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TitraLab salt content analyzer

USER MANUAL

02/2013, Edition 2A

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Section 1 Specifications

These are subject to change without notice!

Performance specifications		
Application area	LLV2303.97.1102	Determination of salt content in solid and liquid dairy products
	LLV2305.97.1102	Determination of salt content in tomato sauce
	LLV2307.97.1102	Determination of salt content in brine
	LLV2308.97.1102	Determination of salt content in water
Measuring range	LLV2303.97.1102	10 mL liquid samples 0.3–10 mL 1 g solid samples 0.25–5.6 % NaCl, 0.20–3.5 % Cl ⁻
	LLV2305.97.1102	1 g sample 0.25–5.6 % NaCl
	LLV2307.97.1102	0.5 mL sample 2.5–50 % NaCl
	LLV2308.97.1102	10 mL sample 10–350 ppm Cl ⁻
Resolution		Dependent on the selected units
Programs		3 titration programs
Languages		English, Spanish, French and Italian
Data logger		55 data records
Date/time		DD-MM-YYYY
Display		128 × 64 pt, backlit liquid crystal display
Keypad		7 membrane keys, splash-proof, PET, lifetime of >6 million key-presses
Burette	Resolution	0.001 mL
	Material of syringe	Polypropylene
	Volume	10 mL
Reagent tubes		White PTFE tubes
Peristaltic pump	Volumetric flow	70 mL/min
	Tube	Novoprene, internal diameter 2 mm)
Inputs and outputs	Measuring electrode	BNC connector
	Magnetic stirrer	RCA connector (cinch)
	Computer or printer	RJ11 telephone connector
	Power supply, external	24 VAC, 1,25 A, 30 VA
	Mouse	Mini-DIN connector (only available on LLV2307.97.1102 and LLV2308.97.1102)
Dimensions of measuring instrument and environmental conditions		
Enclosure material		ABS and enameled steel
Weight		Approximately 4 kg
Dimensions		130 × 160 × 300 mm
Working temperature		+15 to +40 °C (+60 to +104 °F)
Storage temperature		-10 to +50 °C (+14 to +122 °F)
Air humidity		<80 % relative humidity, non-condensing
Warranty		2 years

Section 2 General information

2.1 Safety information

Please read the entire user manual carefully before the equipment is unpacked, set up or put into operation. Pay attention to all danger and warning statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To make sure that the protection provided by this instrument is not impaired, do not use or install this instrument in any manner other than that specified in these operating instructions.

DANGER

Indicates a potentially or imminently hazardous situation that, if not avoided, results in death or serious injury.

WARNING

Indicates a potentially or imminently hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation that, if not avoided, could result in damage to the instrument. Information that requires special emphasis.

Note: Information that supplements points in the main text.

2.1.1 Warning labels

Read all labels and tags attached to the instrument. Failure to do so may result in personal injury or damage to the instrument. For symbols applied to the instrument, corresponding warnings are provided in the user manual.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	This symbol may be found on an enclosure or barrier within the product and indicates a risk of electrical shock and/or death by electrocution.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems after 12 August 2005. In conformity with European local and national regulations, European electrical equipment users must now return old or end-of life equipment to the manufacturer for disposal at no charge to the user. Note: For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment, manufacturer-supplied electrical accessories, and all auxiliary items for proper disposal.

2.1.2 Chemical and biological safety

⚠ DANGER Potential danger in the event of contact with chemical/biological materials. Handling chemical samples, standards and reagents can be dangerous. Familiarize yourself with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.

Normal operation of this instrument may involve the use of hazardous chemicals or biologically harmful samples.

- Observe all cautionary information printed on the original solution containers and safety data sheet prior to their use.
- Dispose of all consumed solutions in accordance with national regulations and laws.
- Select the type of protective equipment suitable to the concentration and quantity of the dangerous material at the respective work place.

2.2 Overview of product

Salt has become an essential part of our diet. It is an important flavor enhancer in our food and also has preservative properties.

The complex balance of water in the human body can only be maintained by salt. When dissolved, it controls numerous functions in the body: It strengthens tissue, underlies the excitability of nerves and muscles, plays a key role as a mineral in bone formation and is part of the body's digestive liquids.

Salt is a building block of life, but the body cannot produce it independently; it must be obtained from food intake.

Common salt is composed of sodium (Na) and chlorine (Cl) and its chemical name is sodium chloride. In solid state, the sodium and chlorine form a crystal composed of both elements in equal measure.

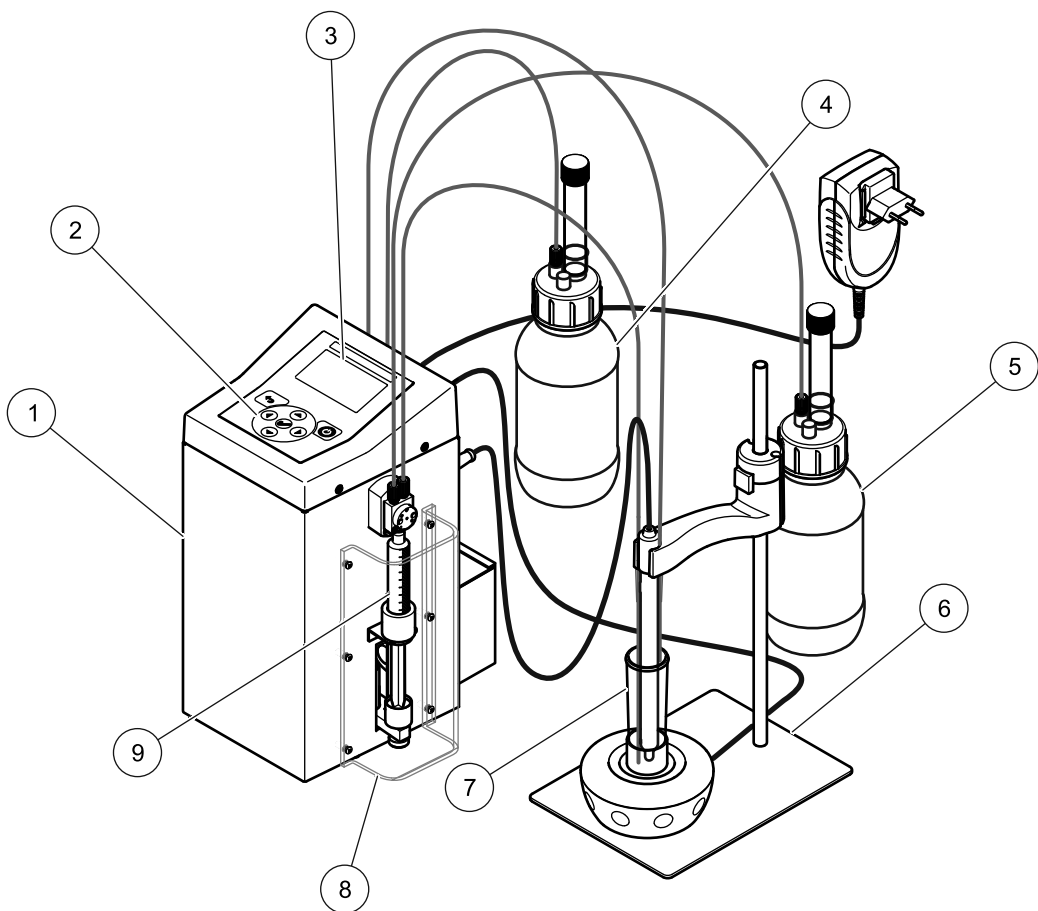
The TitraLab salt system is available in four different versions for application with various foodstuffs:

- Version LLV2303.97.1102 to determine salt in solid and liquid dairy products
- Version LLV2305.97.1102 to determine salt in tomato sauce and tomato products
- Version LLV2307.97.1102 to determine salt in brine
- Version LLV2308.97.1102 to determine salt in water

TitraLab features an RS 232 C interface to enable communication with a computer or printer. Another port enables a mouse to be connected to perform all the functions of "OK" (versions LLV2307.97.1102 and LLV2308.97.1102 only). A convenient titration stand is also integrated and equipped with stirrers; and pump integrated with the titrator add the reagent.

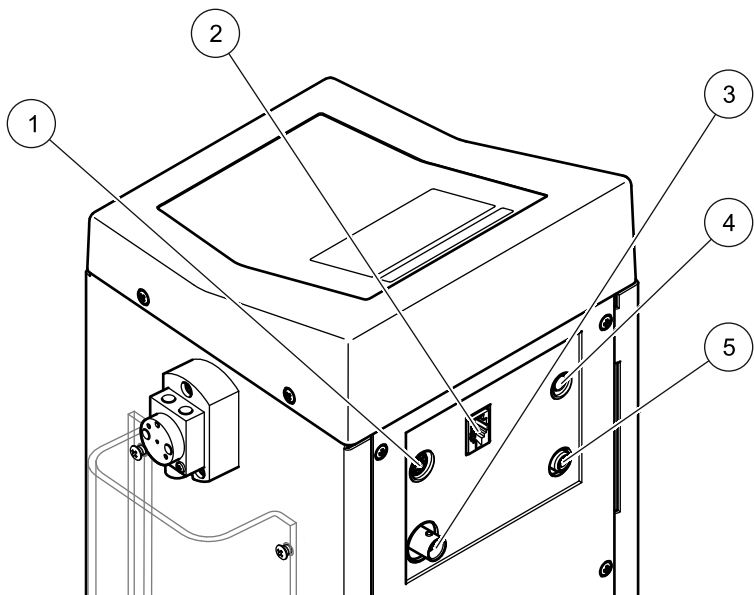
2.3 Front and back view

Figure 1 Front view



1	TitraLab salt system	6	Titration stand with magnetic stirrer
2	Keypad	7	Titration cell
3	Display	8	Syringe cover
4	Auxiliary reagent	9	Burette
5	Titrant		

Figure 2 Back view



1	Connector for mouse	4	Connector for power supply
2	Connector for printer or computer	5	Connector for magnetic stirrer
3	Electrode connector		

Section 3 Installation

WARNING

Risk of injury to eyes, skin and respiratory

When working with chemicals and/or solvents, always observe the relevant accident prevention regulations and wear appropriate personal protective clothing for eye, face, hand, body and/or respiratory protection.

Make sure that the system is only unpacked, assembled, connected and operated by qualified and trained personnel.

3.1 Unpack the instrument

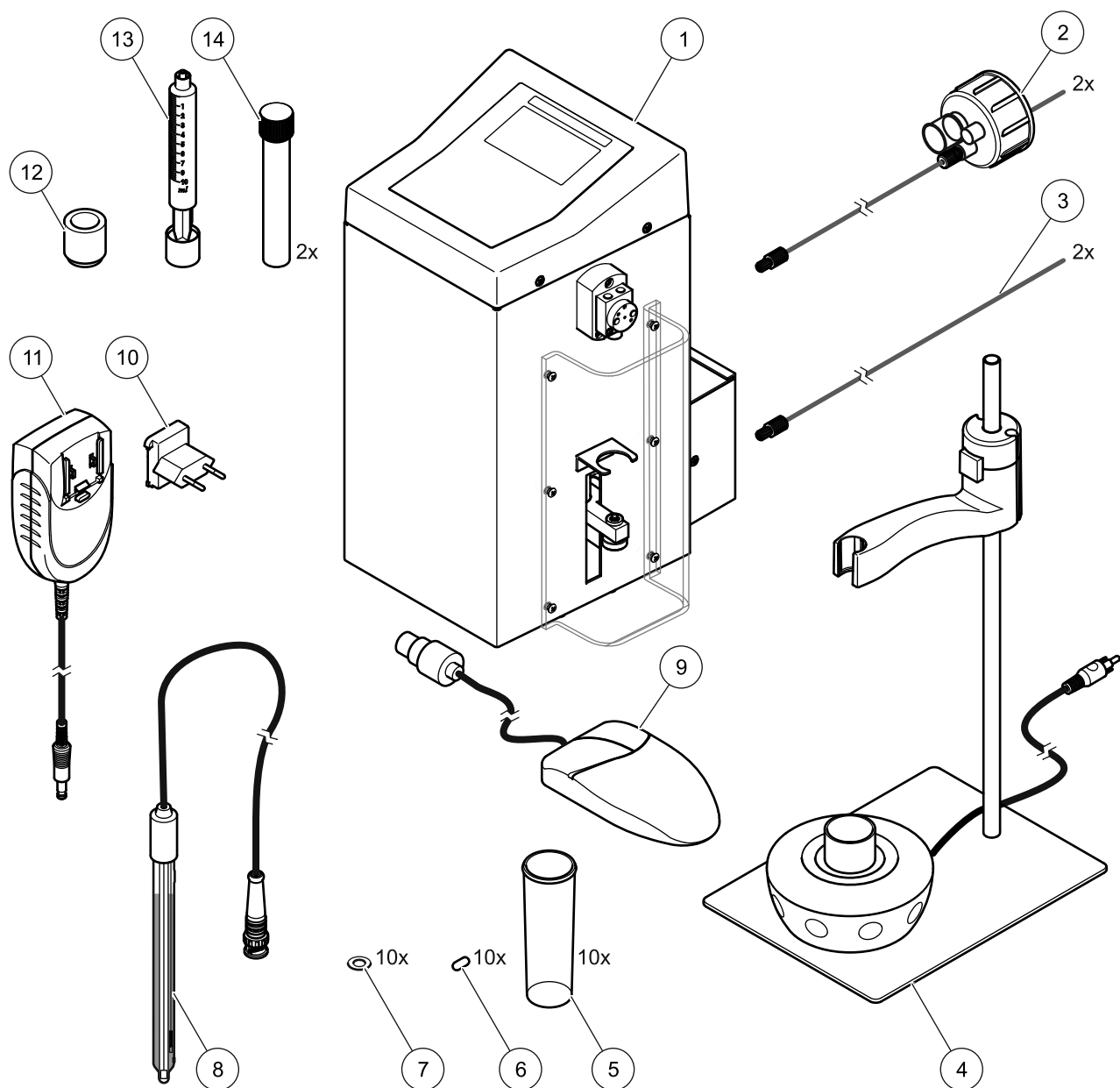
Unpack all supplied parts carefully, as they are highly sensitive in part to shock and impact. Read the user manual prior to installation and proceed exactly as described.

3.2 Scope of delivery

Please check that the order is complete. If anything is missing or damaged, please contact the manufacturer or retailer.

Installation

Figure 3 Scope of delivery



1 TitraLab salt system	8 Silver electrode with cable and tube guide
2 2× tube with bottle closure (DIN 45 thread) supplied pre-installed	9 Mouse (versions LLV2307.97.1102 and LLV2308.97.1102 only)
3 2× tube to attach to electrode, supplied pre-installed	10 Adapter for power supply
4 Titration stand holder including magnetic stirrer	11 Power supply, external
5 10×white O-rings for burette and pump threads	12 Hardware sleeve
6 10× Teflon magnetic stirring bars (20 mm × 6 mm)	13 Syringe with plunger
7 10×titration cells, 50 mL, Ø 30 mm, polypropylene with lid	14 Desiccant cartridge

3.3 Operating environment

Note the following points so that the instrument will operate perfectly and have a long service life.

- Place the instrument firmly on an even surface. Do not push any objects under the instrument.
- The ambient temperature must be 15 to 40°C (60 to 104°F).
- The relative humidity should be less than 80%; moisture should not condense on the instrument.
- A minimum clearance of 15 cm (5.9 in.) must be ensured above and on all sides of the device; this allows the air to circulate and prevents overheating of the electric parts. The dosage arm of the stepper motor must be able to move freely.
- Do not operate or store the instrument in extremely dusty, humid or wet locations.
- Make sure that no liquids enter the instrument and immediately wipe away any liquids that contact the instrument.
- Protect the instrument against vibrations, direct sunlight, corrosive gases as well as strong magnetic and/or electric fields.
- Only use genuine replacement parts and accessories.

The instrument must be serviced by the manufacturer's service department at the prescribed intervals.

3.4 Installation

3.4.1 Installation of the burette

The burette dispenses the titrant, a Silver Nitrate (AgNO_3) solution that, depending on the area of application, is either 0.01 M, 0.1 M or 0.5 M.

The burette comprises the syringe, stepper motor and valve. The stepper motor and valve are already installed in the TitraLab; the syringe has to be installed by the user.

⚠ WARNING

Risk of injury to pinch points and cuts

Make sure that the titrator is never used/operated without the syringe cover.

Make sure that the system is only assembled by qualified and trained personnel.

NOTICE

Warning against system damage

Make sure that the syringe is never operated without the attachment sleeve.

Only use genuine replacement parts and accessories.

The instrument must be serviced by the manufacturer's service department at the prescribed intervals.

Note: Make sure that you do not misplace the attachment sleeve for the syringe. It is not provided with a new syringe.

1. Push the syringe piston into the syringe body.
Slide the attachment sleeve fully onto the syringe so that the narrow end points toward the piston.
2. Remove the syringe cover by unscrewing it.

Installation

3. Point the syringe tip upward, place the syringe into the bracket such that the attachment sleeve is above the bracket.
4. With the narrow side facing down, carefully press the attachment sleeve into the bracket.
Hold the attachment sleeve in the bracket and screw the syringe onto the valve from below.
5. Withdraw the piston from the syringe and place it onto the screw in the dosage arm.
Hold the syringe piston and turn the attachment screw on the dosage arm into the thread in the piston.
6. Fix the syringe cover with six screws.

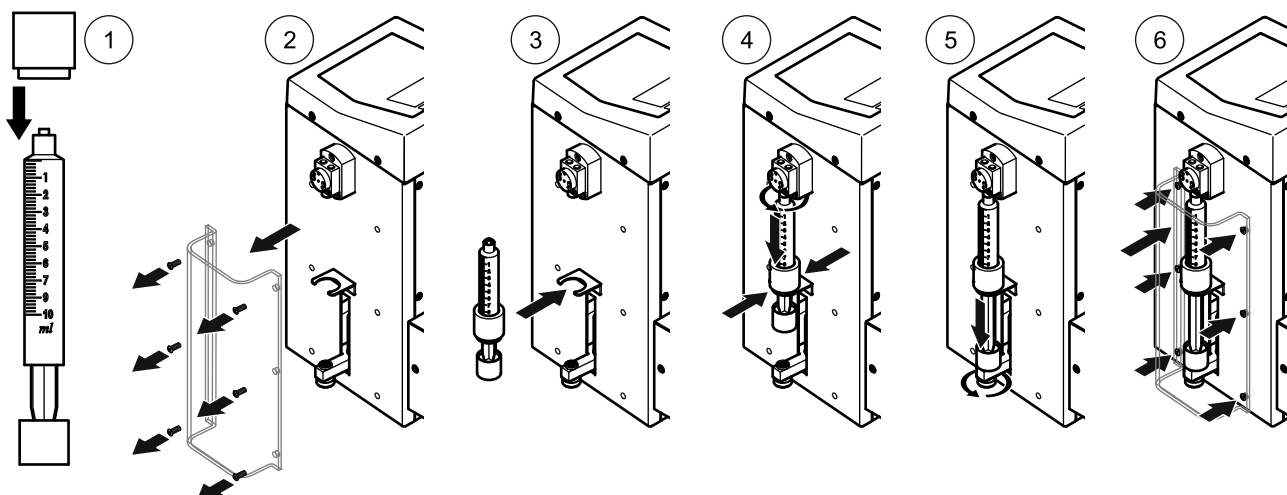
⚠ WARNING

Risk of injury to eyes, skin and respiratory

During the first days of system use, check the screw joint between the syringe and valve to avoid leaks and the potential escape of reagents.

When working with chemicals and/or solvents, always observe the relevant accident prevention regulations and wear appropriate personal protective clothing for eye, face, hand, body and/or respiratory protection.

Figure 4 Installation of the burette



1	Push the piston into the syringe body. Slide the attachment sleeve onto the syringe.	4	Place the attachment sleeve into the bracket. Screw the syringe tip onto the valve.
2	Unscrew the six screws and remove the syringe cover.	5	Screw the piston onto the dosage arm.
3	Insert the syringe into the bracket.	6	Fix the syringe cover with six screws.

3.4.2 Installation of the titration stand

The titration stand consists of a holder onto which the electrode, titration cell and magnetic stirrer are attached. The titration is performed in the titration cell.

1. Place the titration stand on the right side (syringe side) of the titrator (observe the routing of the cable).
2. Place a magnetic stirring bar into a titration cell.
Attach the titration cell to the magnetic stirrer.
3. Place the rubber ring on the stand rod to set the minimum height of the electrode holder.

4. Press the button to lock the electrode holder and place the electrode holder on the stand rod. The electrode holder is locked upon release of the button.
5. Remove the white cap from the tip of the electrode. Insert the electrode into the electrode holder.

NOTICE

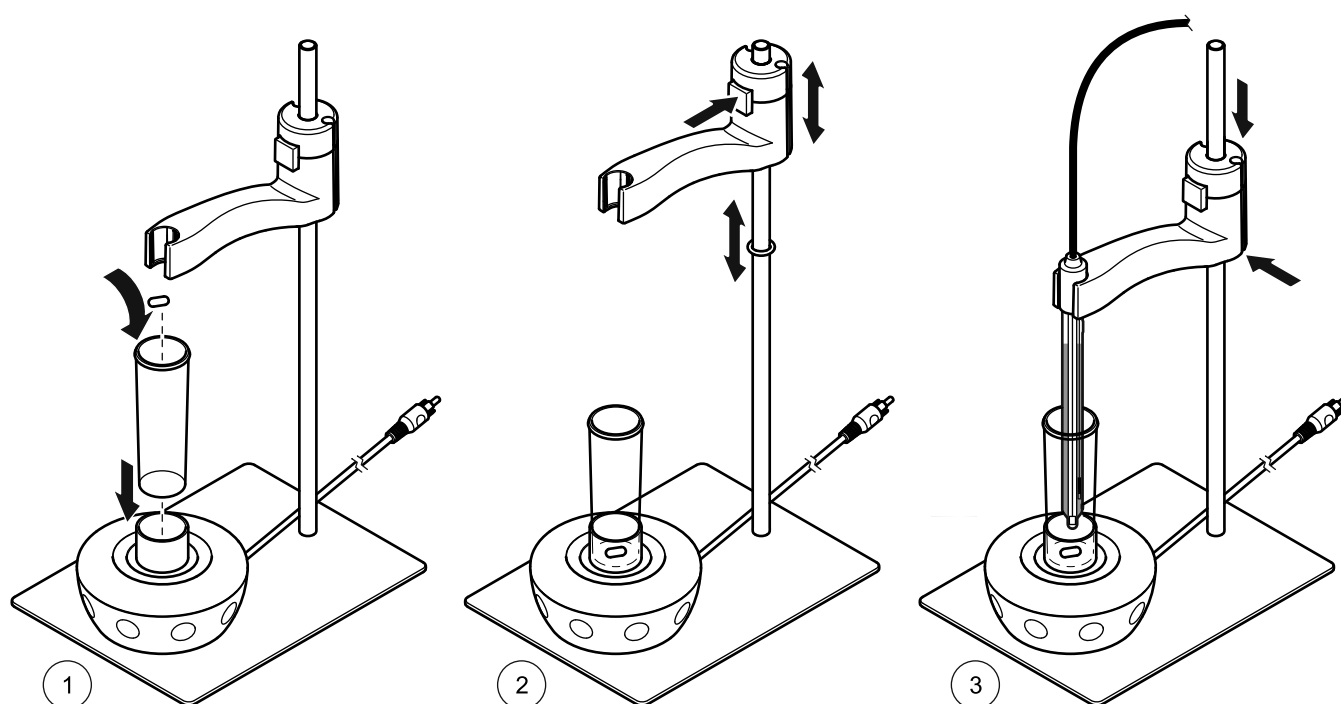
Warning against system damage

Make sure that the height setting of the electrode holder protects the electrode against damage from the stirring bar and against contact with the bottom of the titration cell.

Keep the lock button pressed whenever the electrode holder is being moved.

Note: Whenever the electrode is taken from the titration stand or the titration cell is removed from the titration stand, always place a container beneath the electrode. Otherwise, drips from the sample or chemicals could contaminate the work area.

Figure 5 Installation of the titration stand



1 Place a magnetic stirring rod in a titration cell. Attach the titration cell to the magnetic stirrer.

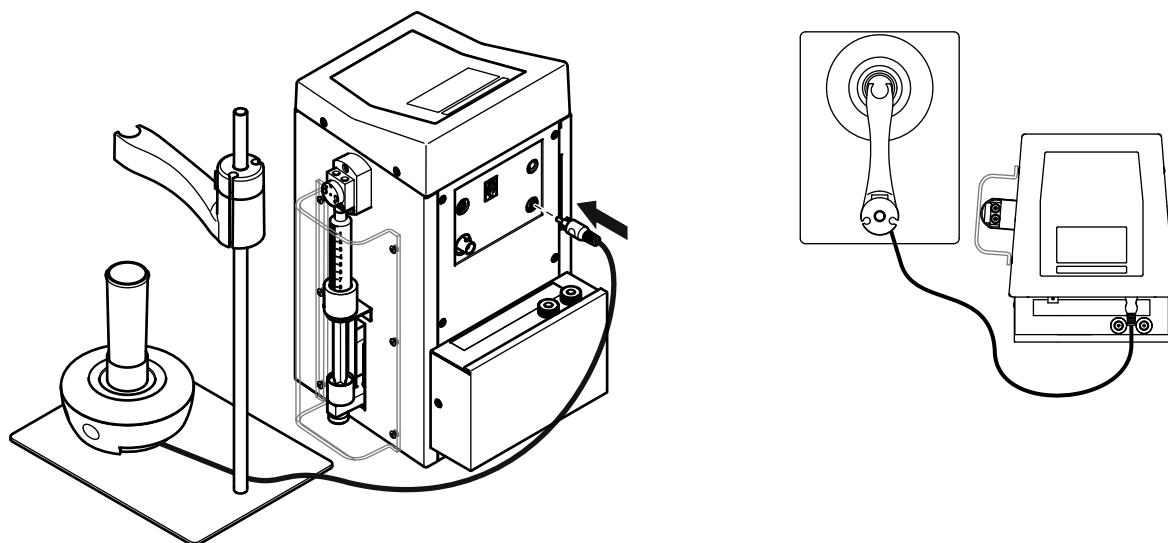
2 Position a rubber ring on the stand rod to set the minimum height of the electrode holder. Press the electrode holder lock button and place the electrode holder on the stand rod.

3 Insert the electrode and adjust the height of the electrode holder.

3.4.2.1 Electrical connection of the magnetic stirrer

1. Connect the cable of the magnetic stirrer to the **STIRRER** port on the back of the TitrLab.
The power is supplied via the TitrLab.

Figure 6 Electrical connection of the magnetic stirrer



- 1 Connect the cable of the magnetic stirrer to the **STIRRER** port.

3.4.3 Installation of tubes

⚠ WARNING

Risk of injury to eyes, skin and respiratory

During the first days of system use, check the screw joint between the syringe and valve to avoid leaks and the potential escape of reagents.

When working with chemicals and/or solvents, always observe the relevant accident prevention regulations and wear appropriate personal protective clothing for eye, face, hand, body and/or respiratory protection.

Make sure that the tubes are never kinked.

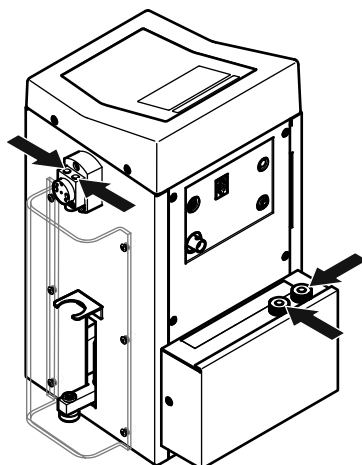
Regularly check the system as well as all tubes and connections for leaks, condition and cleanliness.

To prevent twisting of the tubes, you should always connect flange tube connections before those with grommets.

The system is delivered with four tubes; these are supplied pre-installed on the TitrLab and only need to be connected to the relevant reagent bottles and to the electrode.

3.4.3.1 Removal of protective stickers (Uninstalled tubes configuration)

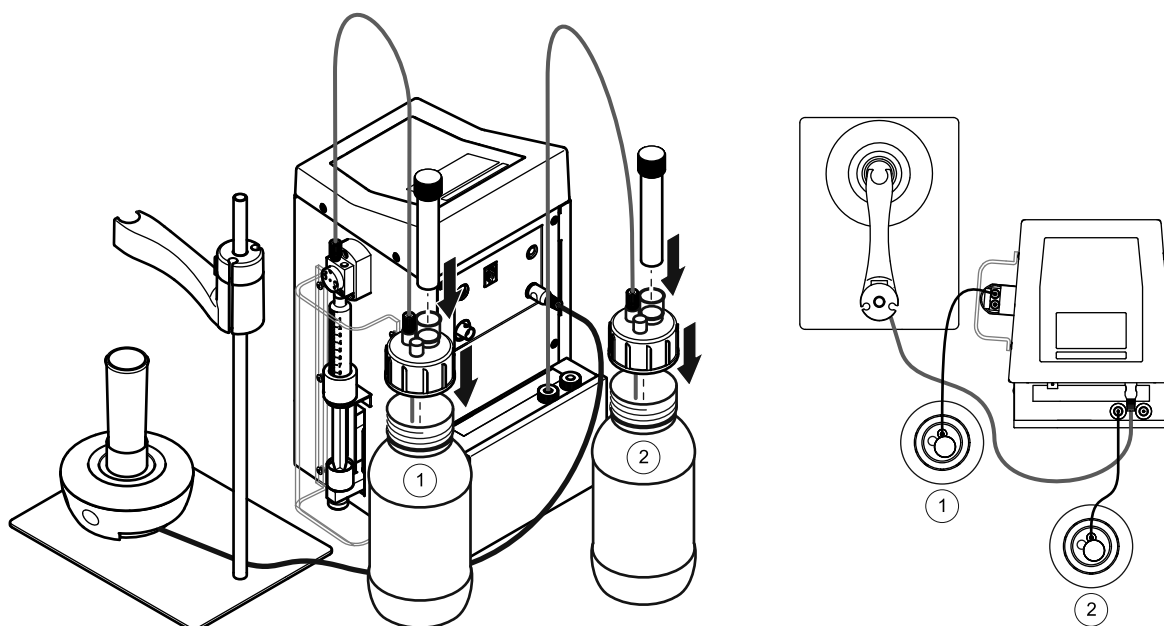
1. Remove the protective stickers on the burette valve and pump connections.
2. Make sure that the pre-installed white O-rings are not removed.
3. Check that the O-rings are in a horizontal position inside the thread.

Figure 7 Position of protective stickers

3.4.3.2 Connection of feed tubes

The system is delivered with two feed tubes with bottle closures (DIN 45 thread). These feed tubes are supplied pre-installed on the TitraLab and only need to be connected to the relevant reagent bottles.

1. Connect the tube from the IN socket of the burette valve to the titrant bottle (AgNO_3). Screw on the bottle closure to do this.
2. Connect the tube from the IN socket of the pump to the acid bottle (HNO_3). Screw on the bottle closure to do this.
3. Place a desiccant cartridge into the designated opening in each bottle closure.

Figure 8 Connection of feed tubes

Installation

3.4.4 Connection of the electrode

3.4.4.1 Electrical connection of the electrode

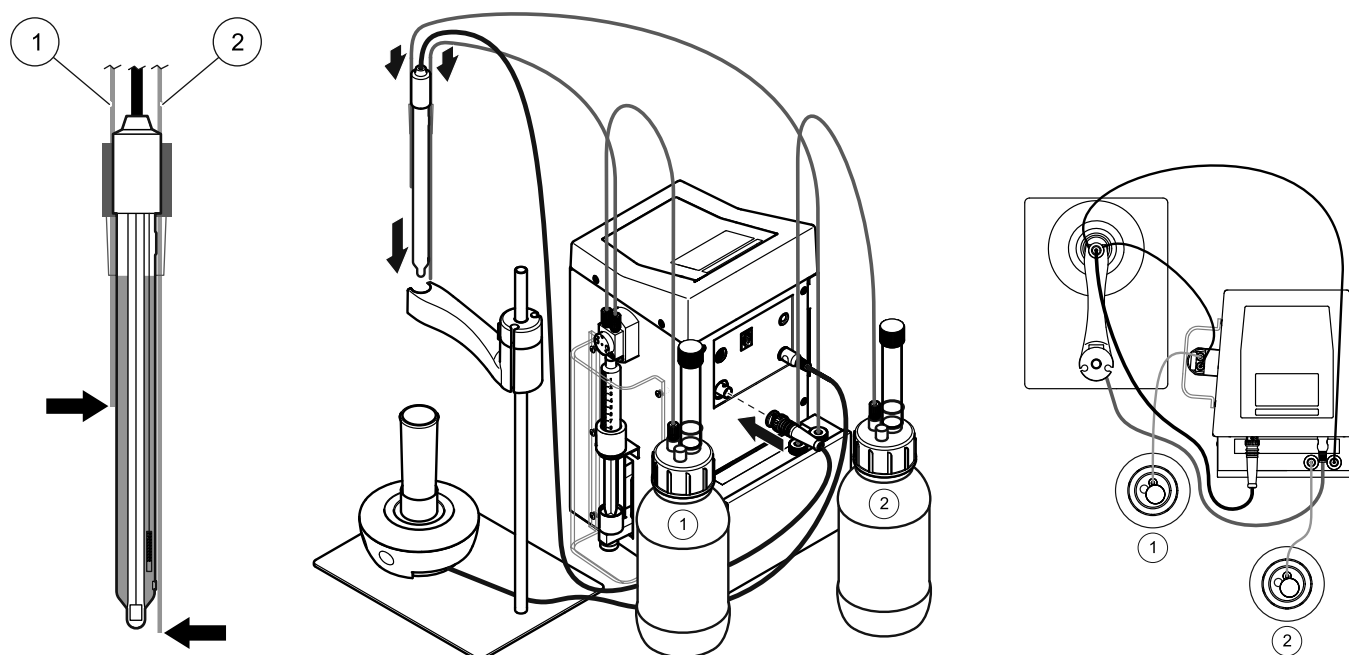
1. Connect the electrode cable to the **ELECTRODE** port on the back of the TitraLab.
The power is supplied via the TitraLab.

3.4.4.2 Connection of the electrode tubes

The sensor holder of the titration stand has two tube guides.

1. Connect the tube from the OUT socket of the pump to the electrode.
2. To do this, push the free end of the tube into guide "1" of the sensor holder until it reaches the middle of the electrode.
3. Connect the tube on the OUT socket of the burette valve to the electrode.
4. To do this, push the free end of the tube into guide "2" of the sensor holder until the end of the tube is flush with the tip of the electrode.

Figure 9 Connection of the electrode



3.4.5 Power supply, external

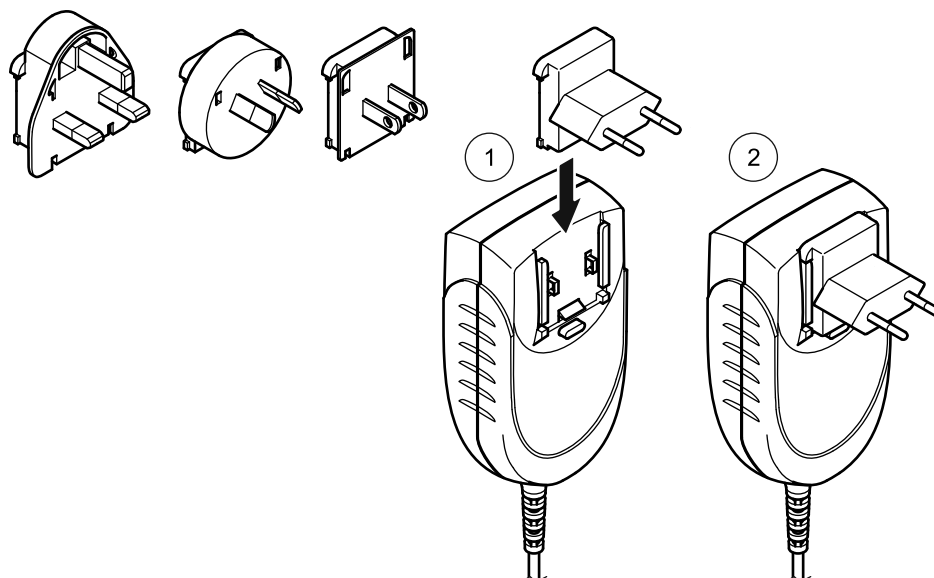
⚠ DANGER

Risk of electric shock

Make sure the AC supply voltage is suitable for the power supply and the mains plug style is suitable for the type of outlet socket.

Only use the original power supply and plug connectors.

The power supply is provided with different plug connectors. The correct plug connector must be attached to the power supply before first use.

Figure 10 Plug connector attachment**1** Slide the plug connector into the power supply**2** Click the plug connector into place

Note: To change the plug connector, press in the catch and slide the plug connector upward.

3.5 Keypad

Navigation key UP

- Used to select between different options on the display.
- Increases numeric values.
- Shows the previous data record in the data log menu.
- Empties the syringe through the discharge tube during manual open loop control.

Navigation key DOWN

- Used to select between different options on the display.
- Reduces numeric values.
- Shows the next data record in the data log menu.
- Fills the syringe through the feed tube during manual open loop control.

ON/OFF key

Navigation key LEFT

- Moves the cursor backward for entry of numeric values.
- Scrolls up in menus.
- Empties the syringe through the feed tube during manual open loop control.

Navigation key RIGHT

- Moves the cursor forward for entry of numeric values.
- Scrolls down in menus.

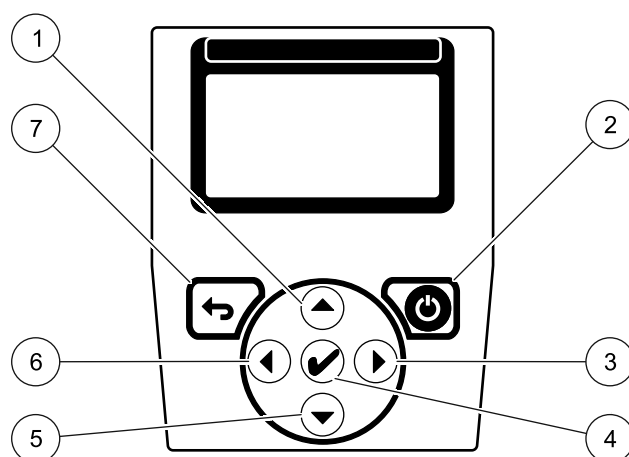
RETURN key

- Scrolls back in menus.
- Cancels a manual control.
- Cancels a titration.

OK key (Check mark)

- Confirms the gray-highlighted menu items and scrolls forward in the menu.
- Shows the first data record in the data log.

Figure 11 Keypad



1	Navigation key UP	5	Navigation key DOWN
2	ON/OFF key	6	Navigation key LEFT
3	Navigation key RIGHT	7	RETURN key
4	OK key (Check mark)		

3.5.1 Optical mouse

On versions LLV2307.97.1102 and LLV2308.97.1102, all functions executed with OK can also be performed with an optical mouse.

1. Connect the mouse cable to the port labeled **MOUSE** on the back of the TitraLab. The power is supplied via the TitraLab.

3.6 Reagents

Cat.No	Application	Sample	Titrant reagent	Auxiliary reagent
LLV2303.97.1102	Salt in solid and liquid dairy products	10 mL / 1 g	AgNO ₃ 0.1 M	HNO ₃ 1M
LLV2305.97.1102	Salt in tomato sauce	1 g	AgNO ₃ 0.1 M	HNO ₃ 1M
LLV2307.97.1102	Salt in brine	0.5 mL	AgNO ₃ 0.5 M	HNO ₃ 1M
LLV2308.97.1102	Salt in water	10 mL	AgNO ₃ 0.01 M	HNO ₃ 1M

- Titrant reagent: Silver Nitrate, AgNO₃ 0.1 M (version LLV2303.97.1102 and LLV2305.97.1102), 0.5 M (version LLV2307.97.1102), 0.01 M (version LLV2308.97.1102)
- Acid reagent: Nitric Acid, HNO₃ 1 M

Section 4 Operation

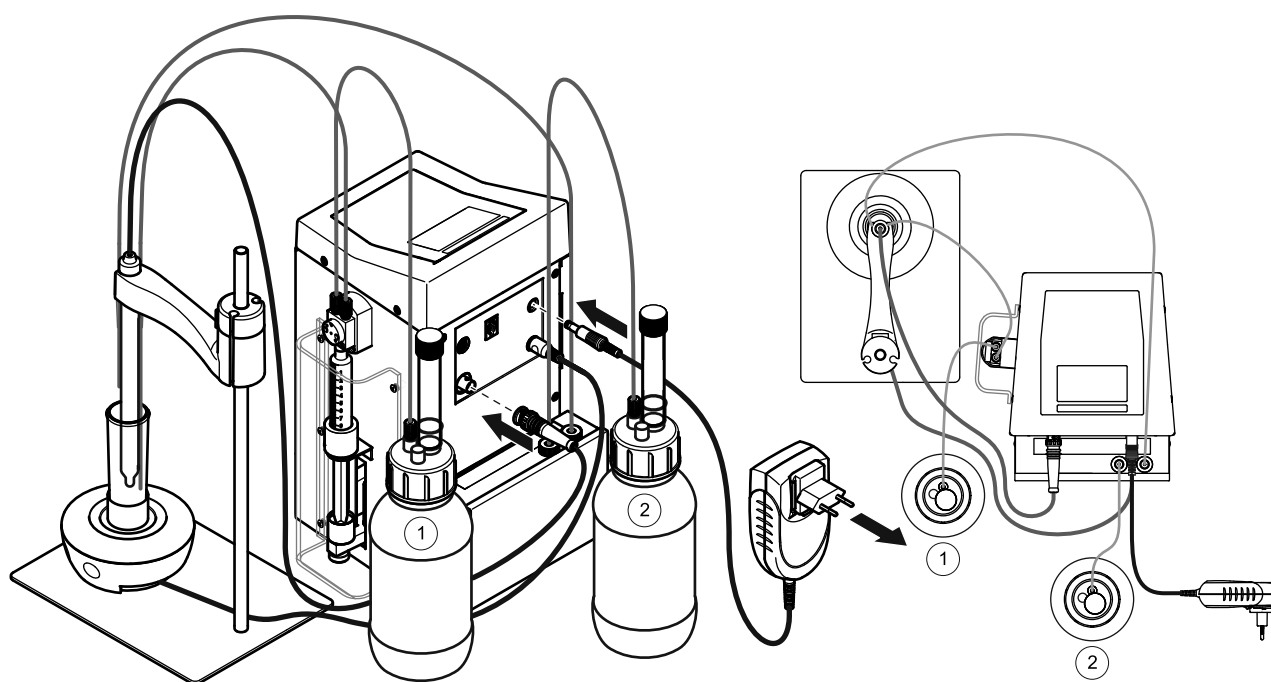
4.1 Switch on the instrument

Become familiar with the instrument functions before operation. Learn how to navigate through the menu and perform the relevant functions.

1. Connect the input connector of the power supply to the **POWER IN** port on the back of the TitraLab.
2. Connect the power supply to a power socket.
3. Press **ON/OFF** below the display to switch on the instrument.
4. The instrument performs a self-test upon each activation.

Note: Wait approximately 20 seconds before switching on again so as not to damage the electronics and mechanics of the instrument

Figure 12 Switch on the instrument



4.2 Startup

4.2.1 Language and data output setting

The titrator software supports multiple languages. The first time the instrument is switched on, a language selection list is displayed automatically upon completion of the self-test.

1. Select the required language.
2. Press **OK** to confirm the selection.
3. Select the type of data output (deactivated, printer, computer) and confirm with **OK**.

Operation

4.2.1.1 Change the language setting

The instrument functions in the selected language until the option is changed.

1. Turn the instrument on.
2. Select **SYSTEM > LANGUAGE**.
3. Select the required language.
4. Press **OK** to confirm the selection.

4.2.1.2 Change the data output setting

The instrument functions in the selected data output until the option is changed.

1. Turn the instrument on.
2. Select **SYSTEM > DATA OUTPUT**.
3. Select the required setting.
4. Press **OK** to confirm the setting.

4.2.2 First steps after installation

1. Prime the burette with titrant ([section 4.6.1](#)).
2. Prime the pump **ACID** to add the acid ([section 4.6.2](#)).
3. Check the stirring speed ([section 4.6.3](#)).

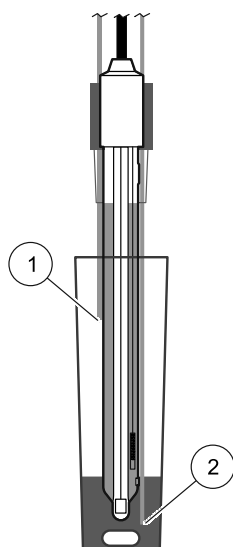
4.3 Menu structure

[Section 6 Troubleshooting](#) provides a list of all error and warning messages, and also describes all necessary countermeasures.

MAIN MENU	
ANALYZE CHLORIDE (W)	Titration program to determine solid salt samples.
sample: 1 Weight:	Entry of sample weight in g.
Insert sample: 1	Dispense solid sample.
Start Analysis	Start analysis.
ANALYZE CHLORIDE (V)	Titration program to determine liquid salt samples.
Insert sample: 1	Dispense 10 mL of liquid sample.
Start Analysis	Start analysis.
MANUAL ACTIVATION	Select which element is to be controlled manually; refer to section 4.6, page 24 .
Burette	Manual control of burette.
Return	Empties the burette into the titrant bottle (navigation key LEFT)
Empty	Empties the burette into the titration cell (navigation key UP)
Fill	Fills the burette with titrant (navigation key DOWN)
Pumps	Manual control of pump.
Pump1 Dispensing	Start the pump.
Stirrer	Sets the stirring speed. Select ON/OFF with OK. Select the stirring speed with UP/DOWN.

MAIN MENU		
SYSTEM		System settings; refer to section 4.7, page 25 .
Sample		The unit and factor to determine salt are adjusted individually.
Weight		Solid samples by weight.
Unit		Unit selection.
% NaCl		Result calculated in % NaCl.
% Cl		Result calculated in % Cl ⁻ .
Factor		The factor can be adjusted individually.
Volume		Liquid samples by volume.
Factor		The factor can be adjusted individually.
Data Logger		Data log with up to 55 results; refer to section 4.7.2, page 26 .
Empty Data-Logger		Empties the data log.
Display data		Display results with search criteria.
By date:		Display results by date.
Continue...		Display all results.
Data Output		Define the data output; refer to section 4.7.3, page 26 .
Deactivated		Deactivates the data output.
For Printer		Activates data output on the printer.
For Computer		Activates data output on the computer.
Date / Hour		Entry of date and time.
Display contrast		Selection of display contrast.
Language		Selection of operating language
SPANISH		
ENGLISH		
ITALIAN		
FRENCH		

4.4 Chloride analysis in solid samples



- Place a magnetic stirring bar in a titration cell and dispense the sample as follows:
 - Cheese or solid dairy products:** Add 1 g of the sample dissolved in approximately 10 mL lukewarm distilled water
 - Tomato sauces:** Add 1 g of the sample dissolved in approximately 10 mL of distilled water
 - Brine:** Add 0.5 g of the sample dissolved in approximately 10 mL of distilled water
- Attach the titration cell to the magnetic stirrer.
- Before the analysis, stir the sample for at least 30 seconds in order to extract the salt in full.
- Lower the electrode into the titration cell.

Note: Make sure that the electrode cannot be damaged by the stirring bar or come into contact with the bottom of the titration cell. Make sure the combined Silver rod electrode, including the reference element porous pin is covered by sample.
- Select **ANALYZE CHLORIDE (W)**. "SAMPLE: 1 WEIGHT" is shown on the display.

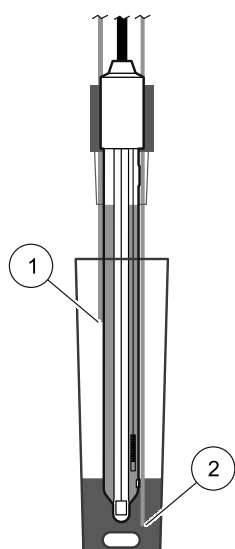
6. Enter the weight of the sample and confirm with **OK**.

The following steps are carried out automatically by TitrLab:

- Acid is dispensed into the titration cell for 2 seconds
- The solution is stirred for 3 seconds
- Titration is then started

7. The result is shown on the display and, depending on the setting, sent to a printer or computer.
8. Press **OK** to confirm the result.
9. To begin another analysis, select **OK**. "**NEXT SAMPLE**" is shown on the display.

4.5 Chloride analysis in liquid samples



1. Place a magnetic stirring bar in a titration cell and dispense the sample as follows:
 - **Milk or liquid dairy products:** 10 mL sample
 - **Water:** 10 mL sample
2. Attach the titration cell to the magnetic stirrer.
3. Lower the electrode into the titration cell.

***Note:** Make sure that the electrode cannot be damaged by the stirring bar or come into contact with the bottom of the titration cell. Make sure the combined Silver rod electrode, including the reference element porous pin is covered by sample.*

4. Select **ANALYZE CHLORIDE (V)**. "**INSERT SAMPLE: 1**" is shown on the display.
5. Select **OK**.

The following steps are carried out automatically by TitrLab:

- Acid is dispensed into the titration cell for 2 seconds
- The solution is stirred for 3 seconds
- Titration is then started

6. The result is shown on the display and, depending on the setting, sent to a printer or computer.
7. Press **OK** to confirm the result.

To begin another analysis, select **OK**. "**NEXT SAMPLE**" is shown on the display.

4.6 Manual component activation

4.6.1 Burette

1. Select **MANUAL ACTIVATION > BURETTE** and press **OK** to confirm.
 - Select **FILL** with the **DOWN** navigation key to fill the burette.
 - Select **EMPTY** with the **UP** navigation key to empty the burette into the titration cell.
 - Select **RETURN** with the **LEFT** navigation key to empty the burette back into the titrant bottle.

***Note:** Repeat this procedure multiple times to make sure that the dispensing process functions correctly.*

4.6.2 Pump

1. Select **MANUAL ACTIVATION > PUMPS** and press **OK** to confirm.
2. Press **OK** to switch the pump on or off.

Note: Repeat this procedure multiple times to make sure that the dispensing process functions correctly.

4.6.3 Stirrer

1. Select **MANUAL ACTIVATION > STIRRER** and press **OK** to confirm.
2. Press **OK** to switch the stirrer on or off.
3. Use the navigation keys **UP** and **DOWN** to select the stirring speed.

4.7 System

This function can be used to adapt the titrator to specific requirements.

4.7.1 Sample

To express the result, the titrator performs the following calculation:

Sample by volume: Result = $V_{\text{AgNO}_3} \text{ (mL)} \times F$

Sample by weight: Result = $[V_{\text{AgNO}_3} \text{ (mL)} \times F] / \text{Sample weight (g)}$

F is a factor including all necessary parameters for expressing the result in the desired units.

WEIGHT: Changes settings for determining chloride in solid samples.

- Either % NaCl or % Cl can be selected as the unit.
- The factor can be adjusted individually.

VOLUME: Changes settings for determining chloride in liquid samples.

The factor can be adjusted individually.

Cat.No	Application	Titrant reagent	Sample	Result unit	Factor ⁽¹⁾
LLV2303.97.1102	Salt in solid and liquid dairy products	AgNO ₃ 0.1 M	1 g	% NaCl ⁽³⁾	0.585
				% Cl	0.355
			10 mL	-	1 ⁽²⁾
LLV2305.97.1102	Salt in tomato sauce	AgNO ₃ 0.1 M	1 g	% NaCl	0.585
LLV2307.97.1102	Salt in brine	AgNO ₃ 0.5 M	0.5 mL	&% NaCl	5.85
LLV2308.97.1102	Salt in water	AgNO ₃ 0.01 M	10 mL	mg/L NaCl	58.5
				mg/L Cl	35.5 ⁽⁴⁾

(1) Calculated factor according to the selected units. This factor can be modified if the analysis conditions change, for example the concentration of the AgNO₃ or the quantity of a sample.

(2) When working with samples by volume, in the version LLV2303.97.1102, it is necessary to introduce the adequate factor depending on the desired units. The result will be displayed without units.

(3) Standard units for version LLV2303.97.1102.

(4) If the concentration of chloride in water is above 300 mg/L it is necessary to work with a titrant of a higher concentration. For example a titrant AgNO₃ 0.1 M can be worked in the range between 200 mg/L and 3 g/L of Chloride. In this case, the factor is F = 355.

4.7.2 Data Logger

This section describes the functions of the data log.

- Up to 55 results are stored.
 - The results can be displayed, printed or sent to a computer.
 - When the data log is full, the oldest result is overwritten automatically.
1. Select **SYSTEM > DATA LOGGER > DISPLAY DATA** and press **OK** to confirm. A range of search filters can be used to display the results.
BY DATE: displays the results for a specific date.
CONTINUE: displays all results.
 2. To empty the data log, select **SYSTEM > DATA LOGGER > EMPTY DATA-LOGGER** and press **OK** to confirm.

4.7.2.1 Sample numbers

When a titration program is started, the first sample is assigned the number 1. All subsequent samples receive sequential numbers until the titration program is closed. When the program is launched again, the sequential numbers reset to 1.

4.7.3 Data Output (printer/computer)

This function is only displayed if a printer or computer is connected and activated for data output. Programs, settings and results can be printed or transferred. Following a titration or calibration, the following data is printed or transferred:

- Type of analysis, date and time, titration result, AgNO₃ solution end volume, duration of titration and sample number.
1. Select **SYSTEM > DATA OUTPUT**.
 2. Select **FOR PRINTER** followed by the relevant printer model, such as thermal or dot matrix. Confirm with **OK**.

Select **FOR COMPUTER** followed by either **CAPTURE** or **TICOM**. Confirm with **OK**.

4.7.4 Date/Hour

Entry of date and time.

4.7.5 Display contrast

Increases or decreases the display contrast.

4.7.6 Language

English, Spanish, Italian, French.

Section 5 Maintenance

WARNING

Risk of injury

Before maintenance or repair work is conducted, thoroughly rinse the instrument with deionized water and make sure that there are no residual chemicals in the tubes and pumps.

Only use genuine replacement parts and accessories.

The instrument must be serviced by the manufacturer's service department at the prescribed intervals.

5.1 Maintenance schedule

Maintenance task	Every week	6 months	12 months
Replace dry desiccant cartridges content.	x		
Check all tube connections for leaks and damage.	x		
Replace burette syringe		x	
Valve block			x
Burette feed tube			x
Burette discharge tube			x
Peristaltic pump, pump cassette			x
Pump feed tube			x
Pump discharge tube			x
Bottle closure set			x

5.2 Power off the instrument

At the end of the working day, deactivate the instrument as follows:

- Empty the contents of the burette into the titrant bottle; refer to [section 4.6.1, page 24](#).
- Empty and clean the used titration cells with deionized water

When the instrument is to be deactivated for multiple days or extended periods, perform the following steps:

- Clean the burette and pumps with deionized water
- Seal the reagent bottles with the original bottle closures
- Empty and clean the used titration cells with deionized water

5.3 Clean the burette

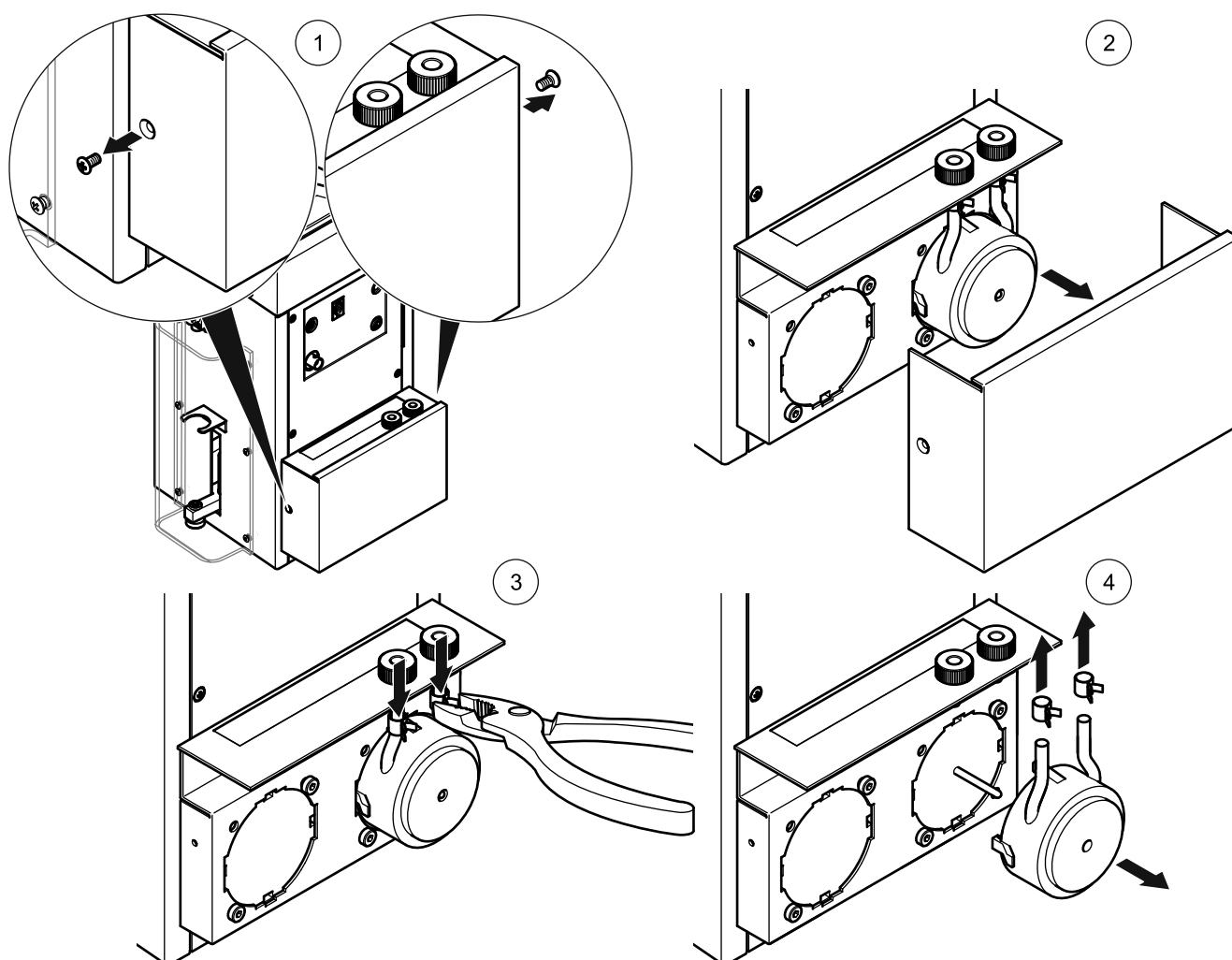
Make sure that there are no crystals or other sediments inside the syringe. If such deposits are discovered, clean the syringe immediately, as this will otherwise damage the plunger.

5.4 Clean the electrode

The silver electrode does not require any special maintenance. Rinse with deionized water if required.

5.5 Replace pump cassette

1. Remove the screws on the right and left of the housing cover (refer to point 1 in [Figure 13](#)).
2. Remove the housing cover.
3. Press the ends of the gripper clamps together (with pliers, for example) and slide the clamps down and off the connectors.
Remove the tubes from the connectors.
4. Press in the catches on the right and left of the pump cassette.
Remove the pump cassette from the shaft.
5. Slide the gripper clamps onto the tubes of a new pump cassette.
6. Slide the new pump cassette onto the shaft until the catches engage.
7. Slide the tubes onto the connectors.
8. Press the ends of the gripper clamps together (with pliers, for example) and slide the clamps up onto the connectors.
9. Put the housing cover back on and tighten the screws.

Figure 13 **Replace pump cassette**

1 Remove the screws on the right and left of the housing cover.	3 Press the ends of the gripper clamps together (with pliers, for example) and slide the clamps down and off the connectors. Remove the tubes from the connectors.
2 Remove the housing cover.	4 Press in the catches on the right and left of the pump cassette. Remove the pump cassette from the shaft.

Section 6 Troubleshooting

6.1 Error messages

Error displayed	Cause	Resolution
Maximum volume reached.	The maximum volume is reached before the titration is completed. The titration is cancelled automatically.	Empty the titration cell and restart the titration.
Equivalence points not found.	No equivalence points found during titration.	Check system with Sodium chloride standard of known concentration. Check electrode according to manufacturer recommendations, maintain electrode as required. Check porous pin is covered by sample.
	Chloride content below measuring range.	
Data logger empty.	No results are stored or no results match the search filter.	Change the search filter criteria.
All data will be erased.	All data in the data log will be erased.	
Printing error.	Printer is connected but not activated.	Switch on the printer.
PC not connected.	Computer is activated but not connected.	Check the computer connection.
Unstable mV reading	Defective Silver rod electrode and/or insufficient immersion.	Check electrode according to manufacturer recommendations, maintain electrode as required. Check porous pin is covered by sample.

Section 7 Replacement parts and accessories

7.1 Replacement parts

Description	Cat. No
TitraLab salt system for dairy products, with 1 × 10 mL syringe and pump. Accessories included: electrode holder with magnetic stirrer, electrode 5046, 10 titration cells and stirring bars	LLV2303.97.1102
TitraLab salt system for tomato sauce, with 1 × 10 mL syringe and pump. Accessories included: electrode holder with magnetic stirrer, electrode 5046, 10 titration cells and stirring bars	LLV2305.97.1102
TitraLab salt system for brine, with 1 × 10 mL syringe and pump. Accessories included: electrode holder with magnetic stirrer, electrode 5046, 10 titration cells and stirring bars	LLV2307.97.1102
TitraLab salt system for water, with 1 × 10 mL syringe and pump. Accessories included: electrode holder with magnetic stirrer, electrode 5046, 10 titration cells and stirring bars	LLV2308.97.1102
Silver electrode, 0–80 °C, glass body with built-in tube guides	LZW5046.97.0002
Magnetic stirrer with sensors support for TitraLab Salt	LZW2322.99
10× Teflon magnetic stirring bars, (20 × 6 mm)	LZW9339.99
10× polypropylene titration cells, 50 mL (Ø 30 mm)	LZW2324.99
Plastic syringe, 10 mL	LZW2323.99
Attachment sleeve for syringe	LZW8743.99
Inlet tube for burette/pump, L = 65 cm, d = 2.5 × 1.5 mm, with R6 racord	LZW8705.99
Outlet tubes set for burette. L = 55 cm, d = 2 × 1 mm, with R6 racord	LZW8709.99
Pump cassette with neoprene tube, internal diameter 2.4 mm, flow rate 100 mL/min.	LZW8691.99
Screw cap DIN 45	LZW8729.99
10× replacement O-rings for tube connections	LZW8734.99
Cotton filter cartridge for reagent bottle cap	LZW9199.99
Electro-valve for Burette	LZW9249.99

7.2 Accessories

Description	Cat. No
3-button mouse	LZW9240.99
Standard PC keyboard, mini-DIN connector.	LZW9013.99
RS 232 C cable for connection between titrator and PC, with 9-pin and USB connectors	LZW9135USB.99

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