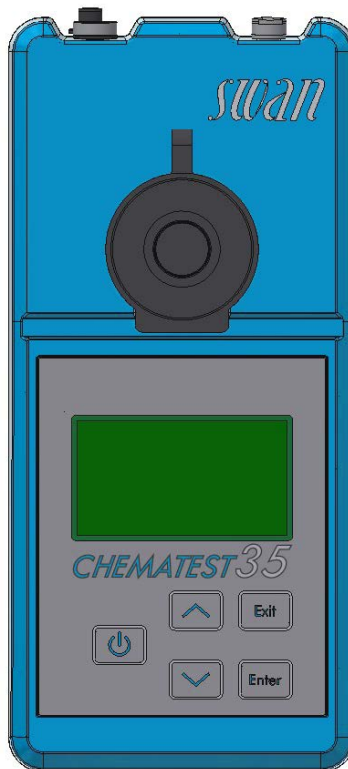


Chematest 35

Operator's Manual



 MADE IN
SWITZERLAND

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Document Status

Title:	Chematest 35 Operator's Manual	
ID:	A-96.730.121	
Revision	Issue	
00	April 2019	First edition
01	May 2020	Added CT App
02	September 2020	Added conductivity sensor
03	February 2023	Hardware V3-A
04	April 2026	Changes to the scope of delivery

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This manual applies to firmware V2.11 and higher.
The information contained in this document is subject to change without notice.

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Operator's Manual

1. Safety Instructions

For safe instrument operation, you must read and understand the instructions in this manual.

Warning notices

The symbols used for safety-related notices have the following meaning:



WARNING

Severe injuries or damage to the equipment can occur if such warnings are ignored.

- ♦ Follow the prevention instructions carefully.



CAUTION

Damage to the equipment, minor injury, malfunctions or incorrect process can be the consequence if such warnings are ignored.

- ♦ Follow the prevention instructions carefully.



Reagents

WARNING



Multiple Hazards

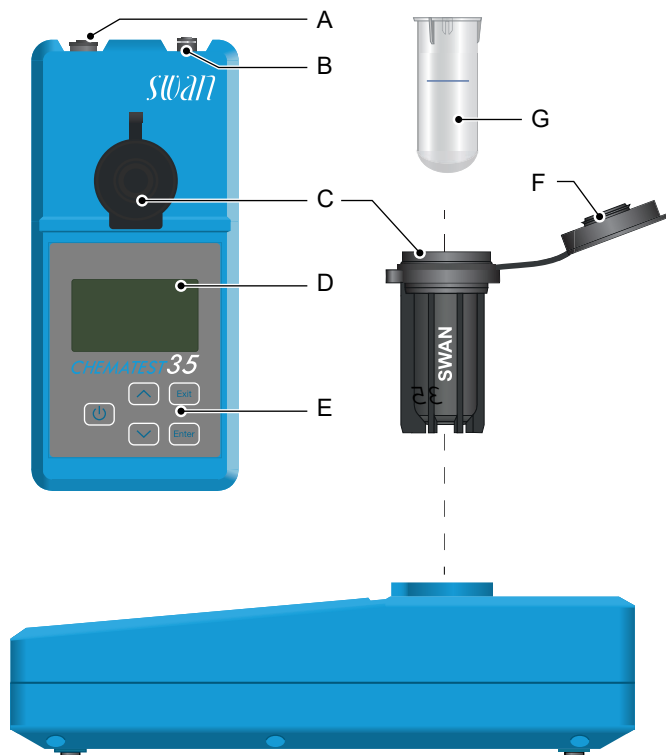
For safe handling of the reagents, you must read and understand the corresponding Material Safety Data Sheets (MSDS). These can be downloaded from **www.swan.ch**.

General Handling Guidelines

- ♦ Only charge the instrument using a standard type A USB socket and the supplied USB cable.
- ♦ Protect from heat and splash water during charging.
- ♦ When no charging or sensor cable is connected, close both sockets with the covers.
- ♦ Do not expose the instrument to direct sunlight or other sources of heat, especially when charging.
- ♦ The housing of the Chematest 35 must not be opened except for the housing parts specified in the maintenance chapter.
- ♦ The battery must only be replaced by authorized service personnel.

2. Product Description

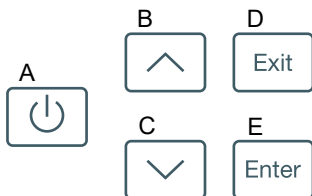
2.1. Instrument Overview



A Sensor socket
B Charging socket
C Cuvette adapter
D Display

E Keypad
F Cuvette cap
G Cuvette

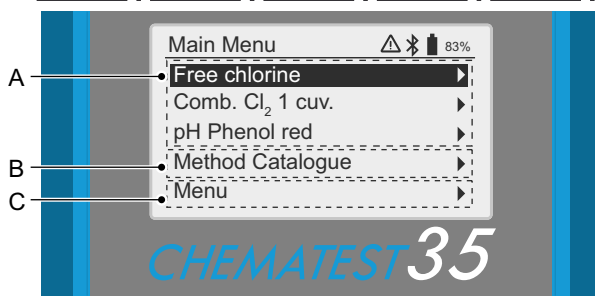
2.2. Keys



- A POWER**
to power on or off the instrument
- B ARROW UP**
to move up in a menu list and to increase digits
- C ARROW DOWN**
to move down in a menu list and to decrease digits
- D EXIT**
to exit a menu or command
to move back to the previous menu level
- E ENTER**
to open a selected sub-menu
to accept an entry

2.3. Display

Once the instrument has started up, the main menu is displayed. The main menu is organized as follows:



A Favorites list

The favorites list provides quick access to frequently used methods. Depending on the configuration, it contains either

- ♦ the last three methods selected from the method catalogue [B] (default setting) or
- ♦ three methods that are defined by the user.

To define the methods that appear in the favorites list, proceed according to [Initial Setup, p. 11](#).

B Method catalogue

List of all available methods.

C Menu

Access to further instrument functions. Detailed descriptions of all functions can be found in chapter [Menu Explanations, p. 41](#).

Symbols

The symbols displayed in the top right corner have the following meaning:

-  Alarm active. See menu **Diagnostics > Alarms** to see all active alarms.
-  Bluetooth activated
-  83% Battery status (remaining capacity in %)
-  Instrument is charging

2.4. CT App

The CT App is a software for communication between the Chematest 35 and a mobile device or PC. The app includes the following functions:

- ♦ Transfer of the stored measurements and export to a CSV or Excel file
- ♦ Editing the user list
- ♦ Editing the ID list
- ♦ Switching between different language packs and language selection

For information on installing and using the app, see [Appendix: CT App, p. 58](#).

3. Initial Setup

3.1. Selecting the Language

Select the applicable language from menu **Settings > Miscellaneous > Language**.

If the required language is not available on the Chematest 35, the CT App can be used to install a different language pack. See [Language packs, p. 60](#) for details.

3.2. Setting Time and Date

Set time and date in menu **Maintenance > Set Time**.

3.3. Setting up ID and User List

Selecting the attributes to be saved

Navigate to menu **Settings > Identification > Attribute** and select which attributes should be saved with each measurement:

- ♦ none
- ♦ user
- ♦ ID or
- ♦ user and ID.

Entering the ID and user list

If applicable, enter the user and ID lists. The user and ID lists can be edited using the CT App:



Edit ID list



Edit User list

Alternatively, the user and ID lists can be entered directly on the Chematest 35 via the menu items

Settings > Identification > ID List and

Settings > Identification > List of Users.



3.4. Activating Expert Mode

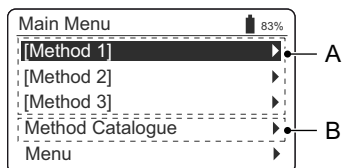
The user can choose between two types of method guidance for photometric measurements. This setting can be changed in menu **Settings > Miscellaneous > Expert mode**.

- ♦ Inactive (default setting):
In this mode, the Chematest 35 displays detailed on-screen instructions. Recommended for inexperienced users.
- ♦ Active:
In this mode, the Chematest 35 displays the instructions in shortened form and requires as few confirmations from the user as possible.

3.5. Setting up Favorites List with Fixed Entries

By default, the instrument is configured to display the last three methods selected from the method catalogue [B] in the favorites list. With this configuration, the favorites list is automatically adjusted each time a method is selected from the method catalogue.

Alternatively, it is possible to set up a favorites list with fixed entries. To do this, perform the following steps:



A Favorites list
B Method catalogue

- 1 Select the required methods from the method catalogue [B] in reverse order: First method 3, then method 2, then method 1. The measurements can be canceled immediately after selection by pressing [Exit].
- 2 Navigate to menu **Settings > Miscellaneous > Method save** and select "No".
⇒ *The favorites list contains the three methods just selected and will remain the same from now on.*

3.6. Further Settings

Detailed descriptions of all instrument settings can be found in chapter Menu explanation, subsection [4 Settings, p. 45](#).

3.7. Sensor Calibration

Before first use, calibrate your pH and redox sensors. See [Calibration of the pH Sensor, p. 32](#) and [Calibration of the Redox Sensor, p. 33](#).

Note: *The rubber caps that the pH and redox sensors are delivered with can be disposed of. Only use the specially designed storage container for the storage of pH and redox sensors.*



4. Photometry

4.1. Basic Rules for Photometry

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

Always use clean utensils

Residues from previous measurements can falsify the results. The cuvette cap and all utensils such as beakers, syringes or cuvettes must be rinsed with clean water after each measurement. Rinse the cuvette additionally with the sample 2 to 3 times before each measurement.

Remove the cuvette from the adapter before emptying it. Otherwise, it may fall out of the adapter.

Keep the outside of the cuvette clean and dry

Keep the cuvette free of fingerprints and dry the outside of the cuvette before inserting it into the cuvette adapter.

If condensation occurs on the cuvette (cold sample in a warm environment), wipe it off and carry out the measurement as quickly as possible.

Observe proper sampling

Take the water samples about 10 cm below the water surface and about 50 cm from the edge of the pool. Allow as little time as possible to elapse between taking the sample and making the measurement.

Observe proper dosing and mixing

Use the provided beaker to take a sample from the pool and to transfer it into the cuvette. If sampling with the beaker is not possible, the 20-ml syringe can be used instead. When using the syringe, flush it several times with the sample and make sure no air bubbles form when drawing up the sample.

The order in which sample and reagents are added to the cuvette varies from method to method. If the reagents are added to the cuvette after the sample, special care must be taken to ensure that the sample and the reagents mix well.

Observe reaction times

With most methods, the measurement can be carried out immediately after the reagents have been added and mixed with the sample. If a reaction time is required, this is indicated on the screen.

4.2. How To Use Reagents

Whenever possible, Swan supplies reagents in liquid form, as used in professional laboratories. We believe that the disadvantage of shorter shelf life is more than compensated for by the ease of use compared to tablets or powders.

The OXYCON-DPD reagent is delivered in two small bottles to increase shelf life. One contains DPD as powder (DPD 1a), the other contains the solvent (DPD 1b). Before use, fill the contents of DPD 1b into DPD 1a, close the bottle with the drop counter and shake firmly until the DPD powder has completely dissolved. Write the mixing date on the bottle. The prepared reagent can be stored at room temperature for 2 months.

The reagents OXYCON START and OXYCON 2 have a shelf life of at least 6 months. They will last a year if handled carefully and stored at 5 °C. With the blister pack, all reagents can be taken out of the case at once and placed in the refrigerator.

To dispense the necessary number of drops, hold the bottle at a 45° angle. Before proceeding with the measurement, make sure that the reagents are well mixed with the sample.

The Chematest 35 is calibrated against Swan's OXYCON reagents. Accuracy may suffer severely if reagents from other sources are used.

4.3. Overview of Methods and Reagents

4.3.1 Chlorine

Method	Reagent 1	Reagent 2	Reagent 3	Result(s) shown
Free chlorine	Oxycon Start	Oxycon DPD	---	Free chlorine in ppm Cl ₂
Total chlorine	Oxycon 2	Oxycon DPD	---	Total chlorine in ppm Cl ₂
Combined chlorine (1 cuvette)	Oxycon Start	Oxycon DPD	Oxycon 2	Free chlorine (fac), total chlorine (tc) and combined chlorine (cc) in ppm Cl ₂ cc = tc - fac
Combined chlorine (2 cuvettes)	Cuvette 1: Measurement of free chlorine			Free chlorine (fac), total chlorine (tc) and combined chlorine (cc) in ppm Cl ₂ cc = tc - fac
	Oxycon Start	Oxycon DPD	---	
	Cuvette 2: Measurement of total chlorine			
	Oxycon 2	Oxycon DPD	---	
Free chlorine in presence of chlorine dioxide or bromine	Measurement A			Free chlorine in ppm Cl ₂ fac = A - B
	Oxycon Start	Oxycon DPD	---	
	Measurement B			
	Oxycon GL	Oxycon Start	Oxycon DPD	

4.3.2 Other Disinfectants

Method	Reagent 1	Reagent 2	Reagent 3	Result(s) shown
Ozone	Oxycon 2	Oxycon DPD	---	ppb as O ₃
Ozone in presence of chlorine	Measurement A			ppb as O ₃ O ₃ = A - B
	Oxycon 2	Oxycon DPD	---	
	Measurement B			
	Oxycon GL	Oxycon 2	Oxycon DPD	
Bromine	Oxycon Start	Oxycon DPD	---	ppm as Br ₂
Iodine	Oxycon Start	Oxycon DPD	---	ppm as I ₂
Chlorine dioxide	Oxycon Start	Oxycon DPD	---	ppm as ClO ₂

4.4. Notes on Individual Methods

Free chlorine and cyanuric acid

When free chlorine is determined in the presence of cyanuric acid, two forms of chlorine are measured: free chlorine and chlorine bound to cyanuric acid. To determine the disinfection capacity of the water, the concentration of cyanuric acid must also be measured and the result of the chlorine determination must be corrected as follows:

Cyanuric acid	20 mg/l	30 mg/l	50 mg/l	70 mg/l
Percentage of free chlorine in the measured value	50 %	43 %	26 %	19 %

Combined chlorine

The method catalogue of the Chematest 35 contains two options for measuring combined chlorine:

- ♦ with one cuvette or
- ♦ with two cuvettes.

Apart from the fact that one or two cuvettes are used, the two methods are identical. Measuring with only one cuvette is faster and requires less reagents. However, some standards require measurement with two cuvettes. The selection of the method should be based on the site-specific requirements.

Ozone

Ozone decomposes in a very short time and is usually only present in traces. It is essential to rinse the cuvette three times with the ozone-containing sample before starting the measurement. Carry out the further steps as quickly as possible, but work meticulously.



4.5. Performing a Photometric Measurement

WARNING



Multiple Hazards

For safe handling of the reagents, you must read and understand the corresponding Material Safety Data Sheets (MSDS). These can be downloaded from www.swan.ch.

General

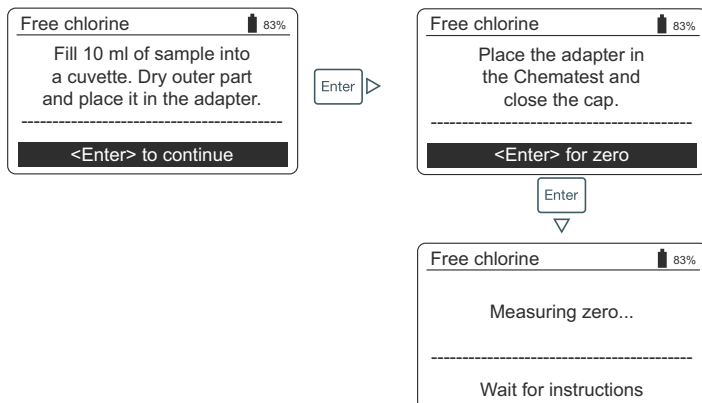
A photometric measurement with the Chematest 35 consists of the following steps:

- ♦ Step 1: Zero measurement
- ♦ Step 2: Addition of reagents and subsequent measurement (for some methods with further intermediate steps and/or reaction times)
- ♦ Step 3: Display and storage of the measured results. For details on the result screen, see example on [p. 20](#).

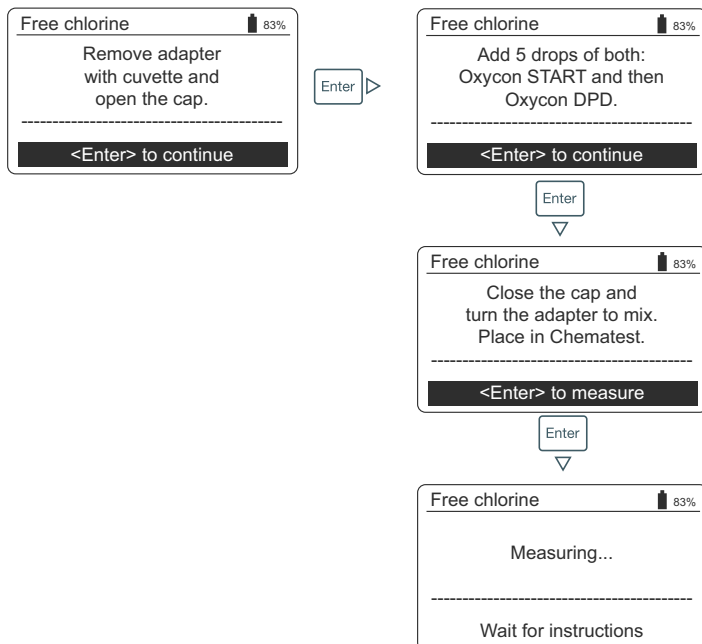
All photometric measurements are menu-driven. Select the corresponding method on the main screen or in the menu catalogue and follow the instructions on the screen.

**Example:
Measurement
of free chlorine**

Step 1: Zero measurement



Step 2: Addition of reagents and measurement



Step 3: Display and storage of the measured results

- ♦ Pressing [Enter] saves the measurement in the data history.
⇒ *The measurement is initially saved without ID and user.*
- ♦ Pressing [Exit] discards the measurement.

Note: Depending on the configuration, the selection dialog for user and/or ID is displayed or the summary screen is displayed directly.

- ♦ If applicable:
 - Select an ID from the list.
 - Select a user from the list.
- ♦ If you press [Exit] at this point, you return to the main screen, saving the measurement without user and ID.

- ♦ Select "<Enter> to continue" and confirm with [Enter].
⇒ *The ID and the user are added to the entry in the data history.*

- ♦ Press [Enter] to return to the main screen.

4.6. Automatic Shutoff

When the instrument is waiting for a user input (e.g. when the measurement result is displayed) and no key is pressed for 10 minutes, the instrument shuts off automatically to save power. This affects the storage of measurement results in the same way as pressing the [Exit] key.



5. pH and Redox

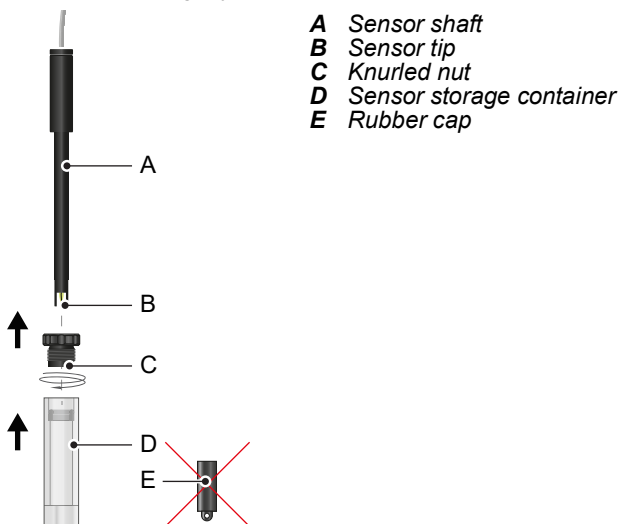
5.1. Basic Rules for pH and Redox

**Calibration
interval**

To ensure correct measurement, calibrate pH and redox sensors monthly. Proceed as described in [Calibration of pH and Redox Sensors](#), p. 32.

**Storage of pH
and redox
sensors**

After use, rinse the pH or redox sensor with clean water. To prevent the sensor from drying out, fill the storage container with clean water. Then slide the knurled nut [C] onto the sensor shaft, push the sensor shaft into the storage container as far as it will go and screw the knurled nut [C] tightly to seal it.



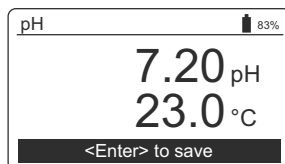
Note: The cap [E] that the sensor is delivered with is not intended for daily use and can be disposed of.

**Electrolyte
refill**

Swan's maintenance-free pH and redox sensors must not be refilled with electrolyte.

5.2. Performing a pH Measurement

- 1 Plug the sensor cable into the sensor socket.
- 2 Remove the storage container from the sensor.
- 3 Rinse the sensor tip with clean water and dip the sensor into the sample.
- 4 Select "pH ISE" from the main screen or from the method catalogue.
⇒ *The displayed pH and temperature values are updated continuously.*

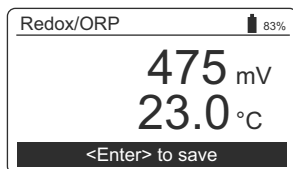


- 5 Move the sensor gently several times before letting it stand.
- 6 Wait until both the pH and the temperature value are stable. Then press [Enter] to save the result.
- 7 Next you can optionally select an ID and/or a user name. This procedure is described in detail on [p. 20](#).
- 8 After use, rinse the sensor tip with clean water.

5.3. Performing a Redox Measurement

- 1 Plug the sensor cable into the sensor socket.
- 2 Remove the storage container from the sensor.
- 3 Rinse the sensor tip with clean water and dip the sensor into the sample.
- 4 Select "Redox/ORP" from the main screen or from the method catalogue.

⇒ *The displayed redox and temperature values are updated continuously.*



- 5 Move the sensor gently several times before letting it stand.
- 6 Wait until both the redox and the temperature value are stable. Then press [Enter] to save the result.
⇒ *With difficult samples, it may take 15–20 minutes until the reading is stable. With a freshly calibrated sensor, it may take even longer. If the Chematest 35 switches off before the measured value has stabilized, switch it on and select the “Redox/ORP” method again. This will not affect the stabilization of the sensor.*
- 7 Next you can optionally select an ID and/or a user name. This procedure is described in detail on [p. 20](#).
- 8 After use, rinse the sensor tip with clean water.

5.4. Automatic Shutoff

When the instrument is waiting for a user input (e.g. when the measurement result is displayed) and no key is pressed for 10 minutes, the instrument shuts off automatically to save power. This affects the storage of measurement results in the same way as pressing the [Exit] key.

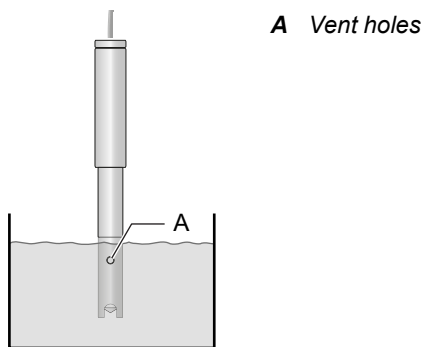
6. Conductivity

6.1. Basic Rules for Conductivity

Calibration and verification	The conductivity sensor of the Chematest 35 is already calibrated at the factory and the cell constant is stored in the sensor. Since the conductivity sensor does not change its properties significantly over time, a periodic recalibration is usually not necessary. Instead of recalibration, Swan recommends to perform a periodic verification as described in section Verification of the Conductivity Sensor, p. 35. If a recalibration is necessary for regulatory reasons, proceed according to Calibration of the Conductivity Sensor, p. 34.
Temperature equalization	For reliable measurement results, the sensor and the sample water must have the same temperature. The process of temperature equalization can take up to five minutes, depending on the temperature difference. To accelerate this process, it is helpful to stir the sample occasionally with the sensor.
Change from high to low conductivity	If you change from a sample with a very high conductivity to a sample with a very low conductivity, rinse the sensor thoroughly with the low-conductivity sample before carrying out the measurement. If necessary, also unscrew the protection sleeve as described in Cleaning the Conductivity Sensor, p. 36 and rinse the internal and external threads with the low-conductivity sample. Screw the protection sleeve back on before carrying out the measurement.
Storage	Rinse the conductivity sensor with clean water after use. If it is heavily contaminated, clean it according to Cleaning the Conductivity Sensor, p. 36. Store the conductivity sensor dry.

6.2. Performing a Conductivity Measurement

- 1 Plug the sensor cable into the sensor socket.
- 2 Rinse the sensor tip with clean water.
- 3 Immerse the sensor at least four times in the sample until the vent holes [A] are below the water surface and lift it up again to allow the sample to flow out.



- 4 Stir the solution with the sensor for approximately five seconds.
- 5 Let the sensor stand in the sample. Make sure that the vent holes [A] are a few millimeters below the water surface.
- 6 Select "Conductivity" from the main screen or from the method catalogue.
⇒ *The displayed conductivity and temperature values are updated continuously.*



- 7 Wait until both the conductivity and the temperature value are stable. Then press [Enter] to save the result.
⇒ *This process can take up to five minutes.*
- 8 Next you can optionally select an ID and/or a user name. This procedure is described in detail on [p. 20](#).
- 9 After use, rinse the sensor tip with clean water.

6.3. Automatic Shutoff

When the instrument is waiting for a user input (e.g. when the measurement result is displayed) and no key is pressed for 10 minutes, the instrument shuts off automatically to save power. This affects the storage of measurement results in the same way as pressing the [Exit] key.



7. Additional Parameters

7.1. Determination of Acid Binding Capacity ACD pH 4.3

Required utensils Use the following utensils from the Chematest 35 carrying case:

- ♦ cuvette
- ♦ cuvette adapter
- ♦ beaker

Procedure

- 1 Place the cuvette in the cuvette adapter.
- 2 Fill 10 ml of sample into the cuvette.
- 3 Add 5 drops of Oxycon-IN.
- 4 Close the cap of the cuvette adapter and turn it over to mix.
⇒ *The solution turns blue.*
- 5 Add Oxycon-CH drop by drop and count the exact number of drops. Mix after each drop and check the sample color.
⇒ *First, the sample color changes to light gray. After the required number of drops has been added, the solution turns light red.*
- 6 Once the sample has turned light red, stop reagent addition.
- 7 From the number of drops, calculate the carbonate hardness according to the conversion factors below.

Conversion factors Each drop of Oxycon-CH corresponds to one German degree of carbonate hardness.

1 °dH German degree corresponds to:

- ♦ 1,25 °eH English degrees
- ♦ 1,78 °fH French degrees
- ♦ 17.8 mg CaCO₃ per liter
- ♦ 0.357 mmol/l acid binding capacity K_S 4,3
- ♦ 0.18 mmol/l alkaline-earth ions

8. Data Management

Up to 2700 measurements are memorized. Then the oldest measurement is deleted to save the newest one.

8.1. Display of Data History on the Chematest 35

Previous measurements can be displayed in menu **Data Storage > Data History**.

Scrolling through the data history

Data History		4	83%
Date, Time	20.03.19 07:59	↑	
Free chlorine	0.26 ppm		
ID	ID 1		
User	User 1		

↓

- ◆ Press the ARROW DOWN and ARROW UP keys to scroll through the data history.



Two-page entries

Data History		5	83%
Date, Time	20.03.19 08:25	↑	
Free chlorine	0.22 ppm		
Total chlorine	0.26 ppm		
Comb. chlorine	0.04 ppm		

<Enter> for more

↓

- ◆ “<Enter> for more” indicates that the selected entry consists of two pages. Use the ENTER key to toggle between the pages.



Data History		5	83%
ID	ID 1	↑	
User	User 1		

<Enter> for more

↓

8.2. Data Transfer to CT App

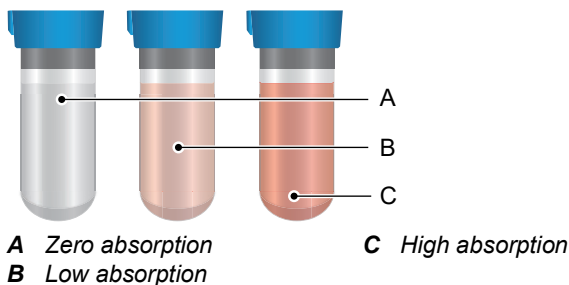
The measurement history can be transferred to a mobile device or PC and converted into an Excel or CSV file using the CT App.

⇓ Start of data transfer and conversion

9. Maintenance

9.1. Photometer Verification

Overview The verification kit contains two reference cuvettes (labeled “Low” and “High”) with certified reference absorptions of approximately 0.3 and 1.5 and an additional cuvette for zero point determination. The exact values are specified in the enclosed calibration certificate.



Reference values Prior to performing the first verification and after each recertification, set the reference values for the cuvettes “Low” and “High” in menu **Settings > Sensors > Photometer**.

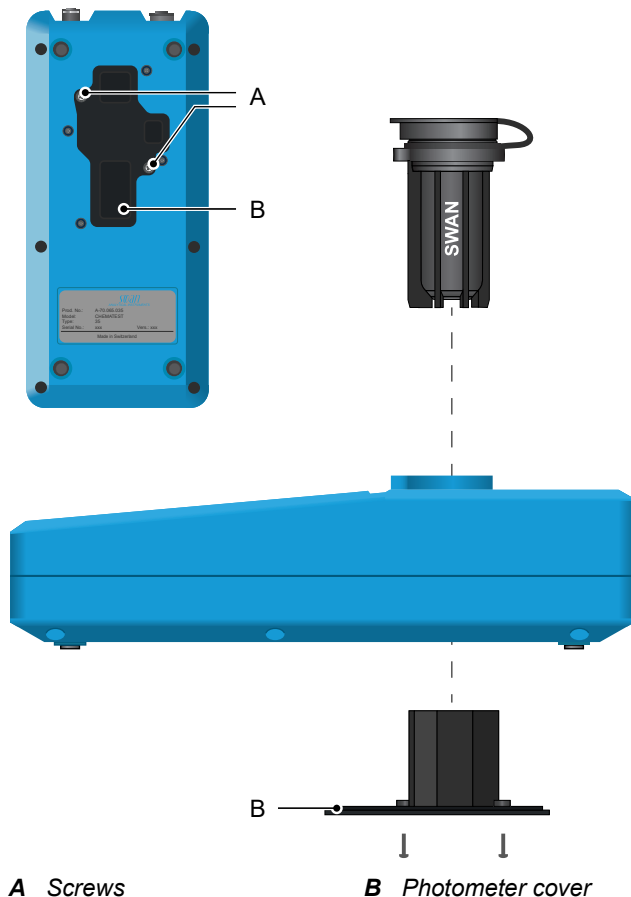
Verification procedure Before each use, check the expiration date on the calibration certificate. If the expiration date has passed, send the verification kit to Swan for recertification.
To start the verification, navigate to menu **Maintenance > Verification > Photometer**. Select cuvette “Low” and follow the instructions on the screen.
Repeat the same procedure with the cuvette “High”.

Verification history Can be reviewed in menu **Data Storage > Ver. History**. Up to 64 verifications are memorized. Then the oldest verification is deleted to save the newest one.

9.2. Cleaning the Instrument

Photometer compartment

The photometer compartment can be easily cleaned if water or reagents have been spilled. Turn the unit to the rear, loosen the two screws [A] and remove the cover [B]. Use a soft, lint-free cloth moistened with water to clean the photometer compartment.



Outside of the housing

If reagents drip onto the housing, wipe them off quickly with a soft cloth moistened with water.

9.3. Calibration of pH and Redox Sensors

9.3.1 Calibration of the pH Sensor

Calibration solutions	The calibration is carried out using two calibration solutions. The instrument is factory programmed for the use of calibration solutions with pH 7 (standard 1) and 9 (standard 2) supplied by Swan. If other calibration solutions are used, the corresponding temperature curves can be entered in menu Settings > Sensors > Electrode > pH > Standards. Use the standards at room temperature. Be careful not to interchange the bottle caps of the standards.
Procedure	1 Plug the sensor cable into the sensor socket. 2 Select menu Maintenance > Calibration > Electrode > pH and follow the instructions on the screen.
Calibration errors	If the calibration is aborted with the message "Offset error!" or "Slope error!": ♦ Make sure that the correct standard solutions have been measured in the correct order. ♦ Carefully clean the sensor tip with a paper tissue. ♦ Repeat the calibration with new standard solutions. If the above steps do not help, the sensor is defective and must be replaced.
History	The calibration history of the pH sensor is stored in the internal memory of the Chematest 35 and can be reviewed in menu Data Storage > Calibration History > Sensors > pH. Up to 64 calibrations are memorized. Then the oldest calibration is deleted to save the newest one.

9.3.2 Calibration of the Redox Sensor

Calibration solution	The instrument is factory programmed to use the 475 mV standard solution supplied by Swan. If a different standard solution is used, enter the mV value in menu Settings > Sensors > Electrode > Redox/ORP > Standards. Use the standard at room temperature.
Procedure	1 Plug the sensor cable into the sensor socket. 2 Select menu Maintenance > Calibration > Electrode > Redox/ORP and follow the instructions on the screen.
Calibration errors	If the calibration is aborted with the message "Offset error!": ♦ Make sure that the correct standard solution has been measured. ♦ Carefully clean the sensor tip with a paper tissue. ♦ Repeat the calibration with a new standard solution. If the above steps do not help, the sensor is defective and must be replaced.
History	The calibration history of the redox sensor is stored in the internal memory of the Chematest 35 and can be reviewed in menu Data Storage > Calibration History > Sensors > Redox/ORP. Up to 64 calibrations are memorized. Then the oldest calibration is deleted to save the newest one.

9.4. Calibration of the Conductivity Sensor

Calibration solution The calibration is carried out using a 0.01 mol KCl solution. Use the calibration solution at a temperature between 18 °C and 30 °C and allow it to reach room temperature before use.

Procedure

- 1 Plug the sensor cable into the sensor socket.
- 2 Select menu **Maintenance > Calibration > Electrode > Conductivity** and follow the instructions on the screen.

Calibration errors If the calibration is aborted with the message "Calibration error!":

- ♦ Make sure that the correct standard solution has been measured.
- ♦ Clean the sensor as described in [Cleaning the Conductivity Sensor, p. 36](#).
- ♦ Repeat the calibration with a new standard solution.

History The calibration history is stored in the conductivity sensor's internal memory and can be reviewed in menu **Data Storage > Calibration History > Sensors > Conductivity** while the conductivity sensor is plugged in. Up to 64 calibrations are memorized. Then the oldest calibration is deleted to save the newest one.

Resetting the cell constant To return to the original, factory-set cell constant and to delete the calibration history, plug in the sensor and select menu **Settings > Sensor > Electrode > Conductivity > Reset cell constant**.

9.5. Verification of the Conductivity Sensor

Calibration solution The 0.01 mol KCl calibration solution can also be used for a verification measurement.
Use the calibration solution at a temperature between 21 °C and 30 °C and allow it to reach room temperature before use.

***Note:** The described verification procedure only works within the specified temperature range in which the relationship between conductivity and temperature is linear.*

Preparations Make the following settings before performing the verification measurement:

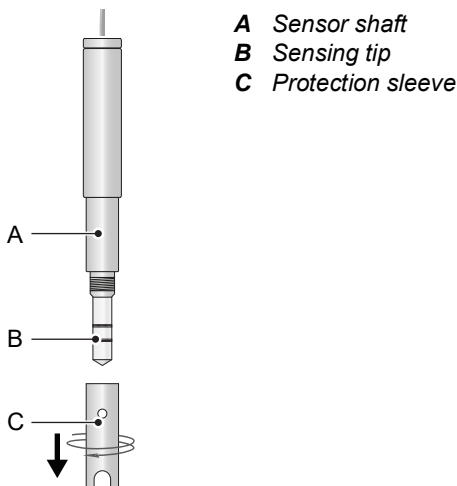
- 1 From menu **Settings > Sensors > Conductivity > Temp. comp.**, select the setting "Coefficient".
- 2 Set the coefficient to 1.95%.
- 3 Create a separate ID for verification measurements and activate query of the ID. These settings can be made in the menus **Settings > Identification > Attributes** and **Settings > Identification > ID List**.

- Verification procedure**
- 1 Carry out the measurement as described in [Performing a Conductivity Measurement, p. 26](#).
 - 2 Assign the previously configured ID to the measurement.
 - 3 After completing the verification measurement, reset the temperature compensation to the previous setting.

9.6. Cleaning the Conductivity Sensor

To clean the conductivity sensor, proceed as follows:

- 1 Unscrew the protection sleeve [C].



- 2 Clean the sensing tip [B] and the inner side of the protection sleeve [C] with a soft brush and a household detergent.
- 3 Rinse the sensing tip and the protection sleeve with clean water.
- 4 Screw the protection sleeve finger-tight onto the sensor.

9.7. Setting Time and Date

The correct setting of the clock is important for the identification of stored measurements. It is therefore recommended to check the date and time setting regularly.

The time and date can be set in menu **Maintenance > Set Time**.

10. Troubleshooting

10.1. Instrument Errors



When this symbol is displayed at the top of the screen, the instrument has an error. Navigate to menu **Diagnostics > Alarms > Pending errors** to see the error message.

Error	Description	Corrective action
E001	Bluetooth	– Switch the instrument on and off and check if the error disappears. – Call support.
E002	IC ADC	– Call support. – Send the instrument back to Swan.
E003	Factory data	– Call support. – Send the instrument back to Swan.
E004	Invalid time	– Set time and date in menu Maintenance > Set Time.
E017	Events erased	– This message informs that the measured data have been deleted by calling the “Set to factory defaults” function. – No action necessary.



10.2. Photometric Measurements

Measurement cannot be started

Error message "Operation not possible! Consult the manual." is displayed

Possible cause	Corrective action
Error E002, E003 or E004 is present	♦ See Instrument Errors, p. 37 for details.

Zero measurement fails

Error message "Operation not possible! Signal out of range. Consult the manual." is displayed.

Possible cause	Corrective action
Extraneous light	♦ Make sure that the cuvette cap is properly closed.
Cuvette dirty	♦ Clean and rinse the cuvette.
Residues of reagents	♦ Clean and rinse the cuvette.
Lenses dirty	♦ Open the photometer compartment and clean all lenses, see Cleaning the Instrument, p. 31.
Turbid or bubble-containing sample	♦ Avoid formation of bubbles when filling the sample into the cuvette. ♦ Check sample / sampling point. ♦ Repeat measurement.

Measurement after adding reagents fails

Error message "Operation not possible! Signal out of range. Consult the manual." is displayed.

Possible cause	Corrective action
Extraneous light	♦ Make sure that the cuvette cap is properly closed.
Cuvette dirty	♦ Clean and rinse the cuvette.
Concentration or pH value outside the measuring range of the instrument	♦ Consult Instrument Specifications, p. 53. ♦ Repeat measurement.
Reagents expired	♦ Use new reagents.
Measured value below zero value	♦ Avoid formation of bubbles when filling the sample into the cuvette. ♦ Repeat measurement.

10.3. Sensor-Based Measurements

Measurement cannot be started Error message “Operation not possible! Consult the manual.” is displayed

Possible cause	Corrective action
Error E002, E003 or E004 is present	♦ See Instrument Errors, p. 37 for details.

Sensor not connected Error message “Operation not possible! Sensor not connected! Consult the manual.” is displayed.

Possible cause	Corrective action
Sensor not connected.	♦ Check if the sensor is properly plugged in.
Wrong sensor connected.	♦ Check if the connected sensor corresponds to the selected method.
Cable or sensor defective.	♦ Call support.

Invalid calibration data Error message “Operation not possible! Invalid calibration data! Consult the manual.” is displayed.

If the error occurs with a pH or redox sensor:

Possible cause	Corrective action
Cannot read factory data in the sensor's internal memory.	♦ Call support.

If the error occurs with a conductivity sensor:

Possible cause	Corrective action
Corrupted user calibration data in the sensor's internal memory	♦ Call the Reset cell constant function and check if the error disappears.
Cannot read factory data in the sensor's internal memory.	♦ Call support.

Sensor failure Error message “Operation not possible! Sensor failure! Consult the manual.” is displayed.

Possible cause	Corrective action
Cable or sensor defective	♦ Call support.
The sensor was disconnected from the instrument too early.	♦ Do not unplug the sensor until the measurement has been completed and the instrument has returned to the main screen.

11. Menu Explanations

Selecting "Menu" on the main screen displays the following submenus:

- ◆ Menu 1 Data Storage
- ◆ Menu 2 Diagnostics
- ◆ Menu 3 Maintenance
- ◆ Menu 4 Settings

The functions and settings of each menu are explained in the following sections.

1 Data Storage

1.1 Data History

Displays saved measurement data. Each record includes the following data:

- ◆ Date, time
- ◆ Measured value(s)
- ◆ ID
- ◆ User

If the fields ID and User contain the text "<Empty>", the assignment of the attributes to the measurement was skipped by the user or deactivated under [4.2 Identification, p. 46](#).

Up to 2700 measurements are memorized. Then the oldest measurement is deleted to save the newest one.

1.2 Verification History

Photometer Displays previous photometer verifications. Each record includes the following data:

- ◆ Date, time
- ◆ Reference value
- ◆ Deviation
- ◆ User
- ◆ Verification passed/failed

Up to 64 verifications are memorized. Then the oldest verification is deleted to save the newest one.

1.3 Calibration History

Sensors Displays previous calibrations of the pH, redox and conductivity sensors (the calibration history of the conductivity sensor can only be displayed if the conductivity sensor is connected).

Each record includes the following data:

- ♦ Date, time
- ♦ Measured values depending on sensor:
 - pH: Offset and slope in mV
 - Redox: Offset in mV
 - Conductivity: Cell constant, temperature in °C
- ♦ User
- ♦ Calibration passed/failed

Note: *For better traceability, both successful and failed attempts are stored in the calibration history. However, if a calibration fails, the instrument continues to use the last valid calibration.*

Up to 64 calibrations are memorized for each sensor. Then the oldest verification is deleted to save the newest one.

2 Diagnostics

2.1 Alarms

Pending errors	Provides the list of active errors with their status (active, acknowledged). If an active error is acknowledged, it is moved to the Message List.
Message List	Shows the error history: Error code, date and time of issue and status (active, acknowledged, cleared). 64 errors are memorized. Then the oldest error is cleared to save the newest error.

2.2 Identification

Designation: Designation of the instrument, e.g. Chematest 35.
S/N: Serial number of the instrument.
Electronics: Installed electronics version.
Firmware: Installed firmware version.
Bootloader: Installed bootloader version.
Language Pack: Installed language pack.
Factory test: Test date of the instrument.

2.3 Sensors

Photometer	Displays the raw value of the photo diode in volts.
Electrode	Displays the raw values of the connected sensor.
Battery	Displays information about the state of the battery.

2.4 Bluetooth

Device name	ID that is visible to other Bluetooth-enabled devices.
State	Status of Bluetooth communication. ♦ <i>Disabled:</i> Bluetooth is switched off. ♦ <i>Advertising:</i> The instrument is waiting for a connection request from another device. ♦ <i>Connected:</i> A connection with another device has been established.
MAC	Hardware address of the Chematest 35, which serves as a unique identification feature during Bluetooth communication.
Firmware	Firmware version of the Bluetooth module.
Hardware	Hardware version of the Bluetooth module.

3 Maintenance

3.1 Verification

Photometer See [Photometer Verification](#), p. 30.

3.2 Calibration

Electrode pH: See [Calibration of the pH Sensor](#), p. 32.
Redox/ORP: See [Calibration of the Redox Sensor](#), p. 33.
Conductivity: See [Calibration of the Conductivity Sensor](#), p. 34.

3.3 Set Time

Adjust date and time.

4 Settings

4.1 Sensors

Photometer Enter the reference values of the verification cuvettes according to the enclosed calibration certificate.
Range: 0.000–2.000

Electrode pH

Filter time constant Used to damp noisy signals. The higher the filter time constant, the slower the system reacts to changes of the measured value.
Range: 5–300 s

Temp. Comp. Choose the compensation model which fits best to your application.

Temp. Comp.
None
Nernst
Coefficient

- ♦ **None:** no temperature compensation.
- ♦ **Nernst:** for potable water, waste water, swimming pools.
- ♦ **Coefficient:** for special applications.
Range: -0.100–0.100 pH unit per °C

***Note:** For this setting the unit °C is always used, regardless of the setting in [4.3 Units](#), p. 47.*

Standards A temperature curve is programmed for SWAN standard 1, pH 7 and SWAN standard 2, pH 9. If you want to use your own standards you can readjust the temperature curve according to your standards.

- ♦ **Standard 1:** Assign the measured pH value to the according temperature from 0–50 °C in steps of 5 °C.
- ♦ **Standard 2:** Assign the measured pH value to the according temperature from 0–50 °C in steps of 5 °C.

- Electrode** Redox/ORP
- Filter time constant Used to damp noisy signals. The higher the filter time constant, the slower the system reacts to changes of the measured value.
Range: 5–300 s
- Standard Enter the mV value of the redox/ORP standard.
Range: 200–900 mV

- Electrode** Conductivity
- Temp. Choose the compensation model which fits best to your application.
- Compensation

Temp. Compensation
None
Coefficient
Non-linear DIN

- ♦ **None:** No temperature compensation.
- ♦ **Coefficient:** Allows the entry of a coefficient for linear temperature compensation. Range: 0.00 %–3.00 %.
- ♦ **Non-linear DIN:** the non-linear temperature compensation should be set for the conductivity measurement of natural waters (EN 27888, ISO 7888).

- Filter time constant Used to damp noisy signals. The higher the filter time constant, the slower the system reacts to changes of the measured value.
Range: 5–300 s
- Factor TDS Factor for the calculation of TDS.
Range: 0.000–10.000
- Reset cell constant Allows to display the cell constant determined during factory calibration and to reset the cell constant to this value.

4.2 Identification

Optionally, each measurement can be assigned an ID (e.g. for sampling points) and/or a user name. If activated, the ID and/or user is queried at the end of each measurement.

- Attribute Select which attributes are to be queried:

Attribute
None
ID
User
ID&User

- ID List Enter up to 10 IDs.
- List of Users Enter up to 10 user names.

4.3 Units

Disinfectants Set the unit for disinfectants (all except ozone) and cyanuric acid.

Disinfectants
ppm
mg/l

Ozone Set the unit for ozone.

Ozone
ppb
µg/l
ppm
mg/l

Temperature Set the unit for temperature.

Temperature
Celsius
Fahrenheit

Concentration Set the unit for concentration calculated from conductivity.

TDS

Concentration TDS
ppm
mg/l



4.4 Miscellaneous

Language Select the language from the list. The choice of languages varies depending on the installed language pack.

Language pack	Supported languages
Europe-1	German, English, French, Spanish, Italian
Europe-2	Danish, English, Swedish
America	Portuguese, English, French, Spanish
Asia-1	Chinese, English, Turkish

Factory Setting The instrument can be reset to factory default values in three different ways:

Set defaults
No
Cal. + Ver.
Data History
Completely

- ♦ **Cal. + Ver.:** Deletes all user calibrations (pH, redox) and the verification history (photometer verification). All other values are kept in memory.
- ♦ **Data History:** Deletes all recorded measurements. All other values are kept in memory.
- ♦ **Completely:** Deletes all user calibrations (pH, redox), all recorded measurements and verifications and sets all settings back to default values.

Expert mode Choose between detailed instructions and expert mode for fast workflow.

Expert Mode
Inactive
Active

Method save Defines the behavior of the favorites list on the main screen. For details, see [Initial Setup, p. 11](#).

Method save
No
Yes

- ♦ **No:** The favorites list remains unchanged when a method is selected from the method catalogue.
- ♦ **Yes:** The favorites list is automatically adjusted every time a method is selected from the method catalogue.

Password Password: Select a password different from 0000 to prevent unauthorized access to the following menus:

- ♦ Maintenance
- ♦ Settings

Each menu can be protected by a different password. If you forgot the passwords, contact the closest SWAN representative.

LCD Contrast Adjusts the contrast of the LCD display.

- ♦ EV: Fine adjustment
- ♦ SRR: Coarse adjustment

4.5 Bluetooth

Bluetooth Activates the Bluetooth connection to connect to the CT App.

Bluetooth
Active
Inactive

12. Part Numbers

Download MSDS

The current Material Safety Data Sheets (MSDS) for the reagents listed below are available for downloading at www.swan.ch.

12.1. Reagents

Reagent sets

Part no.	Product name	Allows measurement of
A-85.590.200	Oxycon Pool	- Free chlorine - pH (phenol red)
A-85.590.300	Oxycon Chlor	- Free chlorine - Total chlorine - Combined chlorine
A-85.590.400	Oxycon Des	- Free chlorine - Free chlorine in presence of chlorine-dioxide or bromine - Chlorine-dioxide - Bromine - Iodine
A-85.590.500	Oxycon Ozone	- Ozone - Ozone in presence of free chlorine
A-85.580.300	Oxycon CA	Cyanuric acid
A-85.580.100	Oxycon pH	pH (phenol red)
A-85.610.100	Oxycon Carbonate Hardness	Carbonate hardness

Reagents

Part no.	Product name	Description
A-85.510.100	Oxycon Start	Buffer solution
A-85.510.200	Oxycon DPD (1a + 1b)	DPD
A-85.510.300	Oxycon 2	Potassium iodide
A-85.580.200	Oxycon GL	Reagent for masking of free chlorine and ozone

Calibration solutions

Part no.	Description
A-85.119.010	pH calibration set consisting of: ♦ 1x pH buffer 7 (40 ml) ♦ 1x pH buffer 9 (40 ml)
A-85.112.300	pH buffer 4 (40 ml)
A-85.113.300	pH buffer 7 (40 ml)
A-85.114.300	pH buffer 9 (40 ml)
A-85.121.300	Redox buffer 475 mV (40 ml)
A-85.131.700	Oxycon RC 1.413 calibration solution for conductivity sensor (1 l)

12.2. Accessories

Part no.	Description
A-85.153.581	Veri-Kit CT, type P
A-87.160.014	Swansensor pH CT for Chematest 35/42
A-87.460.014	Swansensor Redox CT for Chematest 35/42
A-87.391.014	Swansensor Shurecon CT for Chematest 35/42



12.3. Spare Parts and Consumables

Part no.	Description
A-70.065.207	Carrying case for Chematest 35, V2
A-70.065.634	Sensor storage container
A-70.065.632	Cuvette adapter P/T CT3x/42
A-70.065.639	Cuvette CT, type P, plastic
A-70.065.640	Cuvette CT, type P, plastic, 10x
A-70.065.635	Cuvette CT, type P, glass
A-70.065.636	Cuvette CT, type P, glass, 10x
A-70.065.633	Spare part set consisting of: ♦ 1 dropper bottle 125 ml ♦ 1 beaker 100 ml ♦ 3 disposable syringes 10 ml ♦ 3 disposable syringes 20 ml
C-85.520.040	Cleaning wipes for cuvette (100-pack)
A-70.065.600	Brush for cuvette
C-88.917.200	USB charging cable
C-89.511.010	Blister pack for reagent bottles

13. Technical Data

13.1. Instrument Specifications

Housing	IP67 rated
Power supply	Rechargeable lithium-ion battery. Only charge the instrument using a standard type A USB socket and the supplied USB cable. Protect from heat and splash water during charging (not IP67). Charging time: approximately 3 hours. Battery life: approximately 5000 measurements or one week of standby operation. Automatic shutoff after 10 minutes of inactivity.
Conditions for operation	Temperature: 0–45 °C Humidity: 0–100% relative humidity (non-condensing)
Conditions for storage	Temperature: –20–60 °C For reagents and sensors, separate storage conditions apply. Reagents: See label on packaging. Sensors: 0–50 °C.
Dimensions and weight	Instrument: 10 x 7 x 22 cm, 390 g Carrying case with content: 45 x 13 x 37 cm, 2.2 kg

13.2. List of Photometric Methods

	Method	Range	Issued values
Chlorine	♦ Free chlorine	0–10 ppm	Free chlorine
	♦ Total chlorine	0–10 ppm	Total chlorine
	♦ Combined chlorine using one cuvette	0–10 ppm	Free chlorine (fac), total chlorine (tc), combined chlorine (cc)
	♦ Combined chlorine using two cuvettes	0–10 ppm	Free chlorine (fac), total chlorine (tc), combined chlorine (cc)
	♦ Free chlorine in presence of chlorine-dioxide or bromine	0–10 ppm	Free chlorine
Other disinfectants	♦ Ozone	0–4000 ppb	Ozone
	♦ Ozone in presence of free chlorine	0–4000 ppb	Ozone
	♦ Bromine	0–23 ppm	Bromine
	♦ Iodine	0–35 ppm	Iodine
	♦ Chlorine-dioxide	0–19 ppm	Chlorine-dioxide
Other parameters	♦ Cyanuric acid	0–100 ppm	Cyanuric acid
	♦ pH (phenol red)	6.5–8.0	pH

13.3. Sensor Specifications

13.3.1 pH and Redox

Swansensor pH CT	Measuring range:	1–13
	Resolution:	0.01
	Automatic temperature compensation with integrated sensor. DIN/ NIST or technical buffers.	
Swansensor Redox CT	Pt-redox electrode with integrated temperature sensor for consistent data records.	
	Measuring range:	–400–1200 mV
	Resolution:	1 mV
Common characteristics	Poisoning-protected reference systems with solid electrolyte and annular gap diaphragm.	
	Temperature range:	0–50 °C
	Pressure:	≤ 2 bar
	Conductivity of sample:	≥ 100 µS/cm
	Reference system:	Ag/AgCl
	Solid electrolyte:	3.5 M KCl (AgCl-free)
	Diaphragm:	open junction
	Connection:	1 m cable with 4-pin connector

13.3.2 Conductivity

Swansensor Shurecon CT

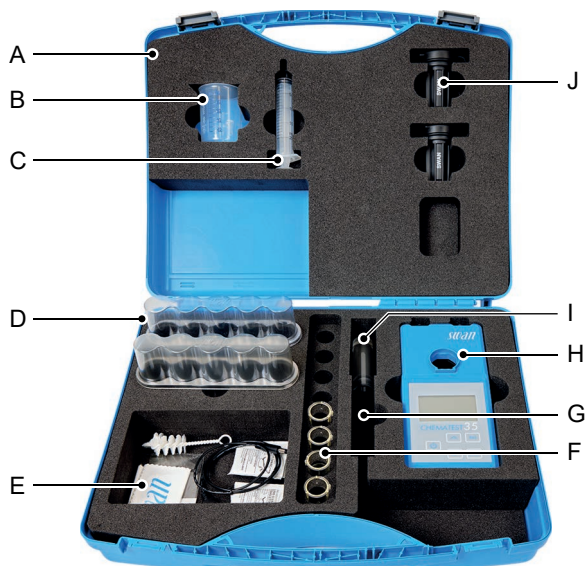
Digital four-electrode sensor with Pt electrodes
Insensitive to polarization effects

Measuring ranges/ resolution:	0.00–9.99 $\mu\text{S/cm}$ 10.0–99.9 $\mu\text{S/cm}$ 100–999 $\mu\text{S/cm}$ 1.00–9.99 mS/cm 10.0–29.9 mS/cm 30–100 mS/cm
Accuracy:	$\pm(0.2 \mu\text{S/cm} \pm 1.5\% \text{ of reading})$
Temperature range:	0–50 °C
Automatic temperature compensation:	absolute (none) linear coefficient in $\%/^{\circ}\text{C}$ non-linear function for natural water according to EN 27888
Connection:	1 m cable with 4-pin connector

Concentration measurements

Measuring ranges/resolution at 20 °C:	
NaCl:	0.00–8.25 %
HCl:	0.00–1.10 %
NaOH:	0.00–2.10 %
H ₂ SO ₄ :	0.00–2.31 %
HNO ₃ :	0.00–1.90 %
Salinity:	0.0–82.5‰ (as NaCl)
TDS:	depending on coefficient

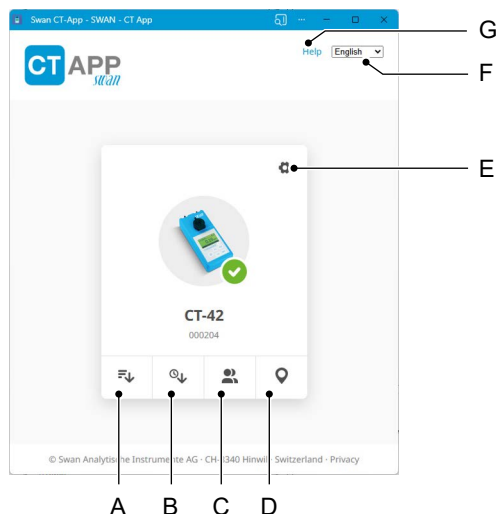
13.4. Scope of Supply



- | | |
|--|---|
| A Carrying case | F 4 photometry cuvettes |
| B 100 ml beaker | G Sensor compartment (sensors sold separately) |
| C 20 ml syringe | H Chematest 35 |
| D 2 blister packs for reagent bottles | I Sensor storage container |
| E Storage compartment containing USB charging cable, brush and 6 wet wipes for cuvette cleaning | J 2 cuvette adapters |

Appendix: CT App

- Requirements** The mobile device or PC must be equipped with the following software and hardware:
- ♦ Web browser: Google Chrome version 80 or higher or Microsoft Edge version 80 or higher
 - ♦ Operating system: Windows 10, Android 7.0 or macOS
 - ♦ Bluetooth 4.0 interface
- Installation** To install the CT App, proceed as follows:
- 1 Start the Chrome or Edge browser and enter ctapp.swan.ch in the address field.
 - 2 Install the CT App by clicking the appropriate icon or menu item in the browser:
⇒ *The app can now be used offline. Depending on your operating system and browser, a shortcut has been created in the start menu or on the home screen of the operating system.*
- Establish Connection**
- 1 Enable Bluetooth on the mobile device or PC.
 - 2 Enable Bluetooth on the Chematest 35 by navigating to **Settings > Bluetooth > Bluetooth** and selecting "Active".
 - 3 In the CT App, click on the "Connect device" button.
 - 4 Select the instrument from the list and click on the "Pair" button.
⇒ *The main screen of the CT App is displayed.*

**CT App
main screen****A Extract measurement data records**

Transfers the measurement history of the Chematest 35 to the CT App and exports it to a CSV or Excel file.

B Extract calibration and verification records

Transfers the calibration and verification histories of the Chematest 35 to the CT App and exports them to a CSV or Excel file.

C Edit users

Allows to modify the user list of the Chematest 35.

D Edit locations

Allows to modify the ID list of the Chematest 35.

E Settings

Here you can install a different language pack, select a language or disconnect from the Chematest 35.

F Language

Sets the language of the CT App.

G Help

Opens the download area of the Swan website in a browser window. There you can download the latest version of this manual.

Language packs

The menu languages of the Chematest 35 are organized in language packs that can be installed by the user via the CT App.

- ♦ A language pack contains up to 5 languages.
- ♦ One language pack can be installed at a time.

List of all supported languages

A list of all supported menu languages across all language packs can be displayed in the CT App in the menu  / <Change language>. For this, the Chematest 35 must be connected to the CT App.

Change language of device

☐ Danish

☒ English

☐ French

☐ German

☐ Italian

☐ Portuguese

☐ Spanish

☐ Swedish

Save

x

A

A Example: List of all menu languages supported by firmware V2.00

Select the language from the list. If the language is part of the currently installed language pack, it can be set directly by clicking "Save".

If the language requires installation of a different language pack, the "Download" button will appear next to the language. A click on "Download" and then on "Install" installs the appropriate language pack.

Regulatory Information



This product contains a third party Bluetooth module, which has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.
Contains FCC ID: T9JRN4020



This product meets all requirements of the relevant EU directives.
The declaration of conformity is available from Swan on request.



This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a guide for writing. There are no margins, text, or other markings on the paper.

[illegible]

Swan Products - Analytical Instruments for:



Swan is represented worldwide by subsidiary companies and distributors and cooperates with independent representatives all over the world. For contact information, please scan the QR code.

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MADE IN
SWITZERLAND



Chematest 35

