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TitraLab pH & acid content analyzer

USER MANUAL

02/2013, Edition 2A

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Section 1 Specifications

These are subject to change without notice!

Performance specifications		
Measuring principle		Acid–base titration pH: potentiometric determination
Application area	LLV2301.97.1002	Determination of pH and acid content of tartaric acid and sulfuric acid in wine
	LLV2302.97.1002	Determination of pH and acid content in dairy products
	LLV2304.97.1002	Determination of pH and acid content of citric acid in tomato sauce and tomato products
	LLV2306.97.1002	Determination of pH and acid content of lactic acid in brine
Measuring range	LLV2301.97.1002	0–37,50 g/L tartaric acid 0–24,50 g/L sulfuric acid 0–14 pH
	LLV2302.97.1002	°SH, °D, g lactic acid/100 mL sample 0–14 pH
	LLV2304.97.1002	0,06–6,4 % citric acid (1 g sample) 0–14 pH
	LLV2306.97.1002	0,04–4,5 % lactic acid 0–14 pH
Resolution		Dependent on the selected units
Electrode		pH electrode, combined reference electrode, with built-in Pt 1000 sensor
Calibration		One, two or three-point calibration
Buffer recognition		Automatic: pH 2,00; 4,01; 7,00; 9,21 and 10,90 (at 25 °C)
Programs		pH measurement, 1 titration program, 1 calibration program
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
	Tubes	White PTFE tubes
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 LLV2301.97.1002, LLV2302.97.1002 and LLV2306.97.1002)

Specifications

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	
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

pH is a key parameter for many foodstuffs, with a significant influence on storage, appearance and taste.

The acid content of a foodstuff has a direct affect on the color of the product and the sensory evaluation of it, including the way it is balanced against sugar and other ingredients.

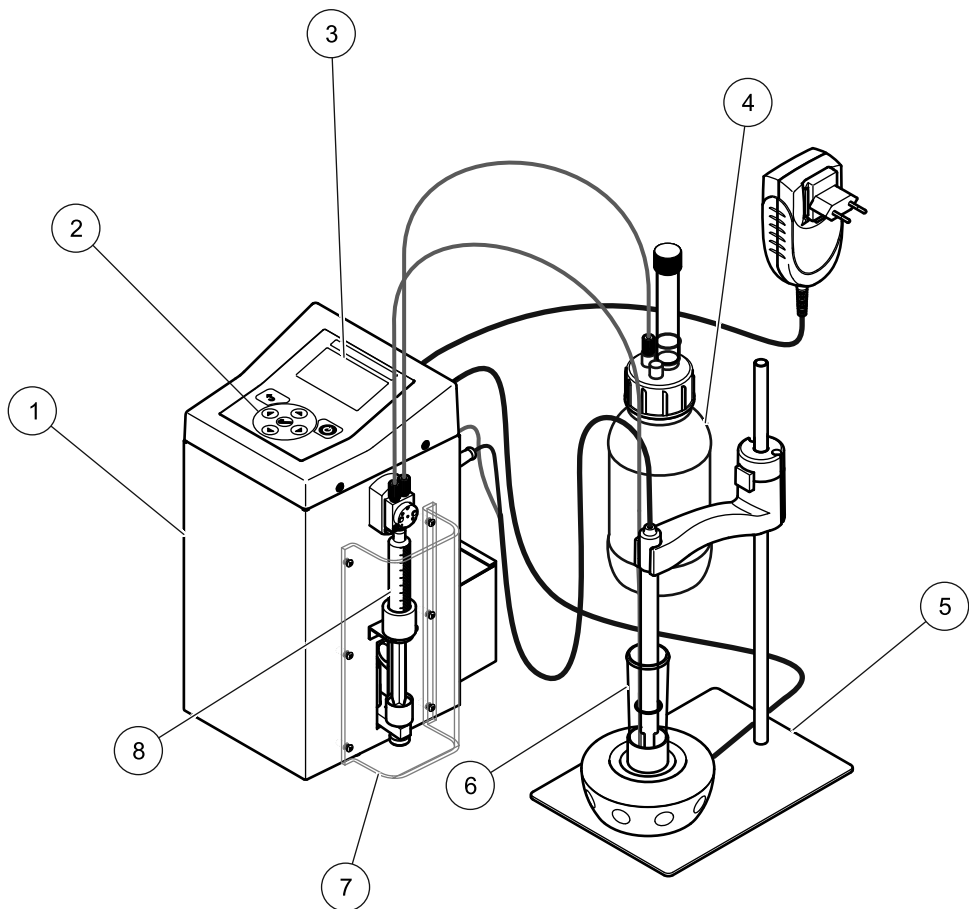
The TitraLab pH & acid content system is available in four different versions for use with various foodstuffs:

- Version LLV2301.97.1002 for determination of the pH and acid content of tartaric acid and sulfuric acid in wine
- Version LLV2302.97.1002 for determination of the pH and acid content of dairy products
- Version LLV2304.97.1002 for determination of the pH and acid content of citric acid in tomato sauce and tomato products
- Version LLV2306.97.1002 for determination of the pH and acid content of lactic acid in brine

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 LLV2301.97.1002, LLV2302.97.1002 and LLV2306.97.1002 only). A convenient titration stand with stirrer is integrated.

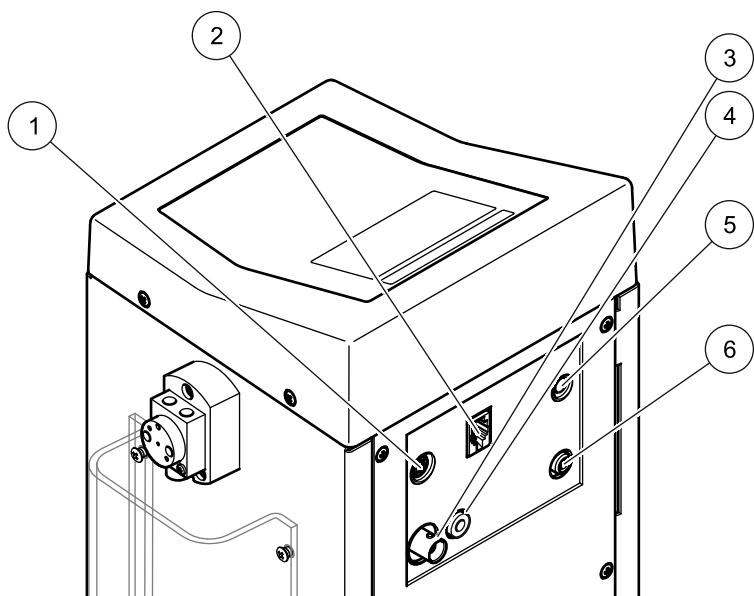
2.3 Front and back view

Figure 1 Front view



1	TitraLab pH & acid content system	5	Titration stand with magnetic stirrer
2	Keypad	6	Titration cell
3	Display	7	Syringe cover
4	Titrant	8	Burette

Figure 2 Back view



1	Connector for mouse	4	Temperature connector of the electrode
2	Connector for printer or computer	5	Connector for power supply
3	Electrode connector	6	Connector for magnetic stirrer

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/or trained personnel.

3.1 Unpack the instrument

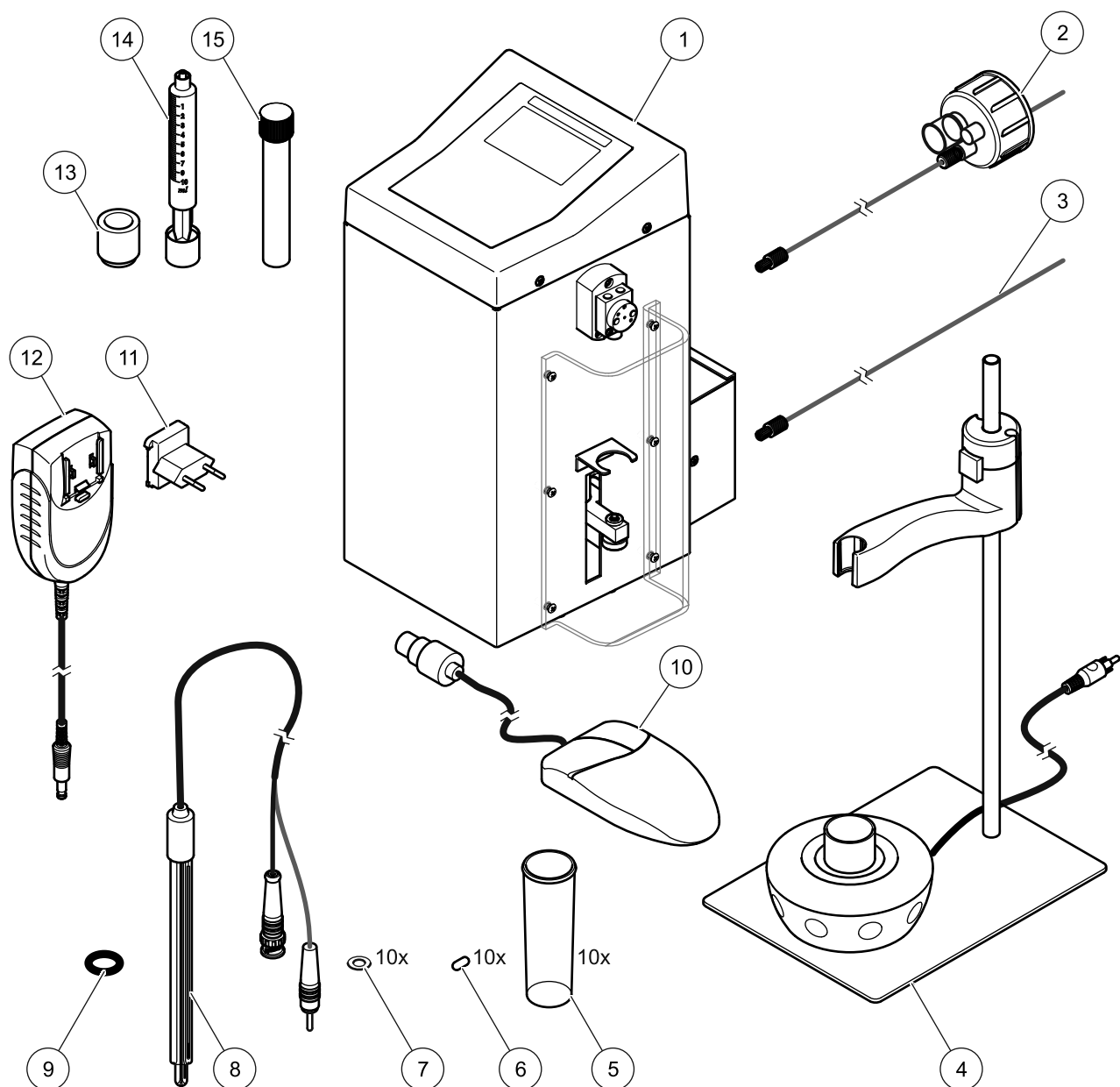
Unpack all supplied parts carefully, as they are highly sensitive in part to shock and impact. Read the user manual prior to installation and proceed exactly as described.

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 pH & acid content system	9 O-ring to secure tube
2 Tube with bottle closure, DIN 45 thread	10 Mouse (versions LLV2301.97.1002, LLV2302.97.1002 and LLV2306.97.1002 only)
3 Tube to attach to electrode	
4 Titration stand holder including magnetic stirrer	11 Adapter for power supply
5 10x white O-rings for burette and pump threads	12 Power supply, external
6 10x Teflon magnetic stirring bars (20 mm x 6 mm)	13 Hardware sleeve
7 10x titration cells, 50 mL, Ø 30 mm, polypropylene with lid	14 Syringe with plunger
8 pH electrode with cable and tube guide	15 empty desiccant cartridge with stopper

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 Sodium Hydroxide (NaOH) base that, depending on the area of application, is either 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.

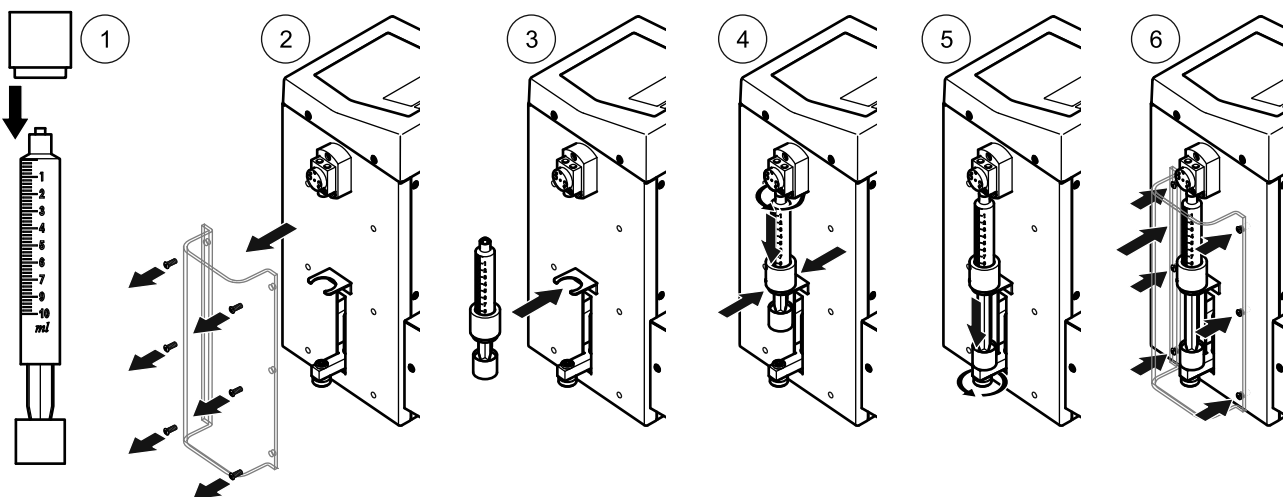
⚠ WARNING

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

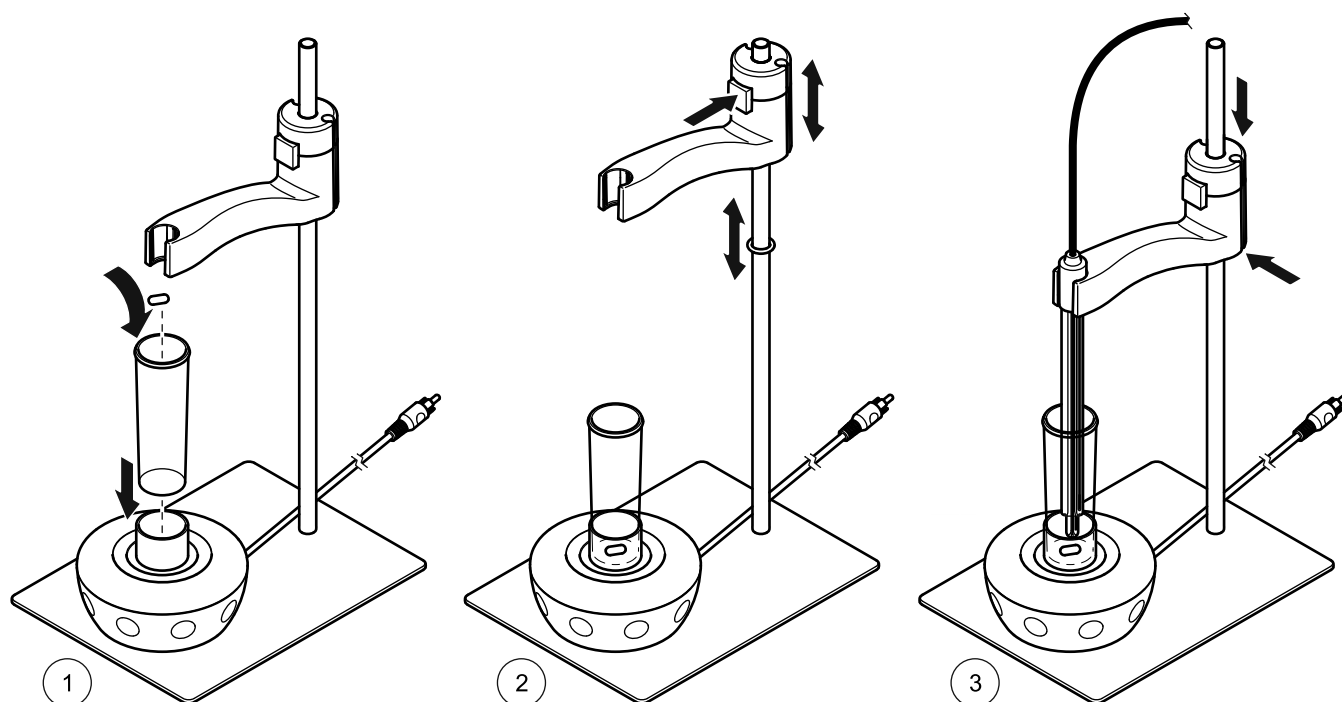
Warning against system damage

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.

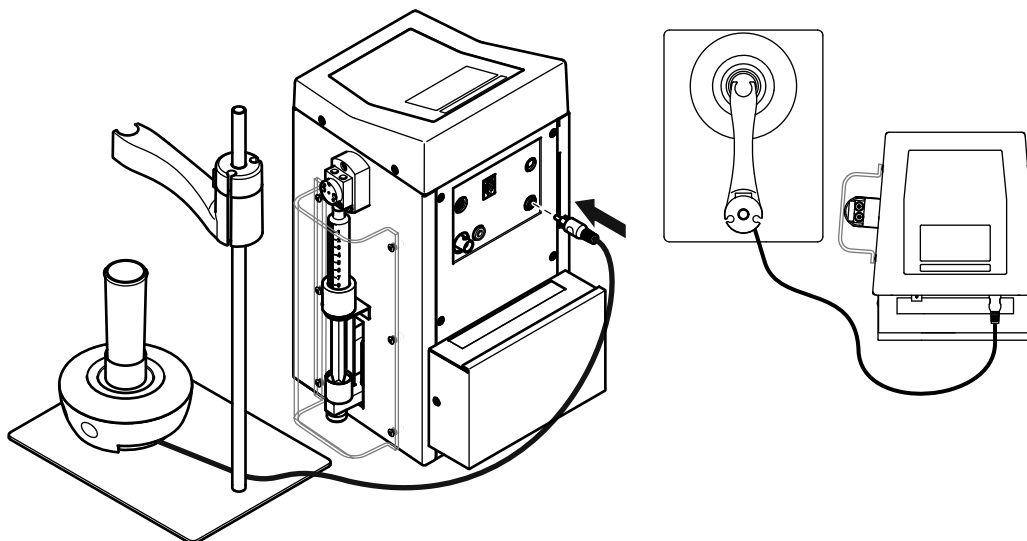
2 Position a rubber ring on the stand rod to set the minimum height of the electrode holder. Press the electrode holder lock button and place the electrode holder on the stand rod.

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.

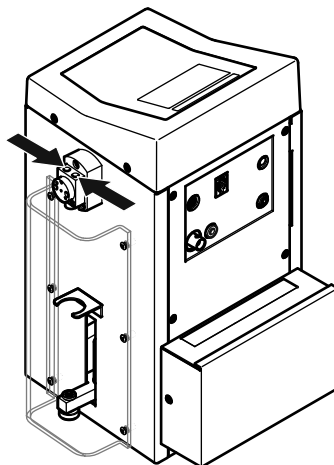
Regularly check the system as well as all tubes and connections for leaks, condition and cleanliness.

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

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

3.4.3.1 Removal of protective stickers (Uninstalled tubes configuration)

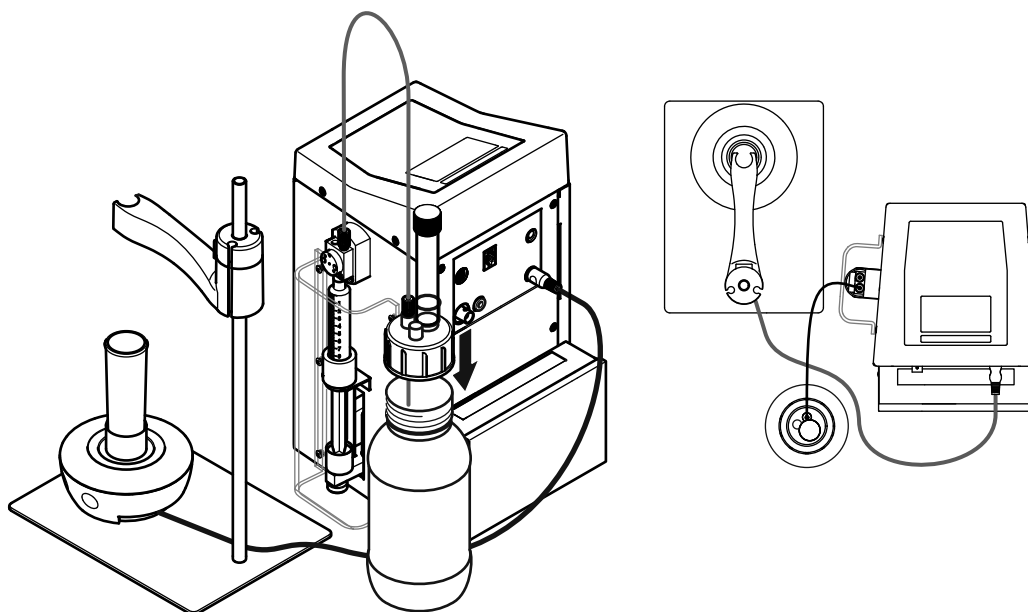
1. Remove the protective stickers on the burette valve.
2. Make sure that the pre-installed white O-rings are not removed.
3. Check that the O-rings are in a horizontal position inside the thread.

Figure 7 Position of protective stickers

3.4.3.2 Connection of feed tube

The system is delivered with a tube with bottle closure (DIN 45 thread). This feed tube is supplied pre-installed on the TitraLab and only needs to be connected to the titrant bottle.

1. Connect the tube from the IN socket of the burette valve to the titrant bottle (NaOH). Screw on the bottle closure to do this.

Figure 8 Connection of feed tube

3.4.4 Connection of the electrode

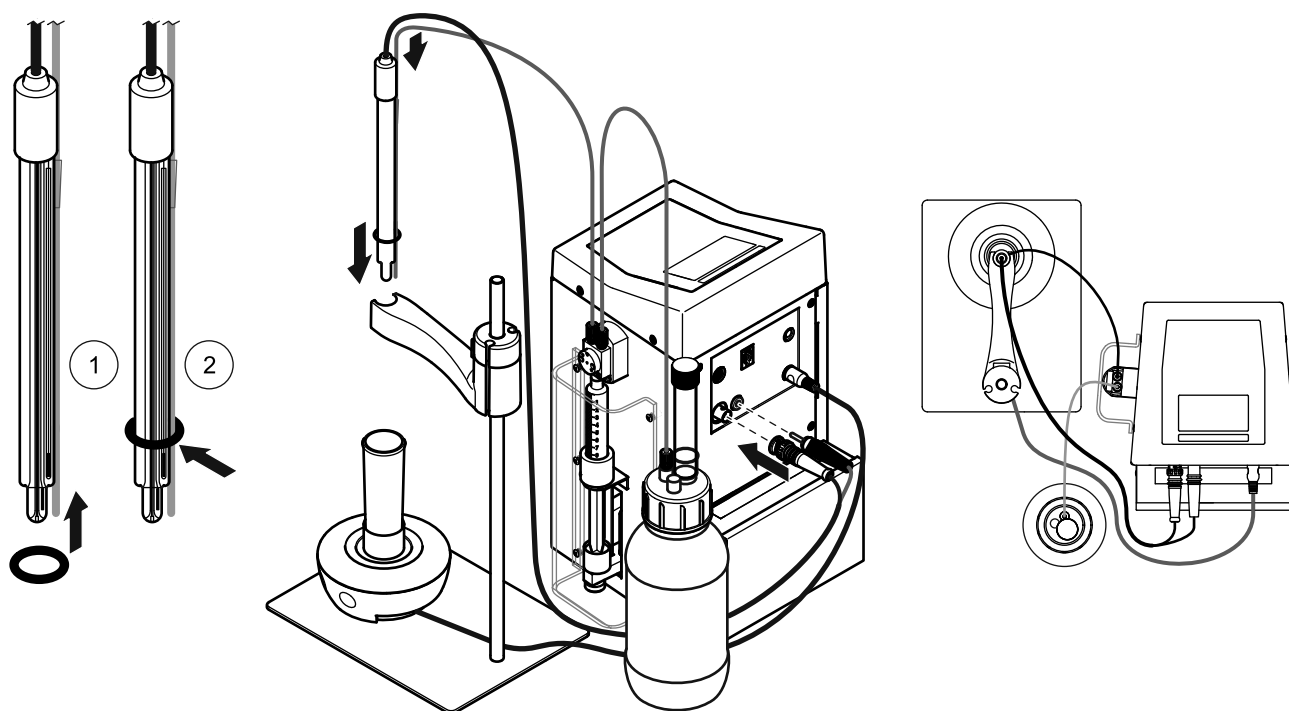
1. Connect the electrode cable to the **ELECTRODE** port on the back of the TitraLab. The power is supplied via the TitraLab.

Installation

3.4.4.1 Connection of the tube to the electrode

1. Connect the tube on the OUT socket of the burette valve.
2. Place the electrode in the sensor holder.
3. Push the free end of the tube into the tube guide of the sensor holder until the end of the tube is flush with the tip of the electrode.
4. Attach the tube to the electrode with a rubber ring.

Figure 9 Connection of the electrode



3.4.5 Power supply, external

⚠ DANGER

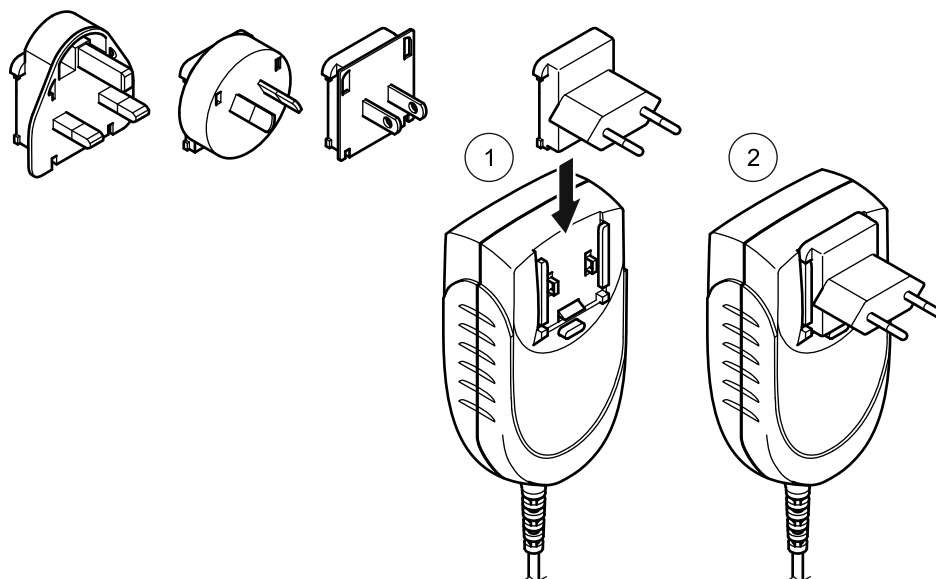
Risk of electric shock

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.

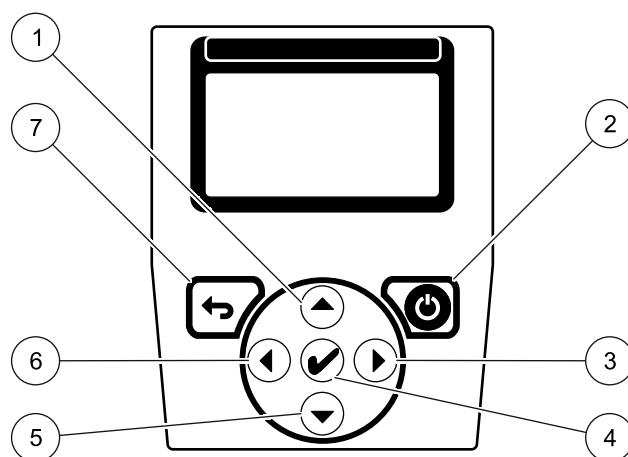
RETURN key

- 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 LLV2301.97.1002, LLV2302.97.1002 and LLV2306.97.1002, 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

- Titrant reagent: Sodium Hydroxide NaOH 0,5 M (versions LLV2301.97.1002 and LLV2306.97.1002), 0,1 M (versions LLV2302.97.1002 and LLV2304.97.1002)

Cat. No	Application	Sample	Titrant reagent
LLV2301.97.1002	pH and acid content in wine	10 mL	NaOH 0,5 M
LLV2302.97.1002	pH and acid content in milk	10 mL	NaOH 0,1 M
LLV2304.97.1002	pH and acid content in tomato products	1 g	NaOH 0,1 M
LLV2306.97.1002	pH and acid content in brine	10 mL	NaOH 0,5 M

Section 4 Operation

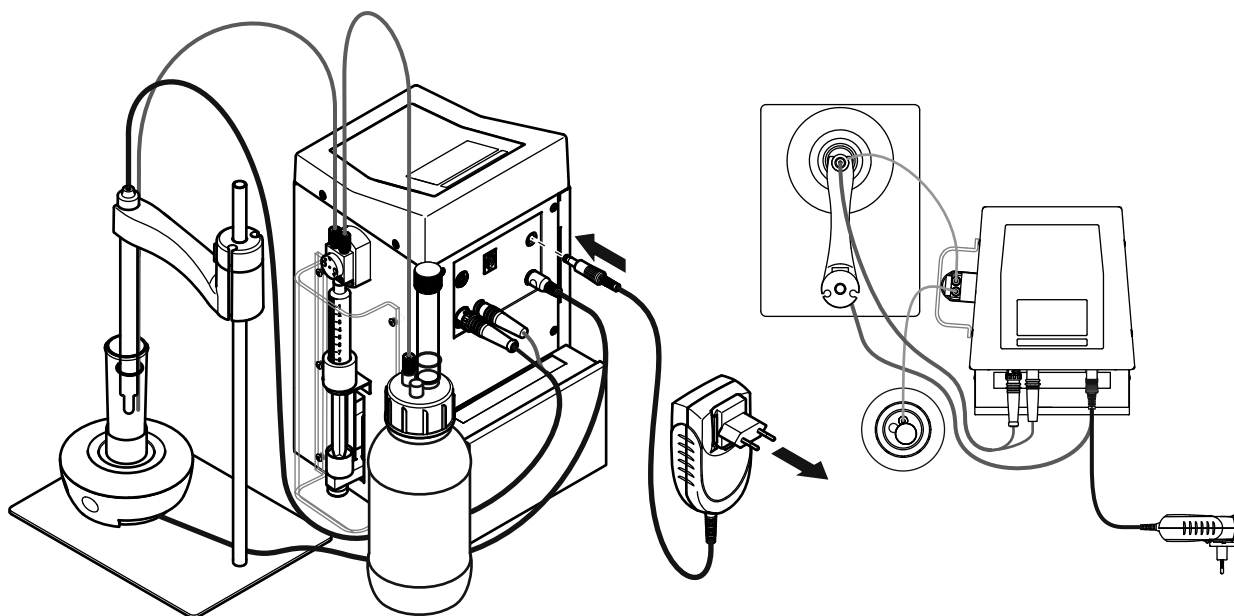
4.1 Switch on the instrument

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**.

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 4.8.1](#)).
2. Check the stirring speed ([section 4.8.2](#)).

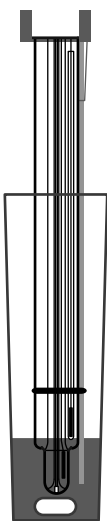
4.3 Menu structure

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

MAIN MENU	
ANALYZE PH+ACIDITY	Titration program to determine pH and acid content.
Sample: 1 Weight:	Version LLV2304.97.1002 only: entry of the sample weight in g.
Insert Sample: 1	Dispense 10 mL sample. (Version LLV2304.97.1002: 1 g sample + 10 mL distilled water)
Start Analysis	Start analysis.
MEASURE PH	Sample pH.
By Stability	pH shown on display once stable.
Start Measurement	Start measurement.
In Continuous	pH continuously shown on display and, if a PC or printer is connected, transferred at a defined interval.
Start Measurement	Start measurement.
PH CALIBRATION	pH calibration, either one, two or three-point.
Immerse the pH electrode in the first buffer.	Place 10 mL of pH 7.00 calibration solution in a titration cell.
Start	Start calibration of the first point.
Finish Calibration	Finish as one-point calibration.
Next Point	Place 10 mL of pH 4.00 calibration solution in a titration cell.
Start	Start calibration of the second point.
Finish Calibration	Finish as two-point calibration.

MAIN MENU	
MANUAL ACTIVATION	Select which element is to be controlled manually; refer to section 4.8, page 26 .
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).
Stirrer	Sets the stirring speed. Select ON/OFF with OK. Select the stirring speed with UP/DOWN.
SYSTEM	System settings; refer to section 4.9, page 27 .
Units Acidity	The unit and factor to determine acidity can be adjusted individually.
Unit	Unit selection.
g/L Sulfuric	Indication in g/L of sulfuric acid. (Example for version LLV2301.97.1002)
g/L Tartaric	Indication in g/L of tartaric acid. (Example for version LLV2301.97.1002)
g/L	Indication in g/L of acid. (Example for version LLV2301.97.1002)
Factor	The factor can be adjusted individually.
End Point Value	Setting for titration end point.
pH 7.00	pH end point 7.00 (in accordance with the OIV "International Organisation of Vine and Wine").
pH 8.20	pH end point 8.20 (in accordance with the AOAC "Association of official agriculture chemistry").
Data Logger	Data log with up to 55 results; refer to section 4.9.3, page 28 .
Empty Data-Logger	Empties the data log.
Display Data	Display results with search filters.
By Date:	Display results by date.
Continue...	Display all results.
Data Output	Define the data output; refer to section 4.9.4, page 28 .
Deactivated	Deactivates the data output.
For Printer	Activates data output on the printer.
For Computer	Activates data output on the computer.
Calibration Validity	Validity of current calibration in days and hours.
Date / Hour	Entry of date and time.
Display Contrast	Selection of display contrast.
Language	Selection of operating language.
SPANISH	
ENGLISH	
ITALIAN	
FRENCH	
Theoretical Cal.	If no current calibration is available, the system can revert to a theoretical calibration.

4.4 pH and acid content



1. Place a magnetic stirring bar in a titration cell and dispense the sample as follows:
 - Add 10 mL of the sample (either milk, brine or degassed wine depending on the area of application)
 - **Tomato sauces:** Add 1 g of the sample dissolved in approximately 10 mL of distilled water
2. Attach the titration cell to the magnetic stirrer.
3. Lower the electrode into the titration cell.

***Hinweis:** 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 pH Electrode, including the reference element porous pin is covered by sample.*

4. Select **ANALYZE PH + ACIDITY**. "INSERT SAMPLE: 1" is shown on the display.
5. Select **START ANALYSIS**.

The following steps are carried out automatically by TitrLab:

- Measurement of pH
 - Subsequent commencement of titration
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.
 8. To begin another analysis, select **OK**. "NEXT SAMPLE" is shown on the display.

4.5 pH measurement

1. Place a magnetic stirring bar and the sample in a titration cell.
2. Attach the titration cell to the magnetic stirrer.
3. Lower the electrode into the titration cell.

***Hinweis:** 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 pH Electrode, including the reference element porous pin is covered by sample.*

4. Select **MEASURE PH**. "STABILITY" or "CONTINUOUS" is shown on the display.
 - **STABILITY:** pH is shown on the display once stable.
 - **CONTINUOUS:** pH is continuously shown on the display and, if a PC or printer is connected, transferred at a defined interval.
5. Select **START MEASURING**.
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.
8. To begin another analysis, select **OK**. "NEXT SAMPLE" is shown on the display.

4.6 pH calibration

1. Place a magnetic stirring bar and 10 mL of the pH 7.00 calibration solution in a titration cell.
2. Attach the titration cell to the magnetic stirrer.
3. Lower the electrode into the titration cell.

***Hinweis:** 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 pH Electrode, including the reference element porous pin is covered by sample.*

4. Select **PH CALIBRATION**. "IMMERSE THE PH ELECTRODE IN THE FIRST BUFFER." is shown on the display.
5. Select **START**.
6. Following successful calibration, "NEXT POINT" or "FINISH CALIBRATION" is shown on the display.
 - **FINISH CALIBRATION:** Calibration finished as one-point calibration.
 - **NEXT POINT:** Place a magnetic stirring bar and 10 mL of the pH 4.00 calibration solution in a titration cell. Continue as described.
7. "IMMERSE THE PH ELECTRODE IN THE SECOND BUFFER." is shown on the display.
8. Select **START**.
9. Following successful calibration, "FINISH CALIBRATION" is shown on the display.
10. Press **OK** to confirm.

***Note:** Use the lids supplied to close the titration cells containing the calibration solutions. The calibration solutions can be used several times.*

4.7 pH calibration with a user define control solution

A user define pH calibration solution (for example: pH 3,56 for wine) can be entered as a third calibration point. A two-point calibration must be performed first (refer to [section 4.6](#)). After this, proceed as follows:

1. Place a magnetic stirring bar and 10 mL of the special calibration solution in a titration cell.
2. Attach the titration cell to the magnetic stirrer.
3. Lower the electrode into the titration cell.

***Hinweis:** Make sure that the electrode cannot be damaged by the stirring bar or come into contact with the bottom of the titration cell.*

4. Select **MEASURE PH**. "**STABILITY**" or "**CONTINUOUS**" is shown on the display.
5. Select **STABILITY**.
6. Select **START MEASURING**.
7. The result is shown on the display and, depending on the setting, sent to a printer or computer.
8. Press the **UP** navigation key for two seconds.
9. "**CONTROL SOLUTION**" and the measured pH are shown on the display.
10. Use the **UP** and **DOWN** navigation keys to adjust the measured pH to the specified standard value for the control solution (for example: pH 3,56 for wine).
11. Press **FINISH** to confirm the entry.
12. Press **OK** to confirm.

4.8 Manual component activation

4.8.1 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.*

4.8.2 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.

4.9 System

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

4.9.1 Units Acidity

The unit and factor for calculation can be adjusted individually. For example, in wine analysis, the result can be given in g/L for sulfuric acid, tartaric acid or overall acid.

The factor is obtained in the following way:

$$\text{Result} = [C_{\text{NaOH}} * \text{MW} * 0.5] / V_{\text{sample}}$$

C_{NaOH} : sodium hydroxide concentration (mol/L) used as a titrant reagent (0.5 mol/L)

MW: molecular weight of the acid used to express the result
(150.1 g/mol tartaric acid, 98.1 g/mol sulphuric acid)

V_{sample} : volume (mL) of analyzed wine, (10 ml).

In other models the factor would be calculated in a similar way.

Version		Titrant	Sample	Result units	Factor ⁽¹⁾
LLV2301.97.1002	Wine	NaOH 0,5 M	10 mL	g/L tartaric acid	3,7525
				g/L sulfuric acid	2,4525
				g/L	1 ⁽²⁾
LLV2302.97.1002	Milk	NaOH 0,1 M	10 mL	°SH	4
				°D	9,09
				g lactic acid/100 mL sample	0,09
LLV2304.97.1002	Tomato products	NaOH 0,1 M	1 g	% citric acid	0,64 ⁽³⁾
LLV2306.97.1002	Brine	NaOH 0,5 M	10 mL	% lactic acid	0,45

(1) Calculated factor according to the selected units. This factor can be modified if the analysis conditions have changed, for example the sodium hydroxide concentration or different sample amount.

(2) Programmable factor depending on the desired units.

For example: for g/L acetic acid , NaOH 0.5 M and 2 mL of sample, the factor F=15.

(3) When the sample is in weight, version LLV2304.97.1002 for acidity in canned tomato, the instrument performs the following calculation:

$$\text{Result} = [V_{\text{NaOH}} (\text{mL}) * F] / \text{sample weight (g)}$$

4.9.2 End Point Value

Setting for titration end point. The end point can be pH 7.00 and corresponds with the provisions of the OIV (International Organization of Vine and Wine). Alternatively, the end point can be pH 8.20 and correspond with the provisions of the AOAC (Association of Official Agriculture Chemistry).

4.9.3 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.

4.9.3.1 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 are reset to 1.

4.9.4 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, NaOH 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**.

4.9.5 Calibration validity

The validity of the last pH calibration can be defined in days and hours.

4.9.6 Date/Hour

Entry of date and time.

4.9.7 Display contrast

Increases or decreases the display contrast.

4.9.8 Language

English, Spanish, Italian, French.

4.9.9 Theoretical Cal.

When no current calibration is available, the system can revert to a theoretical calibration. The current state of the electrode is not factored into the theoretical calibration.

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
Check all tube connections for leaks and damage.	x	x	
Replace burette syringe		x	
Valve block			x
Burette feed tube			x
Burette 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 4.8.1, page 26](#).
- 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 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

Rinse the electrode with deionized water in order to clean it. Never use organic solvents to clean the electrode.

The pH electrode must always be kept wet in a KCl solution when stored. To do this, fill the protective cap with some KCl solution.

Never store the pH electrode in deionized water.

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.	
Expired calibration.	Validity of calibration has expired.	Perform new calibration.
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 pH reading.	Defective pH 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 pH & acid content system for wine, with 1× 10 mL syringe. Accessories included: electrode holder with magnetic stirrer, electrode, 10 titration cells and stirring bars	LLV2301.97.1002
TitraLab pH & acid content system for milk, with 1× 10 mL syringe. Accessories included: electrode holder with magnetic stirrer, electrode, 10 titration cells and stirring bars	LLV2302.97.1002
TitraLab pH & acid content system for tomato products, with 1× 10 mL syringe. Accessories included: electrode holder with magnetic stirrer, electrode, 10 titration cells and stirring bars	LLV2304.97.1002
TitraLab pH & acid content system for brine, with 1× 10 mL syringe. Accessories included: electrode holder with magnetic stirrer, electrode, 10 titration cells and stirring bars	LLV2306.97.1002
pH electrode, pH 2 to 14, 0 to 80 °C	LZW5011T.97.002
Magnetic stirrer with sensors support for TitraLab pH/TA	LZW2321.99
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
Hardware sleeve for syringe	LZW8743.99
Inlet tube for burette/pump, L = 65 cm, d = 2.52,5 ×x 1.51,5 mm,with R6 racord	LZW8705.99
Outlet tubes set for burette.L = 55 cm, d = 2 ×x 1 mm, with R6 racord	LZW8709.99
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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