ANALYTICAL INSTRUMENTS

A-96.730.111 / 080623

Chematest 42

Operator's Manual

SWISS MADE

Customer Support

Swan and its representatives maintain a fully trained staff of technical specialists around the world. For any technical question, contact your nearest Swan representative, or the manufacturer:

Swan Analytische Instrumente AG
Studbachstrasse 13
8340 Hinwil
Switzerland

Internet: www.swan.ch
E-mail: support@swan.ch

Document Status

Title:	Chematest 42 Operator's Manual	
ID:	A-96.730.111	
Revision	**Issue**	
00	March 2023	First edition

This manual applies to firmware V2.10 and higher.
The information contained in this document is subject to change without notice.

Table of Contents

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

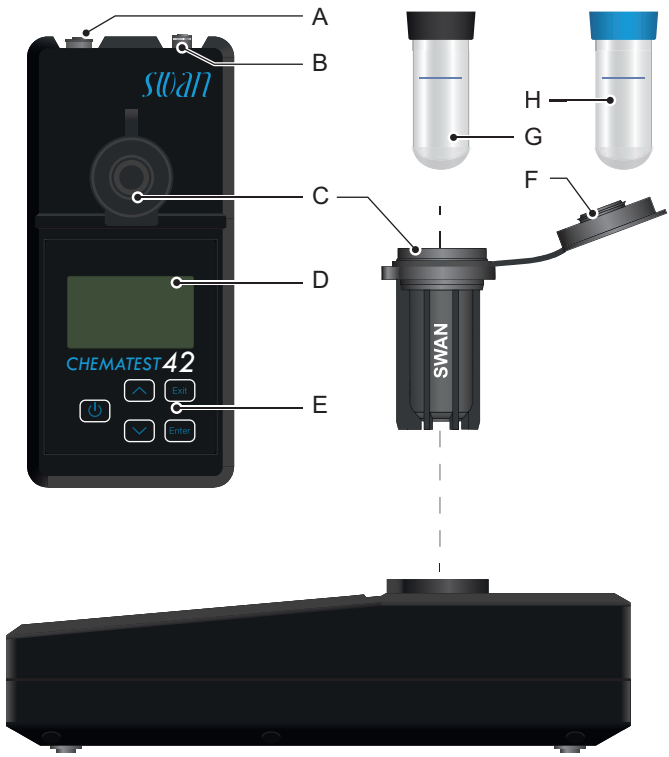
For safe handling of the reagents, you must read and understand the corresponding Material Safety Data Sheets (MSDS). These can be downloaded from **www.swan.ch**.

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 42 must not be opened except for the housing parts specified in the maintenance chapter.
- The battery must only be replaced by authorized service personnel.

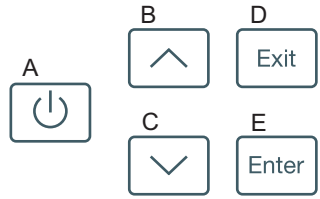
2. Product Description

2.1. Instrument Overview



A *Sensor socket*
B *Charging socket*
C *Cuvette adapter*
D *Display*
E *Keypad*
F *Cuvette cap*
G *Turbidity cuvette (black coding ring)*
H *Photometry cuvette (blue coding ring)*

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

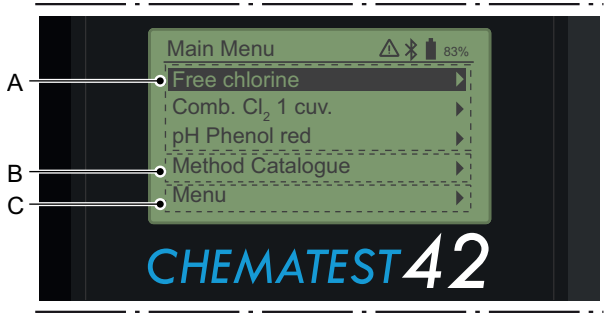
C **ARROW DOWN**
to move down in a menu list and to decrease digits

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. 10.

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. 50.

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 42 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. 70.

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 42, the CT App can be used to install a different language pack. See Language packs, p. 72 for details.

3.2. Setting Time and Date

Set time and date under <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 42 via the menu items
<Menu>/<Settings>/<Identification>/<ID List> and
<Menu>/<Settings>/<Identification>/<List of Users>.

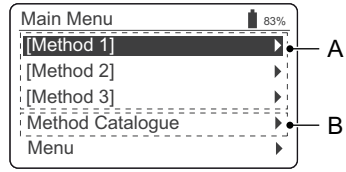
3.4. Activating Expert Mode

The user can choose between two types of method guidance for photometric measurements. This setting can be changed under <Menu>/<Settings>/<Miscellaneous>/<Expert mode>.

- Inactive (default setting):
  In this mode, the Chematest 42 displays detailed on-screen instructions. Recommended for inexperienced users.
- Active:
  In this mode, the Chematest 42 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 in this state.*

3.6. Further Settings

Detailed descriptions of all instrument settings can be found in chapter Menu explanation, subsection 4 Settings, p. 55.

3.7. Sensor Calibration

Before first use, calibrate your pH and redox sensors. See Calibration of the pH Sensor, p. 39 and Calibration of the Redox Sensor, p. 40.

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.*

3.8. Selecting Method for Turbidity Measurement

Select ISO 7027-1 or EPA 180.1 from <Menu>/<Settings>/<Sensors>/<Turbidity>/<Method.>.

Depending on the method selected, the turbidity is automatically displayed in FNU (ISO 7027) or NTU (EPA 180.1). If required, the unit can be selected manually from <Menu>/<Settings>/<Units>/<Turbidity>..

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 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 10 ml syringe for exact dosing of the sample. Rinse the syringe several times with the sample. When filling the syringe, make sure that there are no air bubbles and that the volume is 10 ml.

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

4.3. 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 42 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.

4.4. 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

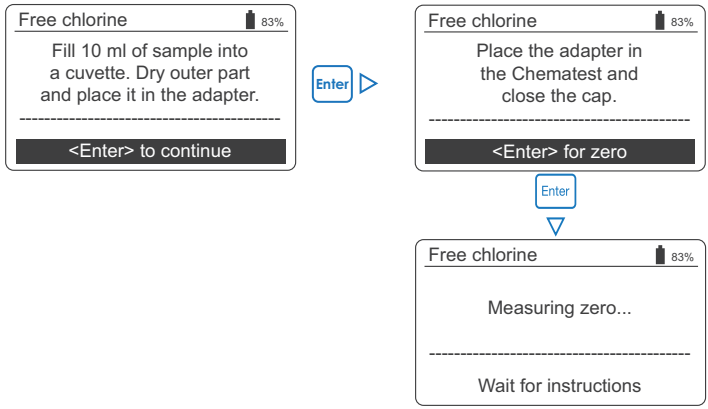
A photometric measurement with the Chematest 42 consists of the following steps:

- 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 18.

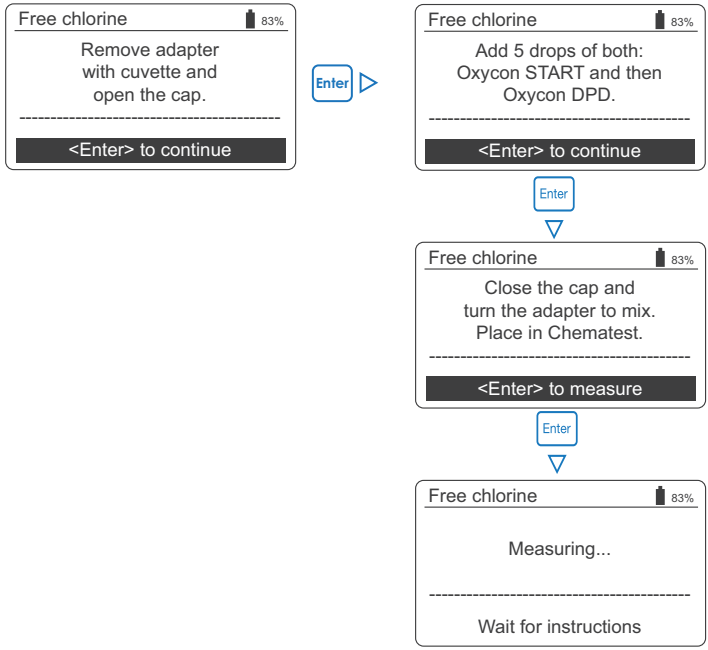
All photometric measurements are completely menu-driven. Just select the corresponding method on the main screen or in the menu catalogue and follow the instructions on the screen.

Example: Measurement of free chlorine

Step 1: Zero measurement



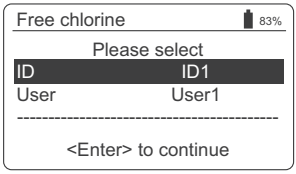
Step 2: Addition of reagents and subsequent measurement



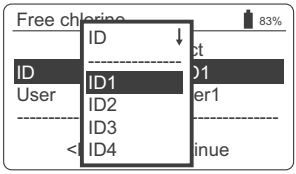
Step 3: Display and storage of the measured results

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

  Note: *Pressing [Exit] discards the measurement.*

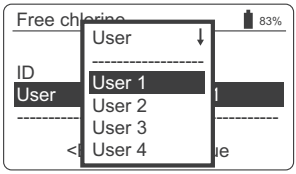


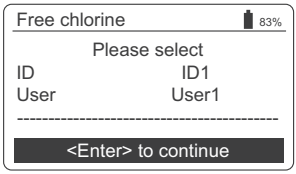
  ⇒ *Depending on the configuration, a selection dialog for user and/or ID is displayed or the summary screen is displayed directly. This can be set under Attribute, p. 57.*



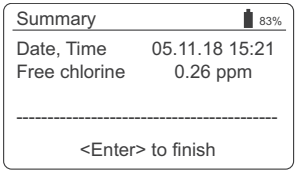
- If applicable:
  – Select an ID from the list.
  – Select a user from the list.

  Note: *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.

4.5. 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. See Step 3: Display and storage of the measured results, p. 18 for details.

5. Turbidity

5.1. Basic Rules for Turbidity

Use of dedicated cuvette

Never use a cuvette for turbidity measurements that has already been used for photometric measurements. Residues of reagents can falsify the measured value.

For this reason, and because the offset stored in the instrument is only valid for one cuvette at a time, the Chematest 42 case contains a dedicated cuvette for turbidity measurements with a black coding ring.

Handling of turbidity cuvette

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

To avoid the formation of lime stains, dry the turbidity cuvette after use.

Cold sample in a warm environment

If condensation occurs on the cuvette (cold sample in a warm environment), let the sample stand for a few minutes until it reaches room temperature.

Proper mixing of sample

Carefully invert the cuvette at least five times before measurement to ensure uniform distribution of the suspension. Shaking should be avoided to prevent the formation of bubbles.

Bubble-containing samples

Bubbles in the sample have a scattering effect on the light beam and falsify the measured value. If the sample contains bubbles, let it stand for 10 minutes before measuring.

5.2. How to Maintain Measurement Accuracy

Maintenance schedule

It is recommended to perform the following maintenance routines regularly:

Maintenance routine	Recommended interval
Check of turbidity cuvette (see 34)	◆ Weekly, if turbidity values below 0.5 FNU/NTU are to be measured. ◆ If the measured turbidity is higher, this interval can be extended.
Verification using a sealed standard (see 32) or wet verification (see 33)	◆ Interval to be defined by user.

Regular check of turbidity cuvette

A part of the measured stray light is caused by reflections on the walls of the cuvette and other surfaces. This value is specific to each combination of Chematest 42 and turbidity cuvette and is compensated by an offset stored in the instrument.

Before delivery, the offset for the turbidity cuvette contained in the Chematest 42 case has already been determined. The instrument is therefore ready to perform turbidity measurements.

Over time, however, the optical properties of the turbidity cuvette may change, for example due to small scratches. Therefore, it is recommended to perform a cuvette check regularly to check whether the offset is still correct.

Offset determination

An offset determination is necessary when the turbidity cuvette is replaced or when the cuvette check fails repeatedly and the corrective actions specified in this manual do not solve the problem.

See also Offset Determination (Turbidity), p. 36.

Replacement of turbidity cuvette

The turbidity cuvette should be replaced if an offset determination is no longer possible (offset determination is aborted with the message “Signal out of range”) or if the cuvette shows visible damage.

Calibration (factor determination)

The turbidity measurement of the Chematest 42 is factory-calibrated using a primary standard (formazine) prior to shipment. The instrument does not require any further calibration before use.

Instead of recalibration, it is recommended to perform a regular verification using a sealed standard or a wet verification.

If a recalibration is necessary for regulatory reasons, proceed as described in Calibration of Turbidity Measurement, p. 37.

5.3. Performing a Turbidity Measurement

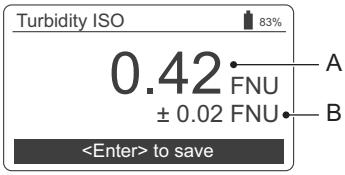
General

The turbidity measurement is completely menu-driven.

Select <Turbidity ISO> or <Turbidity EPA> (depending on which method is preset) on the the main screen or in the menu catalogue and follow the instructions on the screen.

Displayed values

Two values are displayed at the end of a turbidity measurement:



A *Turbidity*
B *Range*

During a turbidity measurement, the Chematest 42 records multiple measuring points from which the turbidity value [A] is determined by averaging.

The range [B] shows how widely the measuring points are distributed and gives an indication of how accurate the measurement is.

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. See Step 3: Display and storage of the measured results, p. 18 for details.

6. pH and Redox

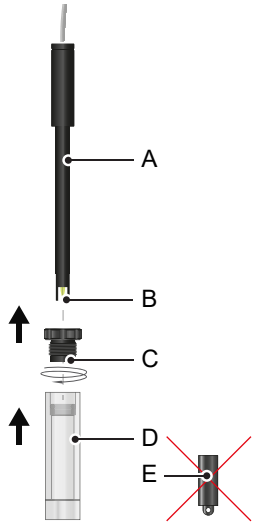
6.1. Basic Rules for pH and Redox

Calibration interval

To ensure correct measurement, calibrate pH and redox sensors monthly. The calibration procedure is described in Calibration of pH and Redox Sensors, p. 39.

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.



A *Sensor shaft*
B *Sensor tip*
C *Knurled nut*
D *Sensor storage container*
E *Rubber cap*

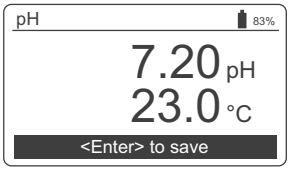
Note: *The cap [E] that the sensor is delivered with is not intended for daily use and can be disposed of.*

Electrolyte refill

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

6.2. 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.*

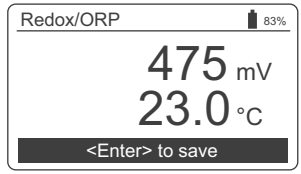


5 Move the sensor gently several times before letting it stand.
6 Wait until both the pH and the temperature value are stable. Then press [Enter] to save the result.
7 Next you can optionally select an ID and/or a user name. This procedure is described in detail on 18.
8 After use, rinse the sensor tip with clean water.

6.3. 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 42 switches off before the measured value has stabilized, switch it on again 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 18.

8 After use, rinse the sensor tip with clean water.

6.4. 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. See Step 3: Display and storage of the measured results, p. 18 for details.

7. Conductivity

7.1. Basic Rules for Conductivity

Calibration and verification

The conductivity sensor of the Chematest 42 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. 42. If a recalibration is necessary for regulatory reasons, proceed according to Calibration of the Conductivity Sensor, p. 41.

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. 43 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. 43.

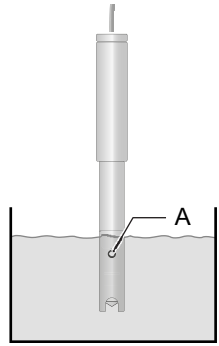
Store the conductivity sensor dry.

7.2. 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.

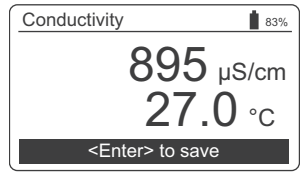


A *Vent holes*

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 18.

9 After use, rinse the sensor tip with clean water.

7.3. 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. See Step 3: Display and storage of the measured results, p. 18 for details.

8. Additional Parameters

8.1. Determination of Acid Binding Capacity ACD pH 4.3

Required utensils

Use the following utensils from the Chematest 42 carrying case:

- cuvette
- cuvette adapter
- syringe

Procedure

1. Place the cuvette in the cuvette adapter.
2. Empty 10 ml of sample into the cuvette using the syringe.
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 $CaCO_3$ per liter
- 0.357 mmol/l acid binding capacity $K_{S\ 4.3}$
- 0.18 mmol/l alcaline-earth ions

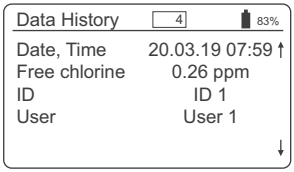
9. Data Management

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

9.1. Display of Data History on the Chematest 42

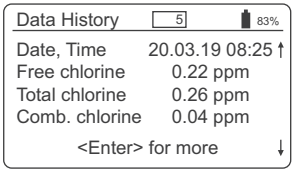
Previous measurements can be displayed under <Menu>/ <Data Storage>/<Data History>.

Scrolling through the data history

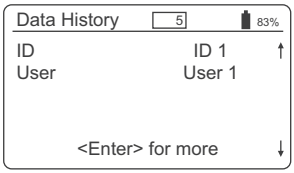


- Press the ARROW DOWN and ARROW UP keys to scroll through the data history.

Two-page entries



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



9.2. 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.

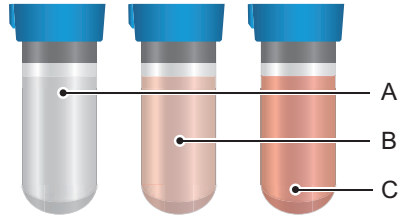
Start of data transfer and conversion

10. Maintenance

10.1. 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.



A *Zero absorption*
B *Low absorption*
C *High absorption*

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.

10.2. Turbidimeter Verification

10.2.1 Overview of Verification Procedures

To check the instrument performance, the Chematest 42 provides the following procedures:

- Verification using a sealed standard:
  Measurement using a sealed cuvette filled with a certified, stabilized formazine standard. Four different cuvettes with turbidity values of approximately 0, 1, 10 or 100 FNU/NTU are available.
  See Verification Using a Sealed Standard, p. 32.
- Wet verification:
  Measurement with a formazine standard of choice.
  See Wet Verification, p. 33.

10.2.2 Verification Using a Sealed Standard

Reference values and matching

Prior to performing the first verification, set the reference values for the standards in <Menu>/<Settings>/<Sensors>/<Turbidity>/<Verikits>. Then, perform the matching procedure with each standard.
To start the matching procedure, select <Settings>/<Sensors>/<Turbidity>/<Matching>.

Verification procedure

Allow the standard to reach ambient temperature before use.
To start the verification, navigate to <Menu>/<Maintenance>/<Verification>/<Turbidity>/<Verification>. Select a cuvette and follow the instructions on the screen.

Note:

- *Handling of 1, 10 and 100 FNU sealed standards:*
  Carefully invert the cuvette 3 times before measurement to obtain a homogeneous distribution of the suspension. Do not shake.
- *Handling of 0 FNU sealed standard:*
  The 0 FNU standard does not require mixing. Let it stand for five minutes before measurement to allow all air bubbles to escape.

Verification history

Can be reviewed in <Menu>/<Data Storage>/<Verif. History>/<Turbidity>/<Verification>.

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

Storage

The sealed standards have a shelf life of one year. Store them in a place protected from sunlight, preferably in the refrigerator at 5–10 °C.

10.2.3 Wet Verification

Handling of formazine standards

Formazine standards must be mixed before use to obtain an even distribution of the suspension. For this purpose, gently turn over the bottle at least 20 times and then let it stand for at least 2 minutes to allow all air bubbles to escape. Strong shaking should be avoided, as this creates more air bubbles, which affect the measurement.

The 20 FNU/NTU formazine standard offered by Swan has a shelf life of one year. Store it in a place protected from sunlight, preferably in the refrigerator at 5–10 °C.

Preparation

Create a separate ID for verification measurements and activate query of the ID. These settings can be made under the menu items <Menu>/<Settings>/<Identification>/<Attributes> and <Menu>/<Settings>/<Identification>/<ID List>.

Verification procedure

1. Allow the standard to reach ambient temperature before use.
2. Select <Turbidity ISO> or <Turbidity EPA> (depending on which method is preset) on the the main screen or in the menu catalogue and follow the instructions on the screen.
3. Assign the previously configured ID to the measurement.

Data History

Can be reviewed in <Menu>/<Data Storage>/<Data History>.

10.3. Check of Turbidity Cuvette

Overview

During the cuvette check, a measurement with particle-free water is performed. The difference in FNU/NTU between this measurement and the offset stored in the instrument is displayed on the results screen.

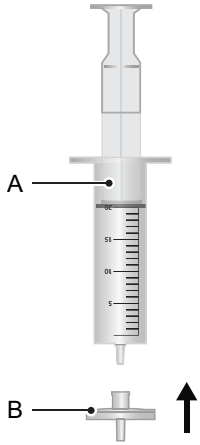
Cuvette check procedure

To start the cuvette check, navigate to <Menu>/<Maintenance>/<Verification>/<Turbidity>/<Cuvette check> and follow the instructions on the screen.

Also follow the instructions for production of particle-free water below.

Production of particle-free water

Use the 20 ml syringe, a syringe filter and drinking water to produce particle-free water.



A *20 ml syringe*
B *Syringe filter*

1. Draw the water into the syringe [A]
2. Place the filter [B] on the syringe
3. Push the water through the filter.

Note: *One filter can be used for 100 ml of water before it needs to be replaced. This is enough for approximately two measurements with particle-free water (including rinsing of the cuvette).*

What to do if the cuvette check fails?

If the cuvette check fails, try the following corrective actions and repeat the cuvette check:

- Thoroughly clean the inside and outside of the cuvette.
- It is possible that the water used still contains particles. Try a new filter or different water.
- It is possible that the water used contains bubbles. Let the water stand for 10 minutes to allow all air bubbles to escape.

If the cuvette check cannot be completed successfully, the offset must be redetermined. See Offset Determination (Turbidity), p. 36

Verification history

Can be reviewed in <Menu>/<Data Storage>/<Verif. History>/<Turbidity>/<Cuvette check>.

Up to 64 cuvette checks are memorized. Then the oldest cuvette check is deleted to save the newest one.

10.4. Offset Determination (Turbidity)

Overview

The offset compensates the influence of the cuvette on the turbidity measurement. It consists of a measurement of particle-free water and the result is displayed in mV.

The offset must be determined in the following cases:

- When the turbidity cuvette is replaced.
- When the cuvette check repeatedly fails and the corrective actions specified in What to do if the cuvette check fails?, p. 35 do not solve the problem.

Offset determination procedure

To start the offset determination, navigate to <Menu>/<Maintenance>/<Calibration>/<Turbidity>/<Offset> and follow the instructions on the screen.

Also follow the instructions in Production of particle-free water, p. 34.

What to do if the offset determination fails?

If the offset determination fails (error message “Signal out of range.” is displayed), the turbidity cuvette needs to be replaced.

Subsequently, an offset determination must be performed with the new turbidity cuvette.

Calibration history

Can be reviewed in <Menu>/<Data Storage>/<Calibration History>/<Turbidity>/<Offset>.

Up to 64 offset determinations are memorized. Then the oldest offset determination is deleted to save the newest one.

10.5. Calibration of Turbidity Measurement

Reference value

Any formazine standard with a turbidity value between 10 and 1000 FNU/NTU can be used for calibration. Program the reference value under <Menu>/<Settings>/<Sensors>/<Turbidity>/<Cal. Std.>.

Handling of formazine standards

Formazine standards must be mixed before use to obtain an even distribution of the suspension. For this purpose, gently turn over the bottle at least 20 times and then let it stand for at least 2 minutes to allow all air bubbles to escape.

Strong shaking should be avoided, as this creates more air bubbles, which affect the measurement.

The 20 FNU/NTU formazine standard offered by Swan has a shelf life of one year. Store it in a place protected from sunlight, preferably in the refrigerator at 5–10 °C.

Procedure

To start the factor calibration, navigate to <Menu>/<Maintenance>/<Calibration>/<Turbidity>/<Factor>.

Calibration history

Can be reviewed in <Menu>/<Data Storage>/<Calibration History>/<Turbidity>/<Factor>.

Up to 64 factor calibrations are memorized. Then the oldest factor calibration is deleted to save the newest one.

10.6. 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.

A *Screws* ***B*** *Photometer cover*

Outside of the housing

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

10.7. Calibration of pH and Redox Sensors

10.7.1 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 under <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 42 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.

10.7.2 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 under <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 42 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.

10.8. 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. 43.
- 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 <Settings>/<Sensor>/<Electrode>/<Conductivity>/<Reset cell constant>.

10.9. 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 under the menu items <Menu>/<Settings>/<Identification>/<Attributes> and <Menu>/<Settings>/<Identification>/<ID List>.

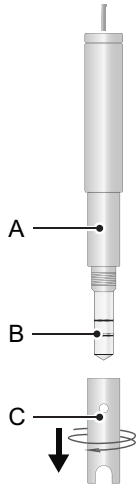
Verification procedure

1. Carry out the measurement as described in Performing a Conductivity Measurement, p. 27.
2. Assign the previously configured ID to the measurement.
3. After completing the verification measurement, reset the temperature compensation to the previous setting.

10.10. Cleaning the Conductivity Sensor

To clean the conductivity sensor, proceed as follows:

1 Unscrew the protection sleeve [C].



A *Sensor shaft*
B *Sensing tip*
C *Protection sleeve*

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.

10.11. 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 under the menu item <Menu>/<Maintenance>/<Set Time>.

11. Troubleshooting

This chapter contains some hints to facilitate troubleshooting. For detailed information on handling and cleaning parts, see Maintenance, p. 31. For detailed information on programming the instrument, see Menu Explanations, p. 50.

11.1. 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	– Check if the installed firmware version supports data exchange with the CT App. See Appendix: CT App, p. 70 for requirements. – 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 under <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.

11.2. 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. 44 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. 38.
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. 64. ◆ 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.

11.3. Turbidity 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. 44 for details.

Sensor failure

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

Possible cause	Corrective action
Instrument is defective.	◆ Call support.

Instrument is charging

Error message “Operation not possible! Instrument is charging! Consult the manual.” is displayed.

Possible cause	Corrective action
Charging cable is connected.	◆ Disconnect charging cable.

Extraneous light

Error message “Operation not possible! S0 signal too high! Consult the manual.” is displayed.

Possible cause	Corrective action
Light from outside reaches scattered light detector.	◆ Make sure that the cuvette cap is properly closed.

Scattering signal too high

Error message “Operation not possible! S signal too high! Consult the manual.” is displayed.

Possible cause	Corrective action
Adapter not empty	◆ Remove the cuvette from the adapter.
Photometer compartment dirty	◆ Clean photometer compartment.

LED signal out of range

Error message “Operation not possible! T signal out of range! Consult the manual.” is displayed.

Possible cause	Corrective action
LED intensity too high or too low	◆ Open the photometer compartment and clean all lenses, see Cleaning the Instrument, p. 38. ◆ Check ambient temperature.
Instrument is defective	◆ Call support.

Signal unstable

Error message “Operation not possible! S signal unstable! Consult the manual.” is displayed.

Possible cause	Corrective action
Sample contains bubbles.	◆ Avoid formation of bubbles when filling the sample into the cuvette.

Measured value out of range

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

Possible cause	Corrective action
Turbidity outside the measuring range.	◆ Check process.

Verikit not matched

Error message “Operation not possible! Verikit has not been matched. Consult the manual.” is displayed.

Possible cause	Corrective action
Verikit has not been matched.	◆ Match the verikit.
“Assigned value” has been changed.	◆ Match the verikit.
Instrument has been reset to factory defaults.	◆ Match the verikit.

11.4. 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. 44 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.

12. 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. 57.

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.

Turbidity

Cuvette check — Displays previous cuvette checks. Each record includes the following data:

- Date, time
- Method (ISO/EPA)
- Difference in FNU/NTU
- User
- Verification passed/failed

Up to 64 cuvette checks are memorized. Then the oldest cuvette check is deleted to save the newest one.

Verification — Displays previous turbidity verifications with a sealed standard. Each record includes the following data:

- Date, time
- Kit (0, 1, 10 or 100 FNU/NTU)
- 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.

Turbidity

Factor — Displays previous factor calibrations. Each record consists of the following data:

- Date. time
- Factor
- Method (ISO/EPA)
- User
- Calibration passed/failed

Offset — Displays previous offset calibrations. Each record consists of the following data:

- Date. time
- Offset
- Method (ISO/EPA)
- User
- Calibration passed/failed

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

1.4 Matching History

If sealed standards have been matched with the Chematest 42, the results of the matching procedure are displayed here.

- Date. time
- Kit (Verikit 0, 1, 10 or 100 FNU/NTU)
- Reference value
- Measured value
- Method (ISO/EPA)

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. The meaning of each error message is explained in section Instrument Errors, p. 44.

2.2 Identification

Designation: Designation of the instrument, e.g. Chematest 42.
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.
Turbidity	Displays the gain factor. The gain factor is a device-specific value that is determined at the factory. In case of a support request, Swan customer service may ask for this value.
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. ◆ *Disabled:* Bluetooth is switched off. ◆ *Advertising*: The instrument is waiting for a connection request from another device. ◆ *Connected:* A connection with another device has been established.
MAC	Hardware address of the Chematest 42, 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. 31.

Turbidity — Cuvette check: See Check of Turbidity Cuvette, p. 34.
Verification: See Turbidimeter Verification, p. 32.

3.2 Calibration

Electrode — pH: See Calibration of the pH Sensor, p. 39.
Redox/ORP: See Calibration of the Redox Sensor, p. 40.
Conductivity: See Calibration of the Conductivity Sensor, p. 41.

Turbidity — Factor: See Calibration of Turbidity Measurement, p. 37.
Offset: See Offset Determination (Turbidity), p. 36.

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 under* *4.3 Units, p. 58**.*

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. Compensation: Choose the compensation model which fits best to your application.

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.

Turbidity

Method — Select ISO or EPA.

Method
EPA
ISO

Verikits — Enter the reference values from the certificates.

Matching — Starts the matching procedure.

Verif. Criteria — Maximum permissible deviation of a verification measurement from the value determined during the matching procedure.
Range: 1–10 %

Cal. Std. — Turbidity value of the calibration standard.
Range: 10–1000 FNU/NTU

Reset Turb. Cal. — Resets the factor or offset calibration to the factory setting.

Reset Turb. Cal
No
Factor Cal
Offset Cal

Stabilisation time — Time that the instrument counts down during the stabilization period before the measurement is carried out.

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 TDS — Set the unit for concentration calculated from conductivity.

Concentration TDS
ppm
mg/l

Turbidity — Choose the displayed unit.

Turbidity
NTU
FNU
Auto

- **NTU:** Displays the turbidity in NTU regardless of the selected method.
- **FNU:** Displays the turbidity in FNU regardless of the selected method.
- **Auto:** Automatic selection of the unit according to the selected method (FNU for ISO and NTU for EPA).

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, turbidity) and the verification history (photometer verfication, turbidity cuvette check). 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, turbidity), 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. 10.

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.

4.5 Bluetooth

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

Bluetooth
Active
Inactive

13. Part Numbers

Download MSDS

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

13.1. 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-85.153.030	Turbidity calibration standard: 20 NTU/FNU
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)

13.2. Accessories

Part no.	Description
A-85.153.581	Veri-Kit CT, type P
A-85.153.590	Veri-Std CT 42, 0 NTU/FNU
A-85.153.591	Veri-Std CT 42, 1 NTU/FNU
A-85.153.592	Veri-Std CT 42, 10 NTU/FNU
A-85.153.593	Veri-Std CT 42, 100 NTU/FNU
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

13.3. Spare Parts and Consumables

Part no.	Description
A-70.065.205	Carrying case for Chematest 35/42
A-70.065.634	Sensor storage container
A-70.065.632	Cuvette adapter P/T CT3x/42
A-70.065.635	Cuvette CT, type P, glass
A-70.065.636	Cuvette CT, type P, glass, 10x
A-70.065.637	Cuvette CT, type T, glass
A-70.065.633	Spare part set consisting of: ◆ 1 dropper bottle 125 ml ◆ 3 disposable syringes 10 ml ◆ 3 disposable syringes 20 ml ◆ Microfiber cloth ◆ Storage container for syringe filters
A-70.065.641	Syringe filters 0.2 µm (Pack of 50)
A-70.065.642	Syringe filters 0.2 µm (Pack of 8)
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

14. Technical Data

14.1. 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: 46 x 12 x 38 cm, 3.1 kg

14.2. 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

14.3. Nephelometry Specifications

Methods	ISO 7027-1 US EPA 180.1 alternate procedure (registration pending)			
Measuring range	0.00–1000 FNU/NTU			
Limit of detection	0.01 FNU/NTU			
ISO 7027-1				
Range	0.00–9.99	10.0–99.9	100–1000	
Accuracy	± (LOD + 1.5 %)	± 1.5 %	± 2.0 %	of reading
Precision	± (LOD + 0.5 %)	± 0.5 %	± 1.0 %	of reading
US EPA 180.1				
Range	0.00–9.99	10.0–99.9	100–1000	
Accuracy	± (LOD + 2.0 %)	± 2.0 %	± 2.5 %	of reading
Precision	± (LOD + 1.0 %)	± 1.0 %	± 1.5 %	of reading

14.4. Sensor Specifications

14.4.1 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

14.4.2 Conductivity

Swansensor Shurecon CT

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

Measuring ranges/ resolution:	0.00–9.99 µS/cm 10.0–99.9 µS/cm 100–999 µS/cm 1.00–9.99 mS/cm 10.0–29.9 mS/cm 30–100 mS/cm
Accuracy:	±(0.2 µS/cm ±1.5% of reading)
Temperature range:	0–50 °C
Automatic temperature compensation:	absolute (none) linear coefficient in %/°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_2SO_4:	0.00–2.31%
HNO_3:	0.00–1.90%
Salinity:	0.0–82.5‰ (as NaCl)
TDS:	depending on coefficient

14.5. Scope of Supply

A *Carrying case*
B *2 blister packs for reagent bottles*
C *1 turbidity cuvette (black coding ring)*
D *4 photometry cuvettes (blue coding ring)*
E *8 syringe filters for the production of particle-free water*
F *Storage compartment containing USB charging cable, 6 wet wipes and 1 microfiber cloth for cuvette cleaning*
G *2 cuvette adapters*
H *Dropper bottle for rinsing water*
I *2 sensor compartments (sensors sold separately)*
J *1 sensor storage container*
K *Chematest 42*
L *Brush for cuvette cleaning*
M *20 ml syringe*
N *10 ml syringe*

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:

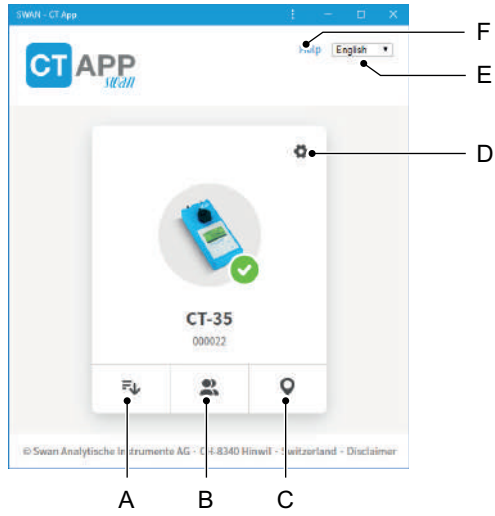
1. Start the Chrome or Edge browser and enter ctapp.swan.ch in the address field.
2. Install the CT App by clicking the appropriate icon or menu item in the browser:
   - On a Windows PC, click the ⊕ icon in the title bar. Confirm by clicking <Install> in the next dialog.
   - On an Android device, click <Add Swan CT-App to the home screen> at the bottom of the app. Confirm by clicking <Add> in the next dialog.

   ⇒ *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 42 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 records
Transfers the measurement history of the Chematest 42 to the CT App and exports it to a CSV or Excel file.

B Edit users
Allows to modify the user list of the Chematest 42.

C Edit locations
Allows to modify the ID list of the Chematest 42.

D Settings
Here you can install a different language pack, select a language or disconnect from the Chematest 42.

E Language
Sets the language of the CT App.

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

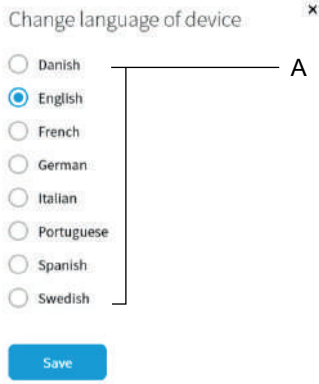
Language packs

The menu languages of the Chematest 42 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 under ⚙/<Change language>. For this, the Chematest 42 must be connected to the CT App.



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

Select the desired 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 desired 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.

> ***Note:*** *An internet connection is necessary to download and install a 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.

swan
ANALYTICAL INSTRUMENTS

A-96.730.111 / 080623

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.

Swan Analytical Instruments · CH-8340 Hinwil
www.swan.ch · swan@swan.ch

SWISS MADE