Cylinder unit OMNIS

6.03001.XX0 / 6.01503.XX0

Product manual

8.0108.8010EN / 2021-07-23

Metrohm

Metrohm AG
Ionenstrasse
CH-9100 Herisau
Switzerland
+41 71 353 85 85
info@metrohm.com
www.metrohm.com

Cylinder unit OMNIS

6.03001.XX0 / 6.01503.XX0

Product manual

8.0108.8010EN /
2021-07-23

Technical Communication
Metrohm AG
CH-9100 Herisau

This documentation is protected by copyright. All rights reserved.

This documentation has been prepared with great care. However, errors can never be entirely ruled out. Please send comments regarding possible errors to the address above.

Disclaimer

Deficiencies arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc., are expressly excluded from the warranty. Unauthorized modifications to the product (e.g. conversions or attachments) exclude any liability on the part of the manufacturer for resulting damage and its consequences. Instructions and notes in the Metrohm product documentation must be strictly followed. Otherwise, Metrohm's liability is excluded.

Table of contents

1 Overview 1

1.1 Cylinder unit OMNIS – Product description ... 1

1.2 Cylinder unit OMNIS – Product versions ... 1

1.3 Symbols and conventions ... 2

1.4 Further information ... 2

1.5 Accessories ... 2

2 Safety 4

2.1 Intended use ... 4

2.2 Responsibility of the operator ... 4

2.3 Requirements for operating personnel ... 5

2.4 Safety instructions ... 5

2.4.1 Danger from electrical potential ... 5

2.4.2 Danger from biological and chemical hazardous substances ... 5

2.4.3 Danger from highly flammable substances ... 6

2.4.4 Danger from leaking liquids ... 6

2.4.5 Danger during transport of the product ... 7

2.5 Design of warning messages ... 7

2.6 Meaning of warning signs ... 8

3 Functional description 9

3.1 Dosing unit – Overview ... 9

3.1.1 Cylinder unit OMNIS – Overview ... 11

3.2 Dosing unit – Function ... 12

3.2.1 Cylinder unit OMNIS – Function ... 13

3.3 Cylinder unit OMNIS – Resistance to chemicals ... 13

3.3.1 Cylinder unit OMNIS – Resistance of cylinder housing ... 14

4 Delivery and packaging 15

4.1 Delivery ... 15

4.2 Packaging ... 15

5 Cylinder unit OMNIS – Operation 16

5.1 Attaching the cylinder unit OMNIS ... 17

5.2 Removing the cylinder unit OMNIS ... 19

5.3 Refitting the cylinder unit OMNIS ... 21

6 Maintenance 22
6.1 Performing maintenance on the cylinder unit OMNIS 22
6.2 Cleaning the cylinder unit OMNIS 23
6.3 Storing the cylinder unit OMNIS 25
6.4 Disassembling the cylinder unit OMNIS 26
6.5 Cleaning and greasing the cylinder unit OMNIS 29
6.6 Checking and replacing the cylinder unit OMNIS 31
6.7 Assembling the cylinder unit OMNIS 32
7 Troubleshooting 36
7.1 Cylinder unit OMNIS – Malfunctions 36
7.2 Cylinder unit OMNIS – Adjusting the piston position 39
7.3 Cylinder unit OMNIS – Clearing the jamming 42
8 Disposal 44
9 Technical specifications 45
9.1 Ambient conditions 45
9.2 Cylinder unit OMNIS – Dimensions 45
9.3 Cylinder unit OMNIS – Housing 45
9.4 Cylinder unit OMNIS – Connectors specifications 46
9.5 Cylinder unit OMNIS – Liquid handling specifications 46
10 Dosing unit – Explanations regarding dosing accuracy 47

1 Overview

1.1 Cylinder unit OMNIS – Product description

The cylinder unit is part of the dosing unit. It provides the liquid volume required for the analysis and can be equipped with different volumes.

The cylinder units 2 mL to 20 mL are used for dosing as well as titrating. The cylinder unit 50 mL is particularly suited for dosing (Liquid Transfer).

1.2 Cylinder unit OMNIS – Product versions

The cylinder units are available in various versions. The versions are distinguished according to their volumes. Cylinder units can be ordered with or without accessories.

Table 1 Product versions

Article number	Designation	Version feature
6.03001.120	Cylinder unit 2 mL	Volume 2 mL
6.03001.150	Cylinder unit 5 mL	Volume 5 mL
6.03001.210	Cylinder unit 10 mL	Volume 10 mL
6.03001.220	Cylinder unit 20 mL	Volume 20 mL
6.03001.250	Cylinder unit 50 mL	Volume 50 mL

Table 2 Product versions without accessories

Article number	Designation	Version feature
6.01503.120	Cylinder unit 2 mL	Volume 2 mL
6.01503.150	Cylinder unit 5 mL	Volume 5 mL
6.01503.210	Cylinder unit 10 mL	Volume 10 mL
6.01503.220	Cylinder unit 20 mL	Volume 20 mL
6.01503.250	Cylinder unit 50 mL	Volume 50 mL

An antidiffusion tip (6.1543.200) is available as an accessory. The antidiffusion tip is used whenever the titration tip is immersed into the sample. The antidiffusion valve prevents the sample from diffusing into the tip.

If accurate dosing is important, a dosing tip (6.1543.060) can be ordered as an alternative to the antidiffusion tip.

1.3 Symbols and conventions

The following formatting may appear in the documentation:

*(5-**12**)*	Cross-reference to figure legend The first number refers to the figure number. The second number refers to the product part in the figure.
1	Instruction step Numbers indicate the order of the instructions steps.
Method	Names of parameters, menu items, tabs and dialog windows
File ▶ New	Menu path
[Continue]	Button or key

1.4 Further information

The Metrohm Knowledge Base *https://guide.metrohm.com* always provides the current version of this document. Further instructions, leaflets, release notes etc. may be available, depending on the product. You can directly access the required information or the associated PDF document using the full-text search function and filters.

1.5 Accessories

Up-to-date information on the scope of delivery and on optional accessories can be found on the Metrohm website. Download this information as follows:

Downloading the accessories list

1. Go to *https://www.metrohm.com*.
2. Enter the article number of the product (e.g. **2.1001.0010**) into the search field.

   The search result is displayed.
3. Click on the product.

   Detailed information regarding the product is shown on various tabs.

4 On the **Included parts** tab, click the link to download the PDF.

The PDF file with the accessories data is loaded.

Metrohm recommends downloading the accessories list from the Internet and keeping it for reference purposes.

2 Safety

2.1 Intended use

Metrohm products are used for the analysis and handling of chemicals.

Usage therefore requires the user to have basic knowledge and experience in handling chemicals. Knowledge regarding the application of fire prevention measures prescribed for laboratories is also mandatory.

Adherence to this technical documentation and compliance with the maintenance specifications make up an important part of intended use.

Any utilization in excess of or deviating from the intended use is regarded as misuse.

Specifications regarding the operating values and limit values of individual products are contained in the "Technical specifications" section, if relevant.

Exceeding and/or not observing the mentioned limit values during operation puts people and components at risk. The manufacturer assumes no liability for damage due to non-observance of these limit values.

The EU declaration of conformity loses its validity as soon as modifications are carried out on the products and/or the components.

2.2 Responsibility of the operator

The operator must ensure that basic regulations on occupational safety and accident prevention in chemical laboratories are observed. The operator has the following responsibilities:

- Instruct personnel in the safe handling of the product.
- Train personnel in the use of the product according to the user documentation (e.g. install, operate, clean, eliminate faults).
- Train staff on basic occupational safety and accident prevention regulations.
- Provide personal protective equipment (e.g. protective glasses, gloves).
- Provide suitable tools and equipment to carry out the work safely.

The product may be used only when it is in perfect condition. The following measures are required to ensure the safe operation of the product:

- Check the condition of the product before use.
- Remedy defects and malfunctions immediately.
- Maintain and clean the product regularly.

2.3 Requirements for operating personnel

Only qualified personnel may operate the product. Qualified personnel are persons who meet the following requirements:

- Basic regulations on occupational safety and accident prevention for chemical laboratories are known and complied with.
- Knowledge of handling hazardous chemicals is present. Personnel have the ability to recognize and avoid potential dangers.
- Knowledge regarding the application of fire prevention measures for laboratories is available.
- Safety-relevant information is communicated and understood. The personnel can operate the product safely.
- The user documentation has been read and understood. The personnel operate the product according to the instructions in the user documentation.

2.4 Safety instructions

2.4.1 Danger from electrical potential

Contact with electrical potential can cause serious injuries or death. To avoid danger from electrical potential, observe the following:

- Operate the product only if it is in perfect condition. The housing must also be intact.
- Only use the product with the covers fitted. If covers are damaged or missing, disconnect the product from the energy supply and contact the regional Metrohm service representative.
- Protect live components (e.g. power supply unit, power cord, connection sockets) against moisture.
- Always have maintenance work and repairs on electrical components carried out by a regional Metrohm service representative.
- Disconnect the product from the energy supply immediately if at least one of the following cases occurs:
  - The housing is damaged or open.
  - Live parts are damaged.
  - Moisture penetrates.

2.4.2 Danger from biological and chemical hazardous substances

Contact with biological hazardous substances may cause poisoning from toxins or infections from microorganisms. Contact with aggressive chemical substances may cause poisoning or chemical burns. To avoid danger from biological or chemical hazardous substances, observe the following:

- Label the product according to regulations if it is used for substances that have a potential for chemical hazards and are generally subject to the Hazardous Substances Ordinance.
- Wear personal protective equipment (e.g. protective glasses, gloves).
- Use exhaust equipment when working with vaporizing hazardous substances.
- Dispose of hazardous substances in accordance with regulations.
- Clean and disinfect contaminated surfaces.
- Only use detergents that do not cause any unwanted side reactions with the materials to be cleaned.
- Dispose of chemically contaminated materials (e.g. cleaning material) in accordance with regulations.
- Proceed as follows in case of a return shipment to Metrohm AG or a regional Metrohm representative:
  - Decontaminate the product or product component.
  - Remove the labeling for hazardous substances.
  - Create a declaration of decontamination and enclose it with the product.

2.4.3 Danger from highly flammable substances

Using highly flammable substances or gases may cause fires or explosions. To avoid danger from highly flammable substances, observe the following:

- Avoid ignition sources.
- Use protective grounding.
- Use exhaust equipment.

2.4.4 Danger from leaking liquids

Leaking liquids may cause injuries and may damage the product. To avoid danger from leaking liquids, observe the following:

- Check the product and its accessories for leakages and loose connections.
- Replace leaking parts and connecting elements without delay.
- Tighten loose connecting elements.
- Do not loosen tubing connections under pressure.
- Do not remove aspiration tubing under pressure.
- Carefully pull the ends of the tubing out of the containers.
- Carefully let liquids from tubing drain into suitable containers.
- Insert the buret tips completely into the containers.
- Remove and dispose of leaked liquids in accordance with regulations.
- If you suspect that liquid has penetrated the instrument, disconnect the instrument from the energy supply. Then have the instrument checked by a regional Metrohm service representative.

2.4.5 Danger during transport of the product

Chemical or biological substances may be spilled during the transport of the product. Parts of the product may fall down or may be damaged. There is a risk of injury from chemical or biological substances and pieces of broken glass. To ensure safe transport, observe the following:

- Remove loose parts (e.g. sample racks, sample vessels, bottles) before transport.
- Remove liquids.
- Lift and transport the product with both hands on the base plate.
- Lift and transport heavy products only according to instructions.

2.5 Design of warning messages

There are 4 hazard levels for warning messages. The following signal words are used for classifying the hazard levels in warning messages:

- **DANGER** indicates a hazardous situation which, if not avoided, will result in serious injury or death.
- **WARNING** indicates a hazardous situation which, if not avoided, could result in serious injury or death.
- **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE** indicates a hazardous situation which, if not avoided, could result in property damage.

Warning messages differ in design (color and warning sign) depending on the hazard level:

DANGER

Type and source of danger

Consequences when not observing the notice: An irreversible injury that may result in death is very probable.

- Measures to avoid the danger

WARNING

Type or source of danger

Consequences when not observing the notice: A serious injury that may result in death is probable.

- Measures to avoid the danger

CAUTION

Type or source of danger

Consequences when not observing the notice: A minor to moderate injury is probable.

- Measures to avoid the danger

2.6 Meaning of warning signs

This documentation uses the following warning signs:

Table 3 Warning sign according to ISO 7010

Warning sign	Meaning
	General warning sign
	Warning of electrical voltage
	Warning of hand injuries
	Warning of sharp object
	Warning of hot surface
	Warning of biological hazard
	Warning of toxic materials
	Warning of flammable materials
	Warning of corrosive substances
	Warning of optical radiation
	Warning of laser beams

Depending on the intended use of the product, the corresponding warning sign stickers must be placed on the product.

3 Functional description

3.1 Dosing unit – Overview

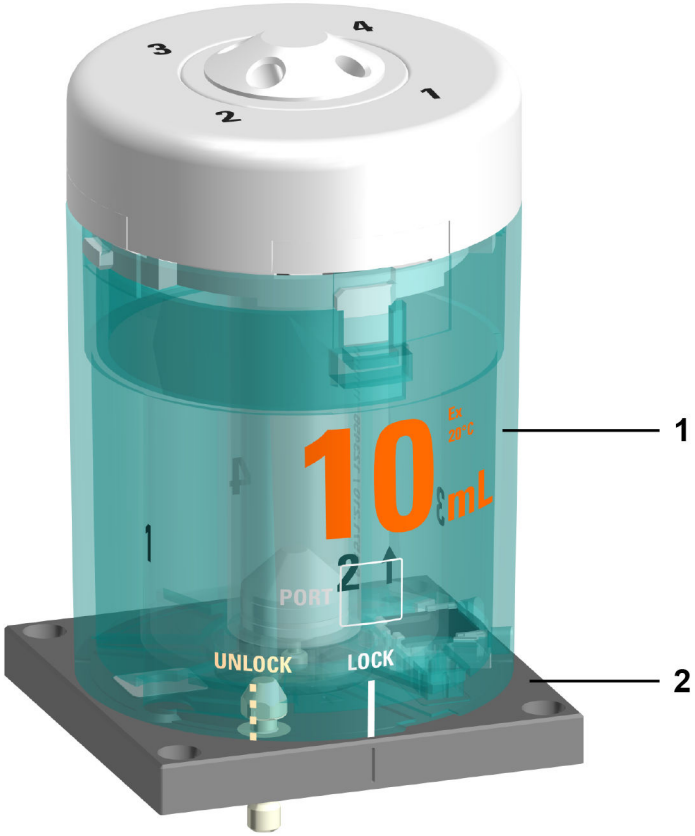


Figure 1 Dosing unit – Overview

1 **Cylinder unit**
Available with various volumes

2 **Dosing drive**
Not in scope of delivery

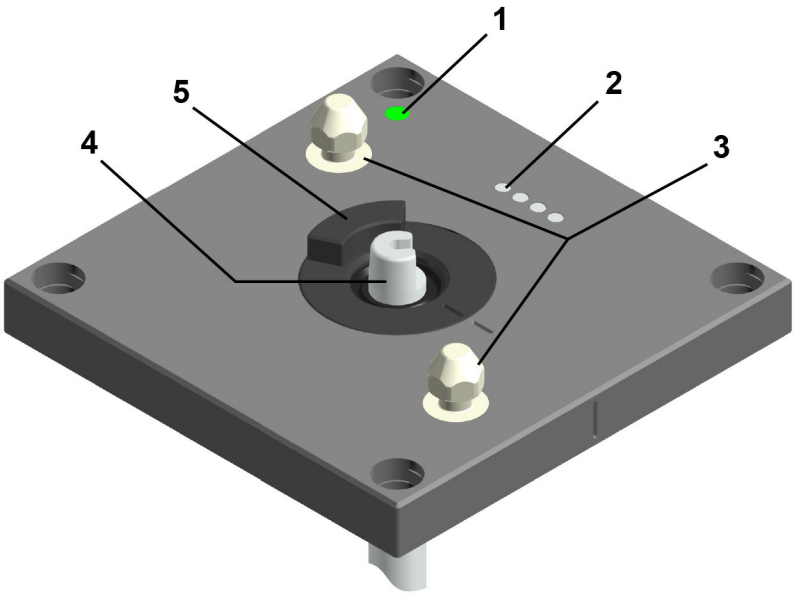


Figure 2 Dosing drive – Overview

1	**Status display** LED. Multi-colored	**2**	**Contact pins** For communicating with the cylinder unit
3	**Twistlocks** For locking the cylinder unit	**4**	**Piston rod** For moving the dosing piston
5	**Valve coupling**		

3.1.1 Cylinder unit OMNIS – Overview

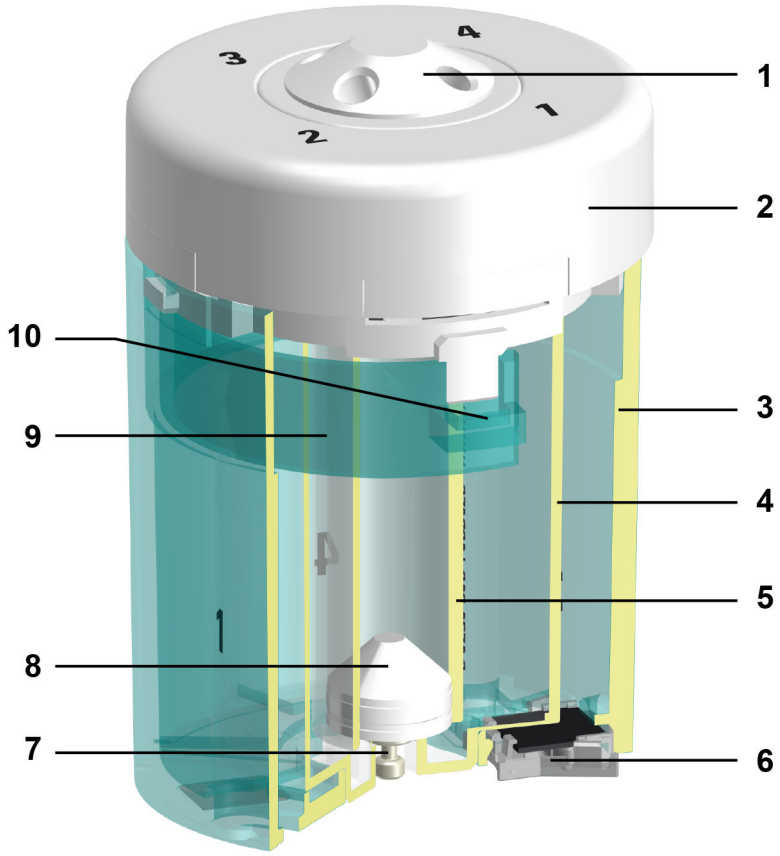


Figure 3 Cylinder unit – Overview

1	**Distributor with 4 ports**	**2**	**Cylinder top piece**
3	**Cylinder housing**	**4**	**Centering tube**
5	**Cylinder**	**6**	**Data chip**
7	**Piston stopper**	**8**	**Dosing piston**
9	**Spring clip**	**10**	**Unlocking button**

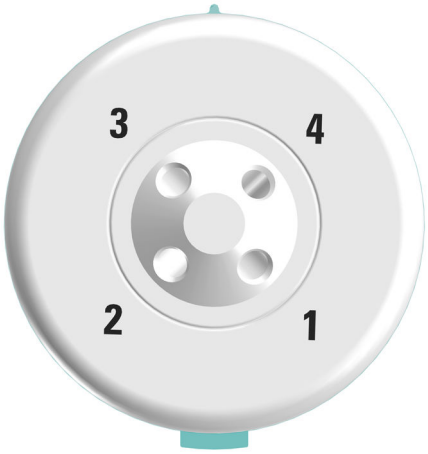


Figure 4 Cylinder unit – Overview from above

The following table shows the standard use of the 4 ports. The use of the ports can be changed in the OMNIS Software.

Port	Use	Connecting or sealing with
1	Dosing	Dosing tip
2	Filling the cylinder	Chemical bottle
3	Not used	Stopper
4	Not used	Stopper

3.2 Dosing unit – Function

Software control of the dosing unit can be used for accurate dosing of liquid volumes.

The dosing unit is comprised of the following units:

- Dosing drive
- Cylinder unit

The dosing drive is permanently installed in the housing of the instrument. The dosing drive is controlled via the OMNIS Software and is responsible for the accurate dosing of the solution.

If the cylinder unit is placed on top of the dosing drive, the dosing drive assumes responsibility for the following functions:

- **Raising and lowering the dosing piston:**
  Solution is aspirated if the dosing piston is lowered. The cylinder fills up.
  Solution is dosed if the dosing piston is raised. The cylinder empties.

- **Rotating the cylinder:**
  The rotation of the cylinder controls which of the 4 ports the solution flows through.
  The valve disk with an opening is located in the middle of the cylinder base.
  The distributor disk with 4 openings corresponding to the 4 ports of the distributor is located at the bottom in the cylinder top piece.
  The dosing drive rotates the cylinder by 90° stages so that the opening of the valve disk fits with an opening on the distributor disk. This results in a passage for the solution to the corresponding port of the distributor.

3.2.1 Cylinder unit OMNIS – Function

The cylinder unit is an accessory set for the dosing unit in OMNIS instruments with dosing function. The cylinder unit provides the liquid volume required for the analysis and can be equipped with different volumes. A distributor with 4 ports enables the filling and emptying of the cylinder.

The cylinder units 2 mL to 20 mL are used for dosing as well as titrating. The cylinder unit 50 mL is particularly suited for dosing (Liquid Transfer).

See also

Cylinder unit OMNIS – Overview (chapter 3.1.1, page 11)

Cylinder unit OMNIS – Product versions (chapter 1.2, page 1)

3.3 Cylinder unit OMNIS – Resistance to chemicals

Conventional reagents and media can be dosed with the cylinder unit. The materials of the single parts that come into contact with the liquid being dosed have been selected for maximum resistance to chemicals and functionality.

However, not all types of aggressive or high-concentration reagents can be conveyed without difficulty. It is the user's own responsibility to determine the resistance of the various single parts to specific, aggressive media.

Observe the following notes to ensure the functional capability of the cylinder unit:

- When using strong inorganic alkalis or concentrated solutions that could crystallize, adhere to the .
- The temperature of the media must not exceed 50 °C.
- Clean and inspect the cylinder unit at regular intervals to avoid problems with aggressive media. *(see "Performing maintenance on the cylinder unit OMNIS", chapter 6.1, page 22)*

Replace the cylinder unit at regular intervals.

See also

Cylinder unit OMNIS – Housing (chapter 9.3, page 45)

3.3.1 Cylinder unit OMNIS – Resistance of cylinder housing

In contrast to the other components of the cylinder unit, the cylinder housing has only limited resistance to chemicals.

good resistance	▪ aqueous solutions ▪ diluted acids ▪ alcohols ▪ hydrocarbons
limited resistance	▪ concentrated organic acids ▪ diluted aqueous alkalis (cold cracking) ▪ acetone ▪ isopropanol ▪ tetrahydrofuran ▪ hot water (> 50 °C)
non-resistant	▪ concentrated inorganic acids and bases ▪ chlorinated solvents ▪ Bromine (Br_2) ▪ Phenol ▪ water vapor (> 100 °C)

4 Delivery and packaging

4.1 Delivery

Inspect the delivery immediately upon receipt:

- Check the delivery against the delivery note to ensure completeness.
- Check the product for damage.
- If the delivery is incomplete or damaged, contact your regional Metrohm representative.

4.2 Packaging

The product and accessories are supplied in protective special packaging. Keep this packaging to ensure safe transportation of the product. If a transport locking device is present, keep this as well for future reuse.

5 Cylinder unit OMNIS – Operation

The product can be operated via the OMNIS Software.
Additional information is available in the *software help*.

Notes on handling

CAUTION

Piston wear

Solutions of solids (e.g. salts or hydroxides) increase the wear of the dosing piston, which may lead to leakage.

- Fill the cylinder with solution and move to the exchange position after each titration/dosing.

If no continuous sample throughput is ensured, fill the cylinder with solution and move to the exchange position, especially when using:

- concentrated solutions that tend to crystallize
- EDTA solutions, ultrapure solvents and ultrapure water
- organic solvents
- alkaline (e.g. KOH or isopropyl alcohol), corrosive or high-concentration reagents

The cylinder unit does not automatically move into the exchange position. In order to automatically move into exchange position after each titration/dosing, insert the **FILL** and **VALVE POS** commands in the method, see *software help*.

For storing the cylinder unit over an extended period of time *(see "Storing the cylinder unit OMNIS", chapter 6.3, page 25)*.

Usage of dosing tubing with antidiffusion valve

If using an antidiffusion valve, the maximum dosing rate is 150 mL/min.

The dosing rate can be saved on the memory chip of the cylinder unit: Enter the dosing rate in the OMNIS Software in **Properties** ▶ **Specific data**.

Usage of dosing tubing without antidiffusion valve

For usage without antidiffusion valve, do not immerse the dosing tubing in the sample solution.

There is a risk of back diffusion of the sample solution from the vessel into the tubing due to open tubing ends.

The cylinder unit and its parts cannot be autoclaved. The sterility of a germ-free solution cannot be guaranteed.

5.1 Attaching the cylinder unit OMNIS

Default settings for the ports 1 and 2

Port 1 is defined as dosing port and port 2 as fill port in the data chip default settings of the cylinder unit. The following instructions describe the default setting.

If the ports should be used differently from the default setting, adjust the ports in the OMNIS Software in **Properties** ▶ **Specific data**.

Preparing for attaching

1 Open the **Manual control** of the dosing unit in the OMNIS Software, see *software help*.

2 Start the **Exchange position** function.

Attaching the cylinder unit

These instructions describe the default installation as defined in the OMNIS Software.

Prerequisite:

- Dosing drive: Valve coupling and piston rod are in the exchange position (port 2 is set).
- Cylinder unit: The piston stopper is flush with the base of the cylinder housing. The centering tube is in the correct position.

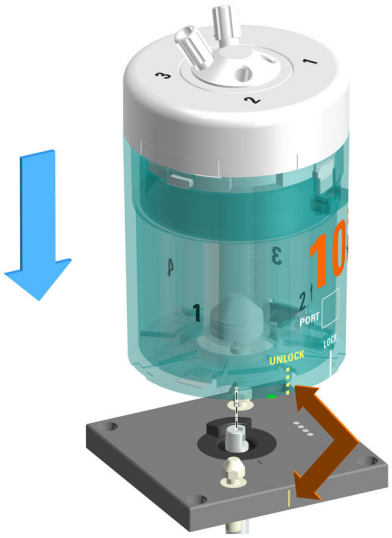
Required accessories:

- Wrench (6.2739.000)
- 2 FEP tubings (6.1805.100)
- Titration tip (6.1543.200)

1 **Aligning the cylinder unit**

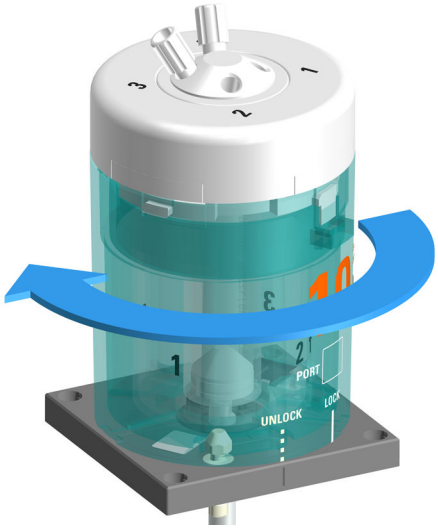
Rotate the cylinder unit until the marking with the label **UNLOCK** is in line with the marking on the dosing drive.

2



Set the cylinder unit down onto the two twistlocks straight from above.

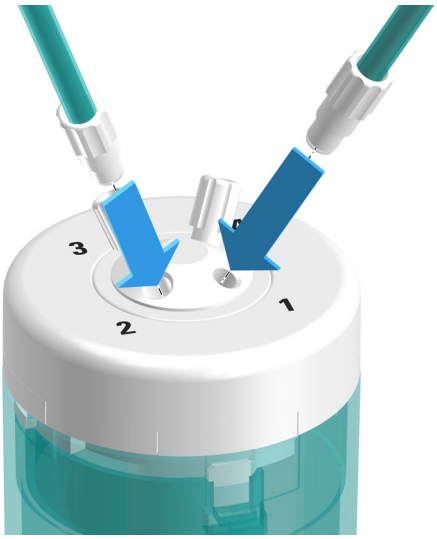
3 **Locking the cylinder unit**



Rotate the cylinder unit to the left until it stops.

Use the marking with the label **LOCK** as a guide.

4 **Mounting the tubings**



Tighten an FEP tubing (6.1805.100) into port 1.

This FEP tubing is used as dosing tubing. Tighten the other end to the titration tip (6.1543.200).

5 Tighten the other FEP tubing (6.1805.100) into port 2.

This FEP tubing is used as filling tubing. Tighten the other end to the OMNIS Liquid Adapter.

6 Firmly tighten the tubing with the wrench (6.2739.000).

See also

Cylinder unit OMNIS – Overview (chapter 3.1.1, page 11)

5.2 Removing the cylinder unit OMNIS

Preparing the removal

1 Open the **Manual control** of the dosing unit in the OMNIS Software, see *software help*.

2 Start the **Empty** function.

3 Start the **Exchange position** function.

Removing the cylinder unit

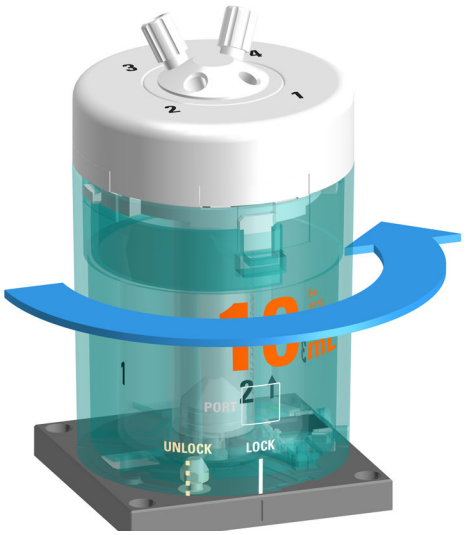
Prerequisite:

- Dosing drive: Valve coupling and piston rod are in the exchange position (port 2 is set).
- Cylinder unit: The piston stopper is flush with the base of the cylinder housing. The centering tube is in the correct position.

1 Removing the tubing

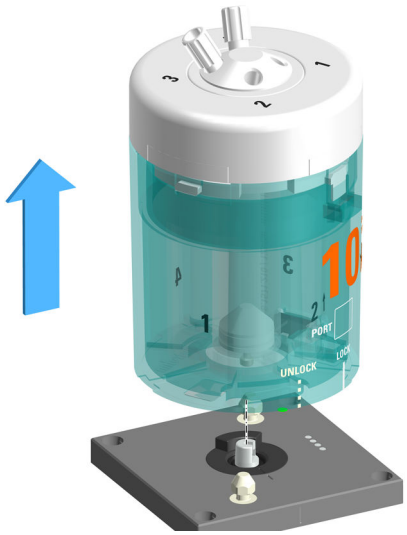
Unscrew the dosing tubing and the filling tubing.

2 Unlocking the cylinder unit



Rotate the cylinder unit to the right as far as the **UNLOCK** position.

3 Raising the cylinder unit



Raise the cylinder unit straight upwards.

See also

Cylinder unit OMNIS – Overview (chapter 3.1.1, page 11)

5.3 Refitting the cylinder unit OMNIS

The cylinder units are available in various versions. The versions are distinguished according to their volumes.

For fitting the instrument with a different cylinder unit:

- Order the cylinder unit with the required volume. *(see "Cylinder unit OMNIS – Product versions", chapter 1.2, page 1)*
- Remove the current cylinder unit. *(see "Removing the cylinder unit OMNIS", chapter 5.2, page 19)*
- Attach the new cylinder unit. *(see "Attaching the cylinder unit OMNIS", chapter 5.1, page 17)*

6 Maintenance

6.1 Performing maintenance on the cylinder unit OMNIS

CAUTION

Damage by chemicals

Chemicals may escape through leaks. Aggressive chemicals damage the data chip and the dosing drive.

- Regularly check the cylinder unit for leaking liquid (under the dosing piston, on the base of the centering tube or the cylinder unit).
- Regularly check the cylinder and dosing piston for wear. *(see "Checking and replacing the cylinder unit OMNIS", chapter 6.6, page 31)*
- Replace a defective cylinder unit immediately. Do not continue using it.

Depending on the application, cylinder, dosing piston and flat stopcock are subject to different mechanical strain. A cylinder unit, for example, that is often used for alkaline, high-concentration or crystallized reagents will be subject to higher wear. This results in shorter maintenance intervals. The cylinder unit must therefore be replaced more often.

Maintenance work	Maintenance interval
Check cylinder housing for contaminations and clean if necessary. *(see "Cleaning the cylinder unit OMNIS", chapter 6.2, page 23)*	Daily
Check electrical contacts for contaminations and clean if necessary. *(see "Cleaning the cylinder unit OMNIS", chapter 6.2, page 23)* Clean cylinder top piece and valve disk. Grease cylinder housing and valve disk. *(see "Cleaning and greasing the cylinder unit OMNIS", chapter 6.5, page 29)* Inspect cylinder and dosing piston. *(see "Checking and replacing the cylinder unit OMNIS", chapter 6.6, page 31)*	Weekly if using: ▪ concentrated solutions that tend to crystallize ▪ EDTA solutions, ultrapure solvents and ultrapure water ▪ organic solvents ▪ alkaline (e.g. KOH or isopropyl alcohol), corrosive or high-concentration reagents
	Every 3 months if using unproblematic reagents.

6.2 Cleaning the cylinder unit OMNIS

WARNING

Danger of poisoning and chemical burns from chemical hazardous substances

Poisoning and/or chemical burns by contact with aggressive chemical substances.

- Use only detergents that do not cause any unwanted side reactions with the materials to be cleaned.
- Clean contaminated surfaces.
- Wear protective equipment.
- Use exhaust equipment when working with vaporizing hazardous substances.
- Dispose of chemically contaminated materials (e.g. cleaning material) properly.

CAUTION

Instrument damage from aggressive chemical hazardous substances

Damage of the instrument or malfunction through contact with aggressive chemical substances.

- Clean up spilled liquids and solids immediately.
- Use protective grounding when working with highly flammable chemical substances and gases.
- If you suspect that chemical substances have gotten into the instrument, disconnect the instrument from the energy supply. Then, notify Metrohm Service.

The cylinder unit requires appropriate care. Excess contamination of the cylinder unit results in malfunctions and a reduction in the service life.

Prerequisite:

The cylinder unit has been removed from the dosing drive. *(see "Removing the cylinder unit OMNIS", chapter 5.2, page 19)*

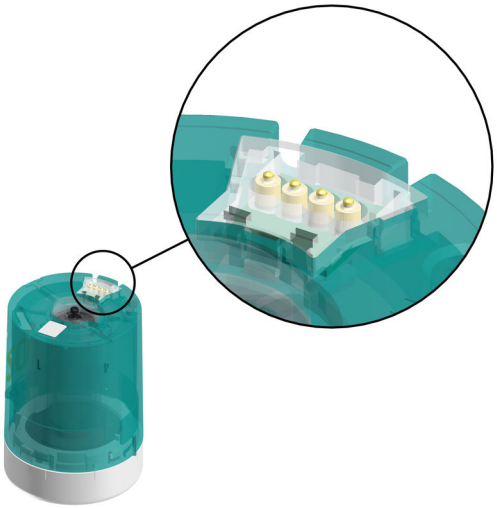
1 Cleaning the cylinder housing

The cylinder housing is not dishwasher proof.

Clean the cylinder housing with lukewarm water and dishwashing detergent.

2 If the cylinder top piece is stuck, place the cylinder unit with the cylinder top piece facing down in warm water (possibly with a little dishwashing detergent) for at least 30 minutes. *(see "Cylinder unit OMNIS – Clearing the jamming", chapter 7.3, page 42)*

3 **Cleaning the electrical contacts of the cylinder unit**



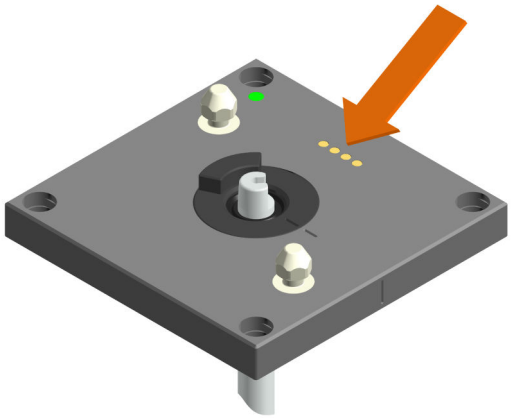
If the electrical contacts are only lightly contaminated, clean the electrical contacts with a cloth moistened with water.

4 If the electrical contacts are heavily contaminated,

- add dishwashing detergent or ethanol to the moist cloth and clean the electrical contacts or
- clean the electrical contacts in an ultrasonic bath with a little dishwashing detergent or ethanol.

Do not exceed 50 °C when drying. Use compressed air if necessary.

5 **Cleaning the electrical contacts of the dosing drive**



- If the electrical contacts are only lightly contaminated, clean the electrical contacts with a cloth moistened with water.
- If the electrical contacts are heavily contaminated, add dishwashing detergent or ethanol to the moist cloth and clean the electrical contacts.

6.3 Storing the cylinder unit OMNIS

If the cylinder unit will not been used for a prolonged period of time, rinse and fill the cylinder with deionized water to prevent the valve disk and distributor disk from sticking together, especially when using:

- concentrated solutions that tend to crystallize
- EDTA solutions, ultrapure solvents and ultrapure water
- organic solvents
- alkaline (e.g. KOH in isopropanol), corrosive or high-concentration reagents

If you are using water sensitive reagents, rinse the cylinder with solvent and then store it empty.

1 Soak the filling tubing in a bottle with rinsing liquid.

2 Open the **Manual control** of the dosing unit in the OMNIS Software, see *software help*.

3 Execute the **Preparing** function 2 to 3 times with rinsing solution.

4 If the cylinder unit is to be stored empty,
- remove the filling tubing from the bottle with rinsing solution and
- start the **Empty** function.

5 Start the **Exchange position** function.

6 Store the cylinder unit at ambient temperature and protect it from direct sunlight.

Rinsing the cylinder unit automatically

To automatically rinse the cylinder unit, download the method for automatically rinsing the cylinder unit as a template or create it yourself .

6.4 Disassembling the cylinder unit OMNIS

Prerequisite:

The cylinder is empty and the cylinder unit has been removed from the dosing drive. *(see "Removing the cylinder unit OMNIS", chapter 5.2, page 19)*

CAUTION

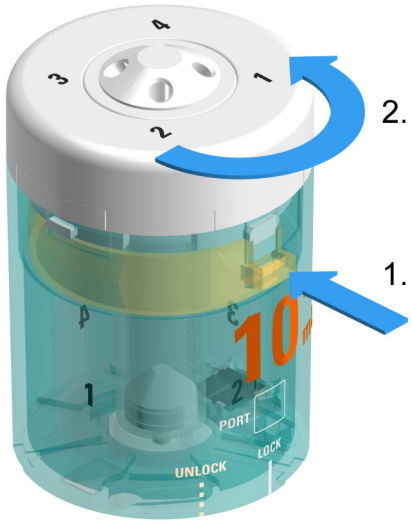
Damage to cylinder unit

Improper handling when disassembling leads to damage of the cylinder unit and/or the dosing piston.
- Do not use force to rotate the cylinder top piece. Instead, place the cylinder unit in water. *(see "Cylinder unit OMNIS – Clearing the jamming", chapter 7.3, page 42)*
- Follow the instructions for taking the cylinder unit apart.
- Do not disconnect the cylinder from the cylinder base.
- Do not remove the dosing piston from the cylinder.

1 **CAUTION**

Contact with chemicals

Chemicals in the cylinder unit may cause chemical burns.
- Empty and rinse the cylinder unit before disassembling it.
- Wear protective equipment, especially gloves.



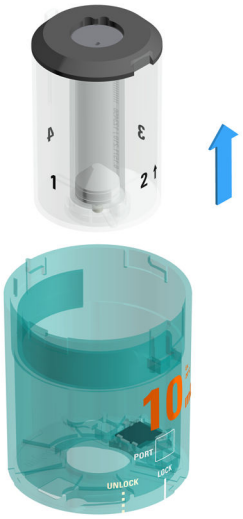
Press the unlocking button and hold it down.

Rotate the cylinder top piece to the right until it stops.

2

Remove the cylinder top piece.

3



Remove the cylinder element (centering tube incl. cylinder).

4

Hold the black cylinder base. Remove the cylinder together with the dosing piston from the centering tube.

Turn the cylinder base with the cylinder around and place it on a flat surface.

Do not disconnect the cylinder from the cylinder base.
Do not remove the dosing piston from the cylinder.

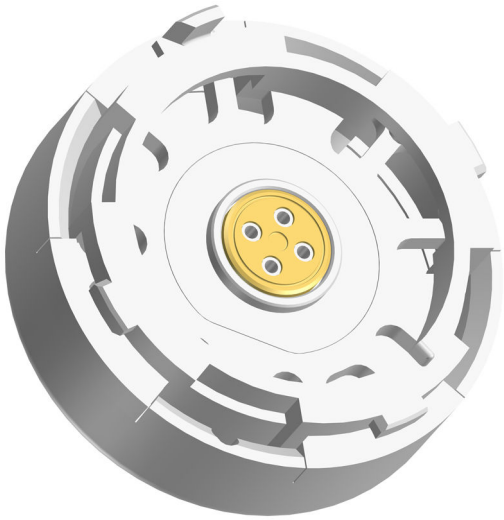
6.5 Cleaning and greasing the cylinder unit OMNIS

Cleaning the cylinder unit

Prerequisite:

The cylinder top piece and the cylinder element (centering tube incl. cylinder) have been removed. *(see "Disassembling the cylinder unit OMNIS", chapter 6.4, page 26)*

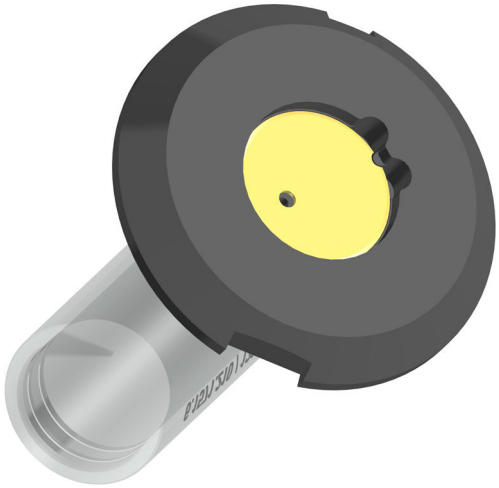
1



Clean the cylinder top piece with water.

Do not remove the distributor disk from the cylinder top piece.

2



- Rinse the centering tube with water and wipe it with ethanol.

- Clean the contact surface of the valve disk with ethanol.

Do not disconnect the cylinder from the cylinder base.

3 Rinse the cylinder housing with water and wipe it with ethanol.

Checking the cylinder unit

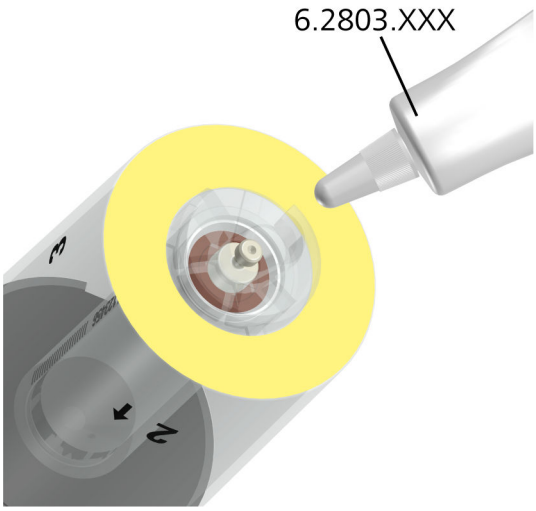
1 *(see "Checking and replacing the cylinder unit OMNIS", chapter 6.6, page 31)*

Greasing the centering tube and the valve disk

Required accessories:

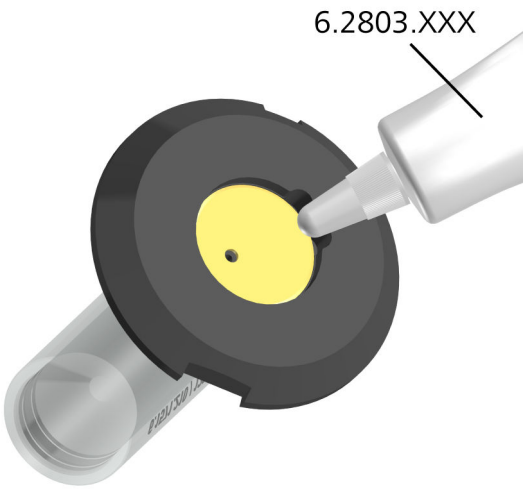
Grease (6.2803.010 or 6.2803.000)

1



Grease the centering tube.

2



Apply a thin layer of grease. Wipe off excess grease with a cloth.

Grease the valve disk sparingly.

Assembling the cylinder unit

1 *(see "Assembling the cylinder unit OMNIS", chapter 6.7, page 32)*

6.6 Checking and replacing the cylinder unit OMNIS

Prerequisite:

The cylinder unit has been taken apart. *(see "Disassembling the cylinder unit OMNIS", chapter 6.4, page 26)*

1 **Inspecting the cylinder**

- Are rough areas or scratches visible on the cylinder?

2 **Inspecting the dosing piston**

- Are scratches visible on the surface of the dosing piston?
- Is any unevenness visible on the sealing lips of the dosing piston?
- Are the cylinder and the dosing piston leakproof?

3 **Replacing the cylinder unit**

If any of these defects is visible, replace the entire cylinder unit.

6.7 Assembling the cylinder unit OMNIS

Assembling the cylinder element

1 Place the cylinder base with cylinder and dosing piston on a flat surface.

2

Place the centering tube on the dosing piston.

- Position the protrusions of the centering tube in such a way that they fit into the recesses of the cylinder base.
- Align the centering tube so that the piston stopper fits in the opening in the centering tube.

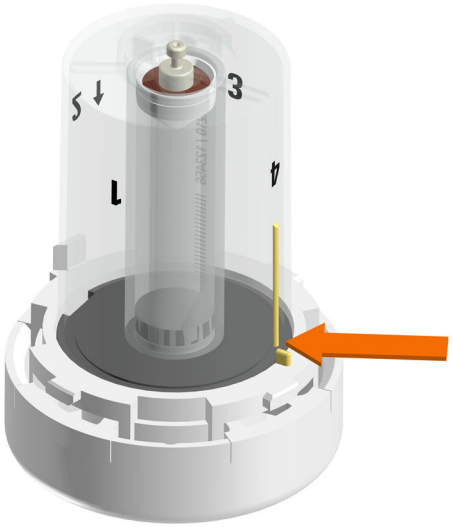
Mounting the cylinder housing

1 Place the cylinder top piece on a flat surface with the ports facing downwards.

2

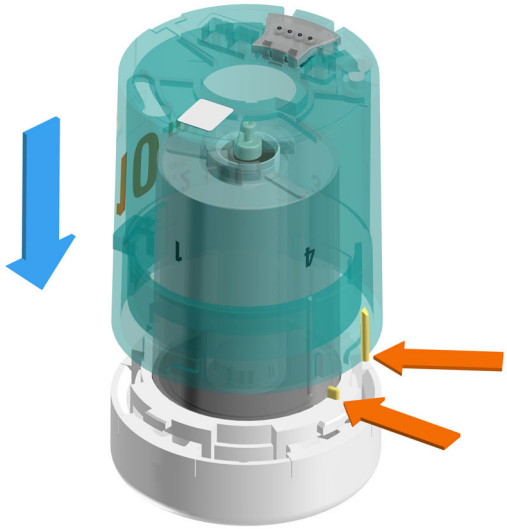
Place the cylinder element (centering tube incl. cylinder) on the cylinder top piece.

3



Rotate the cylinder element (centering tube incl. cylinder) in such a way that the markings on the centering tube and on the cylinder top piece are positioned above one another.

4

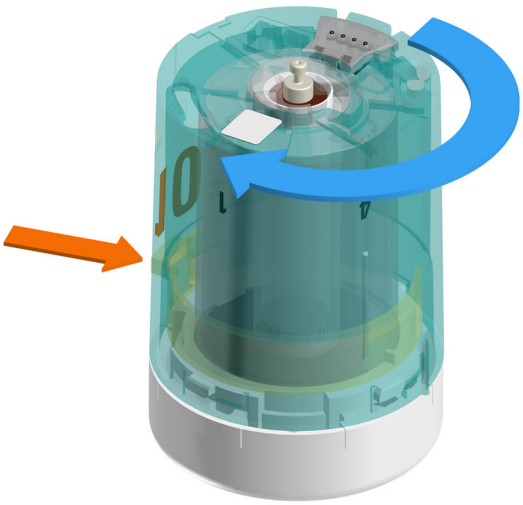


Put the cylinder housing into place.

The markings on the cylinder housing, on the centering tube and on the cylinder top piece must be positioned above one another.

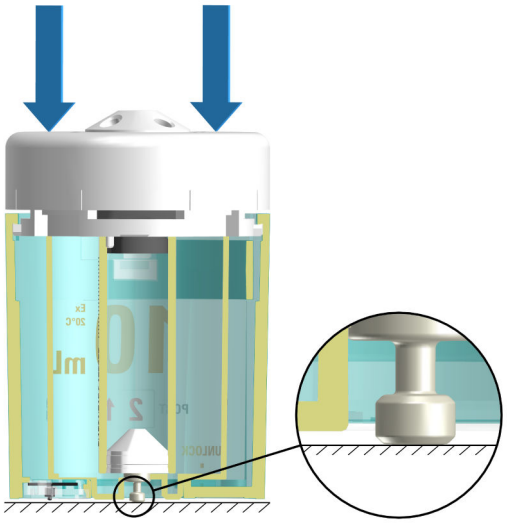
The cylinder housing rests on the cylinder top piece.

5



Hold on to the cylinder top piece and rotate the cylinder housing to the left until the unlocking lever snaps in place.

6



If the piston stopper protrudes the cylinder housing, push the cylinder unit vertically downwards on a flat surface. *(see "Cylinder unit OMNIS – Adjusting the piston position", chapter 7.2, page 39)*

See also

Attaching the cylinder unit OMNIS (chapter 5.1, page 17)

Cylinder unit OMNIS – Adjusting the piston position (chapter 7.2, page 39)

7 Troubleshooting

Messages on malfunctions and errors are displayed in the control software or in the embedded software (e.g. on the display of an instrument) and contain the following information:

- Descriptions of causes of malfunctions (e.g. jammed drive)
- Descriptions of problems with the control (e.g. missing or invalid parameter)
- Information on how to solve the problem

System components with status display elements also indicate malfunctions and errors with a red flashing LED.

Troubleshooting on the product is often only possible with the control software or the embedded software (e.g. initializing, moving to a defined position).

7.1 Cylinder unit OMNIS – Malfunctions

Problem	Cause	Remedy
The entire cylinder unit rotates during dosing.	The friction points have not been greased.	Grease the centering tube and the valve disk. *(see "Cleaning and greasing the cylinder unit OMNIS", chapter 6.5, page 29)*
There is liquid under the dosing piston, on the base of the centering tube or the cylinder unit.	The dosing piston is worn out or defective.	Replace the cylinder unit.
	The cylinder does not seal.	Replace the cylinder unit.
	The distributor disk does not seal.	Clean valve disk and distributor disk. *(see "Cleaning and greasing the cylinder unit OMNIS", chapter 6.5, page 29)*
The cylinder housing does not shut.	The spring clip is inserted incorrectly.	Remove the cylinder housing and insert the spring clip correctly.
The cylinder unit can only be removed from the dosing drive with difficulty.	The friction points have not been greased.	Grease the centering tube and the valve disk. *(see "Cleaning and greasing the cylinder unit OMNIS", chapter 6.5, page 29)*

Problem	Cause	Remedy
	The coupling is contaminated.	Remove the contaminations on the coupling between cylinder unit and drive.
The cylinder unit cannot be removed from the dosing drive. The cylinder top piece cannot be removed from the cylinder unit easily.	The cylinder unit is not in the exchange position.	Start the **Exchange position** function.
	The cylinder unit is jammed because the valve disk and the distributor disk stick together.	*(see "Cylinder unit OMNIS – Clearing the jamming", chapter 7.3, page 42)*
The cylinder unit is recognized either not at all or incorrectly.	The cylinder unit was attached or assembled incorrectly.	▪ *(see "Removing the cylinder unit OMNIS", chapter 5.2, page 19)* ▪ *(see "Attaching the cylinder unit OMNIS", chapter 5.1, page 17)* ▪ Check the correct placement of the cylinder unit. ▪ Switch the control instrument off and then back on again. ▪ If the problem persists, contact your regional Metrohm representative.
	The data chip is mechanically damaged or impaired by chemicals.	▪ *(see "Cleaning the cylinder unit OMNIS", chapter 6.2, page 23)* ▪ If the problem persists, contact your regional Metrohm representative.
Air bubbles are in the cylinder or in the dosing tubing.	Air intrusion through leaky connection.	▪ Check the ends of the tubing, in particular the end of the aspiration tubing. ▪ Tighten the tubing connections at the fill port with the wrench (6.2739.000). ▪ Check the correct placement of the OMNIS Liquid Adapter. ▪ Check the tubing connection of the bottle cap multi-use.
	The reagent degasses excessively; the released air forms bubbles.	▪ Start the **Preparing** function to rinse the cylinder unit and all tubing. ▪ Reduce the filling rate. ▪ Degas the reagent with ultrasound, nitrogen or in a vacuum.

Problem	Cause	Remedy
	The dosing piston is worn out.	Replace the cylinder unit.
	The **Preparing** function has not been executed or false parameters have been set.	▪ Execute the function **Preparing**. ▪ Check the length and diameter of the tubing and correct the settings in the control software if necessary. ▪ Check the fill port and correct the settings in the control software if necessary.
The cylinder unit doses an incorrect volume.	The cylinder unit has been assembled incorrectly.	Check whether the nominal volume on the cylinder housing and the cylinder volume match one another. Use a cylinder housing with the corresponding volume if necessary.
The cylinder unit does not dose.	The tubing connections and/or valve openings are jammed.	▪ Check whether the dosing port is sealed off with a stopper. ▪ Check whether the dosing tip is blocked. Clean the dosing tip if necessary. ▪ Check whether the valve openings are blocked. Clean the valve openings if necessary.
	The cylinder unit has been assembled incorrectly.	Check whether the dosing tubing is connected to the correct port and adjust if necessary.
	The piston rod of the dosing drive does not reach the dosing piston.	Remove the cylinder unit and check the position of the dosing piston. If the piston stopper is not flush with the base of the cylinder housing, correct the position of the dosing piston using the piston tongs. *(see "Cylinder unit OMNIS – Adjusting the piston position", chapter 7.2, page 39)*

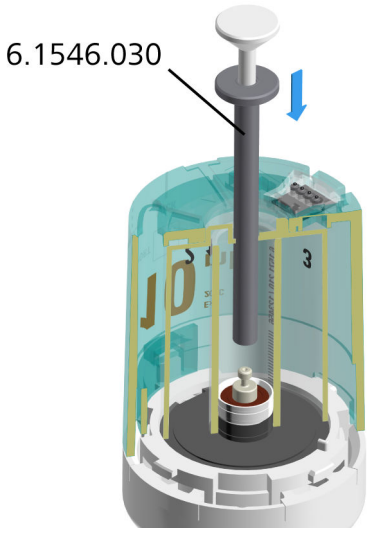
7.2 Cylinder unit OMNIS – Adjusting the piston position

If the piston stopper is not flush with the base of the cylinder housing, the piston rod of the dosing drive cannot reach the dosing piston.

Required accessories:

- Piston tongs (6.1546.030)

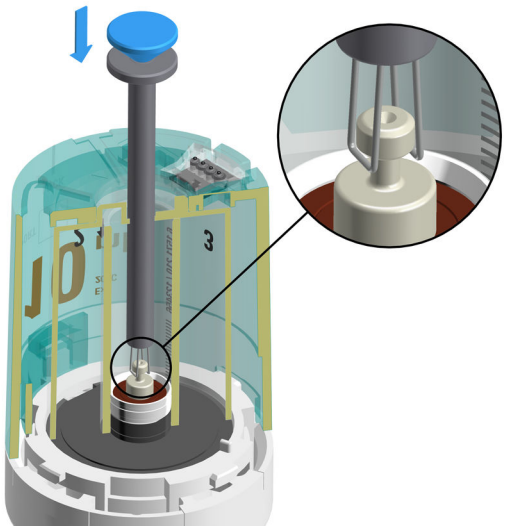
1 Inserting the piston tongs



Insert the piston tongs into the opening of the cylinder.

The image shows the lowest position of the piston. However, the dosing piston may be located at a higher position.

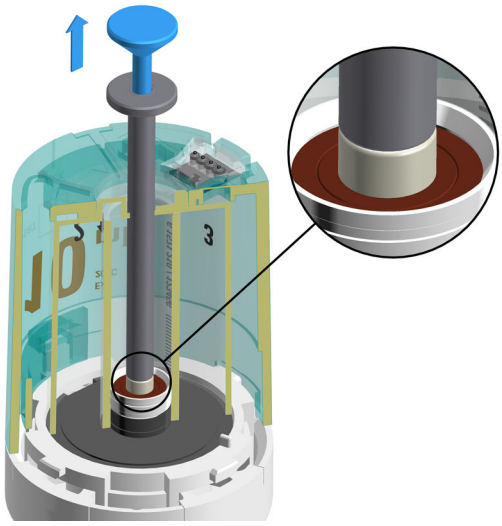
2 Clasping the dosing piston



- Press the plunger of the piston tongs (blue) and hold it down.
- Position the piston tongs in such a way that the wire loops grasp the piston stopper (see zoomed in view).
- Release the plunger of the piston tongs.

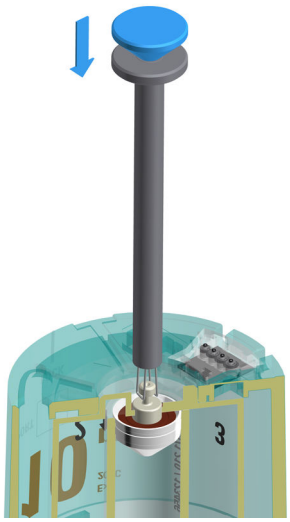
The piston tongs clasp the dosing piston.

3 Positioning the dosing piston



- Make sure that the piston tongs rest flush against the dosing piston (see zoomed in view).
- Hold on to the cylinder unit.
- Hold on to the plunger (blue) of the piston tongs and carefully pull up the dosing piston until it stops.

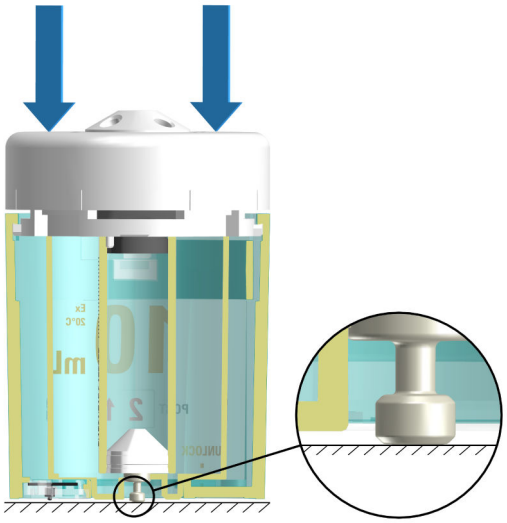
4 Removing the piston tongs



- Press the plunger of the piston tongs (blue) and hold it down.
- Remove the piston tongs.

5 Check the position of the piston stopper

If the piston stopper protrudes the cylinder housing (see zoomed in view), perform the following steps.



- Place the cylinder unit on a flat surface (e.g. laboratory table).
- Carefully push the cylinder unit vertically downwards onto the support surface.

The piston stopper is positioned flush with the cylinder housing. The cylinder unit can now be attached.

7.3 Cylinder unit OMNIS – Clearing the jamming

If it is difficult or impossible to rotate the cylinder top piece, the valve disk and the distributor disk stick to one another. The software displays an error message.

Clearing the jamming of the attached cylinder unit

1. Remove the tubings and the stoppers.
2. Open the **Manual control** of the dosing unit in the OMNIS Software .
3. Start the **Exchange position** function.
4. As soon as the **Exchange position** function has been executed successfully, remove the cylinder unit and soak it *(see "Clearing the jamming of the not attached cylinder unit", page 42)*.

   If the **Exchange position** function is not executed successfully, proceed as follows.
5. Remove the liquid from all ports with a syringe.
6. Fill every port with deionized water or another suitable solvent with a syringe (with needle). Make sure that the needle reaches the valve disk (remains stuck in the port).
7. Allow the cylinder unit to stand for 2 hours.
8. Initialize the dosing unit in the OMNIS Software, if possible, or force the valve to switch using the **Filling** function or the **Exchange position** function.

   Do not force the valve to switch multiple times.
9. If the cylinder unit remains jammed, repeat steps 5 to 8.

Clearing the jamming of the not attached cylinder unit

1. Place the jammed cylinder unit with the cylinder top piece facing down in warm water (possibly with a little dishwashing detergent) for at least 30 minutes.

2 Remove the cylinder unit from the water and dry thoroughly.

3 Attach the cylinder unit to the dosing drive and lock it.

4 Initialize the dosing unit in the OMNIS Software, if possible, or force the valve to switch using the **Dosing** function or the **Exchange position** function.

Do not force the valve to switch multiple times.

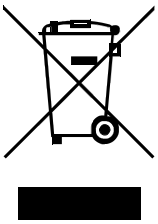
5 If the cylinder unit remains jammed, repeat steps 1 to 4.

If the error persists, call the regional Metrohm service representative or replace the entire cylinder unit.

See also

Cylinder unit OMNIS – Overview (chapter 3.1.1, page 11)

8 Disposal



Properly dispose of chemicals and of the product to reduce negative effects on the environment and public health. Local authorities, waste disposal companies or dealers provide more detailed information on disposal. Observe the WEEE EU directive (WEEE = Waste Electrical and Electronic Equipment) for the proper disposal of waste electronic equipment within the European Union.

9 Technical specifications

9.1 Ambient conditions

Nominal function range	+5 to +45 °C	at max. 80% relative humidity, non-condensing
Storage	+5 to +45 °C	

9.2 Cylinder unit OMNIS – Dimensions

Measurements

Diameter	68 mm
Height	100 mm

Weight

Type	
2 mL	180 g
5 mL	190 g
10 mL	200 g
20 mL	210 g
50 mL	240 g

9.3 Cylinder unit OMNIS – Housing

Materials

Cylinder housing	PETG	poly(ethylene terephthalate) glycol
Centering tube	PETG	poly(ethylene terephthalate) glycol
Dosing piston	PTFE	poly(tetrafluoroethylene)
Cylinder	borosilicate 3.3	

Valve disk	silicone carbide ceramic	
Distributor disk	Al_2O_3 ceramic	
Distributor	PCTFE	polychlorotrifluorethylene

Degree of protection IP 40

9.4 Cylinder unit OMNIS – Connectors specifications

Electrical contacts	4	spring contacts

9.5 Cylinder unit OMNIS – Liquid handling specifications

Cylinder unit

Cylinder volume	2, 5, 10, 20, 50 mL

Tubings

Tubing nipple outer thread	M6	
Inner diameter	2 mm	
Material	PTFE	poly(tetrafluoroethylene)

10 Dosing unit – Explanations regarding dosing accuracy

The dosing unit is equipped with a resolution of 102,400 steps per stroke. Provided that the cylinder is entirely filled, these 102,400 steps can aspirate and dose the following typical whole-number volumes.

Cylinder volume	Examples for volumes that can be dosed with microliter precision	Theoretically smallest volume step
2 mL	5 µL, 10 µL, 15 µL, …	19.53125 nL
5 mL	25 µL, 50 µL, 75 µL, …	48.828125 nL
10 mL	25 µL, 50 µL, 75 µL, …	97.65625 nL
20 mL	25 µL, 50 µL, 75 µL, …	195.3125 nL
50 mL	125 µL, 250 µL, 375 µL, …	488.28125 nL

If a volume is dosed or aspirated that is not a multiple of the theoretically smallest volume step, it is rounded to the previous volume step. The maximum deviation from the required volume thus equals the smallest volume step.

Limit values of the dosing unit

The dosing unit fulfills the *systematic error* and the *random error* according to DIN EN ISO 8655-3 "Piston-operated volumetric apparatus – Part 3: Piston burettes".

Metrohm guarantees that the dosing unit is in compliance with the following limit values at the time of shipment:

Cylinder volume	Maximum permissible systematic measurement deviation		Maximum permissible random measurement deviation	
2 mL	± 0.5%	± 10 µL	± 0.1%	± 2 µL
5 mL	± 0.3%	± 15 µL	± 0.1%	± 5 µL
10 mL	± 0.2%	± 20 µL	± 0.07%	± 7 µL
20 mL	± 0.2%	± 40 µL	± 0.07%	± 14 µL
50 mL	± 0.2%	± 100 µL	± 0.05%	± 25 µL

The regional Metrohm representatives offer the possibility of on-site inspections and certifications of dosing units with respect to accuracy.