TitraLab® AT1000 series workstations

User Manual

12/2014, Edition 1

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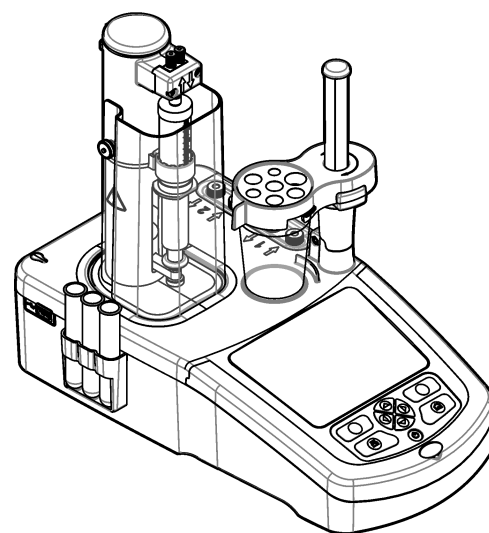
Section 1   Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions (W x D x H)	22 x 40 x 36 cm (8.7 x 15.7 x 14.2 in.)
Weight	4 kg (8.8 lb)
Power requirements	100–240 VAC, 50/60 Hz
Altitude	2,000 m (6,562 ft) maximum
Operating temperature	15 to 35 °C (59 to 95 °F)
Relative humidity	20 to 80%, non-condensing
Storage temperature	–5 to 40 °C (23 to 104 °F)
Installation category	II
Pollution degree	2
Certifications	Safety IEC/EN 61010-1; EMC IEC/EN 61326-1
Warranty	1 year (EU: 2 years)

Specifications

Section 2   General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

2.1 Safety information

N O T I C E
The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

2.1.1 Use of hazard information

⚠DANGER
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

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

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

N O T I C E
Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

⚠	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
⚡	This symbol indicates that a risk of electrical shock and/or electrocution exists.

	This symbol indicates the presence of devices sensitive to Electro-static Discharge (ESD) and indicates that care must be taken to prevent damage with the equipment.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user.

2.1.3 Certification

Canadian Radio Interference-Causing Equipment Regulation, IECS-003, Class A:

Supporting test records reside with the manufacturer.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe A répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "A" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Disconnect the equipment from its power source to verify that it is or is not the source of the interference.
2. If the equipment is connected to the same outlet as the device experiencing interference, connect the equipment to a different outlet.
3. Move the equipment away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

2.2 Product overview

The instrument operates with digital and analog sensors. Measurement applications are installed on the instrument to automate the measurement process. Instructions show on the display when user intervention is required. Refer to Figure 1 for product features.

Figure 1 Product overview
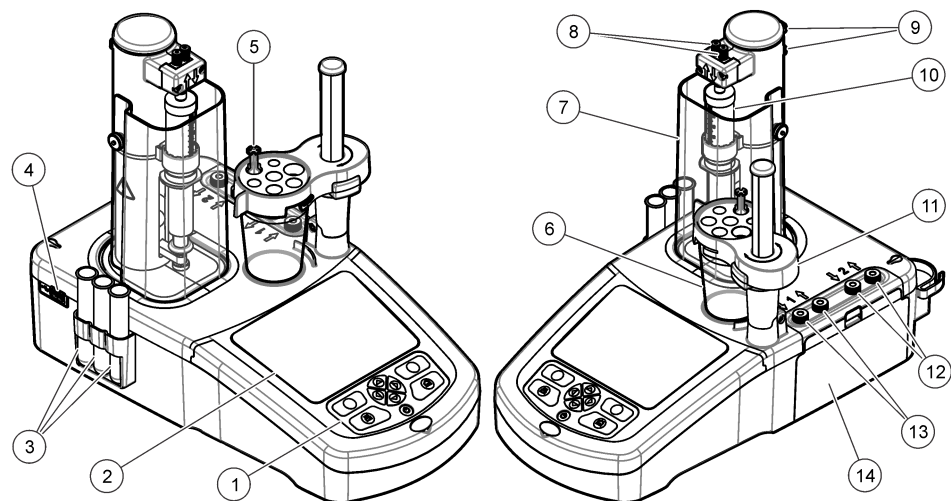
1	Keypad	6	Beaker	11	Sensor holder
2	Display	7	Syringe protection cover	12	Pump 2 input/output
3	Sensor storage tubes	8	Syringe input/output	13	Pump 1 input/output
4	USB port	9	Tube clips	14	Pump access cover
5	Tube holder	10	Syringe		

Note: Depending on the model, there will be 1 or 2 syringes and syringe input/output ports, and 0, 1 or 2 pumps. Refer to Table 1.

Table 1 Instrument configurations

Model	Syringes	Pumps
AT1102	1	0
AT1112	1	1
AT1122	1	2
AT1222	2	2

2.3 Instrument connections

Figure 2 shows the connections on the rear panel of the instrument. Use the USB port on the side of the instrument for the USB applications key supplied with the instrument. Use

the USB port on the rear of the instrument to connect to a printer, mouse, keyboard or a USB hub.

Figure 2 Instrument connections
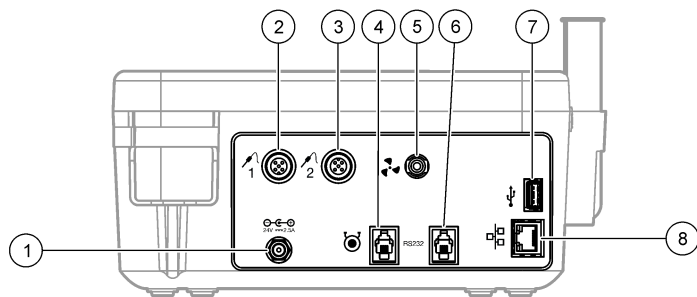
1	24 V external power supply port	**4**	External pump port	**7**	USB port
2	Sensor 1 port	**5**	External propeller port	**8**	Ethernet port
3	Sensor 2 port	**6**	Serial port		

2.4 Product components

Make sure that all components have been received. Refer to the packing list in the box. If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Figure 3 Contents of the instrument box
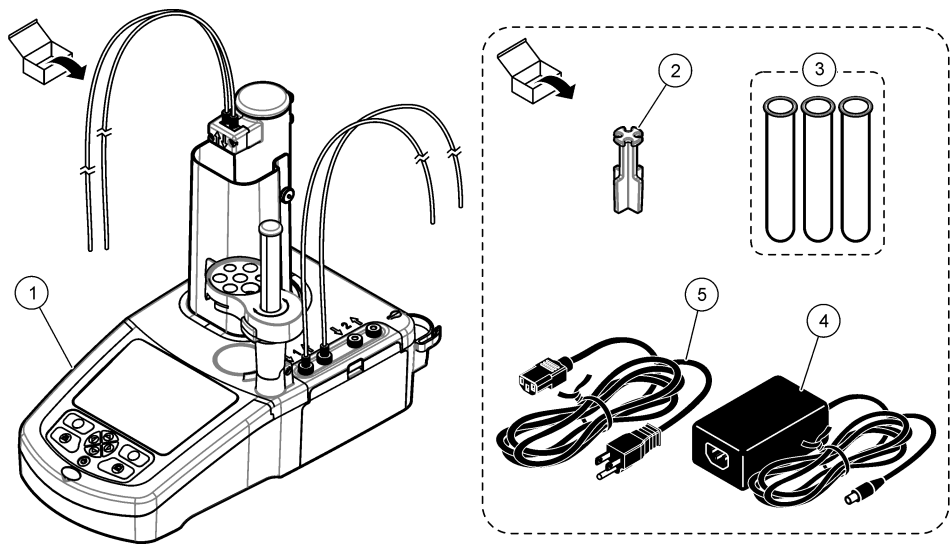
1	Instrument	**3**	Sensor storage tubes (3x)	**5**	Power cord
2	Tube holder[1]	**4**	Power supply		

---

[1] 1 for each syringe position available on the instrument

Figure 4 Contents of the application box
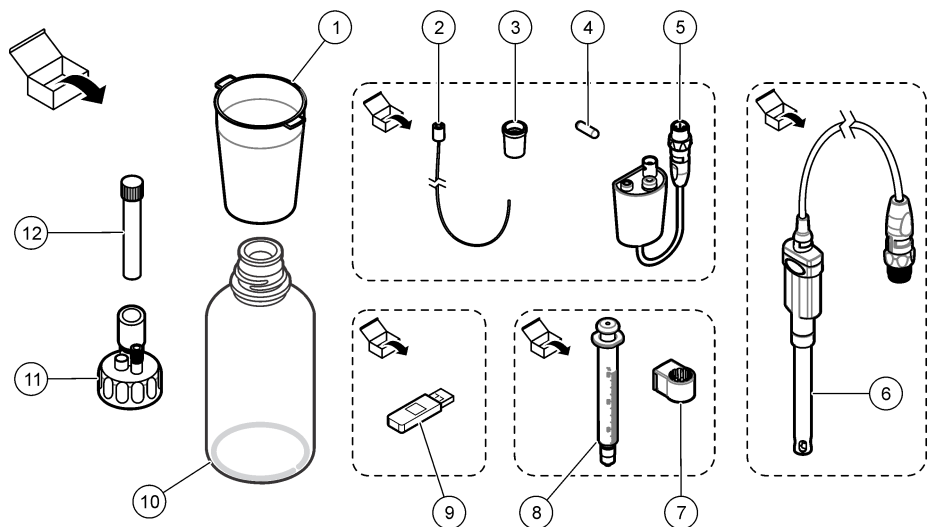
1	Beakers (10 x 50 mL and 10 x 150 mL)	**7**	Syringe holding ring[5]
2	Tube with anti-diffusion tip[2]	**8**	Syringe (refer to Table 1 on page 7 for quantity)
3	Conical adapters (2x)	**9**	USB applications key
4	Magnetic stir bars (10x)	**10**	Glass bottles[6]
5	Legacy sensor adapter[3]	**11**	Bottle caps (2 x GL45 and 1 x GL25)
6	Sensor[4]	**12**	Empty desiccant cartridges (3x)

[5] 1 for each syringe
[2] If necessary for the application
[6] Not in all application kits
[3] Not in all application kits
[4] Type and quantity depends on application

Section 3   Installation

> ## ⚠ CAUTION
>
> Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

The instrument is available in different configurations (refer to Table 1 on page 7). This manual supplies instructions for the installation of an instrument with one syringe and one pump. Adjust the installation procedure as applicable to accommodate the number of syringes and pumps in the instrument.

3.1 Installation guidelines

- This instrument is for indoor use only.
- The power supply connector on the rear panel must be easily accessible so the power can be disconnected quickly in case of emergency.
- Keep the instrument away from temperature extremes, including heaters, direct sunlight and other heat sources.
- Put the instrument on a stable and level surface in a well ventilated place.
- Make sure that there is at least 15 cm (6 in.) of space on all sides of the instrument to prevent electrical parts from overheating.
- Do not operate or keep the instrument in dusty, damp or wet locations.
- Always keep the surface of the instrument and all accessories dry and clean.

3.2 Connect to AC power

> ## ⚠ DANGER
>
> Electrocution hazard. If this equipment is used outdoors or in potentially wet locations, a Ground Fault Circuit Interrupt (GFCI/GFI) device must be used for connecting the equipment to its main power source.

> ## ⚠ CAUTION
>
> Electrical shock and fire hazards. Make sure that the supplied cord and non-locking plug meet the applicable country code requirements.

> ## ⚠ WARNING
>
> Fire hazard. Use only the power supply that is specified for this instrument.

1. Connect the power cord to the power supply.
2. Connect the power supply to the instrument. Refer to Figure 2 on page 8.
3. Connect the power cord to an electrical outlet.

3.3 Install the syringe

Before syringe installation, set the instrument power to on. Push the power button on the front of the instrument. Make sure that the startup sequence shows on the display. The syringe holder lowers to its operating position.

Note: Ignore any warning messages related to missing applications that show on the display.

The sensor holder has two positions: one over the magnetic stirrer and the second at 180° to the right. Move the sensor holder away from the instrument to the second position.

Refer to the illustrated steps that follow.

To install a second syringe, do steps 5 through 7 again.
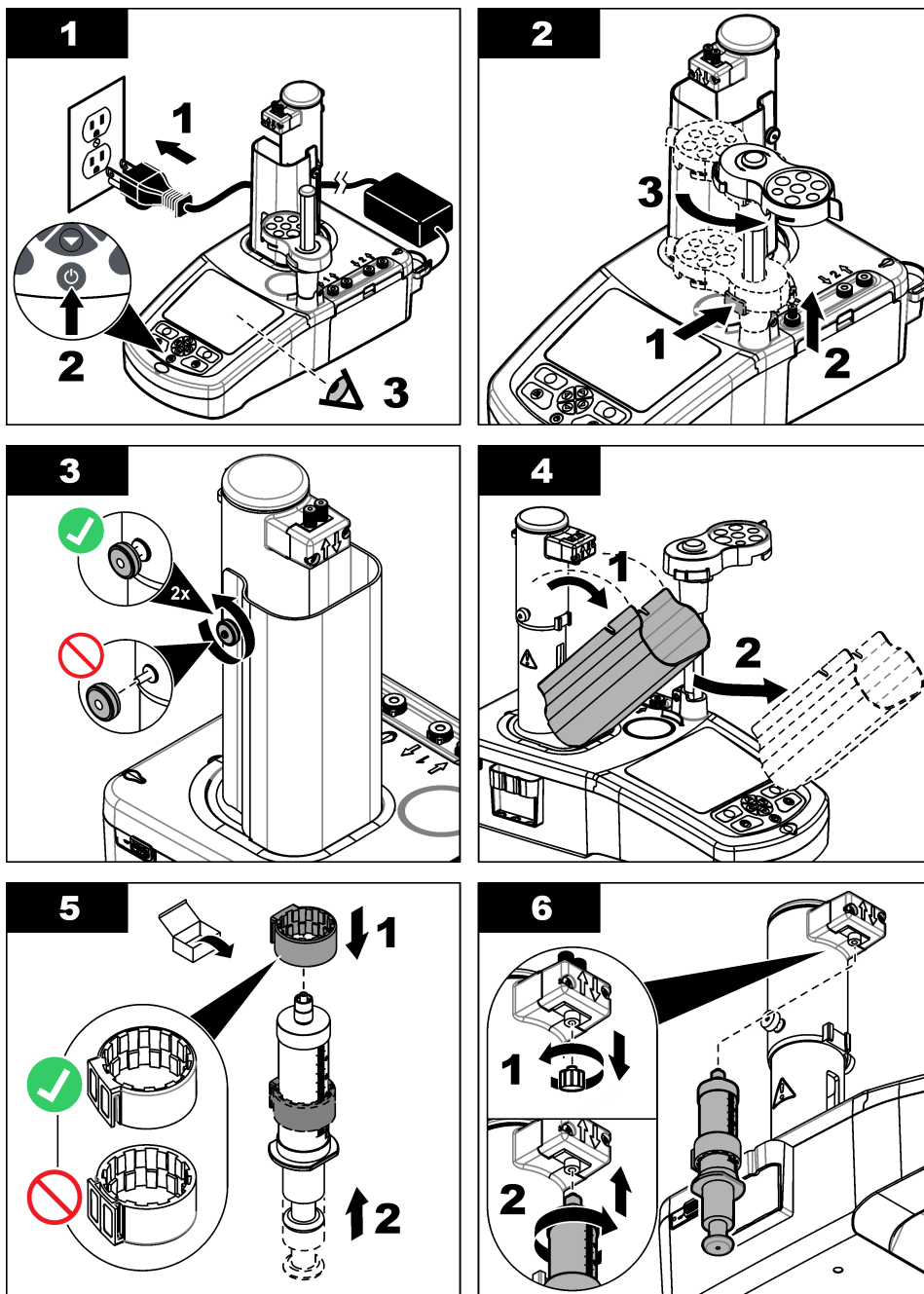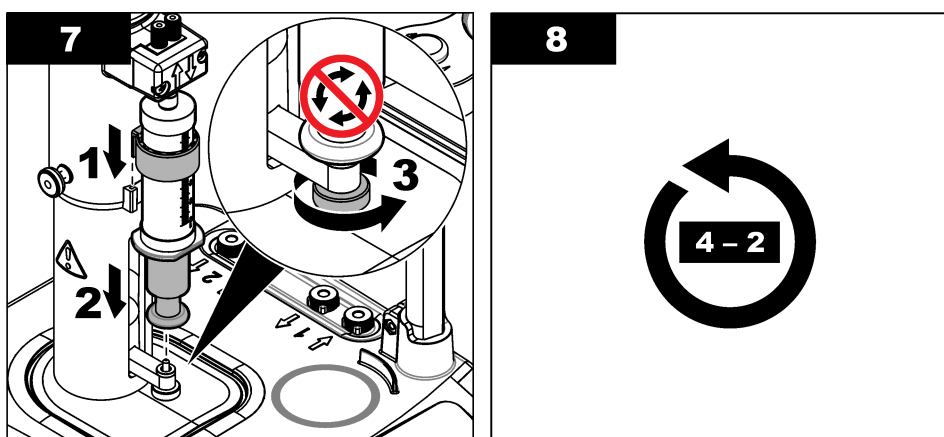
3.4 Install the sensor storage tubes

Put the three sensor storage tubes into the holder that is on the side of the instrument. Refer to Figure 1 on page 7. Keep the sensor in a storage tube when not in use.

3.5 Install the stir bar and the beaker

Add the stir bar to the beaker, and then attach the beaker to the sensor holder. Refer to the illustrated steps that follow.
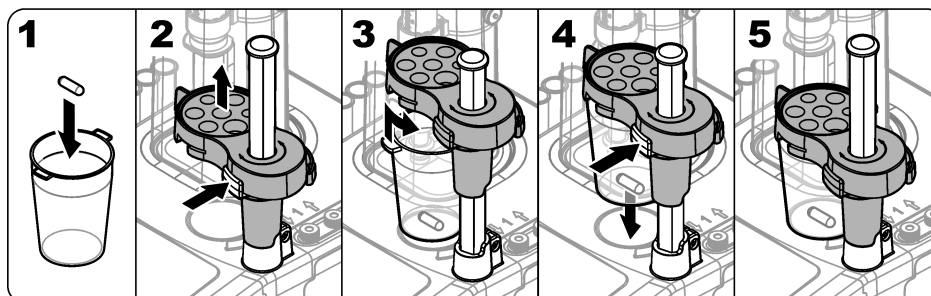
3.6 Prepare the tubes

Remove any bends in the end of the tubes. Refer to the illustrated steps that follow.
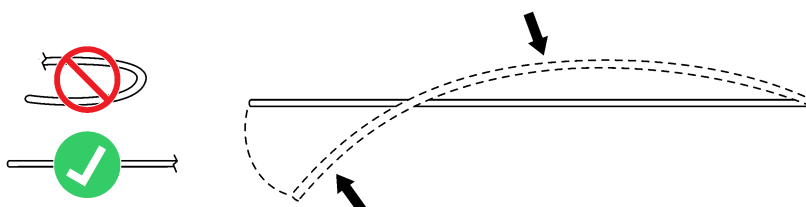
3.7 Connect the tubes

Arrow symbols identify the inlet and outlet ports for the syringe and the pump connections. The "up" arrow is the outlet port. The "down" arrow is the inlet port. Turn the tube connectors on the inlet and outlet ports of the syringe and pump until they click.

The syringe outlet tube has a blue ring on it. If anti-diffusion tips are necessary, remove the pre-installed outlet tube from the syringe and install the tube from the application kit with the pre-installed anti-diffusion tip.

Push the outlet tubes into the tube holder slots so that they are correctly attached.

Refer to the illustrated steps that follow.
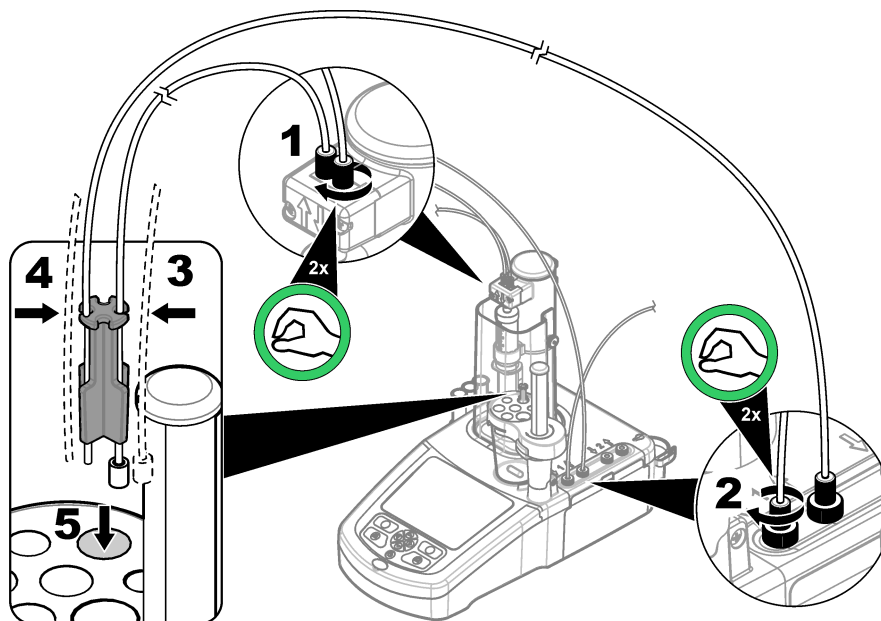
3.8 Install the sensor

3.8.1 Install the legacy adapter

Go to Connect the sensor on page 14 if no legacy adapter is included in the application kit.

1. Connect the measuring, reference and temperature sensors to the legacy adapter.
2. Connect the legacy adapter cable to a sensor socket on the rear panel of the instrument. Refer to Figure 5.

Figure 5 Install the legacy adapter
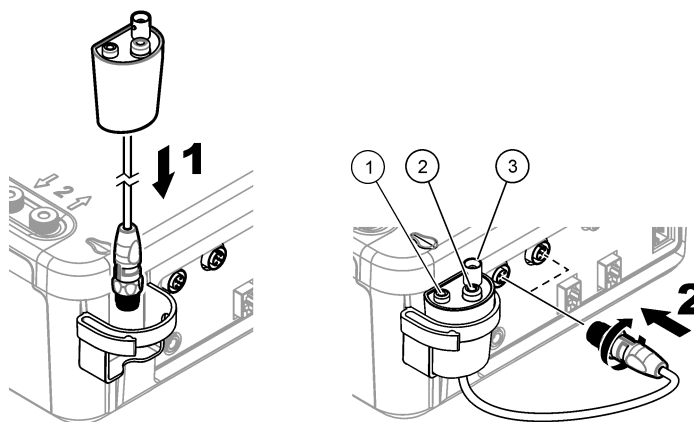
1	Temperature sensor	2	Reference sensor	3	Measuring sensor

3.8.2 Connect the sensor

Use a conical adapter to hold the sensor tightly in the sensor holder.

Connect the sensor to an available sensor port on the rear of the instrument. After the sensor is connected, make sure that the sensor icon shows in the banner at the top of the display. Refer to the illustrated steps that follow.
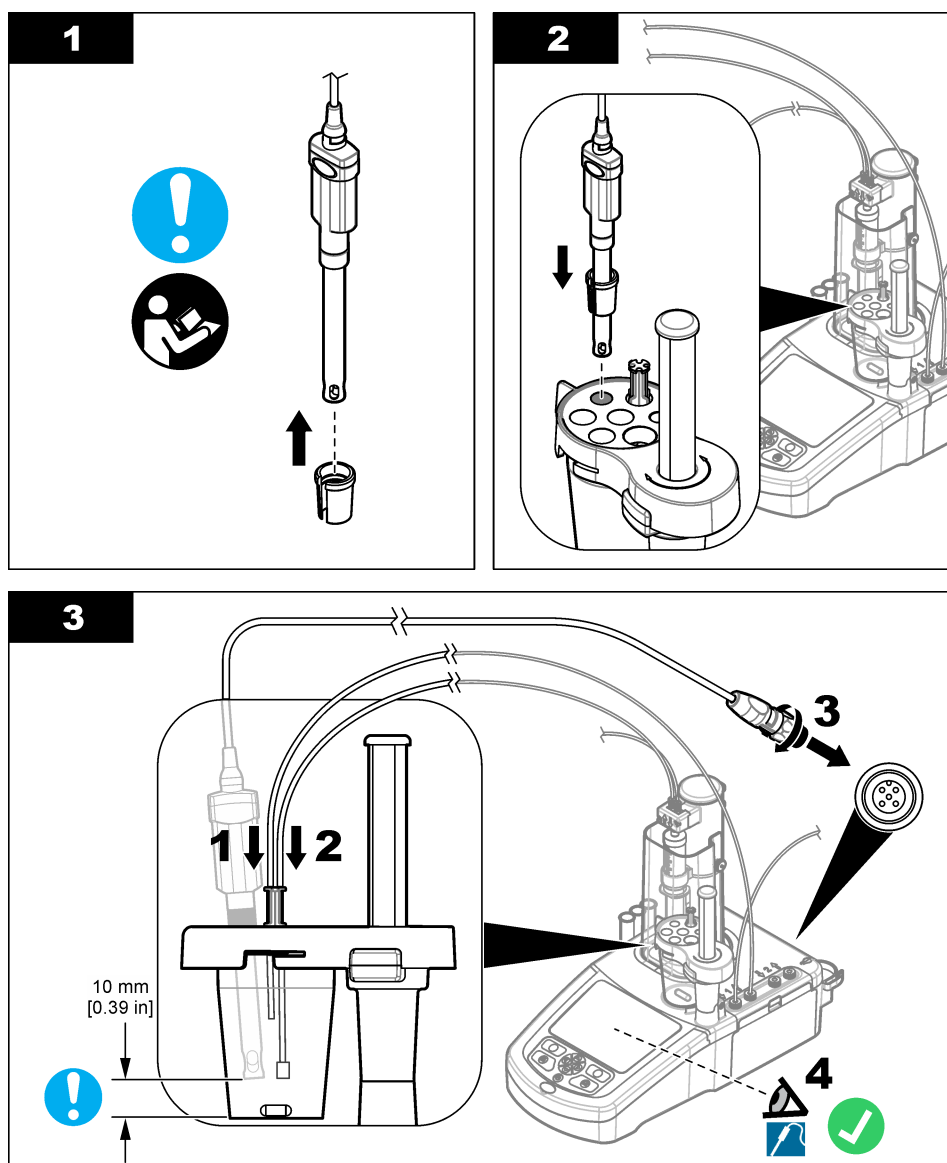
3.9 Install the titrant and the reagent

> ⚠️ **C A U T I O N**
>
> Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

Loosen the tube connector on the bottle cap.

Fill a desiccant cartridge with an applicable desiccant. Put the desiccant cartridge into the adapter on the titrant bottle cap.

Push the inlet tube through the connector. Make sure that the end of the tube is at the bottom of the bottle. Tighten the connector on the bottle cap.

Refer to the "Application Note" on the USB applications key to identify the correct pump to connect to the reagent bottle. Refer to the illustrated steps that follow.
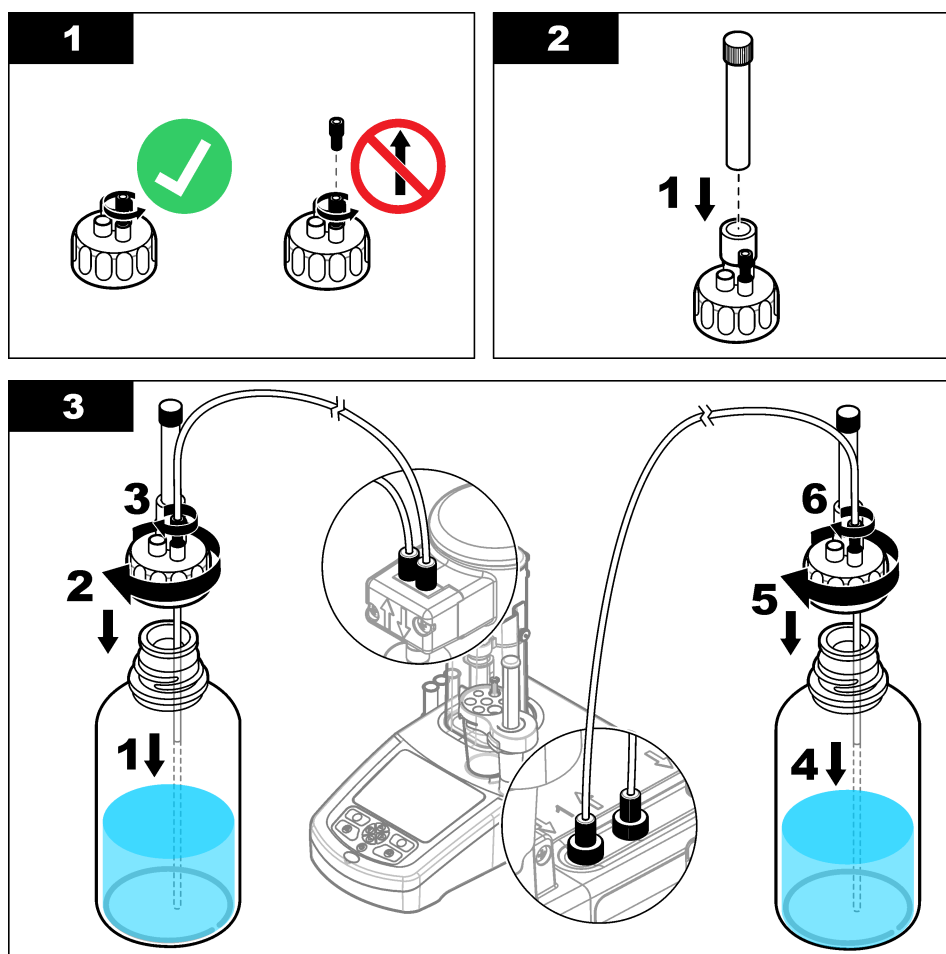
3.10 Tidy the work area

Attach the tubes to the instrument with the clips on the electrovalve and the sensor holder. Refer to the illustrated steps that follow.
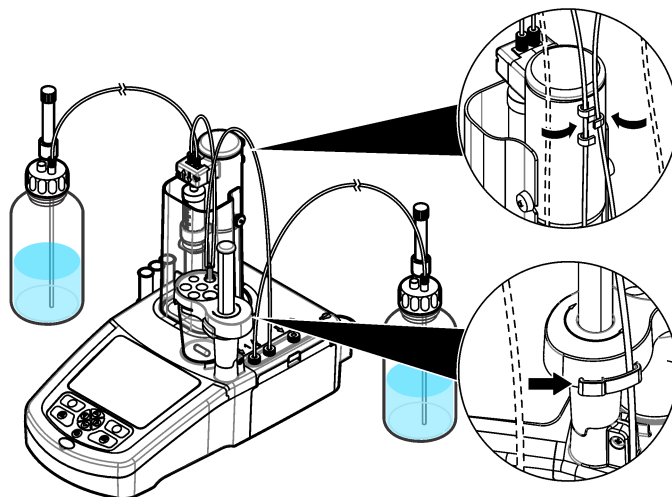
3.11 Install accessories

3.11.1 Install an external pump

This accessory (Item no. LZE142) is used to remove unwanted sample from the beaker.

1. Remove any bends in the end of the tube from the inlet port on the pump.
2. Push the tube into a tube holder slot so it is correctly attached.
3. Make sure that the end of the tube is near the bottom of the beaker.
4. Make sure that the tube from the outlet port of the pump is installed in an applicable container.
5. Connect the pump to the external pump port on the rear of the instrument (refer to Figure 2 on page 8).

3.11.2 Install an external propellor

This accessory (Item no. LZE143) is used as an alternative to the standard magnetic stir bar, for more viscous samples.

1. Install the propellor into an available slot on the sensor holder.
2. Make sure that the end of the propellor is near the bottom of the beaker.
3. Connect the propeller to the external propeller port on the rear of the instrument (refer to Figure 2 on page 8).

3.11.3 Install PC software

The optional PC software connects with the TitraLab® workstation through an Ethernet network. The software can be used to:

- Control a TitraLab® workstation to start and stop analyses
- Control a sample changer to start and stop analyses
- Control a balance for accurate sample weighing
- Show run-time data directly from the workstation
- Manage data stored locally or on a server (search, compare, delete, print, etc.)
- Export data to files for use in other software applications

Full product documentation and on-line help is available with the software.

Refer to Figure 6 for a typical PC setup that includes connections to a balance, printer, TitraLab® workstation and sample changer.

Figure 6 Typical setup that can be used with the PC software
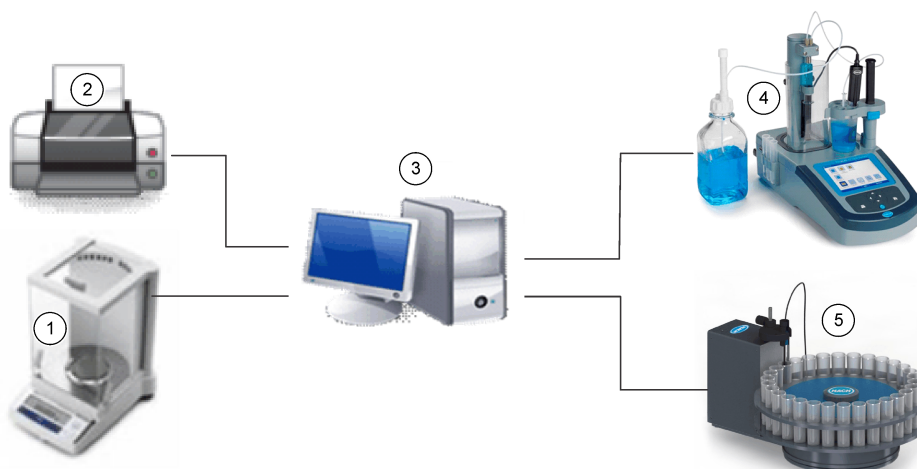
1	Balance for weighing the sample	4	TitraLab® workstation
2	Printer	5	Sample changer
3	Computer with PC software installed		

Section 4 User interface and navigation

4.1 Keypad

Figure 7 shows the keypad and gives the key functions.

Figure 7 Keypad
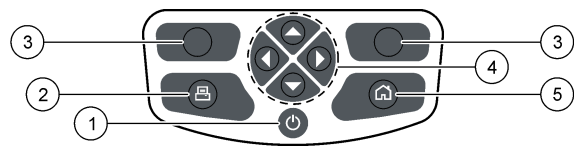
1 Power	4 Navigation keys
2 Printer	5 Home
3 Selection keys	

Key	Description
Power	Sets the instrument power to on or off. Push the key for 2 seconds to set the power to off.
Printer	Sends data to an attached printer. The printer key only operates if a printer is connected to the instrument.
Selection keys (contextual)	Shows the measurement options, selection and confirmation options. Use this key to exit the current menu display or open sub-menus. Available options show on the display above each key.
Navigation keys	Scrolls through menus and data, enter numbers and letters, enter checkbox settings and set options for the syringe and the pump.
Home	Goes to the main menu.

User interface and navigation

Section 5 Startup

<table>
<tr><td>⚠</td><td>⚠CAUTION

Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.</td></tr>
</table>

<table>
<tr><td>⚠CAUTION</td></tr>
<tr><td>Personal injury hazard. Never use the instrument without the syringe cover installed.</td></tr>
</table>

5.1 Configure the instrument

1. From the main menu, select ⚙ **Settings**.
2. Select an option, then push **Select**.

Option	Description
Applications	Exports, changes (refer to Change the application settings on page 21), removes and makes copies of application data. Make sure that the duplication function does not make more than five applications for each syringe installed.
Operators	Adds, changes and removes operators.
Date + Time	Sets the instrument date and time.
Brightness	Sets the brightness of the display.
Sounds	Sets the sound options.
Language	Sets the language.
Network	Give a name to the instrument. This name is used to connect the instrument to a PC. Restart the instrument if the name is changed.
Legacy settings	Specify the sensor data when the legacy adapter is used.
Info	Shows information about the instrument and the attached hardware.
Restore Defaults	Sets the instrument to the default configuration.
Options	Sets the application parameters view to expert mode (refer to Change the application settings on page 21). When the instrument is set to off, sets the syringe to empty into the titrant bottle. Changes the temperature display unit. Prints the measurement and derivative curves if a printer is connected. *Note: When the instrument is set to on, the application parameters view is always set to basic mode. Changes made to application data with the instrument in expert mode are kept.*

3. Push **Back**.

5.1.1 Change the application settings

<table>
<tr><td>NOTICE</td></tr>
<tr><td>The applications installed on the instrument have been pre-defined to optimize the measurement process. Changing these default application parameters will have an effect on the measurement process and measurement results. Only qualified personnel should change these parameters or use the instrument in expert mode.</td></tr>
</table>

Note: The parameters available for change will vary depending on the instrument configuration and the application being edited.

1. From the main menu, select ⚙ **Settings**.
2. Select **Applications** followed by **Edit**.
3. Choose an application to change from the installed list and then push **Edit**.
4. Push the arrow keys to scroll through the application parameters. The **Edit** key is only available when a parameter can be changed.
   Note: Push the left and right arrow keys to go to the previous or next parameter group.
5. Push **Edit** to change the parameter. Enter the new details or select from a list.
   Note: A description of the selected parameter is shown on the bottom of the display.

Refer to the following tables for the parameters that can be changed in basic and expert mode.

Note: The parameters marked with an "x" are available for change.

Table 2 Application parameters

Parameter	Description	Basic mode	Expert mode
Name	Application name	x	x
Advisable syringe	Recommended syringe for the application		

Table 3 Sample parameters

Parameter	Description	Basic mode	Expert mode
Name	Sample name	x	x
Amount	Sample amount	x	x
Unit	Sample unit		x
Minimum amount	Minimum accepted sample amount	x	x
Maximum amount	Maximum accepted sample amount	x	x
Resolution	Number of decimals to show		x

Table 4 QC parameters

Parameter	Description	Basic mode	Expert mode
Name	QC name	x	x

Table 5 Blank parameters

Parameter	Description	Basic mode	Expert mode
Description	Blank description	x	x

Table 6 Probe parameters

Parameter	Description	Basic mode	Expert mode
Type	Type of measurement probe		
Part of name	Part of the name used to identify matching electrodes if the preferred electrode is not connected		
Recommended probe	Recommended probe for the application		x
Calibration frequency	Recommended frequency to calibrate the probe	x	x
Stability criterion	The recommended value is shown in the related application note		x
Maximum stability time	Maximum time to wait for the measurement to become stable		x
Stirring speed	Stirring speed during the calibration	x	x

Table 6 Probe parameters (continued)

Parameter	Description	Basic mode	Expert mode
Minimum slope	For pH probes, the minimum accepted slope value for the calibration		x
Maximum slope	For pH probes, the maximum accepted slope value for the calibration		x
Minimum offset	For pH probes, the minimum accepted offset value for the calibration		x
Maximum offset	For pH probes, the maximum accepted offset value for the calibration		x
Maximum temperature variation	Maximum accepted temperature variation value for the calibration		
Buffer set	For pH probes, define the buffer set to be used for calibration	x	x
Working mode	Specify if the probe is to be used in imposed voltage (AC or DC)		x
Imposed current	Set the value of the imposed current		x
Imposed voltage	Set the value of the imposed voltage		x
Probe settling time	Time to wait for the measurement to become stable before a titration starts		x
Calibration mode	Set the calibration mode		x
Standard	For conductivity probes, define the standard to be used for calibration	x	x
Minimum cell constant	For conductivity probes, the minimum accepted cell constant for the calibration		x
Maximum cell constant	For conductivity probes, the maximum accepted cell constant for the calibration		x
Temperature compensation	For conductivity probes, set the temperature compensation method		x

Table 7 Titrant parameters

Parameter	Description	Basic mode	Expert mode
Name	Titrant name		x
Titrant concentration	Nominal titrant concentration		x
Resolution	Number of decimals to show		x
Unit	Titrant unit		x
Real concentration	Actual concentration of the titrant that is used in measurement calculation	x	x
Resolution	Number of decimals to show		x
Location[7]	The syringe connected to the titrant bottle	x	x
Calibration frequency	Recommended frequency to calibrate the titrant	x	x
Stirring speed	Stirring speed during the titration	x	x
Predose	Volume of titrant added at the start of the calibration		x

---

[7] Can only be changed if more than one syringe is installed.

Table 7 Titrant parameters (continued)

Parameter	Description	Basic mode	Expert mode
Delay	Stirring time before the calibration starts		x
Maximum volume stop point	The calibration stops when this volume is reached		x
Ordinate stop point	The calibration stops when this ordinate is reached		x
Stop on last EQP	The calibration stops when the last equivalent point is found		x
Minimum ordinate	Reserved for technical support		x
Maximum ordinate	Reserved for technical support		x
Minimum stability time	Minimum time after an incremental addition		x
Maximum stability time	Maximum time after an incremental addition		x
Stability criterion	Stability criterion after the increment addition		x
Minimum increment size	Minimum increment volume		x
Maximum increment size	Maximum increment volume		x
Maximum abscissa	Reserved for technical support		x
Derivative filter	Reserved for technical support		x
Curve filter	Reserved for technical support		x
Curvature filter	Reserved for technical support		x
Detection threshold	Reserved for technical support		x
Linearity threshold	Reserved for technical support		x
Curvature sign	Reserved for technical support		x
EQP minimum ordinate	Minimum value for the equivalence point		x
EQP maximum ordinate	Maximum value for the equivalence point		x
EQP 1 minimum ordinate	Minimum value for the equivalence point		x
EQP 1 maximum ordinate	Maximum value for the equivalence point		x
Titrant volume calculation	Volume calculation mode for multiple EQPs		x
Maximum resolution	Maximum number of decimals to show for the titer		x
R1 limit check	Specify if the sample result is checked to be within the accepted boundaries		x
Minimum titer	Minimum value of the actual titer		x
Maximum titer	Maximum value of the actual titer		x
Result 1 EQP index	Index of the equivalent point used to calculate the result		x
Standard name	Define the standard to be used for calibration		x
Standard amount	Quantity of standard to be used for calibration		x
Unit	Unit for the standard		x
Minimum amount	Minimum amount of standard to be used for calibration		x
Maximum amount	Minimum amount of standard to be used for calibration		x
Concentration	Concentration value of the standard	x	x
Unit	Concentration value unit		x

Table 7 Titrant parameters (continued)

Parameter	Description	Basic mode	Expert mode
Resolution	Number of decimals to show for the concentration value of the standard		x
Standard equivalents	Number of exchanged equivalents of the standard		x
Titrant equivalents	Number of exchanged equivalents of the titrant		x
Molar weight	Molar weight of the standard		x

Table 8 Leveling parameters

Parameter	Description	Basic mode	Expert mode
Active	Specify if the method should be used during the analysis	x	x
Time	Time the pump is active	x	x

Table 9 Sample preparation and addition parameters

Parameter	Description	Basic mode	Expert mode
Active	Specify if the method should be used during the analysis	x	x
Message	Information shown during the analysis		
Reagent	Name of the reagent to add	x	x
Pump ID	The pump connected to the reagent bottle		x
Time	Time the method is active	x	x
Stirring speed	Stirring speed while the method is active	x	x

Table 10 Titration parameters

Parameter	Description	Basic mode	Expert mode
Active	Specify if the method should be used during the analysis	x	x
Stirring speed	Stirring speed during the titration	x	x
Measured parameter	Parameter measured by the probe		
Predose	Volume of titrant added at the start of the titration	x	x
Delay	Stirring time before the titration starts	x	x
Addition mode	Specify how the titrant is added		x
Minimum ordinate	Reserved for technical support		x
Maximum ordinate	Reserved for technical support		x
Maximum volume stop point	The titration stops when this volume is reached		x
Ordinate stop point	The titration stops when this ordinate is reached		x
Stop on last EQP	The titration stops when the last equivalent point is found		x
Minimum angle	Reserved for technical support		x
Maximum angle	Reserved for technical support		x
Minimum stability time	Minimum time after an incremental addition		x
Maximum stability time	Maximum time after an incremental addition		x
Stability criterion	Stability criterion after the increment addition		x

Table 10 Titration parameters (continued)

Parameter	Description	Basic mode	Expert mode
Minimum increment size	Minimum increment volume when the working mode is dynamic		x
Maximum increment size	Maximum increment volume when the working mode is dynamic		x
Increment size	Size of the increment when the working mode is monotonic		x
Equivalence point #1	Set the ordinate for equivalence point 1		x
Equivalence point #2	Set the ordinate for equivalence point 2		x
Titrant volume calculation	Define the titrant volume calculation mode for multiple equivalence points		x
Back titration mode	Define the mode of the excess titrant addition		x
Excess volume	Define the volume of excess titrant to add	x	x
Resolution	Number of decimals to show for the volume of excess titrant		x
Excess volume unit	Excess volume unit		
Titrant name	Name of the excess titrant		x
Titrant concentration	Concentration of the excess titrant		x
Resolution	Number of decimals to show for the concentration of excess titrant		x
Titrant concentration unit	Titrant concentration unit		x
Real concentration of excess	Actual concentration of the excess titrant		x
Excess equivalents	Number of exchanged equivalents of the excess titrant		x
Sample equivalents	Number of exchanged equivalents of the sample		x
Titrant equivalents	Number of exchanged equivalents of the titrant		x
Maximum abscissa	Reserved for technical support		x
Derivative filter	Number of points to use when calculating the derivative		x
Curve filter	Reserved for technical support		x
Curvature filter	Reserved for technical support		x
Detection threshold	Reserved for technical support		x
Linearity threshold	Reserved for technical support		x
Curvature sign	Reserved for technical support		x
EQP minimum ordinate	Minimum value for the equivalence point		x
EQP maximum ordinate	Maximum value for the equivalence point		x
EQP 1 minimum ordinate	Minimum value for the equivalence point		x
EQP 1 maximum ordinate	Maximum value for the equivalence point		x
Result 1 (R1) name	Result name	x	x
R1 maximum resolution	Maximum number of decimals to show for the result	x	x
R1 hide	Specify if the result is shown or not shown on the display	x	x
R1 limit check	Specify if the sample result is checked to be within the accepted boundaries		x
R1 minimum	Minimum accepted result value	x	x
R1 maximum	Maximum accepted result value	x	x

Table 10 Titration parameters (continued)

Parameter	Description	Basic mode	Expert mode
R1 QC minimum	Minimum accepted QC result value	x	x
R1 QC maximum	Maximum accepted QC result value	x	x
R1 unit	Result unit		x
R1 EQP index	Index of the equivalent point used to calculate the result		x
R1 molar weight	Molar weight of the analyte used to calculate the result		x
R1 sample equivalent	Number of exchanged equivalents of the sample		x
R1 titrants equivalent	Number of exchanged equivalents of the titrant		x
Result 2 (R2) name	Result name	x	x
R2 maximum resolution	Maximum number of decimals to show for the result	x	x
R2 hide	Specify if the result is shown or not shown on the display	x	x
R2 limit check	Specify if the sample result is checked to be within the accepted boundaries	x	x
R2 minimum	Minimum accepted result value	x	x
R2 maximum	Maximum accepted result value	x	x
R2 QC minimum	Minimum accepted QC result value	x	x
R2 QC maximum	Maximum accepted QC result value	x	x
R2 equation	The equation used to calculate the result		
R2 unit	Result unit		x
R2 user value	Specify the value that can be used in the equation computation		x
R2 EQP index	Index of the equivalent point used to calculate the result		x
R2 molar weight	Molar weight of the analyte used to calculate the result		x
R2 sample equivalent	Number of exchanged equivalents of the sample		x
R2 titrants equivalent	Number of exchanged equivalents of the titrant		x
Result 3 (R3) name	Result name	x	x
R3 maximum resolution	Maximum number of decimals to show for the result	x	x
R3 hide	Specify if the result is shown or not shown on the display	x	x
R3 limit check	Specify if the sample result is checked to be within the accepted boundaries	x	x
R3 minimum	Minimum accepted result value	x	x
R3 maximum	Maximum accepted result value	x	x
R3 QC minimum	Minimum accepted QC result value	x	x
R3 QC maximum	Maximum accepted QC result value	x	x
R3 equation	The equation used to calculate the result		
R3 unit	Result unit	x	x
R3 user value	Specify the value that can be used in the equation computation		x
Result 4 (R4) name	Result name	x	x
R4 maximum resolution	Maximum number of decimals to show for the result	x	x
R4 hide	Specify if the result is shown or not shown on the display	x	x

Table 10 Titration parameters (continued)

Parameter	Description	Basic mode	Expert mode
R4 limit check	Specify if the sample result is checked to be within the accepted boundaries	x	x
R4 minimum	Minimum accepted result value	x	x
R4 maximum	Maximum accepted result value	x	x
R4 QC minimum	Minimum accepted QC result value	x	x
R4 QC maximum	Maximum accepted QC result value	x	x
R4 equation	The equation used to calculate the result		
R4 unit	Result unit	x	x
R4 user value	Specify the value that can be used in the equation computation		x
Result 5 (R5) name	Result name	x	x
R5 maximum resolution	Maximum number of decimals to show for the result	x	x
R5 hide	Specify if the result is shown or not shown on the display	x	x
R5 limit check	Specify if the sample result is checked to be within the accepted boundaries	x	x
R5 minimum	Minimum accepted result value	x	x
R5 maximum	Maximum accepted result value	x	x
R5 QC minimum	Minimum accepted QC result value	x	x
R5 QC maximum	Maximum accepted QC result value	x	x
R5 equation	The equation used to calculate the result		
R5 unit	Result unit	x	x
R5 user value	Specify the value that can be used in the equation computation		x

5.2 Install the applications

Use the supplied USB key to install the applications. The instrument can install a maximum of five applications for each syringe installed. For two syringes, the installed applications shown on the top line of the display refer to syringe one and the installed applications shown on the second line refer to syringe two. If any errors occur during installation, refer to

1. Push **Home** to go to the main menu.
2. Connect the USB key to the USB port on the side of the instrument. The applications on the USB key show on the display.
3. Push the arrow keys to highlight and select an application to install. Push the left or right arrow key to select it. Do this step again to select additional applications to install.
4. Push **Import** to install the selected applications.
5. Push **OK** to complete the installation. The installed applications show on the main menu.
   *Note: To install more applications, push **Home** to go to the main menu, then remove the USB key and reconnect it.*

5.3 Prepare the instrument for measurement

1. From the main menu, select 🕽 **Purge**, then push **Start**. All attached devices are listed.
2. Select **All elements** to purge all the attached devices, or select one device to purge. Push **Select**. Air is removed from the device and filled with liquid from the bottle.
3. Push **OK** when the operation has completed.
4. Make sure that there are no air bubbles in the device. Do step 2 again if there are any air bubbles.
5. Select the next device to purge if individual devices are being selected.
6. Push **Exit** when all the tubes are filled with reagent and the device has no air bubbles.
   Note: If a few small air bubbles can be seen on the inner wall and/or piston of the syringe, they can be left without effecting system performance.

Section 6   Standard operations

> ## ⚠ CAUTION
> Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

> ## ⚠ CAUTION
> Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

> ## ⚠ CAUTION
> Personal injury hazard. Never use the instrument without the syringe protection cover in place.

> ## ⚠ CAUTION
> Chemical exposure hazard. Never remove the stir bar from the beaker before the end of a titration.

6.1 Get a sample measurement

Use this option to get sample measurements with one of the installed applications.

1. From the main menu, select the measurement application, then push **Start**. Application information shows on the display.
2. Read the related "Application Note" from the USB applications key for more instructions.
3. If necessary, select an icon for more information or to change some data.
4. Fill a beaker with the recommended sample amount that shows on the display. If necessary, add sufficient deionized water to make sure the sensor is correctly installed in the sample.
5. Carefully put a magnetic stir bar into the beaker. Make sure there is no liquid spill.
6. Attach the beaker to the sensor holder.
7. Make sure that the icon at the bottom of the display ✓ is highlighted. Do the instructions that show on the display adjacent to this icon. Refer to Connect the sensor on page 14 to make sure that the tubes and sensor are correctly aligned.
8. Push **Start** to start the measurement. Measurement data shows on the display.
9. If the default stirring speed needs to be adjusted, push the up and down arrow keys to increase or decrease the speed.
10. If the options are available during the measurement procedure, push **Skip** to ignore the current step or push **Stop** to abort the measurement.
11. When the measurement is complete, push the arrow keys to see the different measurement views.

12. Push **Next** for the options that follow:

Option	Description
Replicate sample	Use this option to start the same titration on the same sample. This is used to study the repeatability by successively analyzing several parts of the same sample. At the end of each measurement, a window shows the average value, the standard deviation and the relative standard deviation.
New sample	Use this option to start the same titration on a new sample. No standard deviation or relative standard deviation measurements will be done.

13. Push **Exit** to go back to the main menu.

6.2 Manage the data log

To select data to view, delete or export, specify data filters

1. From the main menu, select 🗀 **Data log**.

2. Select an option, then push **Select**.

Option	Description
View data log	Views measurement data. Select individual lines of data to view more content.
Export data log	Exports measurement data from the system to an external device. Preview data selection before it is exported. Make sure that an external device is connected to the instrument (e.g., a USB key, external hard drive, etc.).
Delete data log	Removes measurement data from the system. Previews data selection before it is removed.

3. Specify the data extraction parameters. Push the left and right arrow keys to make a selection. Push the up and down arrow keys to select an option.

Option	Description
Result type	Sets the type of result available.
Application	Sets the available applications.
Date	Sets the date range.
Operator	Sets the available operators.

6.3 Calibration

6.3.1 Calibrate the sensor

1. From the main menu, select 🗠 **Calibration**, then push **Electrode calibration**.

2. If more than one sensor is installed, push the arrow keys to highlight the sensor to calibrate, then push **Select**.

3. If more than one application includes calibration parameters for the sensor, push the arrow keys to choose the application, then push **Select**. Application information shows on the display.

4. If necessary, select an icon for more information or to change some data.

5. Do the instructions that show on the display, then push **Start** to start the calibration. Calibration data shows on the display.

6. If the default stirring speed needs to be adjusted, push the up and down arrow keys to increase or decrease the speed.

7. When the calibration is complete, push the arrow keys to see the different measurement views.

8. Push **Yes** to continue with the next calibration buffer solution.

9. When the calibration is complete, push **Yes** to accept the calibration or **No** to reject.

10. Push **Exit** to go back to the main menu.

6.3.2 Calibrate the titrant

1. From the main menu, select ![icon] **Calibration**, then push **Titrant calibration**. Related information shows on the display.

2. If necessary, select an icon for more information or to change some data.

3. Do the instructions that show on the display, then push **Start** to start the calibration. Calibration data shows on the display.

4. If the default stirring speed needs to be adjusted, push the up and down arrow keys to increase or decrease the speed.

5. When the calibration is complete, push the arrow keys to see the different measurement views.

6. Push **Continue** to continue with the calibration.

7. When the calibration is complete, push **Yes** to accept the calibration or **No** to reject.

8. Push **Exit** to go back to the main menu.

6.4 Purge

Use this procedure to remove air bubbles from the system. Refer to Prepare the instrument for measurement on page 29 for instructions.

Section 7 Maintenance

<div style="background-color: yellow;">

⚠ CAUTION

</div>

Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

NOTICE

Do not disassemble the instrument for maintenance. If the internal components must be cleaned or repaired, contact the manufacturer.

7.1 Maintenance schedule

Table 11 shows the recommended schedule of maintenance tasks. Facility requirements and operating conditions may increase the frequency of some tasks.

Table 11 Maintenance schedule

Task	1 day	7 days	12 months
Clean the instrument on page 35.	x		
Clean the sensor on page 35.		x	
Replace desiccant cartridge contents on page 36.		x	
Replace the syringe. Refer to Syringe replacement on page 37.			x
Replace syringe electro-valve block. Refer to Replace syringe electro-valve block on page 36.			x
Examine the syringe connections and inlet and outlet tubes for leaks and damage. Replace as necessary. Refer to Replacement parts and accessories on page 43 for part numbers.			x
Replace the pump cassettes. Refer to Pump cassette replacement on page 37.			x
Examine the pump connections and inlet and outlet tubes for leaks and damage. Replace as necessary. Refer to Replacement parts and accessories on page 43 for part numbers.			x
Examine the bottle caps and connections for leaks and damage. Replace as necessary. Refer to Replacement parts and accessories on page 43 for part numbers.			x

7.2 Clean the instrument

NOTICE

Never use flammable or corrosive solvents to clean any part of the instrument. Use of these solvents can degrade the environmental protection of the instrument and may void the warranty.

Clean the exterior surface with a moist cloth or with a mixture of water and mild detergent. Dry with a soft cloth.

7.3 Clean the sensor

PtPt sensors have a cleaning procedure included in the software (refer to Other maintenance options on page 38). Use this option to clean a PtPt sensor. Use a beaker with a magnetic stir bar for all the cleaning liquids. Attach the beaker to the sensor holder. Obey the instructions on the display.

For other sensors, obey the cleaning instructions given in the documentation supplied with the sensor.

7.4 Replace desiccant cartridge contents

It is recommended to replace the desiccant cartridge contents weekly, but this will vary depending on the humidity of the laboratory. A humidity indicator, such as color changing silica gel crystal, can be used to show when replacement is necessary.
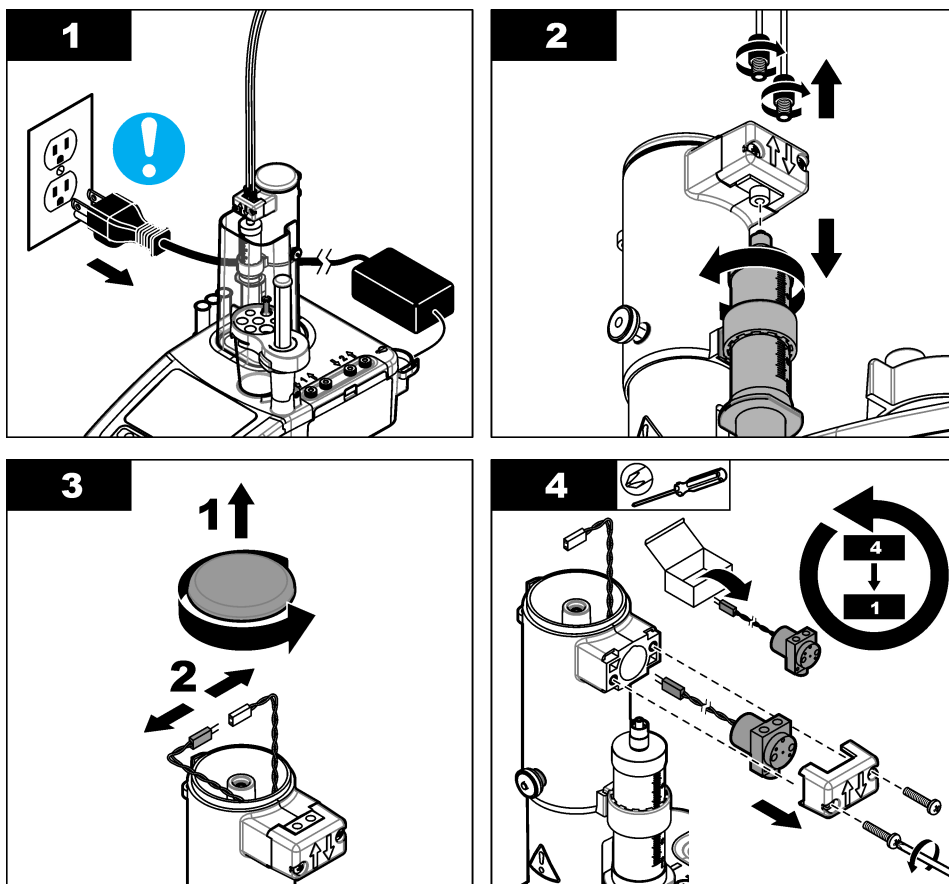
7.5 Replace syringe electro-valve block

⚠️ **DANGER**

Electrocution hazard. Remove power from the instrument before this procedure is started.

NOTICE

It is recommended that this procedure is only done by a qualified service engineer.

Refer to the illustrated steps that follow.

7.6 Maintenance menu

Select ⚒ **Maintenance** from the main menu.

7.6.1 Syringe activation

Do a check of the syringe. Make sure the syringe fills and empties correctly.

1. From the maintenance menu, push **Syringe activation**.

Option	Description
Fill	Fills the syringe with titrant solution. The process stops automatically when the syringe is full.
Empty to bottle	Discards the contents of the syringe into the titrant bottle.
Empty to beaker	Discards the contents of the syringe into the beaker. Make sure that the tube from the outlet port of the syringe is inside the beaker.
Stop	Stops the operation.

2. If a second syringe is installed, push **Toggle** to change to the second syringe.

7.6.2 Pump activation

This option only applies to instruments with pumps installed. Do a check of the pump. Make sure the pump fills and empties correctly.

1. From the maintenance menu, push **Pump activation**.

Option	Description
Start	Starts the pump. The reagent is pumped through the tubes into the beaker. Make sure that the tube from the outlet port of the pump is in the beaker.
Stop	Stops the operation.

2. If more than one pump is installed, push **Toggle** to change to another pump.

7.6.3 Syringe replacement

To replace the syringe, select **Syringe replacement** from the maintenance menu. Obey the instructions on the display. Refer to Install the syringe on page 11.

7.6.4 Pump cassette replacement

> ⚠ **DANGER**
>
> ⚡ Electrocution hazard. Remove power from the instrument before this procedure is started.

This option only applies to instruments with pumps installed.
To replace the pump cassette, refer to the illustrated steps that follow and obey the instructions on the display.
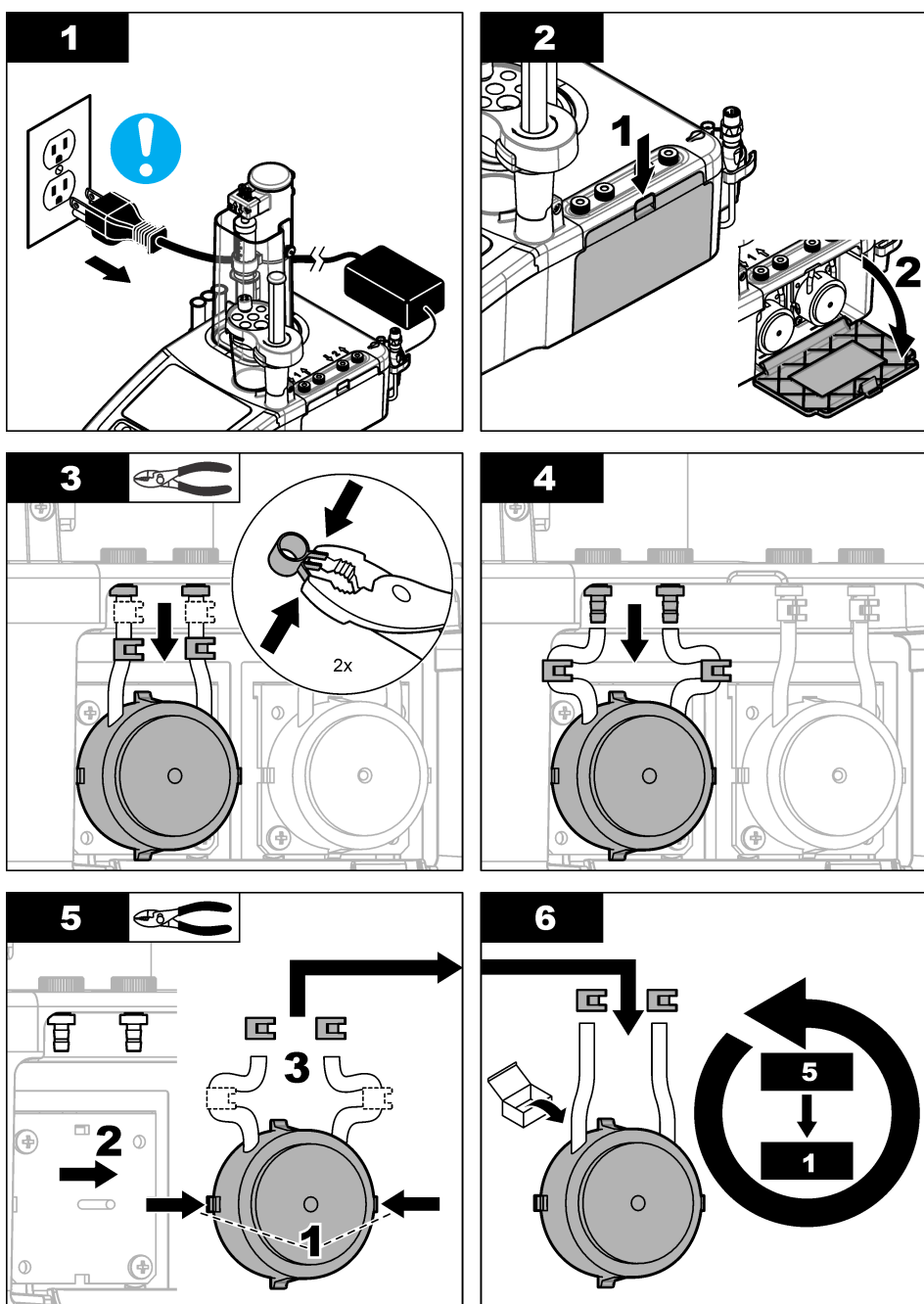
7.6.5 Other maintenance options

1. Select an option, then push **Select**.

Option	Description
Stirring activation	Do a check of the magnetic stirrer. Push the up and down arrow keys to increase or decrease the stirring speed.
Live measure	This option is not available for all sensors. The option shows continuous measurement data with connected sensors to quickly check measurements. The installed applications and the automatic additions to the sample are set to off. Continuous measurements are not temperature compensated, so measurement differences may occur in the same sample between continuous measurements and measurements that use installed applications with temperature compensation.

Option	Description
Maintenance summary	See the number of days remaining for maintenance tasks. After doing a task, push **Reset** to set the number of days remaining to the default value.
Maintenance schedule	See the list of maintenance tasks. Push **Edit** to change the default value.
Reagent replacement	Use this option to replace the reagents. Obey the instructions on the display.

7.7 Storage and transportation

7.7.1 Prepare the instrument for short-term storage

1. Push the power button for 2 seconds to set the power to off. The contents of the syringe drain back into the titrant bottle.
2. Drain the used beakers, then clean the beakers with deionized water.
3. Rinse the sensor with deionized water. Put the sensor in a storage tube that contains a storage solution. Refer to the sensor documentation for storage instructions.

7.7.2 Prepare the instrument for long-term storage

1. Push the power button for 2 seconds to set the power to off. The contents of the syringe drain back into the titrant bottle.
2. Drain the used beakers, then clean the beakers with deionized water.
3. Remove the tubes from the titrant bottles and the reagent bottles. Seal the bottles with the original bottle caps.
4. Flush the syringe and pump tubes with deionized water or an applicable cleaning solution.
5. Rinse the sensor with deionized water. Put the sensor in a storage tube that holds a storage solution. Refer to the sensor documentation for storage instructions.

7.7.3 Prepare the instrument for shipment

1. Refer to Prepare the instrument for long-term storage on page 39.
2. Put the instrument and the necessary accessories in a package with all the packaging materials.
3. Ship the instrument at a temperature –5 to 40 °C (23 to 104 °F) and relative humidity up to 80%.
4. Make sure that the storage location for the instrument does not have dust, condensation or chemical evaporation.

Section 8   Troubleshooting

Refer to the following table for common problem messages or symptoms and possible causes.

Error/Warning	Description
Stop requested	The operator has pushed the stop button
Measurement unstable	The measurement is unstable
Measurement out of range	The measurement is out of range
Temperature out of range	The temperature measurement is out of range
Slope out of range	The calibration slope is outside accepted limits
Offset out of range	The calibration offset is outside accepted limits
Cell constant out of range	The calibration value of the cell constant is outside accepted limits
Equiv. point not found	The titration fails to determine the equivalence point
Out of range	The computed result is outside accepted limits
Electrode calibration has expired	The Calibration date has expired
Titrant calibration has expired	The Calibration date has expired
Maximum number of applications is reached	The maximum number of applications per line has been reached
Requires at least one titrant that cannot be installed	The application is not compatible with applications already installed as it uses a different titration
Requires too many titrants for this instrument model configuration	The instrument hardware configuration is not compatible with this application
Buffer unstable	The value of the buffer is unstable
The connected electrode(s) cannot be calibrated or there is no application that contains calibration parameters!	The type of sensor cannot be calibrated (e.g., PtPt, ORP, etc.) or there is no installed application that contains calibration parameters
Standard unstable	The standard is unstable
Same buffer	The buffer has already been used
Calibration solution already used	The calibration solution has already been used
No titrant information	System failure. Contact technical support
No measure received	System failure. Contact technical support
Burette fails to deliver	The syringe cannot be emptied
Burette fails to fill	The syringe cannot be filled
Burette failed to read delivered volume	System failure. Contact technical support

Section 9 Replacement parts and accessories

⚠ **WARNING**
⚠ Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.

Table 12 Replacement parts and accessories

Description	Item no.
Syringe 2.5 mL, glass	LZE100
Syringe 5 mL, glass	LZE101
Syringe 10 mL, glass	LZE102
Syringe 25 mL, glass	LZE103
O-ring for 2.5 mL syringe	LZE104
O-ring for 5 mL syringe	LZE105
O-ring for 10 mL syringe	LZE106
O-ring for 25 mL syringe	LZE107
Set of beakers 50 mL (10x)	LZE108
Set of beakers 150 mL (10x)	LZE109
Delivery tubing with anti-diffusion tip	LZE112
Set of tubes (2x) for syringe, suction & delivery	LZE114
Set of tubes (2x) for pump, suction & delivery	LZE115
Bottle stopper GL25	LZE116
Bottle stopper GL45	LZE117
Bottle stopper S40	LZE118
Glass bottle, 1L	LZE119
Desiccant tube empty with cotton	LZE120
Desiccant tube filled with molecular sieve	LZE121
Conical adapter NS14.5/23	LZE122
Tube fitting (2x)	LZE124
Spare pump cassette	LZE125
USB key for water applications	LZE128
USB key for biogas applications	LZE129
USB key for amperometric titrations applications	LZE130
USB key for food and beverage applications	LZE131
USB key for petrochemical applications	LZE133
USB key for general chemistry and other applications	LZE134
USB key for plating applications	LZE135
Magnetic stir bar, Teflon®, 20 x 6 mm (10x)	LZE136
Set of accessories, 10 mL syringe	LZE137
Set of accessories, 5 mL syringe	LZE138

Replacement parts and accessories

Table 12 Replacement parts and accessories (continued)

Description	Item no.
Set of accessories, 25 mL syringe	LZE139
Tube holder, 4 positions	LZE141
Sample leveling pump	LZE142
Propeller stirrer, 70 mm shaft	LZE143
Power supply (without power cable)	LZE144
RS-232 adapter cable	LZE145
Syringe protection cover	LZE156
Electro-valve block and connector	LZE165
Conical adapter, large cut (for 7.5 mm diameter)	LZE182
Thermo-Drucker USB printer	LQV161.99.10000

Table 13 Electrodes and electrode accessories

Description	Item no.
MTC301, platinum combined electrode, 1 m cable	MTC30101
MTC306, silver combined electrode, 1 m cable	MTC30601
MTC695, Pt-Pt electrode, 1 m cable	MTC69501
PHC705, pH probe, red rod, glass, general purpose, standard	PHC70501
PHC725, pH probe, glass	PHC72501
PHC805, pH probe, glass, general purpose	PHC80501
CDC401 conductivity probe, standard, 1 m cable	CDC40101
ISECa calcium combined selective	LZW9660C.97.002
Legacy adapter	LZV662
OPT300 photocolorimetric probe	E71T001
PTM450, NP photocolorimetric titration module, without power	X61T005
Power adapter 115/230V/12Vdc, jack 2.1 mm, for use with the PTM450 titration module	A66B014
pHG311-9 pH electrode, pH 0-14, FX	E11M004
pHG201-8 pH electrode, glass	E11M006
REF251 reference electrode, red rod, double junction, banana	E21M001
CL114 cable FX/COAX/1m/BNC	A94L114
REF361 reference electrode, Ag/AgCl, reverse sleeve, FX	E21M003
Adaptor BNC male to banana	LZE184
REF451 reference electrode, calomel, double junction, FX	E21M005
ISE25Cu-9 ion selective, copper, FX	E41M006
CL111 cable FX/COAX/1m/banana	A94L111

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