensor barcode, or if there is a problem reading the barcode, the instrument prompts the user to use a suitable sensor.

The scanner times out after five seconds. If this happens, press TRY AGAIN to restart the scan or press SELECT to select the batch code from a list.

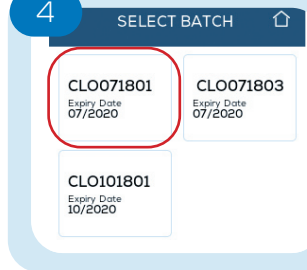
3



Select the test type.

This screen does not appear if only one test type is available. See p. 25 of the Kemio manual for details about selecting tests.

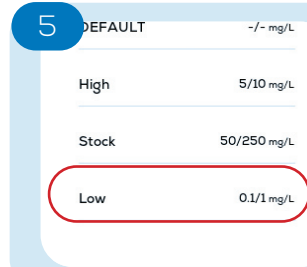
4



Select the correct batch code number from the list.

This screen does not appear if the sensor was scanned. See p. 30 of the Kemio manual for details about sensor batch codes.

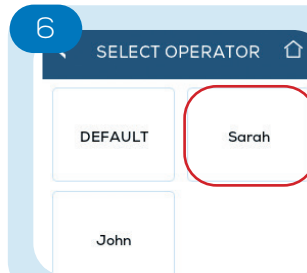
5



Select the label.

This screen does not appear if only one label is defined for this test type or if tagging labels is disabled. See p.15 of the Kemio Manual for details about labels and limits.

6



Select or scan the user.

This screen does not appear if only one user is defined or tagging users is disabled. See p. 19 of the Kemio Manual for details about users.

7

PERFORM 10 X DILUTION

1 PART SAMPLE
9 PARTS WATER

If dilution is required for the test and programmed into the label, perform the dilution with the volumes on the screen.

8



Follow the on-screen test instructions below specific to this test type.

Palintest's chlorine sensors can be used to measure free and total chlorine simultaneously. On Kemio, select either free chlorine or total chlorine to display a single result, or "free & total" to measure and display both parameters.

When using labels with the free and total test, labels set for both free chlorine and total chlorine are listed. The selected label limits apply only to the parameter they were set for in the configuration menu.

Four different sensor types can be used to measure chlorine:

CLO sensors are used for lower concentrations of chlorine.

- 0.02 mg/L - 10 mg/L of free chlorine
- 0.02 mg/L - 75 mg/L of total chlorine

CHR sensors are used for higher concentrations of chlorine at higher temperatures

- 0.1 mg/L - 25 mg/L of free chlorine (5 °C - 25 °C)
- 1 mg/L - 500 mg/L of total chlorine (5 °C - 30 °C)

CLT sensors are used for higher concentrations of chlorine at lower temperatures (2 °C - 15 °C)

- 0.1 mg/L - 25 mg/L of free chlorine
- 1 mg/L - 500 mg/L of total chlorine

FHR sensors are used for high range free only chlorine

- 0.1 mg/L - 100 mg/L of free chlorine (2 °C - 20 °C)

Care Points

If chlorine dioxide is present in solution, it may interfere with the chlorine reading. Use the degassing step from the chlorite test to produce a chlorine dioxide-free solution.

Ensure the vessel is washed with water between each test.

Free chlorine and total chlorine tests display one parameter each. The free and total test result screen displays both results. The data log stores one entry for each test, requiring twice as much space in memory.

The chlorine test methods display the concentration of free and total chlorine in units of mg/L or ppm Cl⁻.

Test Method

1



Lift the arm. If the arm is already open, the screen is skipped.

2



Tear each side of the packet, then twist and tear the short side from the packet, revealing the sensor tracks. Do not touch the dosed half of the sensor.

3



Hold the sensor through the foil packet only, with the white side facing up. Slide it all the way in, until the end stops against the back of the slot.

If the sensor is not fully inserted, push it in all the way using the edges of the sensor only. Do not touch the dosed chemicals on the electrode surface.

4



Fill the right side of the vessel to the line. If there is excess sample, it will pour into the left side of the vessel. Do not overfill both sides or water can splash onto the sensor contacts and interfere with the test.

5



Pull the foil off the sensor. Close the arm. The test will start automatically.

Wait one minute while the instrument performs the electrochemical measurement.



Peracetic acid (Peroxyacetic acid or PAA) is measured using Palintest's PAA sensors for concentrations of peracetic acid ranging from 5 mg/L to 2000 mg/L.

Two sensor types can be used to measure peracetic acid:

PAA sensors are used for higher concentrations.

- 10 mg/L - 2000 mg/L of peracetic acid

PAL sensors are used for lower concentrations.

- 0.02 mg/L - 50 mg/L of peracetic acid

Care Points

Hydrogen peroxide is found in solution with peracetic acid. Palintest's PAA and PAL sensors are not strongly affected by the presence of hydrogen peroxide.

Certain fungicides are known to interfere with the PAA sensor. Contact your Palintest representative when measuring water samples with fungicides.

Results

The peracetic acid test method displays the concentration of peracetic acid in units of mg/L or ppm PAA.

1



Lift the arm. If the arm is already open, the screen is skipped.

2



Tear each side of the packet, then twist and tear the short side from the packet, revealing the sensor tracks. Do not touch the dosed half of the sensor.

3



Hold the sensor through the foil packet only, with the white side facing up. Slide it all the way in, until the end stops against the back of the slot.

If the sensor is not fully inserted, push it in all the way using the edges of the sensor only. Do not touch the dosed chemicals on the electrode surface.

4



Fill the right side of the vessel to the line. If there is excess sample, it will pour into the left side of the vessel. Do not overfill both sides or water can splash onto the sensor contacts and interfere with the test.

5



Pull the foil off the sensor. Close the arm. The test will start automatically.

Wait one minute while the instrument performs the electrochemical measurement.



Chlorine dioxide is measured using Palintest's CDX sensors, for concentrations of chlorine dioxide ranging from 0.02 mg/L to 50 mg/L.

Care Points

- If there is chlorine present in the sample, use Glycine reagent. If there is no chlorine present, skip the glycine step on p. 16
- Chlorine dioxide is a volatile chemical that leaves a sample very easily. Perform a test quickly after taking a sample. Do not agitate the sample.

Results

The chlorine dioxide test method displays the concentration of chlorine dioxide in units of mg/L or ppm ClO_2 .

1



Lift the arm. If the arm is already open, the screen is skipped.

2



Tear each side of the packet, then twist and tear the short side from the packet, revealing the sensor tracks. Do not touch the dosed half of the sensor.

3



Hold the sensor through the foil packet only, with the white side facing up. Slide it all the way in, until the end stops against the back of the slot.

If the sensor is not fully inserted, push it in all the way using the edges of the sensor only. Do not touch the dosed chemicals on the electrode surface.

4



Fill the right side of the vessel to the line. If there is excess sample, it will pour into the left side of the vessel. Do not overflow both sides or water can splash onto the sensor contacts and interfere with the test.

5



If chlorine or copper is present in the solution, add three drops of glycine reagent to prevent them from interfering with the measurement. Use the stir rod to mix the sample. If no chlorine or copper are present, skip this step.

6



Pull the foil off the sensor. Close the arm. The test will start automatically.

Wait one minute while the instrument performs the electrochemical measurement.



The chlorite test method involves three separate measurements of various chemical combinations in the sample, followed by some calculations to determine the total chlorite concentration. The test procedure must be followed carefully to ensure the chemical reactions and measurements occur correctly.

A chlorine dioxide measurement forms a part of the chlorite test. However, in the chlorite test type, only labels and limits for chlorite can be selected.

Care Points

- The chlorite test uses three CDX sensors. These must all be from the same batch of sensors. If sensors from different batches are used, it may produce inaccurate results.
- If there is chlorine present in the sample, use glycine reagent during the first CDX measurement. If there is no chlorine present, skip the glycine step on p. 20.
- Chlorine dioxide is a volatile chemical that leaves a sample very easily. Perform the first test quickly after taking a sample for an accurate measurement. Do not agitate the sample.
- If the chlorite test method is interrupted, or if an error occurs partway through the test procedure, the entire test must restart from the beginning to ensure accurate results.
- Use separate vessels for the first CDX test before the degassing step, and the second and third tests with CR-1 and CR-2. Do not mix up the two vessels.
- Do not let the kit stay wet. Trapped humidity could damage the kit components.

The chlorite results screen displays two readings: the calculated chlorite result and the chlorine dioxide result measured by the first sensor.

The chlorite test method displays the concentration of chlorine dioxide in units of mg/L or ppm ClO_2 , and the concentration of chlorite in units of mg/L or ppm ClO_2^- .

Test Method

1



Lift the arm. If the arm is already open, the screen is skipped.

2



Tear each side of the packet, then twist and tear the short side from the packet, revealing the sensor tracks. Do not touch the dosed half of the sensor.

3



Hold the sensor through the foil packet only, with the white side facing up. Slide it all the way in, until the end stops against the back of the slot.

If the sensor is not fully inserted, push it in all the way using the edges of the sensor only. Do not touch the dosed chemicals on the electrode surface.

4



Fill the right side of the vessel to the line. If there is excess sample, it will pour into the left side of the vessel. Do not overfill both sides or water can splash onto the sensor contacts and interfere with the test.

5



If chlorine or copper is present in the solution, add three drops of Glycine reagent to prevent them from interfering with the measurement. Use the stir rod to mix the sample. If no chlorine or copper are present, skip this step.

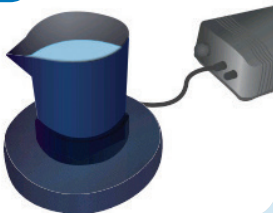
6



Pull the foil off the sensor. Close the arm. The test will start automatically.

Wait one minute while the instrument performs the electrochemical measurement.

7



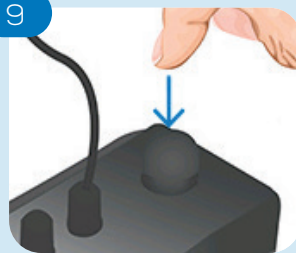
During the one minute electrochemical measurement period, set up the degasser as shown. Ensure the two plastic halves of the degasser are properly connected. Ensure the filter is installed correctly.

8



Fill the degasser vessel up to the mark with fresh sample.

9



Press the start button on the pump to begin degassing the chlorine dioxide from the sample.

It is not a problem to run the degasser for longer than the timer displayed on the screen.

10



Press the START TIMER button to begin the timer. The displayed time is calculated based on the concentration of chlorine dioxide measured in the previous step.

11



While the degasser is running, prepare for the next sensor test. Open the lid, remove the sensor, and discard the old sample.

At the end of the degassing period, perform a test on the degassed sample.

12



Tear each side of the second CDX sensor packet, then twist and tear the short side from the packet, revealing the sensor tracks. Do not touch the dosed half of the sensor.

Hold the sensor through the foil packet only, with the white side facing up. Slide it all the way in, until the end stops against the back of the slot.

13



Fill the right side of the vessel to the line with degassed water.

14



Add three drops of CR-1 reagent.

15



Pull the foil off the sensor. Close the arm. The test will start automatically.

Wait one minute while the instrument performs the electrochemical measurement.

16



Open the arm, discard the sensor. **KEEP** the sample from the previous test.

17



Add three drops of CR-2 reagent.

18



Close the arm with no sensor inserted.

19

REACTION IN PROGRESS

01 :57

Wait two minutes while chlorite reacts with the CR-2 reagents.

At the end of the two minute period perform the final test.

20



Lift the arm. If the arm is already open, the screen is skipped.

21



Open the foil packet.

22



Hold the final CDX sensor through the foil packet only, with the white side facing up. Slide it all the way in, until the end stops against the back of the slot.

23



Pull the foil off the sensor. Close the arm. The test will start automatically.

Wait one minute while the instrument performs the electrochemical measurement.



Kemio Heavy Metals and Kemio Multi test for multiple metals using a similar test method with different sensors.

Lead is measured using Palintest's MPB sensors, for concentrations of lead ranging from 1 μ g/L to 100 μ g/L.

Cadmium is measured using Palintest's MCD sensors, for concentrations of cadmium ranging from 0.5 μ g/L to 10 μ g/L.

Copper is measured using Palintest's MCU sensors for concentrations of copper ranging from 0.1mg/L to 2.0mg/L.

Care Points

- The sensor contains small amounts of mercury. Check your local laws for disposal. In most regions there are no special requirements. In some regions the capped disposable vessel must be disposed of per regional laws.
- Avoid touching the chemicals on the sensor surface.
- Avoid cross-contamination between samples by using a fresh disposable vessel and clean crushing rod for each test.
- Ensure the Soluprep tablet is completely dissolved before starting the test.

Results

The lead, cadmium and copper results screens display one reading.

The metals test methods display the concentration of lead, cadmium or copper in units of μ g/L or ppb Pb or Cd or Cu.

1



Lift the arm. If the arm is already open, the screen is skipped.

2



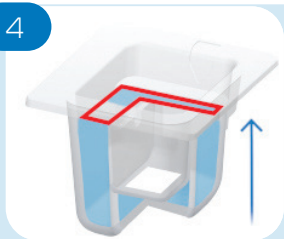
Tear each side of the packet, then twist and tear the short side from the packet, revealing the sensor tracks. Do not touch the dosed half of the sensor.

3



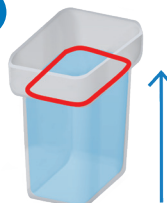
Hold the sensor through the foil packet only, with the white side facing up. Slide it all the way in, until the end stops against the back of the slot.

4



Fill the L-shaped vessel to the line. This is so that the temperature probe is in contact with the sample for temperature compensation.

5



Fill the disposable vessel to the shoulder. Do not overfill, or water can splash onto the sensor contacts and interfere with the test.

6



Add one Soluprep SP-A tablet into the disposable vessel. Crush and stir using the crushing rod until the tablet is fully dissolved.

7



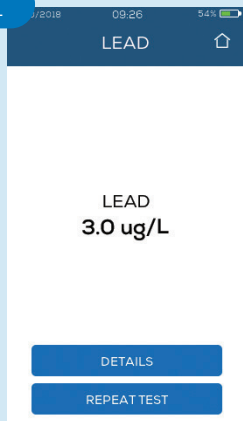
Insert both vessels into the instrument.

8



Pull the foil off the sensor. Close the arm. The test will start automatically. Wait three minutes while the instrument performs the electrochemical measurement.

1



At the end of the countdown, the test results will display on screen. The number of results displayed depends on the test type.

Disinfection test results are displayed in mg/L or ppm. Metals tests results are displayed in $\mu\text{g/L}$ or ppb.

Dilution

If a label with a dilution factor was used during the test, the factor will have applied to the number on screen. For example, if a 50mg/L solution was diluted 5X and measured by Kemio using a label with a 5X dilution factor, the result displayed on the screen will be 50mg/L.

It is critical that the correct dilution is performed when a label with a dilution factor is used.

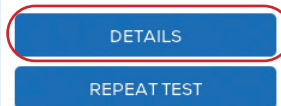
No Limits

If no label or a label with no limits was used during testing, the page title will be DETAILS on a blue background.

Limits

If a label with limits was used, either a green PASS or a red FAIL will be displayed at the top of the screen. This is simple traffic light system enables a quick and clear decision by the operator.

2



Press DETAILS to view the complete information for the test.

If a warning or flag was raised before or during testing, a note will be added to the test record. The result will still be displayed. A reading that falls within the test limits will still be a pass. However, the note will indicate in the record that the test was not normal.

1

01/04/2018 11:47 71%

FREE CHLORINE

FREE CHLORINE 0.44 mg/L

Label: DEFAULT

Limits: -/-

Temperature: 24.4°C

User: DEFAULT

Time: 11:47

Date: 01/04/2018

ADD REFERENCE

ADD NOTES

REPEAT TEST

The first line displays the test type and the measured concentration (after dilution if applicable).

Up to three test types and concentrations can be displayed in this way.

Label indicates which label was selected at the start of the test. If no label was selected, DEFAULT is displayed.

Limits indicates the minimum and maximum acceptable concentrations set by the label that was selected. If a limit is not set on the label or if no label was selected, "-" is displayed.

Temperature indicates the temperature of the sample in the vessel. Note: this may differ from the sample temperature.

User indicates which user was selected at the start of the test. If no user was selected, DEFAULT is displayed.

Time indicates the time when the test was performed.

Date indicates the date on which the test was performed.

Batch Code indicates the batch used for the test.

Dilution factor indicates the multiplier on the measured result to produce the displayed result. Default is 1.

User: DEFAULT

Time: 11:47

Date: 01/04/2018

ADD REFERENCE

ADD NOTES

REPEAT TEST

Press ADD REFERENCE

to add information from a barcode (or the information can be typed in manually) to enrich the data record. See p. 9 in the instruction manual for details on producing and using barcodes.

User: DEFAULT

Time: 11:47

Date: 01/04/2018

ADD REFERENCE

ADD NOTES

REPEAT TEST

Press ADD NOTES to

type information about the test using the on-screen keyboard. Maximum of 48 characters. After a failed test, it is recommended to write an explanatory note or explain the corrective actions taken, as the information will be stored alongside the test in memory.

Error messages are stored in the note field automatically.

After the test results are displayed, the user must complete the test by removing the sensor, disposing of the sample and cleaning the instrument. This protects the instrument, prevents microbial growth, prevents spills, and prepares the instrument for the next test. Kemio will prompt the user to complete these actions.

After viewing the results, the user has the choice to:

- A** Finish the test and clean for the instrument
- B** Return to the home screen
- C** Perform another test
- D** Shut down the instrument

A. Finish The Test (Disinfection Test)

1



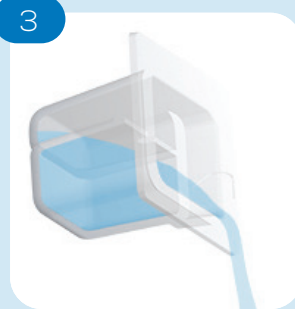
Open the lid.

2



Remove the sensor.

3



Discard the sample.

4



If Kemio is wet, wipe it down with a cloth according to the care and maintenance suggestions. Take special care of the electrical contacts. These can be accessed by opening the front lid of the arm.

5



Close the lid. Kemio will return to the results screen.

Kemio does not detect whether the sensor and sample have been removed - only that the lid has been opened to do so. Take care of the instrument and ensure they are properly removed.

A. Finish The Test (Metals Test)

1



Open the front lid to drop the sensor into the disposable vessel.

2



Open the lid.

3



Remove both vessels from Kemio

4



Place a cap on the disposable vessel. If required by local regulations, dispose of the sample, sensor and vessel in a secure manner.

5



Discard the sample from the L-Shaped vessel

Kemio does not detect whether the sensor and sample have been removed - only that the lid has been opened to do so. Take care of the instrument and ensure they are properly removed.

B. Return To The Home Screen

If the "Finish the test" instructions have not yet been completed, Kemio will prompt the user to do these. After the lid is closed, Kemio will return to the home screen.

If the lid has already been opened, Kemio will proceed directly to the home screen.

C. Perform Another Test

Press REPEAT TEST.

When retesting, Kemio reuses the same label, user and batch information from the previous test.

If testing a sample that should use a different label, if a different user is testing or if the next sensor comes from a new batch, DO NOT press REPEAT TEST. This could lead to an inaccurate result or incorrect information. Instead, press the HOME button and PERFORM TEST.

D. Shut Down The Instrument

Press the power button.

If the user presses and holds the power button before opening the lid, Kemio will display a warning message reminding the user to discard the sensor and sample, and then turn off.

If the lid has already been opened, the regular "Goodbye" screen will display and Kemio will turn off.

Sensor type	Test type	Range	Temp Range (°C)	Resolution (mg/L)	Precision (mg/L)
CLO	Free Chlorine	0.02-10 (mg/L)	2 - 35	0.01 up to 5.0 0.1 up to 10	≤ 0.05 @ 10 mg/L, 20°C
	Total Chlorine	0.05-75 (mg/L)	2 - 35	0.01 up to 5.0 0.1 up to 20 1 up to 75	≤ 0.5 @ 10 mg/L, 20°C
CHR	Free Chlorine	0.1 - 25 (mg/L)	5 - 25	0.01 up to 5.0 0.1 up to 25	≤ 2.0 @ 20 mg/L, 10°C
	Total Chlorine	1 - 500 (mg/L)	5 - 30	0.1 up to 20 1 up to 500	≤ 10.0 @ 200 mg/L, 10°C
CLT	Free Chlorine	0.1 - 25 (mg/L)	2 - 15	0.01 up to 5.0 0.1 up to 25	≤ 2.0 @ 20 mg/L, 5°C
	Total Chlorine	1 - 500 (mg/L)	2 - 15	0.1 up to 20 1 up to 500	≤ 10.0 @ 200 mg/L, 5°C
FHR	Free Chlorine	0.1 - 100 (mg/L)	2 - 20	0.02 up to 10 0.1 up to 100	≤ 2.25 @ 30 mg/L, 2°C ≤ 5.63 @ 75 mg/L, 14°C
CDX	Chlorine Dioxide	0.02 - 50 (mg/L)	5 - 40	0.01 up to 10.0 0.1 up to 50	≤ 0.05 @ 10 mg/L, 20°C
	Chlorite	0.02 - 50 (mg/L)	5 - 40	0.01 up to 2.5 0.1 up to 20 1.0 up to 50	≤ 0.05 @ 10 mg/L, 20°C

Sensor type	Test type	Range	Temp Range (°C)	Resolution (mg/L)	Precision (mg/L)
PAA	Peracetic Acid	5 - 2000 (mg/L)	5 - 30	0.1 up to 20.0 1 up to 500 5 up to 2000	≤ 125 @ 25 mg/L, 10°C ≤ 10 @ 200 mg/L, 20°C ≤ 75 @ 1500 mg/L, 20°C
PAL	Peracetic Acid	0.02 - 20 (mg/L)	2 - 30	0.01 up to 5 0.1 up to 20	≤ 0.04 @ 0.2 mg/L, 20°C ≤ 0.05 @ 1.0 mg/L, 5°C
PAH	Peracetic Acid	400 - 4000 (mg/L)	10 - 60	1 up to 1000 10 up to 4000	≤ 125 @ 2500 mg/L, 50°C ≤ 175 @ 3500 mg/L, 50°C
MPB	Lead	1 - 100 (µg/L)	5 - 35	1 up to 100 µg/L	≤ 1.0 µg/L @ 5 µg/L, 20°C
MCD	Cadmium	0.5 - 10 (µg/L)	5 - 35	0.1 up to 10.0 µg/L	≤ 1.0 µg/L @ 5 µg/L, 20°C
MCU	Copper	0.1-2.0 mg/L	5 - 35	0.001mg/L up to 0.6mg/L 0.005mg/L up to 2.0 mg/L	≤ 0.1mg/L @ 0.5mg/L, 20°C

Reorder Codes

Description	Product Code
Chlorine Free High Range Sensors (FHR) (100 pack)	KEM21FHR
Chlorine Free High Range Sensors (FHR) (500 pack)	KEM25FHR
Chlorine Standard Range Sensors (CLO) (100 pack)	KEM21CLO
Chlorine Standard Range Sensors (CLO) (500 pack)	KEM25CLO
Chlorine High Range Sensors (CHR) (100 pack)	KEM21CHR
Chlorine High Range Sensors (CHR) (500 pack)	KEM25CHR
Chlorine High Range Low Temp Sensors (CLT) (100 pack)	KEM21CLT
Chlorine High Range Low Temp Sensors (CLT) (500 pack)	KEM25CLT
Chlorine Dioxide and Chlorite Sensors (CDX) (100 pack)	KEM21CDX
Chlorine Dioxide Sensors and Chlorite (CDX) (500 pack)	KEM25CDX
Glycine Reagent	PT549
CR-1 Reagent	PT546
CR-2 Reagent	PT547
Peracetic Acid Sensors (PAA) (100 pack)	KEM21PAA
Peracetic Acid Sensors (PAA) (500 pack)	KEM25PAA
Peracetic Acid Sensors Low Range (PAL) (100 pack)	KEM21PAL
Peracetic Acid Sensors Low Range (PAL) (500 pack)	KEM25PAL
Peracetic Acid Sensors High Range (PAL) (100 pack)	KEM25PAH
Peracetic Acid Sensors High Range (PAL) (500 pack)	KEM25PAH
Lead Sensors (MPB) (10 pack)	KEM22MPB
Cadmium Sensors (MCD) (10 pack)	KEM22MCD
Copper Sensors (MCU) (10 pack)	KEM22MCU

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