Chematest 25

Operator's Manual

A70.065.611

ANALYTICAL INSTRUMENTS

Swan Analytical Instruments AG CH-8340 Hinwil/Switzerland

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P r e f a c e

Congratulations on your choice of the Chematest 25 which combines ease of operation with precise measurements. This manual will guide you through the first steps of operating your Chematest 25 and will serve as a reference guide for your daily routine.

Please read the general remarks on the reagents, the photometric measurement and the treatment of electrodes carefully. This will result in longer equipment life and better analysis.

All the information you need to determine a parameter is listed step by step in the corresponding chapter.

The Chematest 25 includes a portable case with all the accessories you need to control the water quality:

The Professional Water Control System.

In addition to the operation of the Chematest 25, you will find a chapter on how to measure temperature and hardness.

We know that instrument development is a continuous process. Your comments and suggestions are always welcome and will be considered for future generations of Chematest instruments.

We hope you will enjoy your instrument.

With best regards

Swan Analytical Instruments AG

1.1 Basic Rules for Photometric Determinations

The precision and repeatability of a determination depends greatly on the operator's technique. Please observe the following rules:

Always use clean utensils

Residuals from previous determinations may falsify your results. All utensils like pipettes, cuvettes, glass rods and flasks must be rinsed with clean water after each measurement. **Fill and empty the cuvette 2 to 3 times with the sample before each measurement.**

Mark cuvettes

Gain more security by marking (with the waterproof pen) the cuvettes to be used exclusively for a single parameter.

Position cuvettes correctly

Cuvettes must always be positioned in the same way, the vertical marking towards the small point on the keypad. **It is important to keep the cuvette free of fingerprints and to dry the outside of the cuvette before placing it into the photometer.**

Observe reaction times

Reaction time of DPD with the disinfectant is fast. After mixing with the sample, consistent readings are possible within two minutes. After this time has elapsed, a further deepening of the red color starts.

One exception is the determination of total chlorine. The reaction time is approximately 1½ minutes. In this measuring mode (C2), a timer is started after pressing the M key, counting down from 90 to 0 seconds (bottom left on the display). Only when the time has elapsed, the measurement is carried out.

Observe proper sampling

Take the sample ca. 5 cm under the water surface and roughly 50 cm from the pool border. You will find three sampling flasks in the portable case. Therefore, you can take samples from different spots in the pool. Rinse the flasks several times with sample water, cap them for transportation and do not shake them. Perform your tests as soon as possible after sampling.

Observe proper dosing of samples

For all photometric determinations, a sample volume of 10 ml is mixed with 5 drops of one or more reagents. Press the ball of the special pipette completely down from the top with your thumb and hold the pipette vertically into the water. By slowly releasing the ball, the pipette fills with 10 ml of water. Take care that no water gets into the ball. Empty the pipette gently into the cuvette, preventing air bubbles from forming, but fast enough to mix the sample with the reagent. The content of one pipette fills the cuvette up to the line.

1.2 How to Use Reagents

Whenever possible, Swan supplies reagents in liquid form, as they are used in professional laboratories. We believe that the disadvantage of a shorter shelf life is greatly compensated by the ease of handling when compared to tablets or powders.

Your OXYCON-DPD reagent for 200 determinations is delivered in two small bottles to increase shelf lifetime. One contains DPD as a powder (DPD 1a), the other the solvent (DPD 1b). Before using it, pour the content of DPD 1b into DPD 1a, cap the bottle with the drop counter and shake firmly until the DPD powder has dissolved completely. Record the date of mixing on the bottle. It can be used during 2 months if stored at room temperature.

Note the safety descriptions on the reagent bottles !

The reagents OXYCON START and OXYCON 2 have shelf life of at least 6 months. They will last a year if handled carefully and stored at 5° C.

To dispense the necessary number of drops, hold the bottle at a 45° angle. Always cap the bottles after use!

The Chematest 25 is calibrated against Swan's OXYCON reagents. Precision may suffer severely, when reagents from other sources are used.

1.3 How to Configure Photometry

Switching on the instrument will display the measuring mode and the result of the last analysis:

Display in DES-Mode

Should the instrument indicate a different mode, press the DES key.

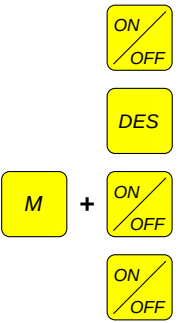
Your instrument has been configured by Swan for the routine determination of free, total, and combined chlorine.

How to access the other photometric parameters is shown on the next page. There, you are instructed on how to configure your instrument (i.e. if you only want to measure ozone).

In the chlorine mode all three parameters, free chlorine (c1), total chlorine (c2) and combined chlorine (c3) are accessible.

Under all circumstances pH and REDOX are accessible by the pH/REDOX key.

Make All Parameters Accessible.



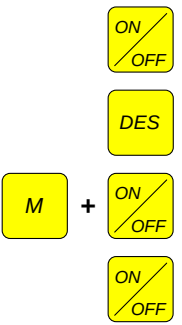
Switch instrument on.

Go into DES mode if necessary.

Switch instrument off while pressing the **M** key.

Switch instrument on. All parameters are accessible.

Make Only One Parameter Accessible.



Switch instrument on.

Press key until the desired parameter is displayed.

Switch instrument off while pressing the **M** key.

Switch instrument on. Only the selected parameter is accessible.

1.4 How to Select Photometric Parameters

Switch on the instrument. The last parameter selected and the last result is displayed.

Press key several times until the desired parameter appears in the bottom of the display's left corner.

If not all parameters are displayed, see chapter 1.3 How to Configure Photometry.

Available Parameters:

Parameter		Reagent 1	Reagent 2
free chlorine	**c1**	Oxycon Start	Oxycon DPD
total chlorine	**c2**	Oxycon 2	Oxycon DPD
combined chlorine	**c3**	*Difference between c1 and c2*	
ozone	**o3**	Oxycon 2	Oxycon DPD
chlorine-dioxide	**cd**	Oxycon Start	Oxycon DPD
bromine	**br**	Oxycon Start	Oxycon DPD
iodine	**Jd**	Oxycon Start	Oxycon DPD
cyanuric acid	**cA**	Oxycon CA	
aluminium	**AL**	Oxycon Al	
iron	**FE**	Oxycon Fe	

2.1 Determination of Free Chlorine

☞ Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside of cuvette if necessary.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON/OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **c1** appears in the bottom left corner of the display.

CAL Press key.
The display shows 0.00.

☞ Remove and empty the cuvette.

 Put 5 drops of OXYCON START and 5 drops of OXYCON DPD into the cuvette.

☞ Pour the full pipette of sample into the cuvette, dry outside if necessary, put it into the photometer, align cuvette and cover it with lid.

M Press key and read result.

2.2 Determination of Total Chlorine

☞ Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside if necessary.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON/OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **c2** appears in the bottom left corner of the display.

CAL Press key.
The display shows 0.00.

☞ Remove and empty the cuvette.

 Put 5 drops of OXYCON 2 and 5 drops of OXYCON DPD into the cuvette.

☞ Pour the full pipette of sample into the cuvette, dry outside if necessary, put it into the photometer, align cuvette and cover it with lid.

M Press key. The counter appears in the lower left corner of the display.

90 The measurement is taken and the result is shown when the time has elapsed.

2.3 Routine Determination of Free, Total and Combined Chlorine

☞ Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside if necessary.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON/OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **c1** appears in the bottom left corner of the display.

CAL Press key.
The display shows 0.00.

☞ Remove and empty the cuvette.

 Put 5 drops of OXYCON START and 5 drops of OXYCON DPD into the cuvette.

☞ Pour the full pipette of sample into the cuvette, dry outside if necessary, put it into the photometer, align cuvette and cover it with lid.

M Press key and read result for free chlorine.

Routine Determination of Free, Total and Combined Chlorine Continued

DES — Press key. Parameter **c2** appears in the lower left corner of the display.

 Add 5 drops of Oxycon 2 and stir with glass rod. Cover with lid.

M — Press key. The counter appears in the lower left corner of the display.

90 — The measurement is taken and the result for total chlorine is shown when the time has elapsed.

DES — Press key. Parameter **c3** appears in the lower left corner of the display.

Read result for combined chlorine.

☞ Rinse cuvette and glass rod carefully.

Recall the three values by pressing the DES key. The values stay in memory until you press M or CAL once. The values are saved when the instrument is turned off.

Residues of OXYCON 2 in a cuvette will falsify the determination of free chlorine. Therefore, you better carry out the above operation with two cuvettes, although it is more time-consuming and requires more reagents.

2.4 Determination of Combined Chlorine with Two Cuvettes

Take two cuvettes, mark one for free, the other for total chlorine. These cuvettes should never be used for other purposes.

Empty a full pipette of sample into the clean cuvette marked for free chlorine, rinsed repeatedly with sample. Dry outside of cuvette if necessary.

Insert cuvette into the photometer, align and cover it with lid.

Measuring mode and result of last determination appear in the display.

Press key until parameter **c1** appears in the bottom left corner of the display.

Press key.
The display shows 0.00.

Remove and empty the cuvette.

Put 5 drops of OXYCON START and 5 drops of OXYCON DPD into the cuvette.

Pour the full pipette of sample into the cuvette, dry outside if necessary, put it into the photometer, align cuvette and cover it with lid.

Press key. Read result for free chlorine.

☞ Empty a full pipette of sample into the cuvette for total chlorine, rinsed repeatedly with sample. Dry outside if necessary.

☞ Put cuvette into the photometer, align and cover it with lid.

DES Press key. Parameter **c2** appears in the lower left corner of the display.

CAL Press key.
The display shows 0.00.

☞ Remove and empty the cuvette.

 Put 5 drops of OXYCON 2 and 5 drops of OXYCON DPD into the cuvette.

☞ Pour the full pipette of sample into the cuvette, dry outside if necessary. Put cuvette into the photometer, align and cover it with lid.

M Press key. The counter appears in the lower left corner of the display.

90 The measurement is taken and the total chlorine result shown when the time has elapsed.

DES Press key. Parameter **c3** appears in the lower left corner of the display.

Read result for combined chlorine.

2.5 Determination of Free Chlorine in Presence of Chlorine-Dioxide and Bromine

(How to separate free chlorine - ozone s. chapter 3.5).
Parameter c1 has to be chosen for all measurements. The difference will be free chlorine. In a first step, you need the total content of free disinfectants according to chapter 2.1 with parameter **c1**. Proceed then as follows:

Remove and empty the cuvette. Rinse repeatedly with sample.

Put 5 drops of OXYCON GL into the cuvette. Add full pipette of sample, wait 30 sec.

Add 5 drops of OXYCON START and 5 drops of OXYCON DPD into the cuvette.

Stir with glass rod, put cuvette into the photometer, align and cover it with lid.

The result indicates the total content of free disinfectants without chlorine.

You get the value for free chlorine by subtracting this number from the previous measurement.

Residues of OXYCON GL in a cuvette will falsify the determination of free chlorine. Therefore, you should clean your cuvettes thorougly after use under running water.

3.1 Determination of Chlorine-Dioxide

Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside if necessary.

Insert cuvette into the photometer, align and cover it with lid.

Measuring mode and result of last determination appear in the display.

Press key until parameter **cd** appears in the bottom left corner of the display.

Press key.
The display shows 0.00.

Remove and empty the cuvette.

Put 5 drops of OXYCON GL into the cuvette. Add full pipette of sample, wait 30 sec. If no chlorine is present, you do not need OXYCON GL. Accordingly there is no waiting time.

Add 5 drops of OXYCON START and 5 drops of OXYCON DPD into the cuvette.

Stir with glass rod, put cuvette into the photometer, align and cover it with lid.

Press key and read result.

3.2 Determination of Bromine

☞ Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside if necessary.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON/OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **br** appears in the bottom left corner of the display.

CAL Press key.
The display shows 0.00.

☞ Remove and empty the cuvette.

 Put 5 drops of OXYCON GL into the cuvette. Add full pipette of sample, wait 30 sec. If no chlorine is present, you do not need OXYCON GL. Accordingly there is no waiting time.

 Add 5 drops of OXYCON START and 5 drops of OXYCON DPD into the cuvette.

☞ Stir with glass rod, put cuvette into the photometer, align and cover it with lid.

M Press key and read result.

3.3 Determination of Iodine

☞ Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside if necessary.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON/OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **Jd** appears in the bottom left corner of the display.

CAL Press key.
The display shows 0.00.

☞ Remove and empty the cuvette.

 Put 5 drops of OXYCON START and 5 drops of OXYCON DPD into the cuvette.

☞ Pour the full pipette of sample into the cuvette, dry outside if necessary. Put cuvette into the photometer, align and cover it with lid.

M Press key and read result.

All other disinfectants are measured together with the iodine. No separation is done.

3.4 Determination of Ozone

Ozone decomposes in a very short time and often is only present in traces. Therefore, it is important to measure it as fast as possible after sampling. Do all steps until the sample is mixed with the reagent as quickly as possible, but work meticulously.

☞ Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside if necessary.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON/OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **o3** appears in the bottom left corner of the display.

CAL Press key.
The display shows .000.

☞ Remove and empty the cuvette.

 Put 5 drops of OXYCON 2 and 5 drops of OXYCON DPD into the cuvette.

☞ Pour the full pipette of sample into the cuvette, dry outside if necessary. Put cuvette into the photometer, align and cover it with lid.

M Press key and read result.

3.5 Determination of Ozone in presence of Free Chlorine

The separation measurement with the parameter o3 is described here.
See chapter 3.4 about sampling etc.

1. Measurement:

☞ Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside if necessary.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON / OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **o3** appears in the bottom left corner of the display.

CAL Press key.
The display shows .000.

☞ Remove and empty the cuvette.

 Put 5 drops of OXYCON 2 and 5 drops of OXYCON DPD into the cuvette.

☞ Pour the full pipette of sample into the cuvette, dry outside if necessary, put it into the photometer (observe marking) and cover it with lid.

M Press key and read result. Note the value of **measurement 1**.

Measurement 2:

Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside of cuvette if necessary.

Insert cuvette into the photometer, align and cover it with lid.

Measuring mode and result of last determination appear in the display.

The parameter **o3** is still in the bottom left corner of the display. Otherwise, press the key until it appears.

Press key.
The display shows .000.

Remove and empty the cuvette.

Put 5 drops OXYCON GL into the cuvette. Add full pipette of sample and wait 30 sec.

Put 5 drops of OXYCON 2 and 5 drops of OXYCON DPD into the cuvette.

Stir well. Dry outside of cuvette if necessary, put cuvette into the photometer (observe marking) and cover it with lid.

Press key and read result. Note the value of **measurement 2**.

Subtract the result of measurement 2 (with OXYCON GL) from the result of measurement 1 to get the content of **ozone in mg/l**.

For more accuracy you should wait 90 seconds before pressing the M key in each measurement.

How to determine free chlorine see chapter 2.1.

Residues of OXYCON GL in a cuvette will falsify the determination of ozone. Therefore, you should clean your cuvettes thorougly after use.

3.6 Determination of Cyanuric Acid

☞ Empty a full pipette of sample into a clean cuvette.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON/OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **cA** appears in the bottom left corner of the display.

CAL Press key.
The display shows 0.

☞ Remove and empty the cuvette.

 Add content of one capsule of Oxycon CA into the same cuvette.

☞ Pour a full pipette of sample into the cuvette. Mix thoroughly with glass rod.

 Wait for 5 minutes. White turbidity indicates the presence of cyanuric acid.

☞ Mix once more, put cuvette into the photometer and cover it with lid.

M Press key and read result.

When Using Products Containing Cyanuric Acid

When determining free chlorine in the presence of cyanuric acid, two forms of chlorine are measured: free chlorine and chlorine bound to cyanuric acid. To determine the disinfecting capacity of the water, the result from the chlorine determination must be corrected in the following way:

Cyanuric Acid (mg/l)	**20**	**30**	**50**	**70**
Free Chlorine as	**50%**	**43%**	**26%**	**19%**

of photometric determination.

3.7 Determination of dissolved Aluminium

☞ Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside if necessary.

☞ Insert cuvette into the photometer, align and cover it with lid.

ON/OFF Measuring mode and result of last determination appear in the display.

DES Press key until parameter **AL** appears in the bottom left corner of the display.

CAL Press key.
The display shows 0.00.

☞ Remove and empty the cuvette.

☞ Pour the full pipette of sample into the cuvette. Put **one tablette no. 1** into the cuvette, crush and dissolve it entirely. Add **one tablette no. 2**, crush and dissolve it entirely. **No air bubbles should stick to the cuvette side!**

☞ Dry outside of cuvette if necessary. Put cuvette into the photometer, align and cover it with lid.

M Press key and read result.

3 The measurement is taken and the result shown when the time (display in minutes) has elapsed.

3.8 Determination of dissolved Iron

Empty a full pipette of sample into a clean cuvette, rinsed repeatedly with sample. Dry outside of cuvette if necessary.

Insert cuvette into the photometer, align and cover it with lid.

Measuring mode and result of last determination appear in the display.

Press key until parameter **FE** appears in the bottom left corner of the display.

Press key.
The display shows 0.00.

Remove and empty the cuvette.

Put 5 drops of OXYCON FE into the cuvette.

Pour the full pipette of sample into the cuvette, dry outside if necessary. Put cuvette into the photometer, align and cover it with lid.

Press key and read result.

3

The measurement is taken and the result shown when the time (display in minutes) has elapsed.

4.1 Basic Rules for pH and REDOX

The Chematest 25 is supplied with a pH electrode. Optionally, a REDOX electrode is available. Please observe the following recommendations to take full advantage of the electrode performance:

Cover the Sensing Part of Electrodes

The sensitive electrode tips are protected by rubber caps. Put some drops of water in the cap to create a humid atmosphere. Better, fill the cap with 3.5 molar KCl-solution before putting the cap on the electrode. Thus drying out of the electrode is precluded and the lifetime of the electrode is increased.

Swan's maintenance free electrodes must not be refilled with electrolyte.

Calibrate Electrodes Periodically

During lifetime all electrodes slowly change their properties. To insure proper measurement, calibrate your electrodes once a week.

Handling Calibration Standards

Use the standards at room temperature. Rinse the electrodes with clean water before dipping them into the standards. Be careful not to mix up the bottle caps of the standards.
By following this simple procedure, you will ensure the integrity of your standards for max. six months.

4.2 pH Determination

Press the pH/REDOX key once or twice to obtain the pH label in the top right corner of the display.

Display in pH Mode

Remove the protective cap from the electrode, rinse the tip in clean water and dip the electrode into the sample water. Move the electrode gently several times before letting it stand.
The displayed pH value is updated continuously. After 2 minutes, the reading should be stable; with dry or old electrodes, it might take more time.

The precision of a measurement is higher with freshly calibrated electrodes. If you find unexpected results, recalibrate the electrode and perform the measurement again.

4.3 pH-Electrode Calibration

Usually, a pH electrode is calibrated with two buffer solutions (two point calibration). For a quick check, one buffer solution is sufficient (one point calibration).

Display in CAL-Mode (pH)

P = Technical Buffer
n = ISO/DIN

Decimal point blinking at 2nd calibration point

ON / OFF	Measuring mode and result of last determination appear.
pH / RED	Press key until pH appears in the top right corner of the display.
☞	Rinse electrode tip and dip it into a buffer (i.e. pH 7).
CAL	Press key; the buffer value (bottom left) and unit (top right) are blinking.
?	Check the displayed buffer value against the value on the bottle.
⧗	Wait until reading is stable (approx. 2 minutes).
CAL	Press key; the buffer value appears as the measured result.

A one point calibration has been completed. To complete a two point calibration, continue immediately with the following steps:


Rinse electrode tip again.


Dip electrode into a different buffer solution (i.e. pH 9).

CAL
Press key; the buffer value, unit and decimal point are blinking.

?
Check the displayed buffer value against the value on the bottle.


Wait until reading is stable (approx. 2 minutes).

CAL
Press key, the buffer value appears as measuring result.

IMPORTANT: Between point one and two of the calibration, the instrument should not be switched off, neither manually nor automatically.

The electrode is calibrated now. Rinse the tip of the electrode before making the next measurement.
The Chematest 25 accepts deviations of up to 1 pH unit from the theoretical value and corrects the normal ageing of electrodes.
If you get an error message, first replace the calibration buffers. If this does not help, the electrode is defective and must be replaced.

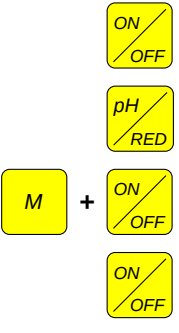
4.4 Select Between two Buffer Sets

The Chematest 25 is programmed to recognize two different sets of buffers:

P: Technical Buffers pH: 2 4 7 9

n: ISO/DIN Buffers pH: 1.68 4.01 6.86 9.18

The instrument is factory configured in the 'technical buffer' mode, these are the buffers provided by Swan. If you prefer the ISO/DIN buffers, you may change to the 'ISO/DIN' mode following the key combination below.



Measuring mode and result of last determination appear.

Press key until pH appears in the top right corner.

Switch instrument off while pressing the **M** key.

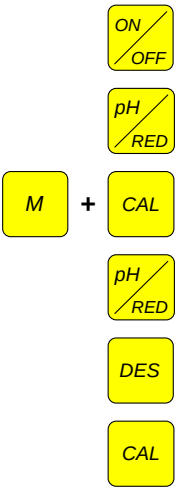
Switch instrument on. The other buffer set is active now.

Toggle between the two buffer sets by repeating above operation.

Never use two buffers of different buffer sets!

4.5 Temperature Compensation

Room temperature (25° C) is assumed during the calibration procedure. If your sample temperature deviates significantly from 25° C, adjust the instrument's reference temperature:



You can change the reference temperature any time. Only a new calibration will result in the temperature being reset to 25° C.

4.6 REDOX Potential Determination

Press the pH/REDOX key once or twice to obtain the REDOX label on the left side of the display.

Display in Redox Mode

Remove the protective cap from the electrode, rinse the tip in clean water and dip the electrode into the sample water. Move the electrode gently several times before letting it stand.

The displayed REDOX value is updated continuously.

It may take 15 to 20 minutes to obtain a stable reading. With freshly calibrated electrodes, it might even take more time.

The stabilization of the electrode continues even when the instrument switches off or during a photometric determination. Press the ON/OFF key or the pH/REDOX key respectively to return to REDOX mode.

4.7 REDOX Electrode Calibration

ON/OFF — Measuring mode and result of last determination appear.

pH/RED — Press key until REDOX appears on the left side of the display.

 Remove cap and rinse electrode tip in clean water.

 Dip electrode into standard solution.

CAL — Press key; REDOX label and unit are blinking.

 Wait until reading is stable.

CAL — Press key; the calibration value (475 mV) appears on the display.

You have now carried out the calibration of the REDOX electrode. The Chematest 25 accepts deviations of up to ± 200 mV from the theoretical value and corrects the normal ageing of electrodes.

If you get error message E-9, replace first the standard. If this does not help, the electrode is defective and must be replaced.

5.1 Determination of Acid Binding Capacity ACD pH 4.3 (Carbonate Hardness)

☞ Empty a full pipette of sample into a clean cuvette.

Add 5 drops of Oxycon-IN.

☞ Mix with glass rod, the solution turns blue.

Add Oxycon-CH drop by drop, count the drops!

? Mix after each drop and check the sample color.
First, the sample color changes to light gray. **As soon as it turns to light red, stop reagent addition.** Each drop OXYCON-CH corresponds to one German Degree of carbonate hardness.

Conversion Table:

1	°dH	German Degree corresponds to:
1.25	°eH	English Degrees
1.78	°fH	French Degrees
17.8	mg $CaCO_3$	per liter
0.357	mmol/l	Acid Binding Capacity $K_{S\ 4,3}$
0.18	mmol/l	Alkaline-Earth Ions

5.2 Electronic Thermometer

Technical Specifications:

Measuring Range:	-40°C bis +250°C (-40°F to +482°F)
Resolution:	0.1°
Precision:	2% ± 2° full scale
Ambient Temperature:	0 - 50°C
Sampling time	2.0 seconds
Battery:	LR44 (1.5V)

Measuring:

Remove protective sheath, switch on thermometer and dip steel sensor into water. Move gently and read temperature.

Changing °C to °F:

The temperature unit can be changed from displaying °C to °F by pressing the °C / °F button.

Changing operating mode:

The operating mode can be changed by pressing HOLD MAX/MIN button. Press once more to return to “Normal” mode.

Battery Change:

If the display gets weak or readings are not stable, change the batteries.

6.1 Calibration of Controllers

Automatic controllers should be checked daily by a hand measurement. Please note that the water composition near the controller can deviate considerably from that in the pool, water quality may change in the control line.

For the calibration of controllers, always take the sample water from the flow cell of the controller.

For the setting of regulating points consider the changes of water quality in the control line.

When Using Products Containing Cyanuric Acid

If your controller measures chlorine by amperometry or REDOX and you use products containing cyanuric acid, the results will deviate from the concentrations found photometrically.
When determining free chlorine in the presence of cyanuric acid, two forms of chlorine are measured: free chlorine and chlorine bound to cyanuric acid. To determine the disinfecting capacity of the water, the result from the chlorine determination must be corrected as follows:

Cyanuric Acid (mg/l)	**20**	**30**	**50**	**70**
Free Chlorine as	**50%**	**43%**	**26%**	**19%**

of photometric determination.

6.2 Maintenance

Treat your Chematest carefully and it will not need any maintenance. Even when used frequently, a battery change is necessary only once a year. You find the battery holder on the rear of the instrument. Open it by pressing firmly on the 'open arrow'. Remove batteries and replace (4 x 1.5 V alcaline, size LR6 / AA / AM3) them. Observe proper polarity of the batteries!

If necessary clean the cuvette compartment with a wet soft tissue. You can also use a tissue wettened with alcohol. Clean mainly the part directly after the shoulder.

Remove drops of reagents immediately from the keypad with a soft tissue, wetted in alcohol.

The instrument is protected against dripping water. Never dip it into water!

Disposal of Reagents and Accessories

All chemicals are strongly diluted and can be disposed of via waste water.

All plastic packings are made from non toxic polyethylene and can be disposed via standard waste removal or recycling.

Electrodes contain several materials but are free from any poisonous substances like mercury.

Dispose batteries via proper recycling.

6.3 Reagents

A85.590.300 **Oxycon Chlor** (Reagent kit for 200 determinations of free and bound chlorine).

A85.590.400 **Oxycon Des** (Reagent kit for 200 determinations of free chlorine, chlorine-dioxide, bromine and iodine).

A85.590.500 **Oxycon Ozone** (Reagent kit for 200 selective determinations of ozone).

A85.610.100 **Oxycon Carbonate Hardness** (Reagent kit for approx. 50 determinations of acid binding capacity (ADC) at 10 °d).

A85.580.300 **Oxycon CA** (Capsules for 40 determinations of cyanuric acid).

A85.580.200 **Oxycon GL** (Special reagent for masking chlorine).

A85.571.200 **Oxycon Al** (Reagent for determination of dissolved aluminium)

A85.572.200 **Oxycon Fe** (Reagent for determination of dissolved iron)

A85.510.100 Oxycon Start (50 ml)
A85.510.200 Oxycon DPD (1a + 1b) (50 ml)
A85.510.300 Oxycon 2 (50 ml)
These reagents are included in the above kits.

Please observe safety instructions on the reagent bottles !

6.4 Spare Parts and Standards

Electrodes

A87.120.013	pH electrode with cable and BNC connector
A87.420.013	Redox electrode with cable and BNC connector

Calibration Standards

A85.112.300	Buffer solution pH 4 (40 ml)
A85.113.300	Buffer solution pH 7 (40 ml)
A85.114.300	Buffer solution pH 9 (40 ml)
A85.121.300	Redox standard (475 mV) (40 ml)

Spare Parts

A70.065.603	Glass cuvette 62 mm
A70.065.604	Cuvette lid
A70.065.606	Ball pipette complete
A70.065.608	Glass rods (5 pcs)
A70.065.609	Sample flasks (4 pcs)
A70.065.516	Electronic thermometer

A set of test cuvettes is available for the Chematest 25, to control the instrument according to ISO 9000.

A85.124.000 Test kit Chematest

If you order the test kit (test cuvettes) please send us the Chematest for a check-up. The cuvettes will be adjusted to your instrument.

6.5 Specifications Photometer

Measuring Range (mg/l)	low	medium	high
Chlorine	0,00 - 2,49	- 4,9	- 10
Chlorine-dioxide	0,00 - 4,99	- 9,9	- 20
Bromine	0,00 - 4,99	- 9,9	- 20
Iodine	0,00 - 9,99	- 19,9	- 35
Ozone	0,000 - 0,499	- 0,99	- 2,5
Dissolved iron	0 - 2,5		
Disolved aluminium	0		- 0,8
Accuracy in % of measuring range	± 1%	± 2.5%	± 5%

Cyanuric acid : Measuring range: 0 - 100 mg/l
Accuracy: ±10% of Bereichsendwert

Repeatability better than accuracy.
Automatic range switching.

6.5 Specifications pH

	pH	Redox
Measuring range:	0 - 14 pH	- 400 mV to + 1'500 mV
Resolution:	1/100 pH	1 mV
Accuracy:	± 1/100 pH	± 0,5 mV

pH automatic buffer recognition

Temperature compensation

ISO/DIN or technical buffers

Dimensions, weight	Instrument:	10 x 20 cm, 450 g
	Portable case:	38 x 27 x 10 cm, 2,900 g (complete)

6.6 Error Messages

E-0 Low battery

The display starts to blink when the batteries are low. You may still get precise results for another week until error message E-0 appears.

If the batteries are run-down the instrument switches off after pressing the Cal or M key. If batteries are completely exhausted, there is no display any more.

If necessary clean the battery contacts.

E-1 Not enough light for zero point

- No cuvette installed
- Dirty or empty cuvette
- Air bubbles in the sample
- Dirty cuvette compartment

E-2 DES over range

See specifications of Chematest 25

E-3 DES under range

No valid setting of zero point

E-4 Combined chlorine not valid

Total chlorine lower than free chlorine

E-5 Negative pH value

Redox electrode instead of pH electrode connected

E-6 Automatic buffer recognition failed

- Buffer wrong or needs replacement
- Electrode defective

E-7 pH zero point error (deviation > 1.1 pH-units)

- Buffer wrong or needs replacement
- Electrode defective

E-8 pH electrode slope error (slope < 35 or > 65 mV/pH)

- Buffer wrong or needs replacement
- Electrode defective

E-9 Redox zero point error (deviation > 200 mV)

- Standard wrong or needs replacement
- Elektrode defective

F-1 Contact repair service

F-2 Contact repair service

F-9 Contact repair service

6.7 Display and Key Pad

Possible Values:

MODE: DES pH Redox

PARAMETERS:

DES-Mode: c1/c2/c3/o3/cd/br/Jd/cA/AL/FE
or timer 90 ... 0

pH Mode measuring: reference temperature
pH Mode calibration: buffer value

K e y P a d

pH/Redox Toggle

Zero Point Calibration

Switch

Select Parameter

Measure

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