Eco Dosimat

Product manual

8.1007.8001EN / v7 / 2024-12-02

Metrohm

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Eco Dosimat

Firmware version 57.1007.0019 or higher

Product manual

8.1007.8001EN / v7 /
2024-12-02

Technical Communication
Metrohm AG
CH-9100 Herisau

This documentation is an original document.

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 Product description

The Eco Dosimat is a dosing device for universal use that is equipped with the following functional units:

- Built-in magnetic stirrer
- Dosing unit with exchangeable cylinder unit
- Separate Manual Dosing Controller

Various methods can be created. A method determines how the instrument carries out dosing. The methods can be copied from one instrument to another with a USB flash drive.

If continuous dosing without interruption is required, then 2 Dosimats can be operated in tandem mode.

Dosing modes

The following dosing modes are supported:

- **DOS**
  Dosing in steps for semi-automatic titrations.
- **XDOS**
  Extended dosing with various dosing options.
- **CNTD**
  Create solutions with defined concentrations.

1.2 Product versions

The product is available in the following versions:

Table 1 Product versions

Art. no.	Designation	Version feature
2.1007.0010	Eco Dosimat	with magnetic stirrer

The article number and serial number for identification of the product can be found on the type label:

Figure 1 Type label (example)

1 **(01) = External article number**

2 **(21) = Serial number**

3 **(240) = Metrohm article number**

1.3 Displaying accessories

Up-to-date information on the scope of delivery and on optional accessories can be found on the Metrohm website.

1 **Searching for a product on the website**

- Go to *https://www.metrohm.com*.
- Click on .
- Enter the article number of the product (e.g. **2.1001.0010**) into the search field and press **[Enter]**.

The search result is displayed.

2 **Displaying product information**

- To display the products matching the search term, click on **Product models**.
- Click on the desired product.

Detailed information regarding the product is displayed.

3 Displaying accessories and downloading the accessories list

- To display the accessories, scroll down to **Accessories and more**.
  - The **scope of delivery** is displayed.
  - Click on **[Optional parts]** for the optional accessories.
- To download the accessories list, click on **[Download accessories PDF]** under **Accessories and more**.

Metrohm recommends keeping the accessories list for reference purposes.

1.4 Further information

Additional information on the product is available on the following pages:

- Metrohm website *https://www.metrohm.com* – Documents as PDF, overview of product family, information on applications and details of accessories.
- Metrohm Knowledge Base *https://guide.metrohm.com* – Thematically filtered individual content, videos, information on OMNIS Software.

1.5 About the documentation

Possible depictions in the documentation:

Depiction	Meaning
*(5-**12**)*	Cross-reference to figure legend (Figure number - ***Element in the figure***)
1	Instruction step
Method	Parameters, menu items, tabs, and dialogs
File ▶ New	Menu path
[Continue]	Button or key
	Supplementary information to the descriptive text
	Note In graphics, orange arrows or frames indicate the reference to the descriptive text. The relevant elements may also be colored orange.

Movement

In graphics, blue arrows indicate the movement direction. The elements to be moved may also be colored blue.

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

The present documentation uses warning messages as follows.

Structure

1. Severity of the danger (signal word)
2. Type and source of danger
3. Consequences of disregarding the danger
4. Measures for averting the danger

Hazard levels

Signal color and signal word designate the hazard level.

⚠ DANGER

Indicates an immediate danger. It will result in serious injuries or death if not avoided.

⚠ WARNING

Indicates a potential danger. Failure to avoid the danger may result in death or serious injury.

⚠ CAUTION

Indicates a potential danger. If not avoided, it may result in light or minor injuries.

NOTICE

Indicates a potentially damaging situation. If not avoided, the product or something in the surrounding area could be damaged.

2.6 Meaning of warning signs

Warning signs on the product or in the documentation indicate potential dangers or draw attention to certain behaviors in order to avoid accidents or damage.

Depending on the application purpose, the operating company attaches additional warning signs to the product. The corresponding instructions of the operator must be followed.

Table 2 Warning signs according to ISO 7010 (examples)

Warning signs / meaning		Warning signs / meaning	
	General warning sign		Warning of hot surface
	Warning of sharp object (cut/ puncture)		Warning of hand injuries (crushing)
	Warning of electrical voltage		Warning of corrosive substances
	Warning of optical radiation		Warning of a laser beam
	Warning of flammable materials		Warning of biological hazard
	Warning of toxic materials		

3 Functional description

3.1 Eco Dosimat – Overview

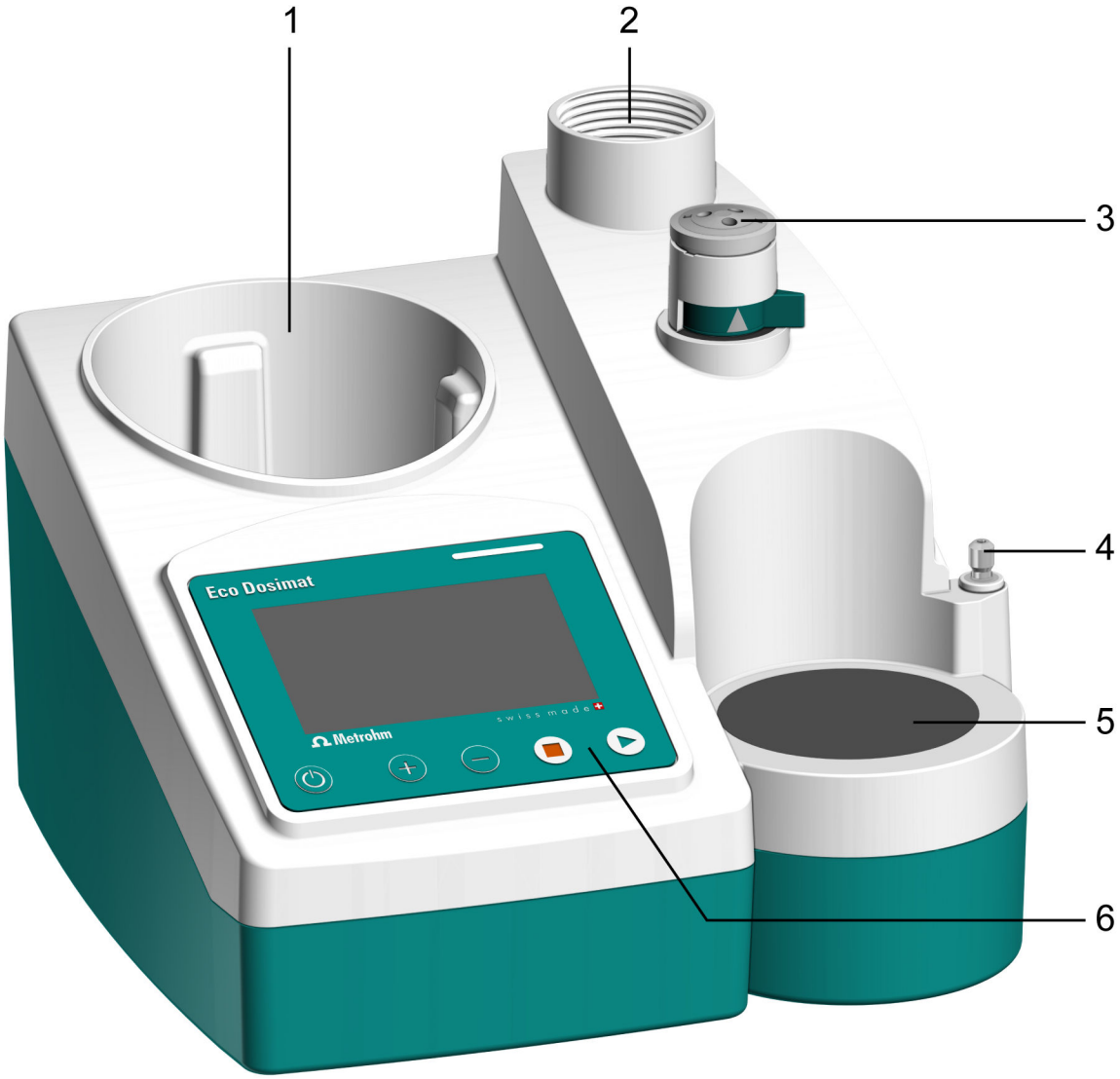


Figure 2 Eco Dosimat – Front

1	**Bottle holder**	**2**	**Space for cylinder unit**
3	**Flat stopcock**	**4**	**Stand attachment**
5	**Magnetic stirrer**	**6**	**Status display, touch screen and control bar**

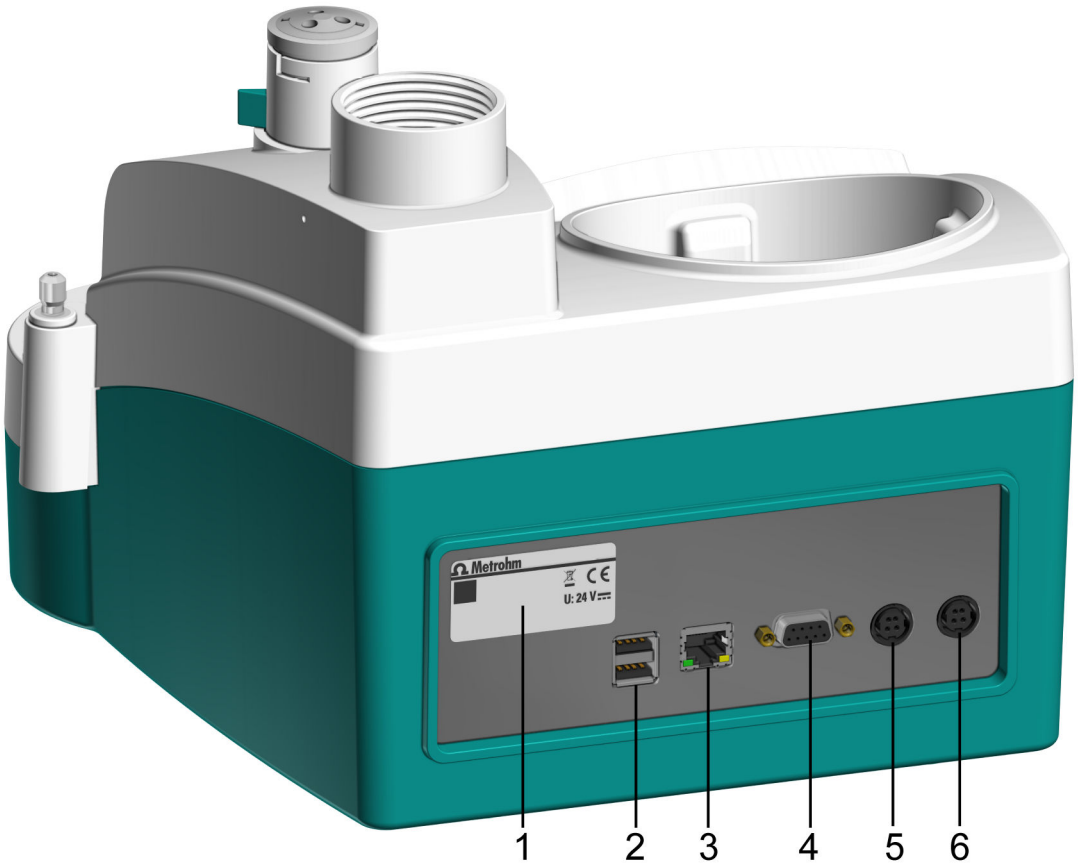


Figure 3 Eco Dosimat – Rear

1	**Type label**	**2**	**USB (USB 1 and USB 2)** Connect USB flash drive, printer, balance, etc.
3	**Ethernet (RJ-45)** Remote control via local network Connecting the Eco Dosimat for tandem mode	**4**	**Remote** Connecting the instrument with remote interface (e.g. Manual Dosing Controller)
5	**Power OUT** Energy supply for additional instrument possible	**6**	**Power IN** Connecting the power supply unit

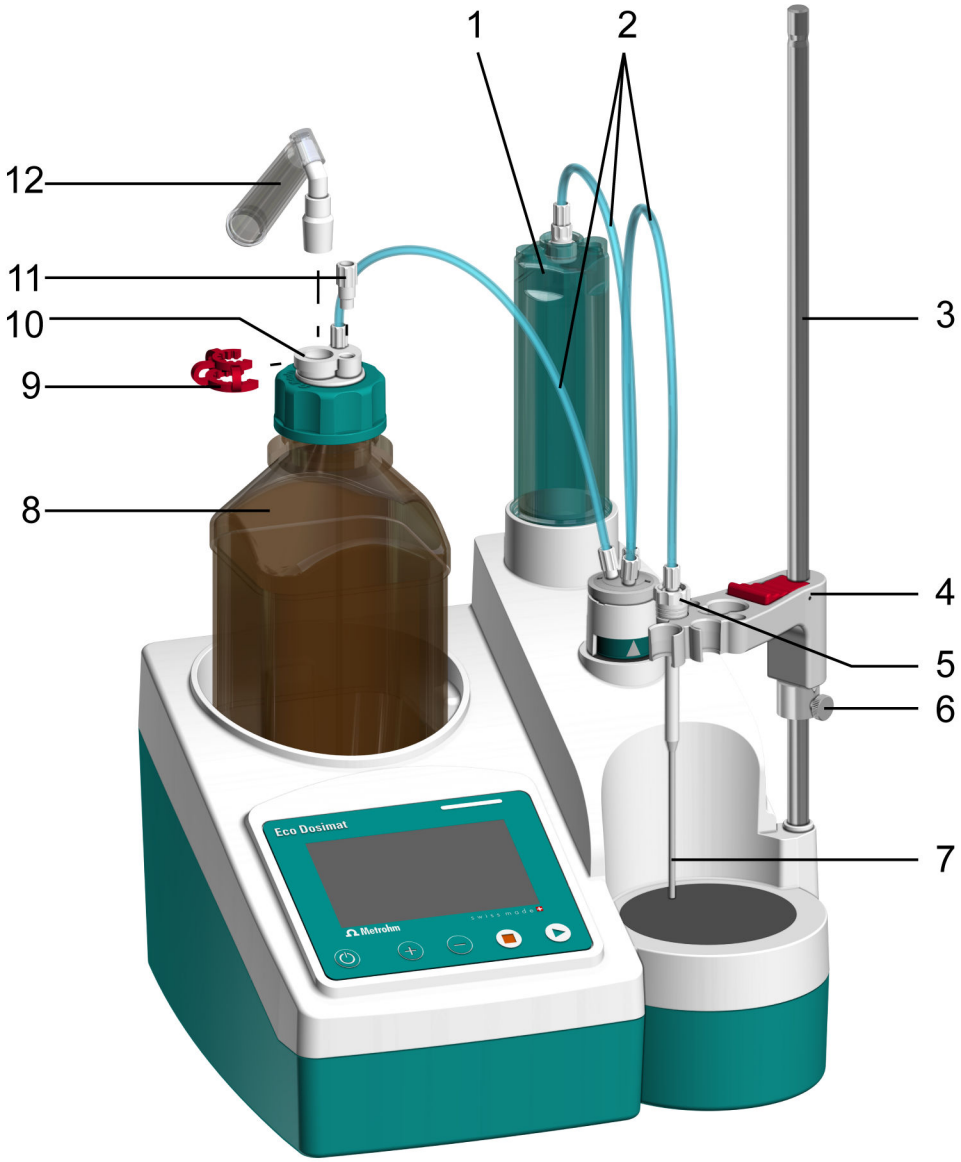


Figure 4 Eco Dosimat – Accessories

1	**Cylinder unit**	**2**	**Tubing connections**
3	**Support rod**	**4**	**Electrode holder**
5	**Guide sleeve**	**6**	**Clamping ring**
7	**Buret tip**	**8**	**Amber glass bottle with GL 45 thread**
9	**Ground-joint clip SGJ 14/15**	**10**	**Bottle cap**
11	**Threaded stopper**	**12**	**Adsorber tube**

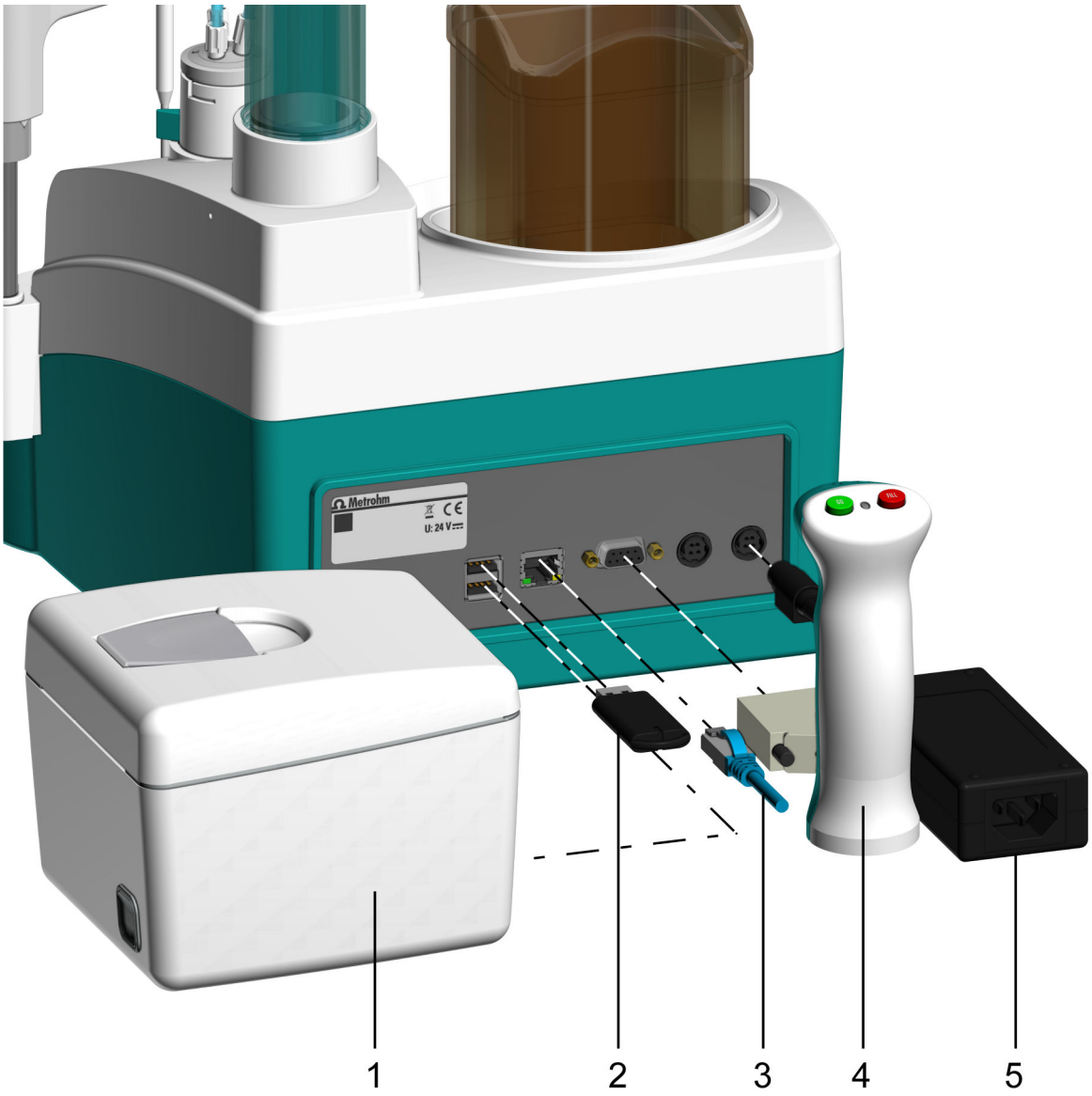


Figure 5 Eco Dosimat – Peripherals

1	**Printer Q3X (optional)**	**2**	**USB flash drive (optional)**
3	**Ethernet cable (optional)**	**4**	**Manual Dosing Controller**
5	**Power supply unit**		

3.2 Function of the components

3.2.1 Magnetic stirrer

The magnetic stirrer ensures that the sample is well mixed. In order to do so, a suitable stirring bar *(see "Lengths of stirring bar", page 113)* must be placed in the sample vessel.

Adjust the stirring rate and the stirring bar to the amount and viscosity of the sample.

The stand attachment, to which the support rod, the clamping ring, and the electrode holder are attached, is located directly at the magnetic stirrer.

3.2.2 Dosing unit

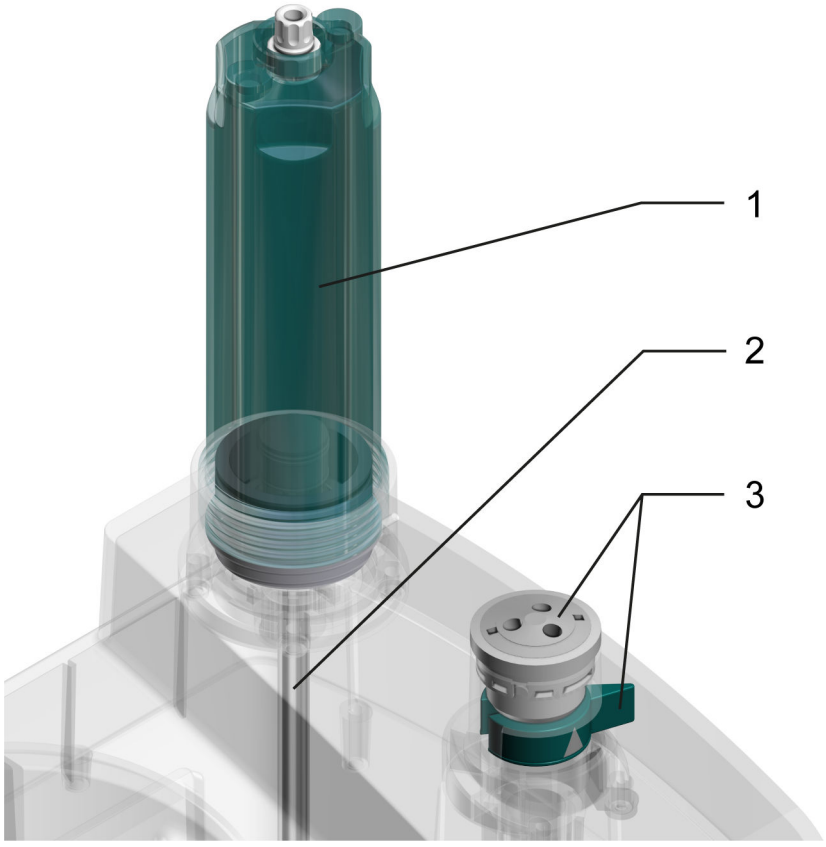


Figure 6 Dosing unit – Overview

1	**Cylinder unit**	**2**	**Piston rod (dosing drive)**
3	**Flat stopcock**		

Liquid volumes can be accurately dosed with the dosing unit.

The dosing drive is permanently installed in the housing of the instrument. The drive moves the push rod to raise and lower the piston in the dosing cylinder of the cylinder unit and is responsible for accurate dosing of the solution.

The flat stopcock switches between filling and emptying the dosing cylinder of the cylinder unit.

Once the cylinder unit is put into place, the dosing drive and the flat stopcock assume responsibility for the following functions:

- **Raising and lowering the piston:**
  Solution is aspirated while the piston is being lowered. The dosing cylinder fills up.
  Solution is dosed while the piston is being raised. The dosing cylinder empties.
- **Rotating the flat stopcock:**
  The position of the flat stopcock determines which connectors the solution flows through.

3.2.2.1 Cylinder unit

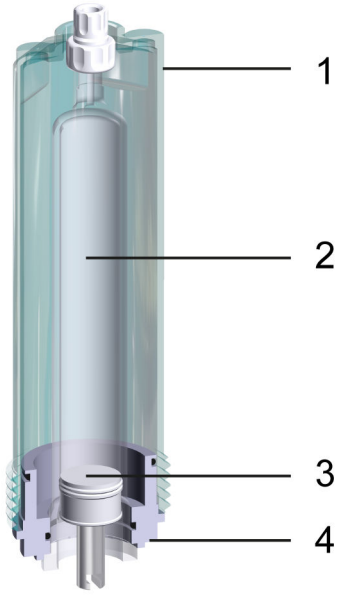


Figure 7 Cylinder unit – Overview

1	**Light protection**	**2**	**Dosing cylinder**
3	**Piston with sealing lips and piston rod**	**4**	**Mounting ring**

3.2.2.2 Flat stopcock

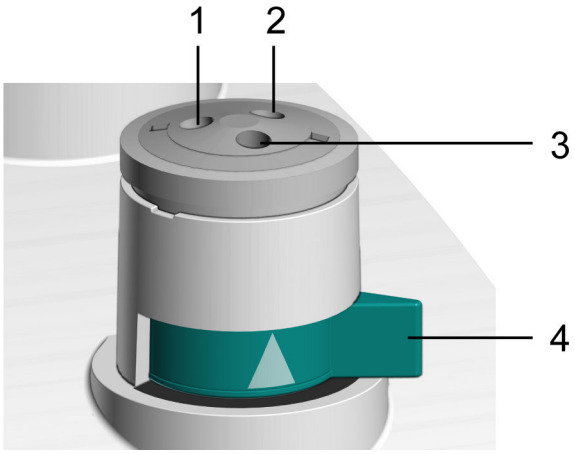


Figure 8 Flat stopcock – Overview

1	**Connector for the tubing connection to the bottle**	**2**	**Connector for the tubing connection to the buret tip**
3	**Connector for the tubing connection to the cylinder unit**	**4**	**Switching lever**

3.2.3 Manual Dosing Controller

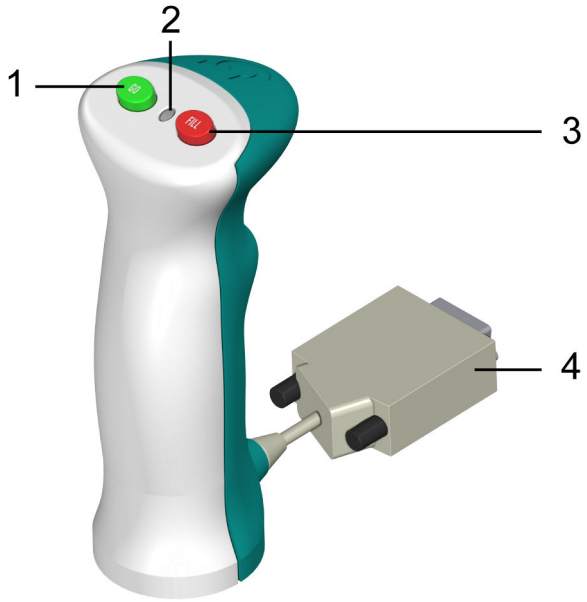


Figure 9 Manual Dosing Controller – Overview

1	**Dosing key [GO]**	**2**	**Status LED**
3	**Stop/Fill key [FILL]**	**4**	**Connector plug** Connecting to the instrument

The Manual Dosing Controller is an accessory for dosing in steps or extended dosing.

Pressing the [GO] key causes the dosing to run in accordance with the set parameters. The dosed volume is displayed. Pressing the [FILL] key cancels the dosing. The dosing cylinder is filled automatically.

Operational readiness of the Manual Dosing Controller is displayed by the Status LED lit up green.

The Manual Dosing Controller can also be used for 865 Dosimat plus, 876 Dosimat plus, and 876 Manual Titrator plus.

3.2.4 Bottle unit

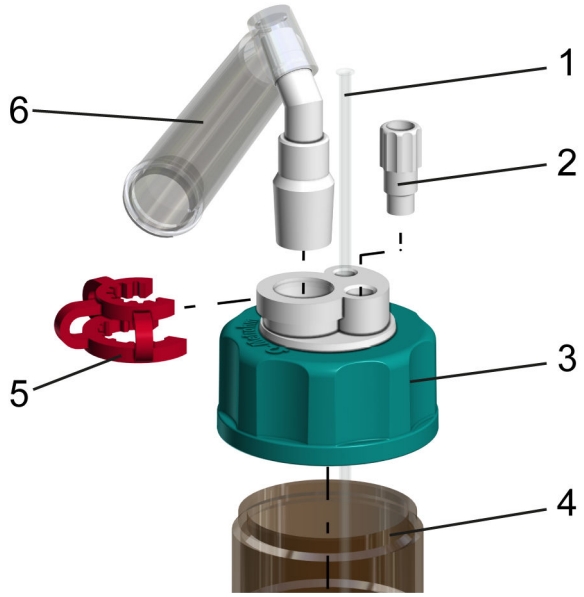


Figure 10 Bottle unit – Overview

1	**Cannula**	**2**	**Threaded stopper**
3	**Bottle cap**	**4**	**Amber glass bottle with GL 45 thread**
5	**Clip for SGJ 14/15**	**6**	**Adsorber tube**

3.3 Indicators and controls

Indicators

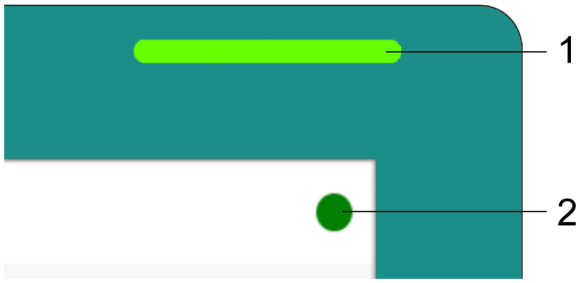


Figure 11 Indicators

1	**Status display**	**2**	**Status indicator**

Control bar

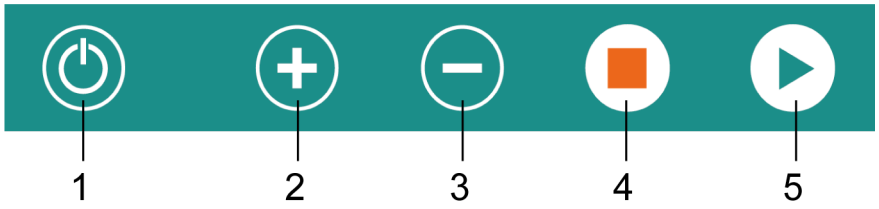


Figure 12 Control bar keys

1	**On/Off**	**2**	**Increasing the dosing rate**
3	**Reducing the dosing rate**	**4**	**Stop**
5	**Start**		

Magnetic stirrer – Controls

The stirring rate can be adjusted in the **Stirrer** work area.

The most recently used stirring rate will be used again when the instrument is switched on.

Stirring rate

Input range	**1** to **15 steps**
Default value = 8	

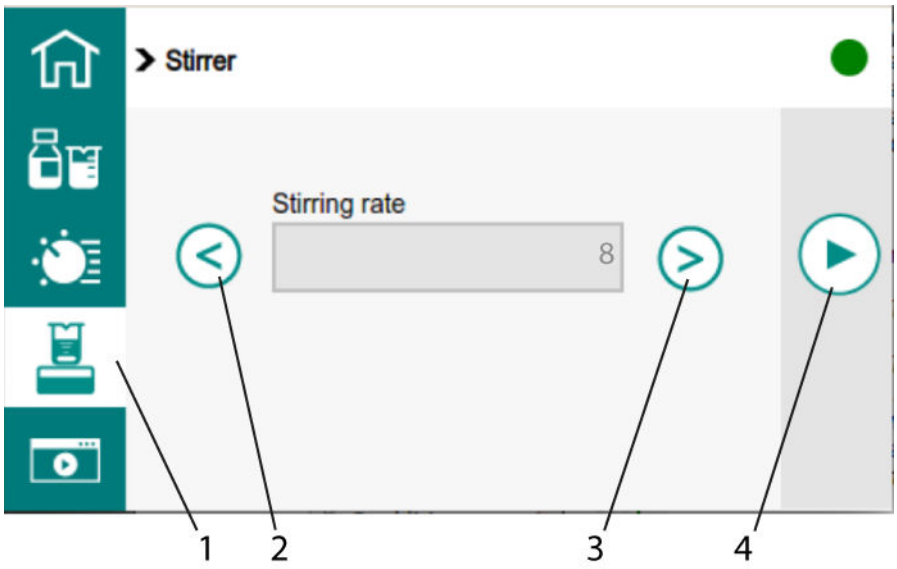


Figure 13 Stirring rate – Controls

1	**Stirrer work area**	**2**	**Reducing the stirring rate**
3	**Increasing the stirring rate**	**4**	**Starting the magnetic stirrer** If the stirrer is in operation, ⏹ is displayed.

Display – Controls

The brightness of the display can be adjusted on the start page in the **System** ▶ **Diagnosis** ▶ **Display test** menu.

The most recently set brightness appears when the instrument is switched on.

Brightness

Input range	**1** to **10**
Default value = 7	

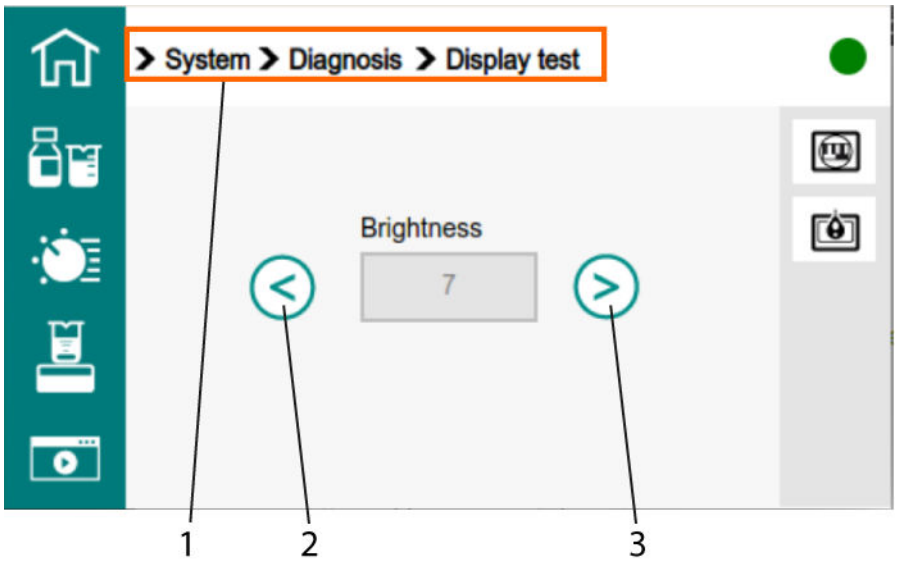


Figure 14 Display – Controls

1	**Menu path**	**2**	**Reducing brightness**
3	**Increasing brightness**		

3.4 Signals

The status display uses flashing patterns to display the operating status of the instrument.

Table 3 Status display

Signal	Flashing pattern	Meaning
	LED lights up green	Ready for operation
	LED flashes green (slowly)	In operation / Waiting
	LED flashes green (fast)	Malfunction or error

The status indicator uses colors to display the operating status of the instrument.

Table 4 Status indicator

Signal	Color	Meaning
	Green	Ready for operation
	Orange	In operation

Signal	Color	Meaning
	Yellow	Waiting
	Red	Malfunction or error

3.5 Remote interface

Pin assignment of the remote interface

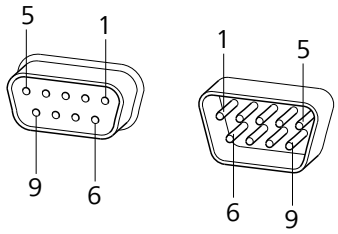
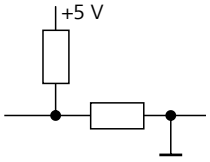


Figure 15 Pin assignment of remote socket and remote plug

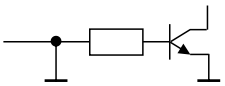
The above figure of the pin assignment applies to all Metrohm instruments with 9-pin D-Sub remote connector.

Table 5 Inputs and outputs of the remote interface

Pin no.	Assignment	Function
1	Output 0	Ready/EOD
2	Output 1	–
3	Output 2	–
4	Output 3	–
5	Output 4	Error
6	0 volt (GND)	
7	+5 volt	
8	Input 0	Start
9	Input 1	Stop

Inputs	
	approx. 5 kΩ Pull-up  t_P > 100 ms active = low, inactive = high

Outputs



Open Collector

t_p > 200 ms

active = low, inactive = high

I_C = 20 mA, V_{CEO} = 40 V

+5 V: maximum load = 20 mA

Status diagrams of the remote interface

EOD = End of Determination

Dosing mode DOS

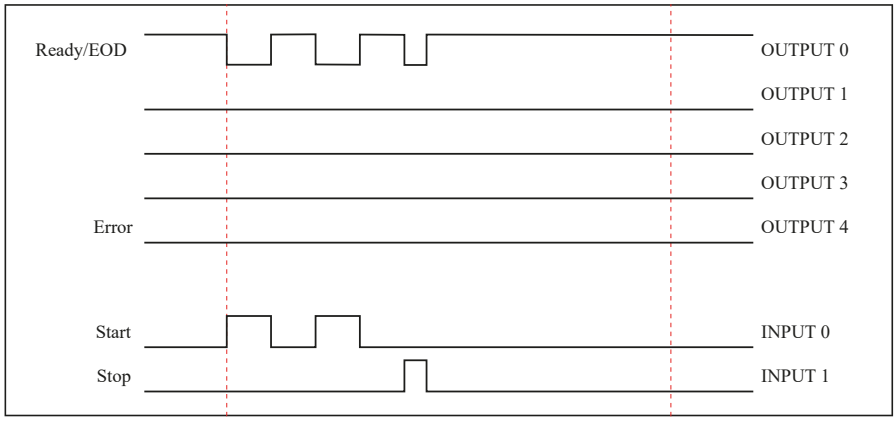


Figure 16 Remote status diagram DOS, without error event

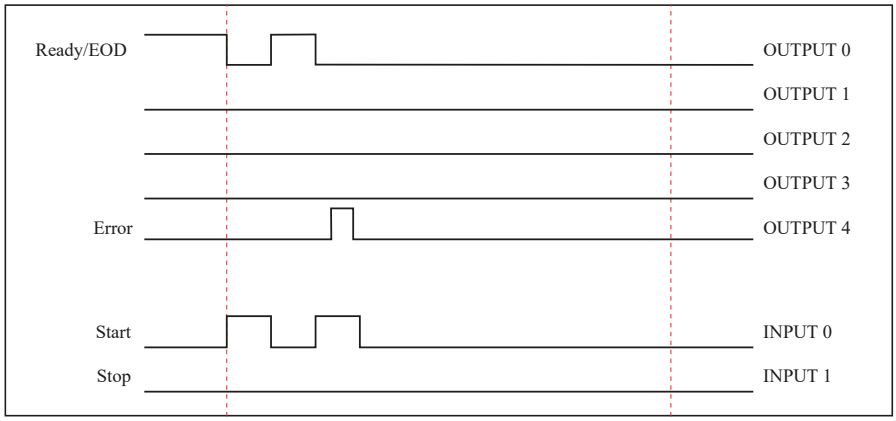


Figure 17 Remote status diagram DOS, with error event

Dosing mode XDOS

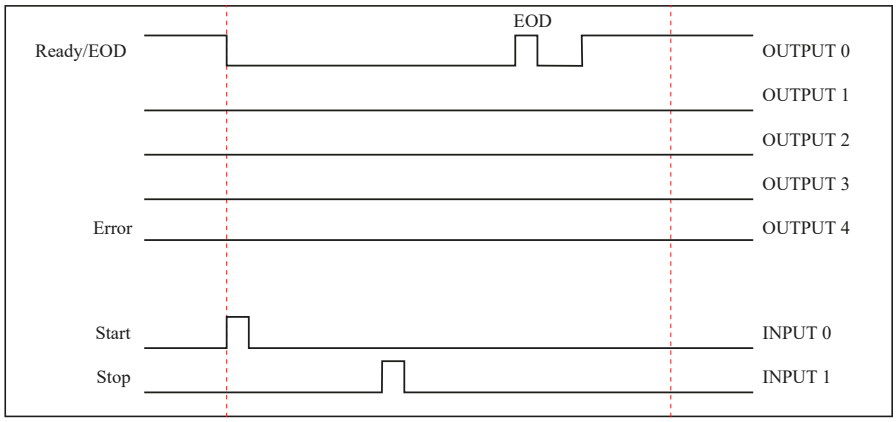


Figure 18 Remote status diagram XDOS, without error event

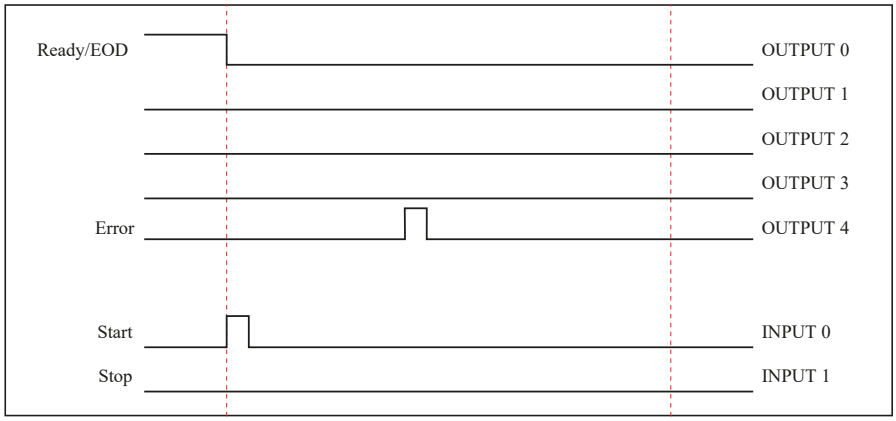


Figure 19 Remote status diagram XDOS, with error event

Dosing mode CNTD

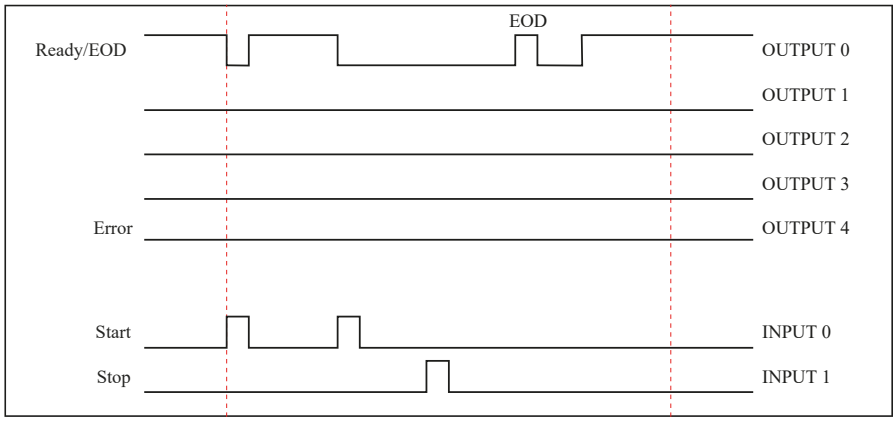


Figure 20 Remote status diagram CNTD, without error event

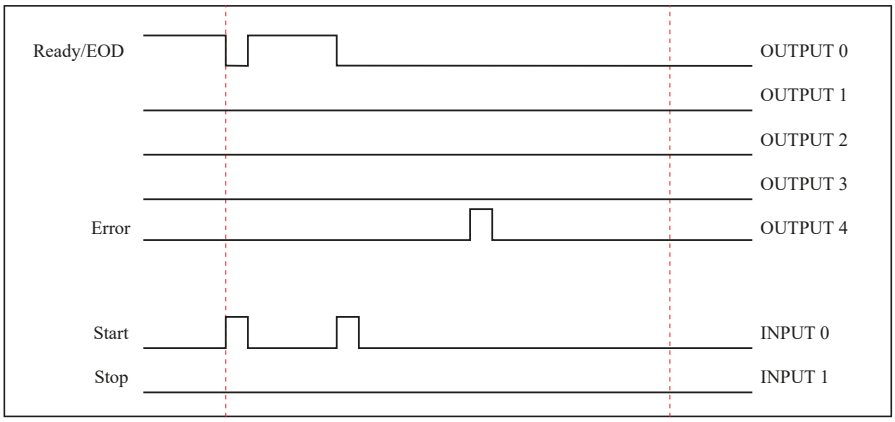


Figure 21 Remote status diagram CNTD, with error event

3.6 Remote control

The instrument can be remote controlled via an Ethernet connection. To do this, plug an Ethernet cable into the *(3-**3**)* connector provided.

The connection can be established only if the instrument and the computer are part of the same local network (LAN) and communicate via the port 8005. The IP address of the instrument is defined under: **System ▶ Ethernet settings**

Transfer protocol

The data communication is synchronous. On each command there is an acknowledgement by the instrument.

Send a command to the instrument with the control characters **CR LF** as terminator. The responses of the instrument will also be transferred with **CR LF** as terminator.

The instrument does not send spontaneous messages.

Table 6 Commands and variables

Command	Function	Comment
$G	Start/Continue	Corresponds to the **[START]** or **[Continue]** key.
$S	Stop	Corresponds to the **[STOP]** key.
$H	Hold	Hold the method run.

Command	Function	Comment
$D	Scan instrument status	Responses: *Ready;0*, *Busy;0* or *Hold;0* (0 = no message). If a message on the instrument requires the interaction of the user, the acknowledgement of the status scan displays the corresponding message number. Example: Busy;010-119 = "Check buret unit" The message can be acknowledged with **[OK]** or **[Cancel]**, see below.
$A	Confirm message	Confirm the message on the instrument with **[OK]**. A mandatory status scan providing the message number must take place immediately before confirming the message, see above.
$A(CONTINUE), **$A(CANCEL)**	Confirm message	Confirm the message with **[CONTINUE]** or **[CANCEL]**.
$A(DELETE), **$A(CANCEL)**	Confirm message	Confirm the message with **[DELETE]** or **[CANCEL]**.
$A(YES), **$A(CANCEL)**	Confirm message	Confirm the message with **[YES]** or **[CANCEL]**.
$A(RECONNECT)	Confirm message	Confirm the message with **[RECONNECT]**.
$L(*method name*)	Load method	The method name must be known and unique.

Table 7 Responses of the instrument

Response	Comment
OK	Command executed
E1	Method not found
E2	Invalid variable
E3	Invalid command

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 Installation

5.1 Setup location

The product is only suitable for operation indoors and may not be used in explosive environments.

The following requirements apply to the setup location:

- The room is well-ventilated and protected against both direct sunlight and excessive temperature fluctuations.
- The setup space is stable and free of vibrations. The setup space must be suitable for the dimensions and weight of the components (see technical specifications).
- All cables and connectors are accessible during operation. The cables are safely installed (no tripping hazards).
- The workplace is ergonomically designed and ensures trouble-free operation of the product.

5.2 Connecting the power cord

WARNING

Health hazards from electrical potential.

Severe injuries with possibly fatal consequences.

- Operate the product only if it is in perfect condition. The housing must also be intact.
- Only use the product with the covers fitted.
- 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.

Connecting the power cord

Required accessories:

- Power supply unit (6.2164.010)

Use only this power supply unit. Other products are not permitted.

- Power cord:
  - Length: max. 2 m
  - Number of conductors: 3, with protective ground
  - Conductor cross-section: 3 × min. 1.0 mm^2 / 18 AWG
  - Coupling: IEC 60320, type C13, 10 A
  - Power plug: 6.2122.XX0 (according to customer requirement), min. 10 A

1

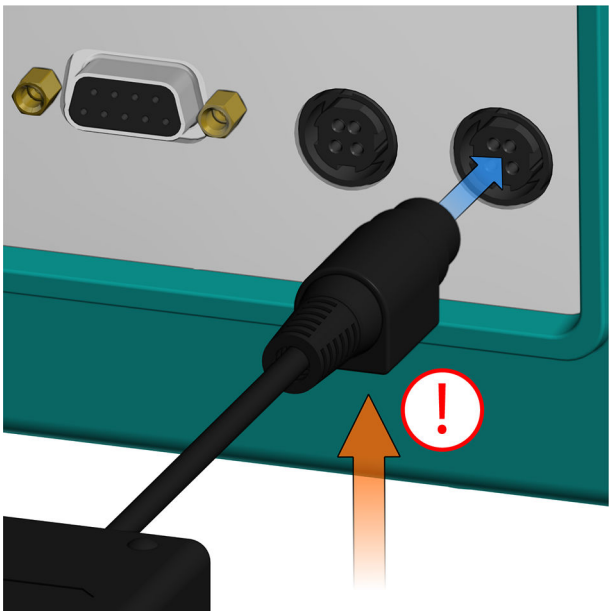


Figure 22 Rear of the instrument – Connecting the power cord

Connect the power supply unit to the **Power IN** connector.

Note the alignment (see figure).

2 Connect the power cord to the power supply unit.

3 Connect the cable to the energy supply.

The instrument can now be switched on and off: *(see "Switching the instrument on and off", chapter 6.1, page 34)*

5.3 Mounting the cylinder unit

NOTICE

Material damage caused by incorrect handling of the cylinder unit

The cylinder unit is blocked or damaged in some other way and must be replaced.

- Follow strictly the instructions for assembly, disassembly, and maintenance of the cylinder unit.
- Use only the tools specified.

Preparing the cylinder unit

Required accessories:

- Cylinder unit Eco with desired volume (6.03002.xxx)
- Piston tool (6.1546.040)

1 Insert the piston tool into the dosing cylinder and connect it to the piston rod.

2 Carefully lift out the piston until the piston protrudes approx. 6 mm from the dosing cylinder.

Make sure that the sealing lips and the piston in the dosing cylinder are not damaged.

The cylinder unit is prepared.

Installing the cylinder unit

Prerequisite:

- The instrument is switched on *(see "Switching the instrument on and off", chapter 6.1, page 34)*.
- The cylinder unit is prepared.

1 Press the ▶ key and wait until the push rod is extended.

2 Connect the cylinder unit to the push rod and carefully align the piston rod into the hook profile of the push rod while doing so.

3 Grasp the cylinder unit at the light protection and press it **carefully and straight** down (the piston is pressed into the dosing cylinder) until the mounting ring rests on the housing.

Make sure that the sealing lips and the piston in the dosing cylinder are not damaged.

4 Screw the cylinder unit securely into the thread of the housing and tighten it.

5 Press the key.

The push rod moves the piston into the basic position.

The cylinder unit has been mounted and is ready for use.

5.4 Mounting the support rod

Mounting the support rod, clamping ring and electrode holder

Required accessories:

- Support rod (6.2016.070)
- Clamping ring (6.2013.010)
- Electrode holder (6.2021.020)

1 **Mounting the support rod**

- Screw the support rod onto the stand attachment.

The clamping ring and the electrode holder can now be mounted to the support rod.

2 **Mounting the clamping ring**

- Push the clamping ring over the support rod with the groove facing upward.
- Push the clamping ring down as far as possible.

3 **Mounting the electrode holder**

- Press the locking lever on the electrode holder.
- Push the electrode holder over the support rod.
- To secure the electrode holder in place, release the locking lever at the desired height.

4 **Securing the electrode holder in place**

- Push the clamping ring under the electrode holder.
- Rotate the clamping ring in such a way that the wedge on the electrode holder fits in the groove in the clamping ring.
- Tighten the knurled screw on the clamping ring.

The clamping ring serves as a lower stop for the electrode holder and prevents the electrode holder with the mounted electrode from being lowered too far.

The electrode holder can now be equipped with the other accessories.

5.5 Mounting the bottle unit

Preparing the bottle cap

Required accessories:

- Bottle cap (6.1602.105)
- Cannula (6.1819.020)
- Threaded stopper (6.1446.080)
- Adsorber tube (6.1619.010)
- Ground-joint clip SGJ 14/15 (6.2023.020)
- Cotton
- Suitable sorbent
  - Molecular sieve for water-sensitive samples.
  - Soda lime for CO_2-sensitive samples.

1 Insert the cannula into the bottle cap.

2 Screw the threaded stopper into the bottle cap.

3 Fill the adsorber tube with a suitable sorbent.

If no special sorbent is required, then the adsorber tube can be filled with cotton and used as a dust filter.

4 Place the filled adsorber tube on the bottle cap.

5 Secure the adsorber tube in place with the ground-joint clip for SGJ 14/15.

The bottle cap is prepared.

Mounting the bottle unit

Prerequisite:

- The bottle cap is prepared.

Required accessories:

- Amber glass bottle (6.1608.023)

1 Set the bottle in the bottle holder.

2 Screw the prepared bottle cap onto the bottle and tighten it by hand.

The bottle unit is mounted

5.6 Mounting the tubing connections

The tubing connections connect the flat stopcock with the bottle unit, the cylinder unit, and the buret tip.

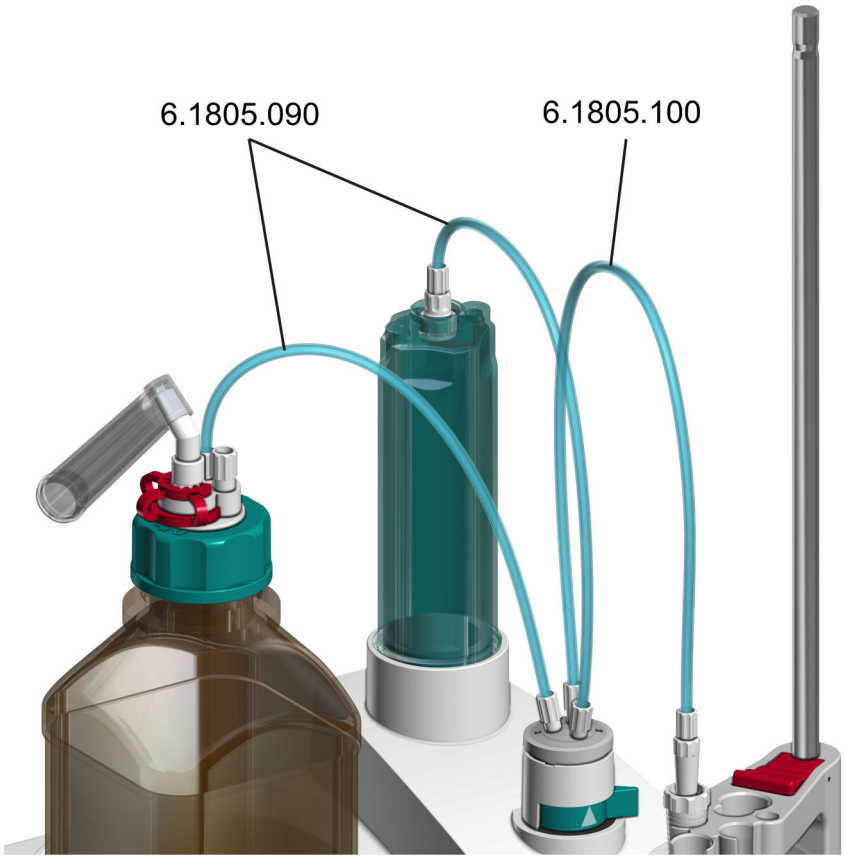


Figure 23 Tubing connections

Mounting the tubing connections and the buret tip

NOTICE

Deformation of the screw nipple of the tubing connections.

The tubing connections are unusable and must be replaced, otherwise liquids may leak out.

Measures to be avoided:

- Carefully screw in and tighten all tubing connections.
- Use no other investigative tools or other tools.

Prerequisite:

- The cylinder unit, electrode holder and bottle unit are mounted.

Required accessories:

- 2x FEP tubing 31 cm (6.1805.090)
- 1x FEP tubing 40 cm (6.1805.100)
- Desired buret tip:
  - Tip M6 (6.1543.060)
  - Titration tip M6 (6.1543.200)

  Suitable holder for the buret tip:
  - Link stopper (6.1446.030)
  - Guide sleeve (6.2709.070)

1. Screw the 6.1805.090 tubing securely to the cylinder unit and to the flat stopcock.
2. Screw the 6.1805.090 tubing securely to the bottle unit and to the flat stopcock.
3. Screw the 6.1805.100 tubing securely to the flat stopcock.
4. Screw the buret tip securely to the 6.1805.100 tubing.
5. Mount a suitable holder for the buret tip on the electrode holder and insert the buret tip into the holder.

   The tubing connections and the buret tip are mounted.

6 Operation and control

6.1 Switching the instrument on and off

Switching on the device

Prerequisite:

- The power cord is connected.
- The device is switched off.

1 Press the key.

The instrument is initialized and a system test is performed.

If enabled in **System** ► **Settings**, then the following can occur after switching on:

- A **beep** sounds.
- **PREP warning** appears and indicates that the buret needs to be prepared *(see "Preparing the buret (PREP)", chapter 6.4.2, page 43)*.

The instrument is switched on and the **start page** is displayed.

Powering down the system

Prerequisite:

- The instrument is switched on.

1 Press and hold down the key until the progress bar is full.

If the key is released during this time, then the system will remain active.

The system is powered down. Indicators and controls are inactive.

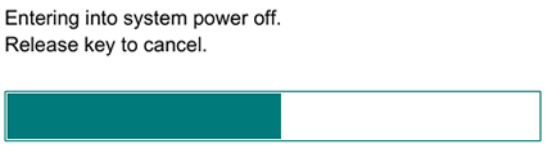
Press the key to reactivate the system.

Switching off the system

Prerequisite:

- The instrument is switched on.

1 Press and hold down the ⏻ and ▶ keys simultaneously until the progress bar is full.



If the keys are released during this time, then the instrument will remain switched on. This is to prevent accidental switch-off.

The system is switched off.

6.2 Indicators and controls

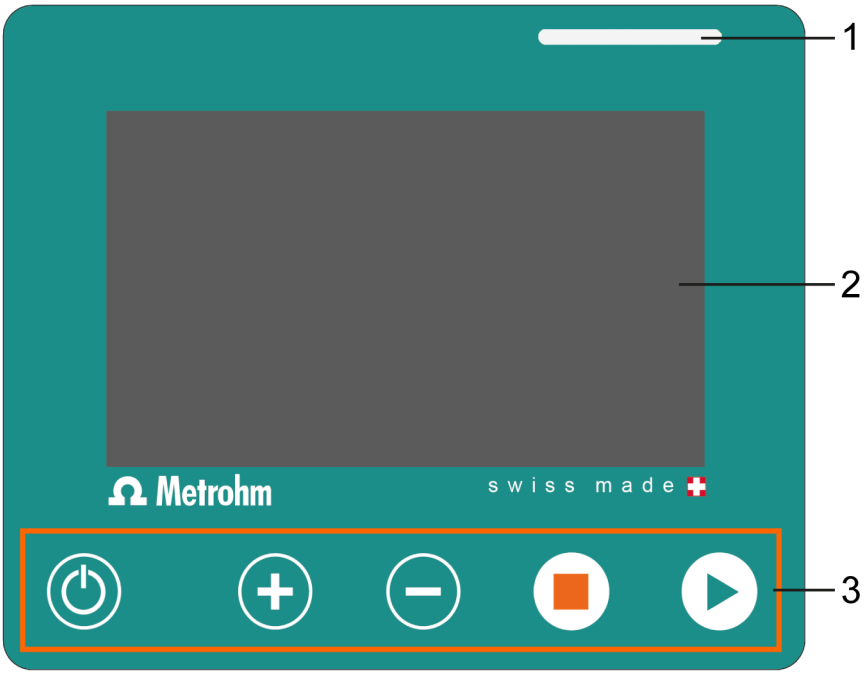


Figure 24 Status display, touch screen and control bar

1 Status display
Indicates the operating status of the instrument.

2 Touch screen
Used to set and control the instrument as well as to display results and additional information.

3 Control bar
Used to switch the instrument on and off, to control the dosing rate, and to start and stop the dosing process.

6.3 User interface – Brief description

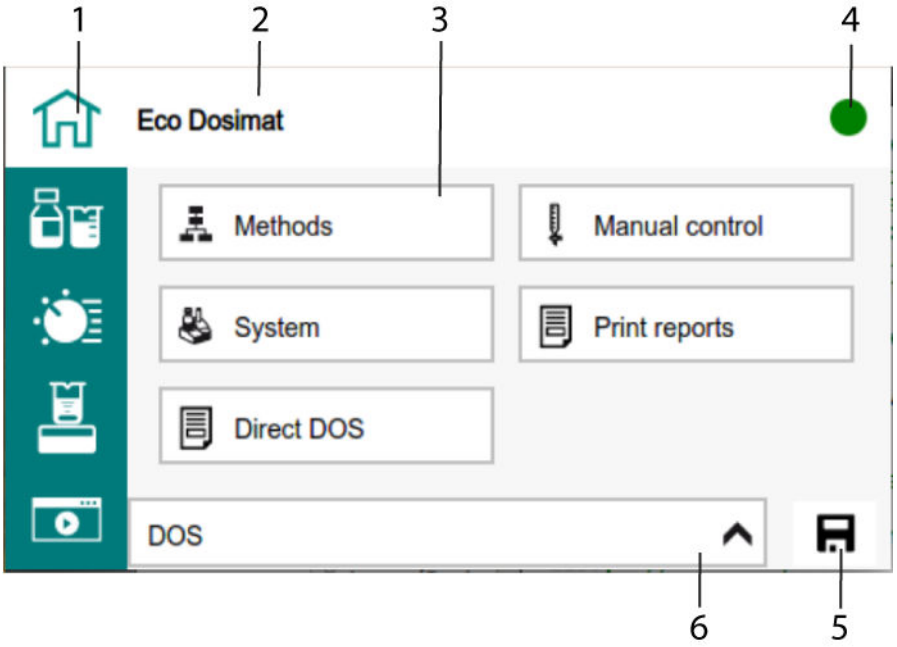


Figure 25 Start page with access to the functions

1	**Work area**	**2**	**Menu path**
3	**Button**	**4**	**Status indicator**
5	**Icon**	**6**	**Selection bar**

Work areas

If the piston is in the basic position (status indicator is green, status display is illuminated), then all of the following work areas can be selected.

If necessary, press the key so that the piston moves to the basic position.

Eco Dosimat

The start page with access to the functions:

- Methods
- Manual control
- System
- Print reports
- Direct DOS
- Method selection bar

Sample data

Access to the functions:

- Sample size
- Unit
- ID1
- ID2

Parameters

Access to the functions:

- Solutions
- Dosing parameters
- Calculation
- Reports

Stirrer

Access to the functions:

- Stirring rate
- Starting and stopping the stirrer

Live status

Display of the current dosing status.

Keyboards – Input of text and numbers

An appropriate keyboard is called up, depending on the type of input.

Figure 26 Keyboard (example: lower-case characters)

1 Input field	**2 Deleting the input field**

3	**Backspace**	**4**	**Canceling the entry (closing the window)**
5	**Applying the entry**	**6**	**Forwards in the input field**
7	**Backwards in the input field**	**8**	**Space**
9	**Switch keyboard**		

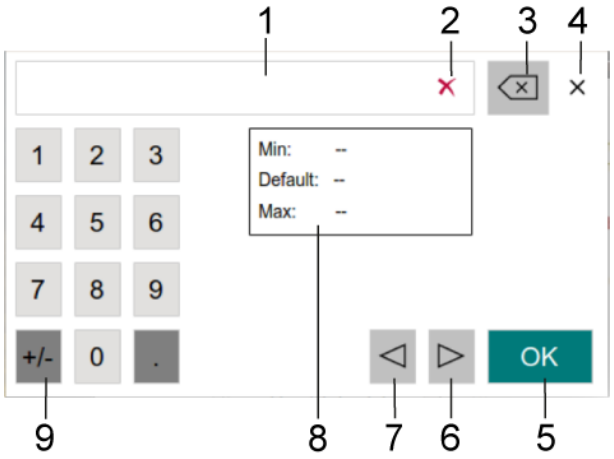


Figure 27 Keyboard (example: numbers)

1	**Input field**	**2**	**Deleting the input field**
3	**Backspace**	**4**	**Canceling the entry (closing the window)**
5	**Applying the entry**	**6**	**Forwards in the input field**
7	**Backwards in the input field**	**8**	**Default value and limit values**
9	**Algebraic sign change**		

Help texts

Help texts are available for selection bars and input fields.

Clicking on a selection bar or input field for at least 3 seconds calls up the corresponding help text.

6.4 Manual control

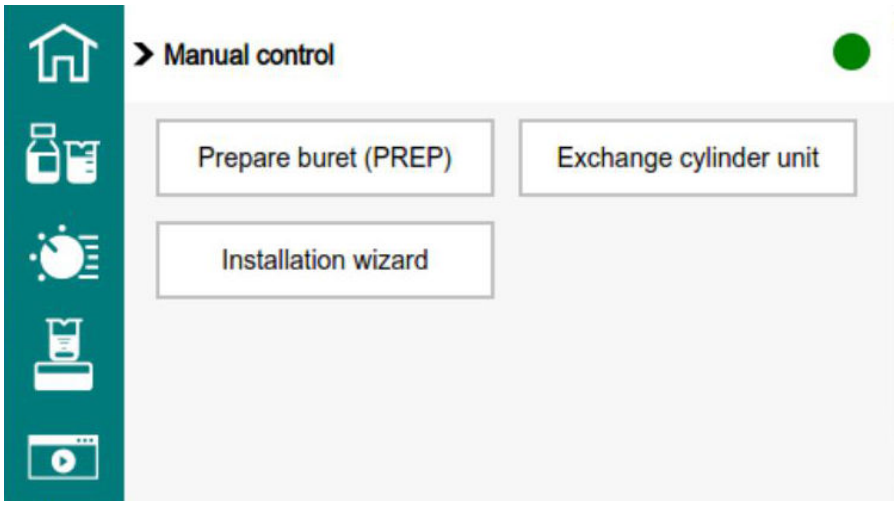


Figure 28 Manual control menu

6.4.1 Exchanging the cylinder unit

In the **Exchange cylinder unit** function, the drive moves the push rod into the exchange position.

NOTICE

Material damage caused by incorrect handling of the cylinder unit

The cylinder unit is blocked or damaged in some other way and must be replaced.

- Follow strictly the instructions for assembly, disassembly, and maintenance of the cylinder unit.
- Use only the tools specified.

NOTICE

Material damage from aggressive chemical hazardous substances

If the product comes into contact with aggressive chemical substances, this can lead to malfunctions or the product may be damaged and must be replaced.

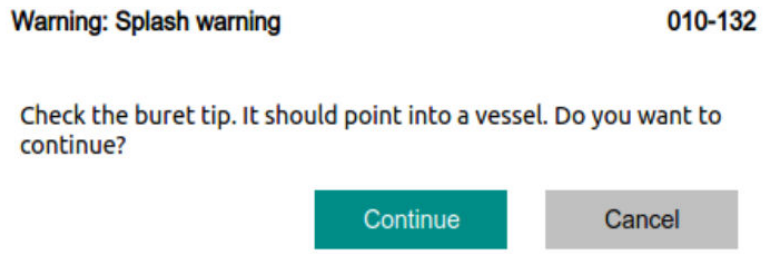
- Clean up spilled liquids and solids immediately.
- Use protective grounding when working with highly flammable chemical substances and gases.
- If you suspect that chemical substances have penetrated the product, disconnect the product from the energy supply immediately. Then notify the regional Metrohm service representative.

Emptying and removing the cylinder unit

1 On the **Start page**, open the **Manual control** menu.

Click **[Exchange cylinder unit]**.

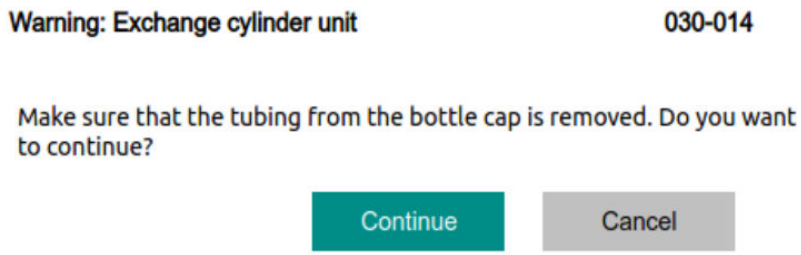
A splash warning appears:



2
- Make sure that the buret tip points into a vessel.
- **[Continue]**

The piston rises and the dosing cylinder empties as much as possible. The message **Exchanging cylinder unit...** appears.

Once the push rod has reached the top position, the following warning appears:

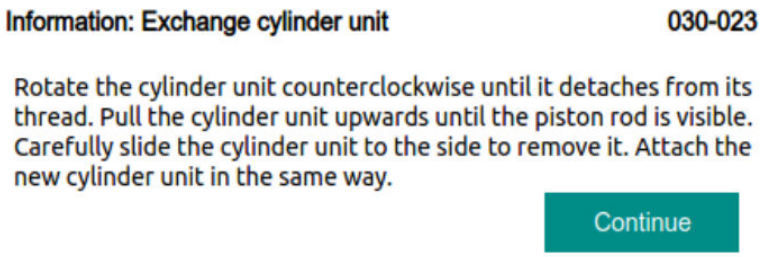


3
- Make sure that the tubing from the bottle cap is removed.
- **[Continue]**

The message **Exchanging cylinder unit...** appears and the piston is lowered down to the height at which the cylinder unit can be disassembled.

4
- Remove the tubing from the cylinder unit.
- **[Continue]**

The following message is displayed:



5 **Dismantling the cylinder unit**

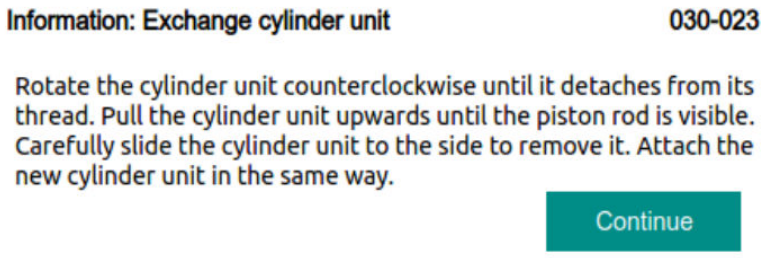
- Rotate the cylinder unit counterclockwise until it detaches from its thread.
- Pull the cylinder unit vertically upwards until the piston rod is visible.
- Carefully slide the cylinder unit to the side to remove it.

The disassembled cylinder unit can be cleaned and reused or replaced with a new cylinder unit.

Mounting the cylinder unit

Prerequisite:

- The instrument is switched on.
- The **[Exchange cylinder unit]** process was executed up to the point when the cylinder unit can be removed from the instrument.
- The instrument is carrying out the **[Exchange cylinder unit]** procedure and the push rod of the dosing drive is at the height at which the cylinder unit can be mounted. The following message is displayed:



- The maintenance has been carried out professionally or a new cylinder unit is ready for assembly.
  The cylinder unit is prepared: *(see "Preparing the cylinder unit", page 29)*

1 Connect the cylinder unit to the push rod and carefully align the piston rod into the hook profile of the push rod while doing so.

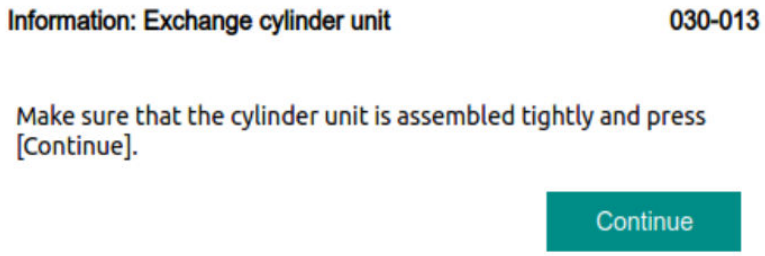
2 Grasp the cylinder unit at the light protection and press it **carefully and straight** down (the piston is pressed into the dosing cylinder) until the mounting ring rests on the housing.

Make sure that the sealing lips and the piston in the dosing cylinder are not damaged.

3 Screw the cylinder unit securely into the thread of the housing and tighten it.

4 **[Continue]**

The push rod moves the piston into the basic position.

5 

Make sure that the cylinder unit has been mounted correctly.

[Continue]

6 **[Continue]**

Make sure in the **System** ▶ **Settings** menu that the value of the cylinder volume matches the volume of the mounted cylinder unit.

The cylinder unit is ready and the **Prepare buret (PREP)** command can be executed.

6.4.2 Preparing the buret (PREP)

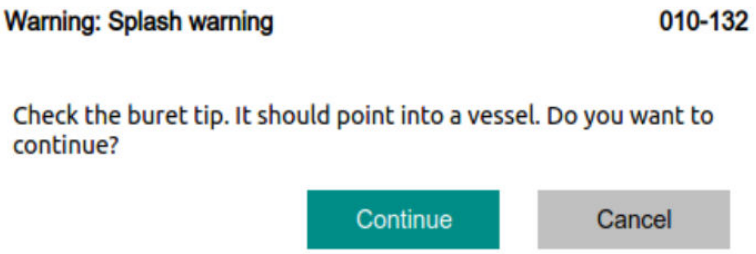
The **PREP** function is used to rinse the cylinder and tubings of the buret unit and fill them air bubble-free. You should carry out this function daily before the first determination.

Preparing the buret (PREP)

1 On the **Start page**, click on **[Manual control]**.

2 Click **[Prepare buret]**.

A splash warning appears:



3 Make sure that the buret tip points into a vessel.

[Continue]

The piston rises and sinks and the cylinder empties and fills in 2 cycles.

The buret is prepared and can be used.

6.4.3 Operating the magnetic stirrer

Switching the stirrer on and off

Prerequisite:

- The instrument is switched on.

1 Add a stirring bar to the sample vessel.

2 Open the **Stirrer** work area:

The controls for the magnetic stirrer appear:

3 **Switching on the stirrer**

Click on . This icon is visible only when the stirrer is switched off.

The stirrer begins stirring with the most recently set stirring rate.

4 **Switching off the stirrer**

Click on . This icon is visible only when the stirrer is switched on.

The stirrer stops.

Setting the stirring rate

The stirring rate can be adjusted in 15 steps. The default value is 8.

Prerequisite:

- The **Stirrer** work area is open.
- The stirrer is switched on.

1 Reducing the stirring rate in steps

Click < repeatedly until the desired stirring rate has been reached.

With each click, the stirring rate is reduced by one step. The current stirring rate is displayed.

2 Increasing the stirring rate in steps

Click > repeatedly until the desired stirring rate has been reached.

With each click, the stirring rate is increased by one step. The current stirring rate is displayed.

6.4.4 Carrying out direct dosing (Direct DOS)

Direct dosing **Direct DOS** is used for fast dosing of a defined amount of the solution. A method must not be loaded.

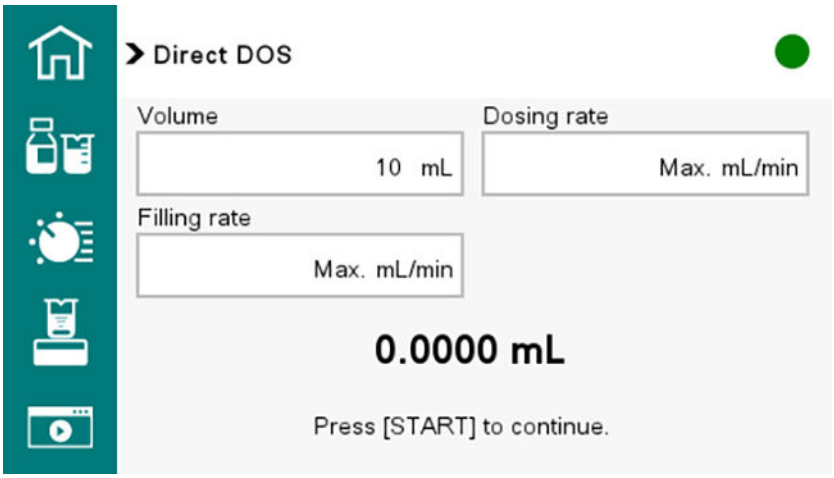
Carrying out direct dosing (Direct DOS)

Prerequisite:

- The buret tip points into a sample vessel or dosing vessel.
- The defined cylinder volume in **System** ▶ **Settings** corresponds to the volume of the mounted cylinder unit.

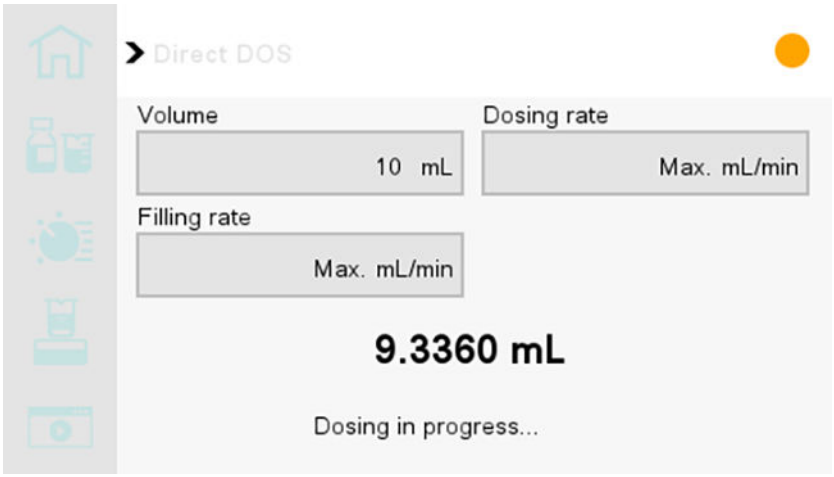
1 Dosing

- On the start page  , click on the **Direct DOS** button.



- Enter the volume to be dosed into the **Volume** input field.
- If necessary, change the **dosing rate** or the **filling rate**.
- Switch on the stirrer in the work area if required.
- Press the key on the instrument or on the Manual Dosing Controller.

Dosing is in progress. The dosed volume is shown on the screen:



The instrument fills the dosing cylinder automatically.

6.5 Methods

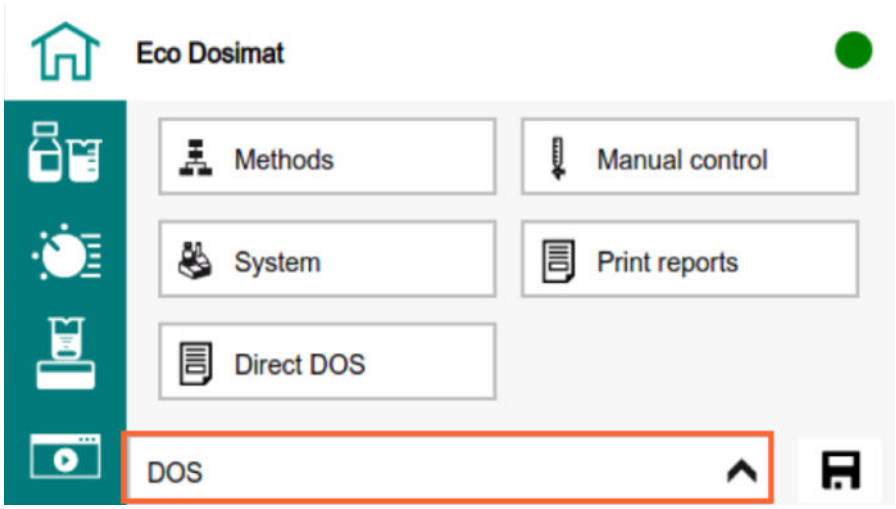
Definition

A **method** determines how dosing is carried out. The dosing mode, the solution used and further parameters are defined in a method.

Methods are saved under a freely selectable method name. A method name consists of a maximum of 24 characters.

Method selection bar

The **method selection bar** on the start page shows the method that has been loaded. If needed, another method can be loaded in the method selection bar. Dosing can be carried out with the method that has been loaded.



Display in the method selection bar	Example	Meaning
Method name	DOS	The method is saved in the method list.
Method name [New]	DOS [New]	The method has just been created. It has not been saved.
Method name [Modified]	DOS [Modified]	The method has been modified. The modifications have not been saved.

A new or modified method is available for dosing until it is changed or until another method is loaded. To use the method at a later point, it can be saved in the method list.

Method list

The **[Method]** button on the start page shows a list of all the saved methods. Methods can be created, exported and deleted here.

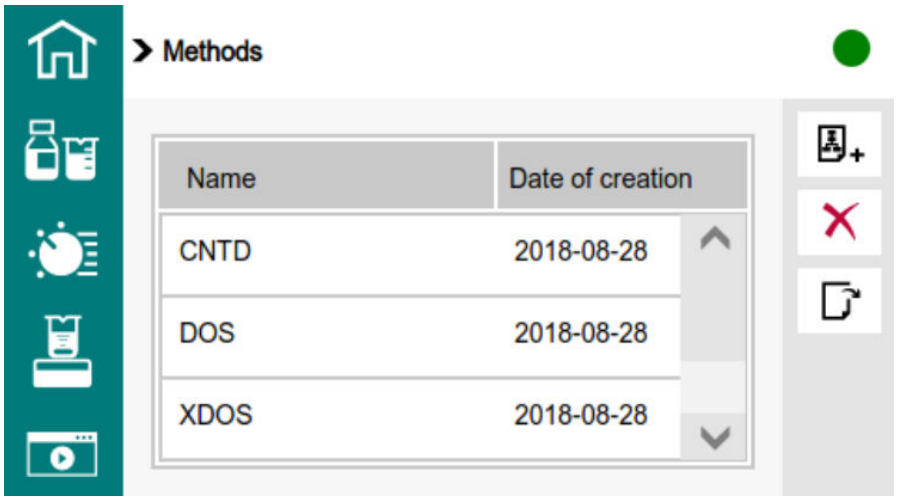


Figure 29 Method list (example)

A scroll bar appears if the list is longer.

Dosing mode

Each method is based on a dosing mode. The following dosing modes are available:

- **DOS** – Interactive dosing in steps with optional result calculation. For semi-automatic titrations.
- **XDOS** – Extended dosing with 2 user-selectable dosing criteria:
  - Volume and time
  - Volume and dosing rate
  - Dosing rate and time

  In tandem operation: Continuous dosing without interruption.
- **CNTD** – Automatic creation of solutions with specified content. For standard solutions, sample solutions, or dilutions.

6.5.1 Using and managing methods

Methods are used for dosing as follows:

- **Load method** – Allows for carrying out dosing with the method that has been loaded. Allows for changes of the method that has been loaded.
- **Change method parameters** – Changes the parameters of the method that has been loaded.
- **Store method** – The method that has been loaded can be added to the method list.

The following options are available to create and manage methods:

- **Create new method**
- **Delete method** – Remove the method from the method list.
- **Export method** – Print out the method or save it to a USB flash drive.
- **Import method** – Add a method from a USB flash drive to the method list.

Loading the method

1 Open the method selection bar on the **Start page**:

Click on ^.

A list with the saved methods appears. The list can be searched with the scroll bar.

2 Select the desired method.

The desired method appears in the method selection bar and is loaded.

3 Change the method parameters if necessary.

The method is available for measurements.

Changing the method parameters

1 Load the method that you want to change in the method selection bar on the **Start page**.

2 Open the **Parameters** work area: 

3 Set the parameters if necessary.

4 Continue with one of the following steps:

- Carry out measurements with the modified method.
- Go to the **Start page** and save the method for later use.

Saving a method

If the method parameters change, then they can be saved as your own method. A maximum of 120 methods can be saved.

Prerequisite:

- The method that you want to save is loaded in the **method selection bar**.

- The method is marked [New] or [Modified].

1 Save the method:

An input field for the name appears.

2 Click on the input field.

A keyboard appears.

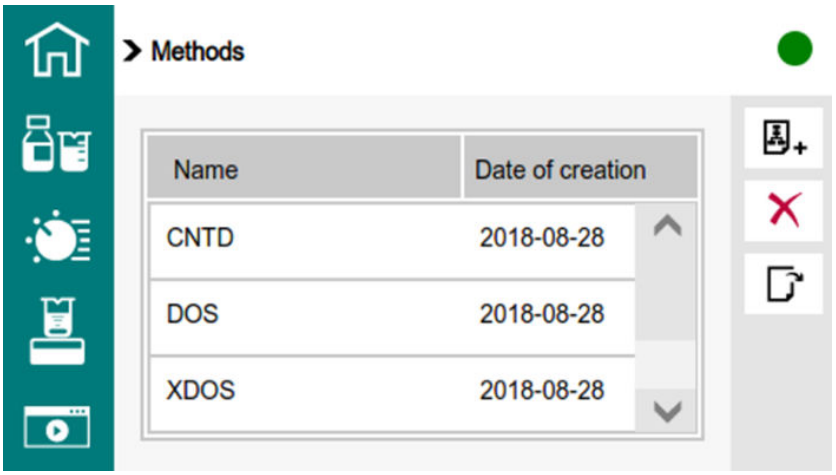
3 Enter the desired name with the keyboard. Finish with **[OK]**.

The name that was entered appears in the method selection bar. The method is now saved in the method list.

Creating a new method

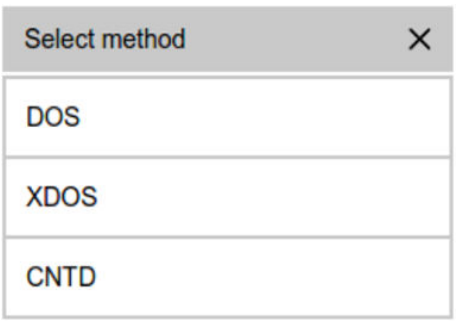
1 On the **Start page**, click on the **[Methods]** button.

The method list opens.



2 Create a new method:

A selection of dosing modes appears.



If modifications on the method that was loaded before have not been saved, the following warning appears:
Store method: The modifications of the current method have not been saved. Do you want to load the method anyway?
- **[Yes]** – a new method is created. The changes on the method that is currently loaded are discarded.
- **[Cancel]** – creation of the new method is canceled.

3 Select the desired dosing mode by clicking on it. Example: DOS

The new method appears in the method selection bar. The method is marked with *[New]*. Example: DOS [New]

4 Set the method parameters.

5 Continue with one of the following steps:
- Carry out measurements with the new method.
- Save the method for later use.

Deleting a method

1 On the **Start page**, click on the **[Methods]** button.

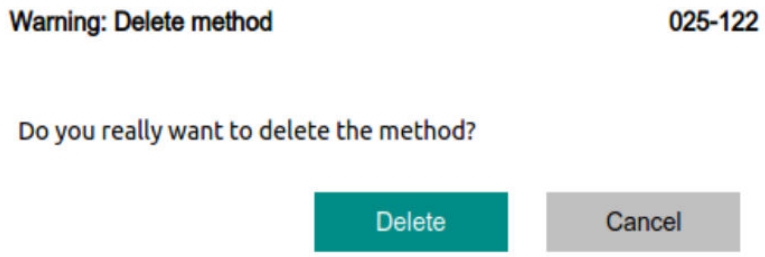
The method list appears.

2 Select the method that you want to delete by clicking on it.

The selected method is highlighted in green.

3 Delete the highlighted method:

The warning **Delete method** appears.



4 Confirm deleting: **[Delete]**

The deleted method is no longer available in the method list.

Exporting a method

1. Connect the USB flash drive to the instrument.
2. On the **Start page**, click on the **[Methods]** button.

   The method list appears.
3. Select the method that you want to export by clicking on it.

   The selected method is highlighted in green.
4. Export the marked method:

   The message **Exporting method to USB flash drive...** appears.

   Once the message has disappeared, the method is saved to the USB flash drive that is connected.

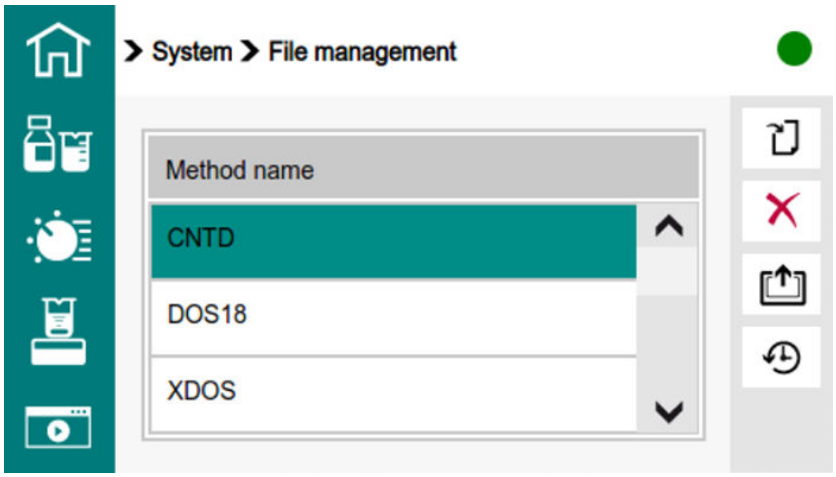
   If a method with the same name already exists on the USB flash drive, then the following warning appears: **Store method: Method name already exists. Do you want to overwrite the name?**.
   - **[Yes]**: The method on the USB flash drive will be overwritten.
   - **[No]**: The method will not be exported.

Importing a method

1. Connect the USB flash drive to the instrument.
2. On the **Start page**, click on the **[System]** button.

   Click **[File management]**.

   A list with the methods saved on the USB flash drive appears.



3 Select the method that you want to import by clicking on it.

The selected method is highlighted in green.

4 Import the highlighted method:

The message **Importing method from USB flash drive...** appears.

Once the message has disappeared, the method is saved to the instrument.

If a method with the same name already exists on the instrument, then the following warning appears: **Store method: Method name already exists. Do you want to overwrite the name?**.

- **[Yes]**: The method on the instrument will be overwritten.
- **[No]**: The method will not be imported.

6.6 Sample data

Definition

A **sample** is the substance to be analyzed. With the **sample data**, the samples can be identified. The sample data consist of the variables ID1 and ID2 as well as the sample size and the corresponding unit.

Entering sample data

In the dosing mode DOS, a sample size can be used for calculation. In the mode CNTD, the volume to be dosed is calculated depending on the sample size.

The button shows the **Sample data** work area.

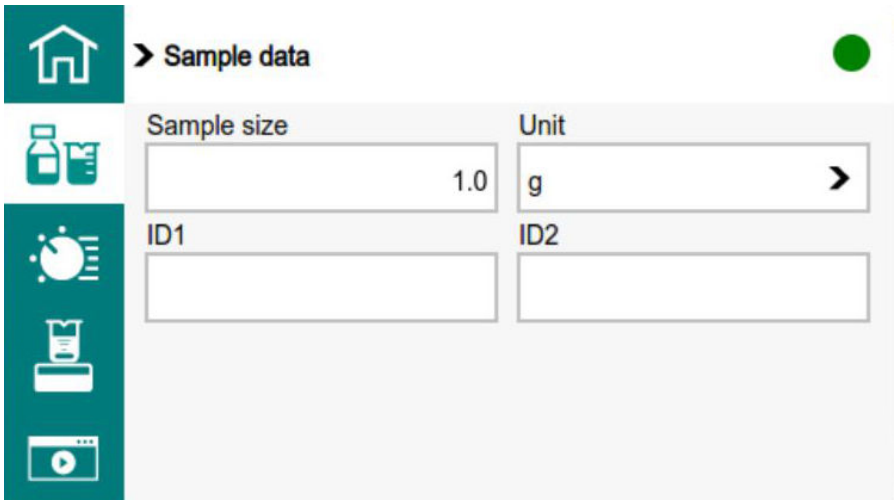


Figure 30 Sample data

The data for the sample can be entered in the **Sample data** work area, even if dosing is ongoing.

ID1

Sample identification **ID1**.

Input: max. 10 characters

Default value: empty

ID2

Sample identification **ID2**.

Input: max. 10 characters

Default value: empty

Sample size

Value of the sample size.

Input range	**–999,999,999** to **9999999999**
Default value	**1.0**

Unit

Unit of the sample size.

Selection:

- **g**
- **mg**
- **µg**
- **mL**
- **µL**
- **Pieces**
- Empty unit: If no unit is needed, the empty unit can be selected.
- **User-defined**
  A user-defined unit can be created. This will be added to the selection list. The previous entry will be overwritten as soon as the new unit has been defined.

Default value: **g**

6.6.1 Applying the sample size from the balance

Sending the sample size

Prerequisite:

- A Sartorius balance is connected to the Eco Dosimat via the USB interface.
- The balance uses the **PC text format** protocol for the USB interface.

1 Open the **Sample data** work area: 

2 Print the measured sample size on the balance: **Print**

The balance sends the sample size and the unit to the Eco Dosimat.

6.7 System – Configuration

The system configuration of the Eco Dosimat is in the **System** menu with the functions:

- Settings
- File management
- Solutions
- Diagnosis
- External devices
- Ethernet settings
- Service
- About
- Change password

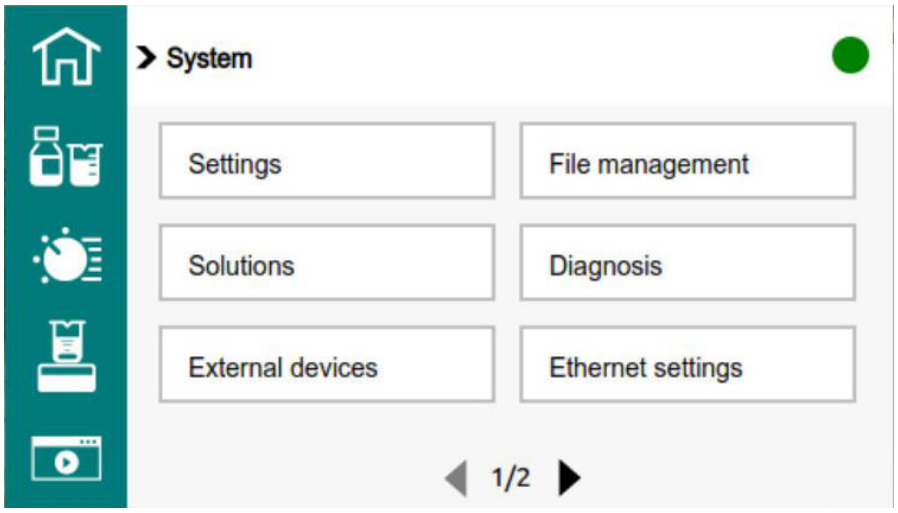


Figure 31 Page 1/2

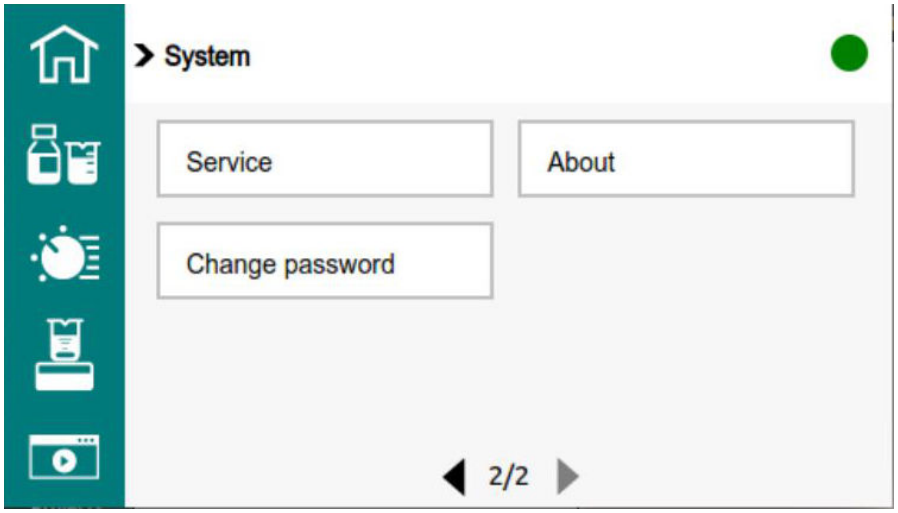


Figure 32 Page 2/2

6.7.1 Instrument settings

All general instrument settings for the Eco Dosimat are in the **System** ▶ **Settings** menu.

Adjusting instrument settings

1 On the **Start page**, open the **System** ▶ **Settings** menu.

2 Adjust the settings. Pay attention to the following notes:

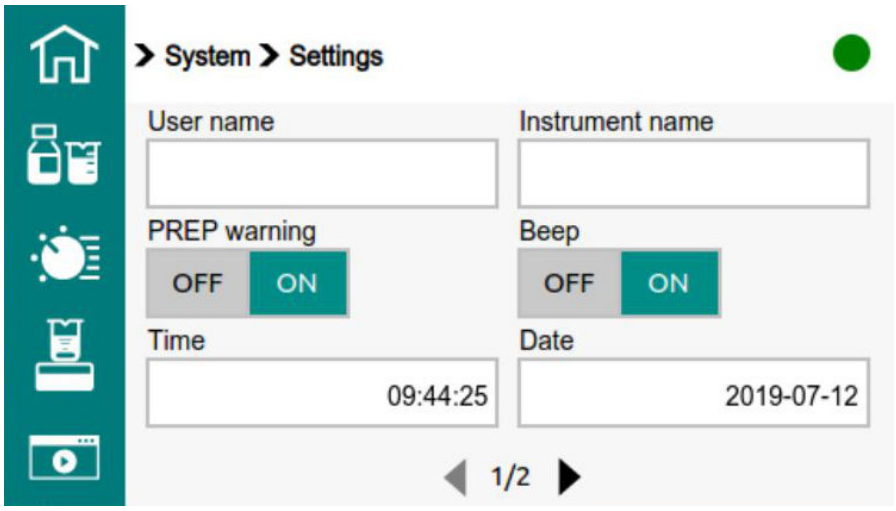


Figure 33 Settings page 1/2

User name

Enter the user name. If a user name is defined, it will be displayed in the report.

Instrument name

Enter the instrument name. If an instrument name is defined, it will be displayed in the report.

PREP warning

If the **PREP warning** is enabled, the **Prepare buret (PREP)** prompt will appear in the following cases:

- After the instrument is switched on.
- After a cylinder unit is installed or exchanged.

All tubing and the cylinder are rinsed and filled with **Prepare buret (PREP)**.

Signal sound

If the **Signal sound** parameter is enabled, then a short acoustic signal will sound in the following cases:

- After the instrument is switched on.
- At the press of a key.
- At the end of the determination.

Time

Current time. Format: hh:mm:ss.

Date

Current date. Format: YYYY-MM-DD.

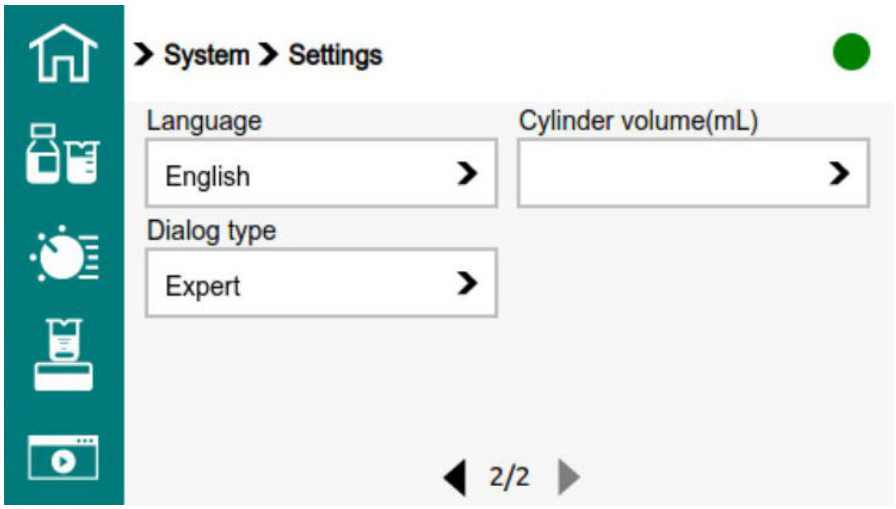


Figure 34 Settings page 2/2

Language Set the dialog language.

Cylinder volume Cylinder volume of the cylinder unit in mL.

The cylinder volume must match the volume of the mounted cylinder unit!

Dialog type There are 2 dialog types with different permissions:

- **Expert**
  Complete dialog. All menus are available.
- **Routine**
  Limited dialog for routine operations.

6.7.1.1 Setting the language, date and time

Setting the language

Prerequisite:

- The instrument is switched on.

1 On the **Start page**, open the **System** ▶ **Settings** menu.

2 Click on > for **Language** to expand the list.

The list of available languages is displayed.

3 Select the desired language from the list.

If the desired language is not available, import the language:

The user interface is now displayed in the selected language.

Setting the date and time

Prerequisite:

- The instrument is switched on.

1. On the **Start page**, open the **System** ► **Settings** menu.
2. Click in the **Date** input field.
3. Enter the current date. Format: YYYY-MM-DD.
4. Confirm the entry with **[OK]**.
5. Click in the **Time** input field.
6. Enter the current time. Format: hh:mm:ss.
7. Confirm the entry with **[OK]**.

6.7.1.2 Setting the dialog type

The user rights can be restricted by changing the **Dialog type**:

- Dialog type **Expert** (default value)
  In the dialog type **Expert**, all the user settings are available.
- Dialog type **Routine**
  In the dialog type **Routine**, the availability of the settings is restricted. The **System** and **Methods** menus as well as the **Parameters** work area can only be opened with a password. Methods can be loaded, however, on the start page.

If the instrument is switched off, the dialog type that was set remains activated.

Setting the Routine dialog type

Prerequisite:

- The instrument is switched on.
- The instrument is in the **Expert** dialog type.

1. On the **Start page**, open the **System** ► **Settings** menu.
   The **Dialog type** is on page 2/2:

2 Click on ❯ to expand the list and select the **Routine** dialog type.

3 Exit the **System** menu.

The instrument is now in **Routine** mode. The availability of the settings is restricted.

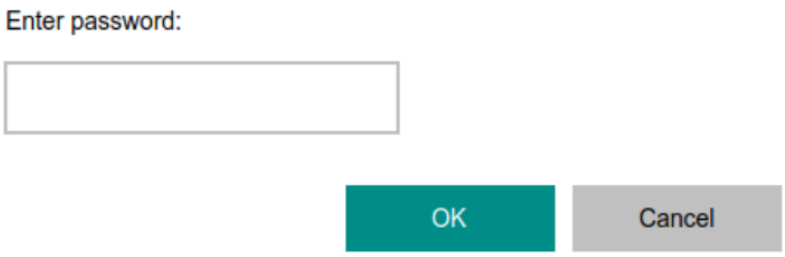
Setting the Expert dialog type

Prerequisite:

- The instrument is switched on.
- The instrument is in the **Routine** dialog type.

1 On the **Start page**, click on **System**.

The **Enter password** prompt appears:



2 Click in the input field.

A keyboard appears.

3 Enter the password **METROHM9100** and confirm with **[OK]**.

The password is displayed in encrypted form.

4 Confirm the entry with **[OK]**.

The **System** menu opens. The menu is now ready for use.

If you exit the **System** menu at this point, then the instrument will remain in Routine mode.

5 Click **[Settings]**.

6 Click on ❯ to expand the list and select the **Expert** dialog type.

All the user settings are now available.

6.7.2 Managing solutions

A **solution** is the liquid that is dosed into the sample beaker or dosed to the sample.

The **System** ▶ **Solutions** menu is used to manage up to 20 different solutions.

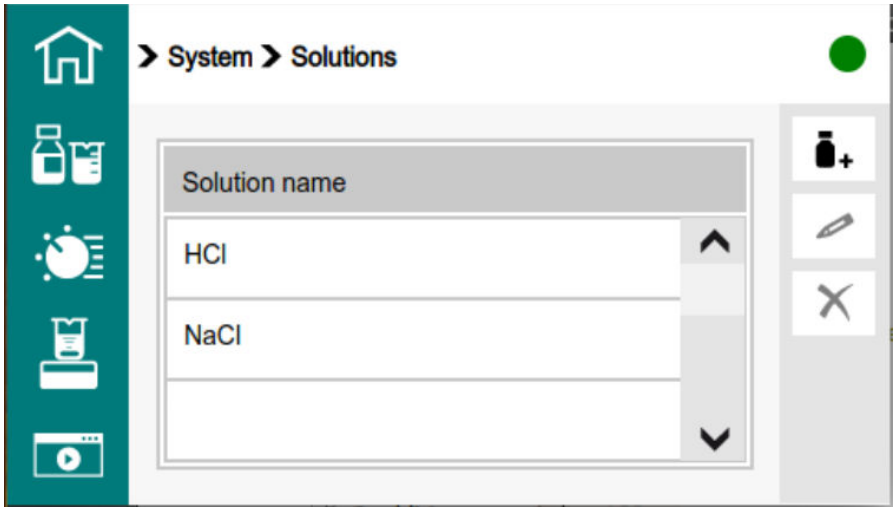


Figure 35 Solutions menu with the solution list (example)

Functions for managing the solution list:

Create new solution

Add a new solution to the list.

Editing the solution

Edit data of the highlighted solution.

Deleting the solution

Delete the highlighted solution from the list.

Solution parameters

It is possible to enter the following parameters for each solution:

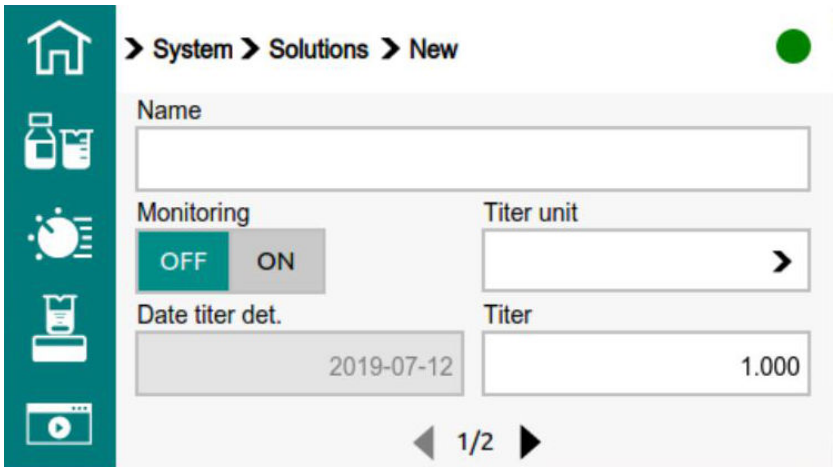


Figure 36 Solution parameters page 1/2

- **Name**
  The name of the solution is used for unique identification.
- **Monitoring**
  Switch the titer monitoring on or off.
- **Titer unit**
- Unit of the titer.
- **Date titer det.**
  Date of the last titer determination.
- **Titer**
  Titer of the solution.

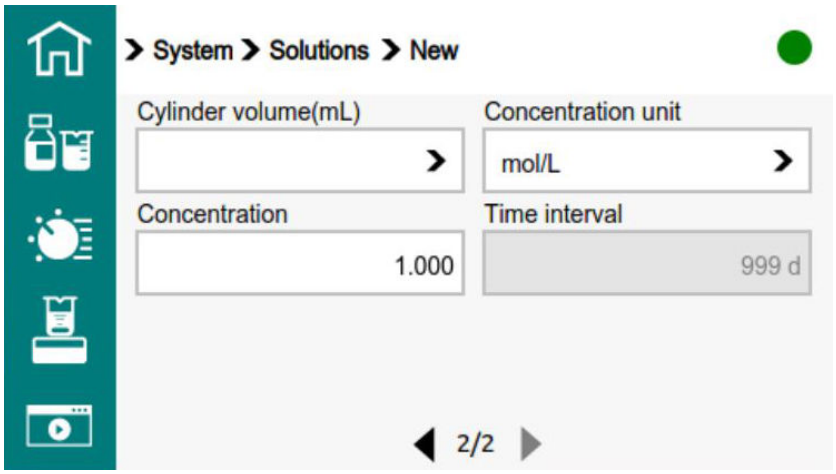


Figure 37 Solution parameters page 2/2

- **Cylinder volume**
  Cylinder volume of the buret unit in mL.

The cylinder volume must match the volume of the mounted cylinder unit and the cylinder volume defined in **System** ▶ **Settings**!

- **Concentration unit**
  Unit of the concentration.

- **Concentration**
  Concentration of the solution.
- **Time interval**
  This parameter is visible only when **Monitoring = on**.
  When you start a method, you will be notified if this time interval (in days) has already elapsed. You can then select whether or not you would still like to start the method.

Creating a new solution

1 On the **start page**, open the **System** ▶ **Solutions** menu.

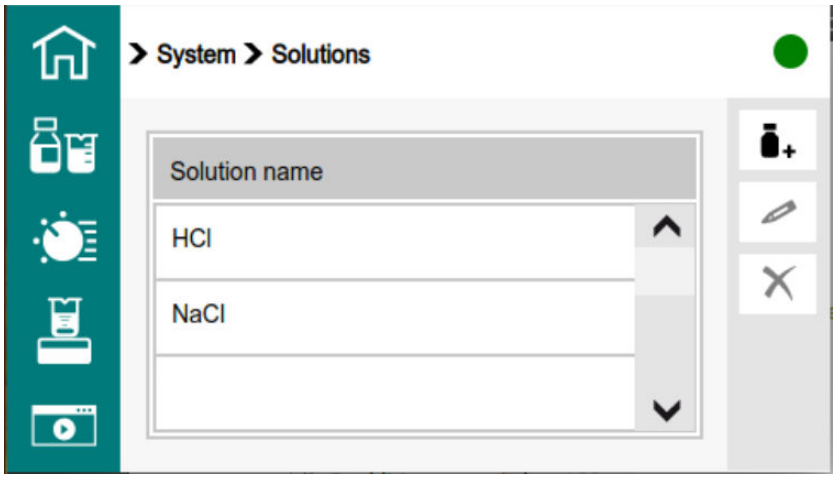


Figure 38 Solution list

2 Create new solution:

3 Enter the name of the solution.

Define additional solution parameters.

Editing the solution

1 On the **start page**, open the **System** ▶ **Solutions** menu.

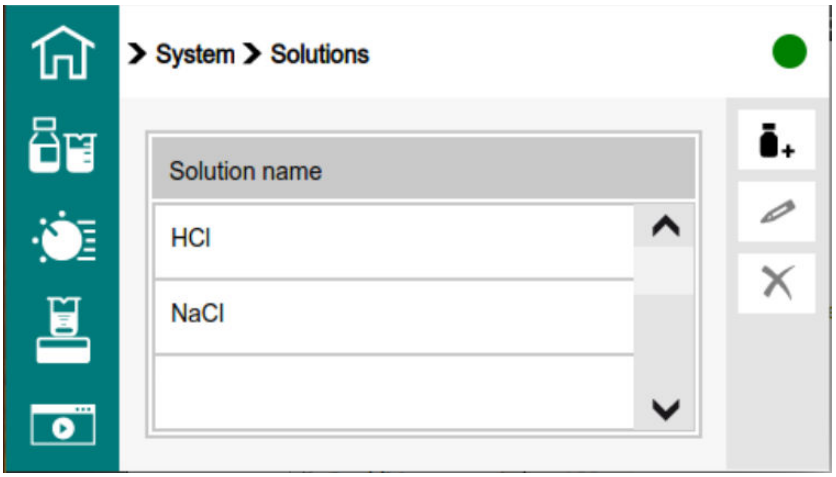


Figure 39 Solution list

2 Highlight the desired solution.

3 Edit the highlighted solution:

4 Change the solution parameters if needed.

Deleting the solution

1 On the **start page**, open the **System** ▶ **Solutions** menu.

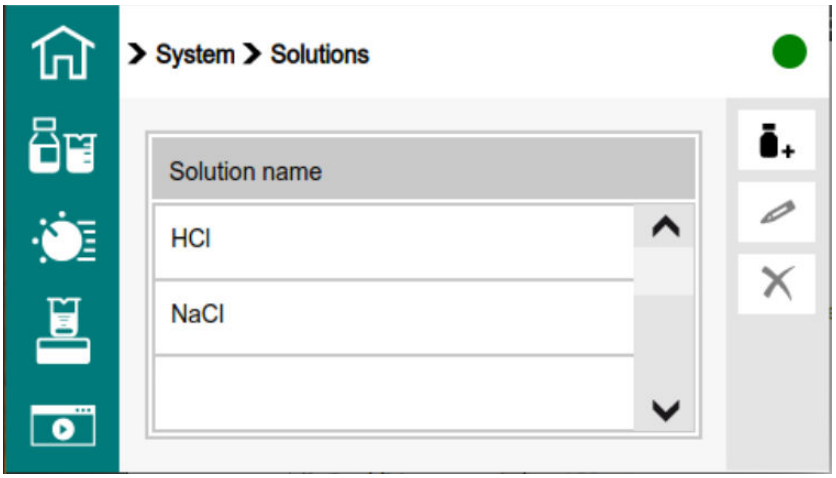


Figure 40 Solution list

2 Highlight the solution to be deleted.

Delete the highlighted solution:

A warning appears.

3 Confirm deleting: **[Continue]**

The solution is deleted.

6.7.3 Managing external devices

The **System** ▶ **External devices** menu defines the connected printers and balances.

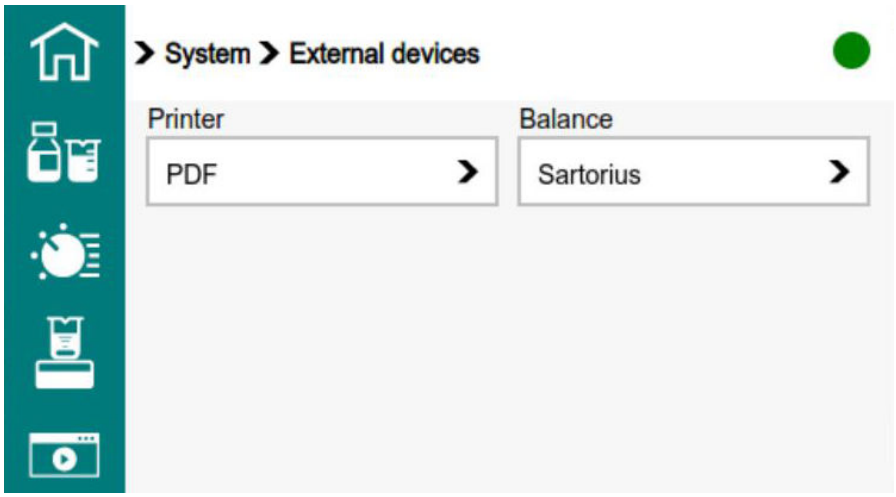


Figure 41 External devices menu

Printer

Open the **Printer** selection list:

- With **Custom printer**, you can print out on a Q3X printer.
- With **PDF**, you can save a PDF file on the USB flash drive. If no USB flash drive is connected, an error message will appear.
- **PostScript** – Commercially available A4 printers that communicate via PostScript can be connected directly via USB.

Balance

For balances with RS-232 interface: Use the 6.2148.050 USB/RS-232 Converter.

Configure the serial interface: **Start page** ▶ **System** ▶ **COM port settings**

The parameters set for the RS-232 interface on the balance must match those on the Eco Dosimat.

6.7.4 File management

In the **System** ▶ **File management** menu, a system backup (all data and settings) can be created. Also, an existing backup can be reloaded. Individual methods can also be imported from a USB flash drive.

A USB flash drive must be connected. If no USB flash drive is connected, the message **Connect USB flash drive** will appear.

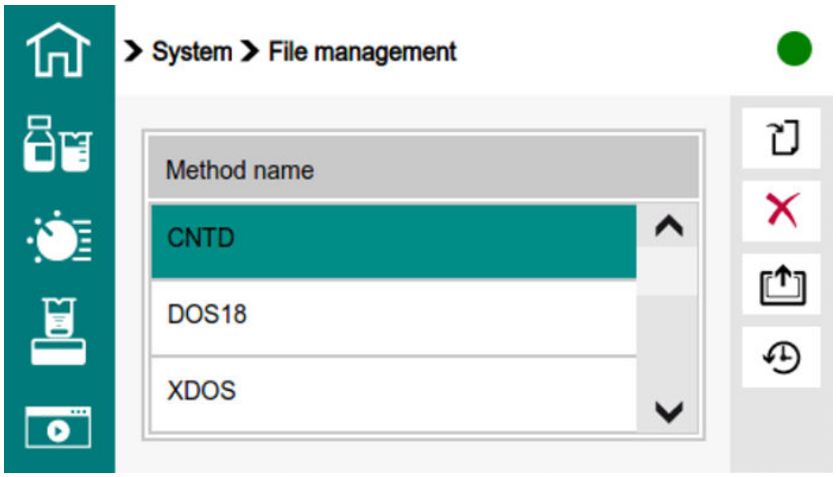


Figure 42 File management menu with the method list (example)

File management functions:

Import

Import the highlighted method from the USB flash drive.

Delete

Delete the highlighted method on the USB flash drive.

Backup

Create a backup of all data and settings on the USB flash drive.

Only **one** backup can be created on the same USB flash drive. If a backup is already stored on the flash drive, then this will be overwritten.

Restore

Load the backup from a connected USB flash drive.

Importing a method

Only methods that are stored in the **Files** folder on the USB flash drive are displayed in the method list.

1. On the **start page**, open the **System** ▶ **File management** menu.
2. Highlight the desired method.
3. Import the highlighted method:

   The method is imported.

6.7.5 Instrument diagnostics

Start page ▶ System ▶ Diagnosis

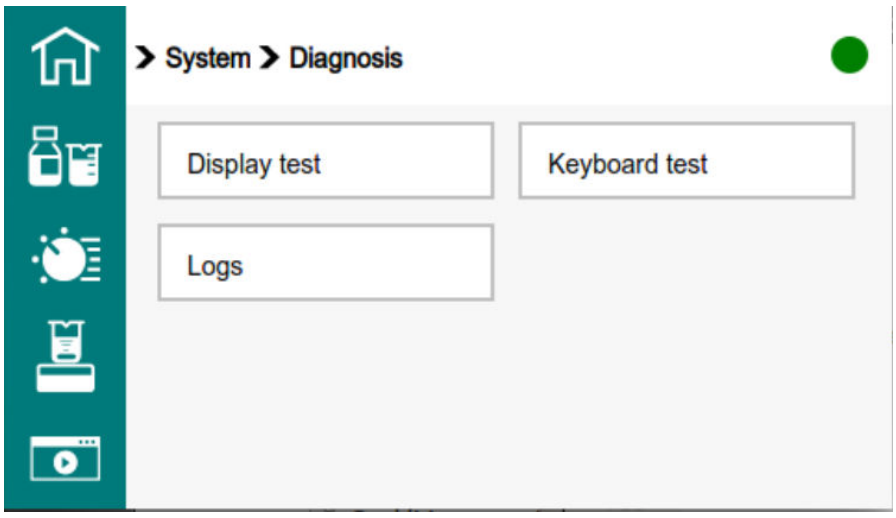


Figure 43 System menu – Diagnosis

Display test

The display test offers settings for brightness, various test images and a calibration program for the screen.

Start display test: System ▶ Diagnosis ▶ Display test

Brightness	Set the screen brightness: < and > buttons
	Shows a number of test images to check image quality.
	Starts the calibration program. ▪ Check on the screen that your line of sight is vertical to the screen. ▪ A crosshair appears in succession at various places on the screen. Each time, click in the center of the cross-hair. Once the calibration has been completed, the instrument is restarted automatically.

Keyboard test

- Start keyboard test: System ▶ Diagnosis ▶ Keyboard test
- Press the five keys of the control bar one after the other:
- The instrument confirms each successful press of a key with a tick: ✓

Logs

- Show error log: System ▶ Diagnosis ▶ Logs

- Export an error log to the USB flash drive:

6.7.6 Ethernet settings

Start page ▶ System ▶ Ethernet settings

Example of usage: Connection with a second Eco Dosimat for tandem operation.

Mode

This network configuration can be done manually or automatically.

Selection:

- **Static**
  The network configuration is done manually. The input fields **IP address**, **Subnet mask** and **Gateway** are used for this.
- **DHCP**
  The network configuration is assigned automatically via a server.

Default value: **DHCP**

6.7.7 Service – Brief description

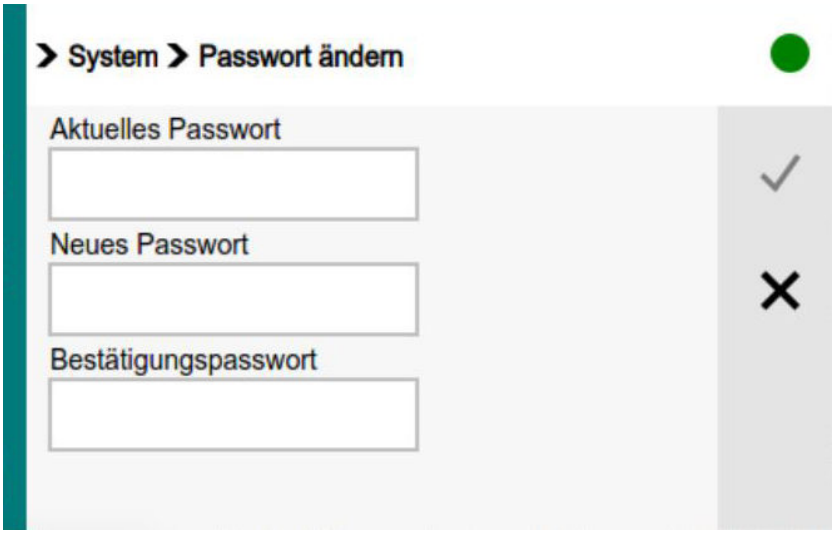
The **[Service]** button leads to a protected area to which only regional Metrohm service representatives have access.

6.7.8 Changing the password

With the password for the **Expert** dialog type you can control access to the menus **System** and **Methods** as well as the **Parameters** work area.

Changing the password for the **Expert** dialog type:

1 On the **Start page**, open the **System ▶ Change password** menu.



2 Enter the current password and then the new password twice.

3 Perform the change: ✓

The password is changed.

Make a note of the password and store it in a safe place.
If you lose the password, the system must be reset to factory settings with a system initialization. The default password is:
METROHM9100
The system can then be restored with a backup.

6.7.9 COM port settings

System ▶ COM port settings

When using a balance with serial interface, adjust the corresponding settings. The parameters set for the RS-232 interface on the balance must match those on the instrument.

Use the 6.2148.050 USB/RS-232 Converter. This converter provides the serial connector.

Baud rate

Transfer rate in characters per second.

Selection:

- **1200**
- **2400**
- **4800**
- **9600**
- **19200**
- **38400**
- **57600**
- **115200**

Default value: **9600**

Data bits

Number of data bits.

Selection:

- **7**
- **8**

Default value: **8**

Stop bits

Number of stop bits.

Selection:

- **1**
- **2**

Default value: **1**

Parity

Type of parity testing.

Selection:

- **Even**
- **None**
- **Odd**

Default value: **None**

Handshake

Type of the data transfer protocol.

Selection:

- **Hardware**
- **Software**
- **none**

Default value: **Hardware**

If communication problems occur, set the parameter **Handshake** to **Software**, and make another attempt.

6.7.10 System data and error log

System data

Start page ▶ **System** ▶ **About…**:

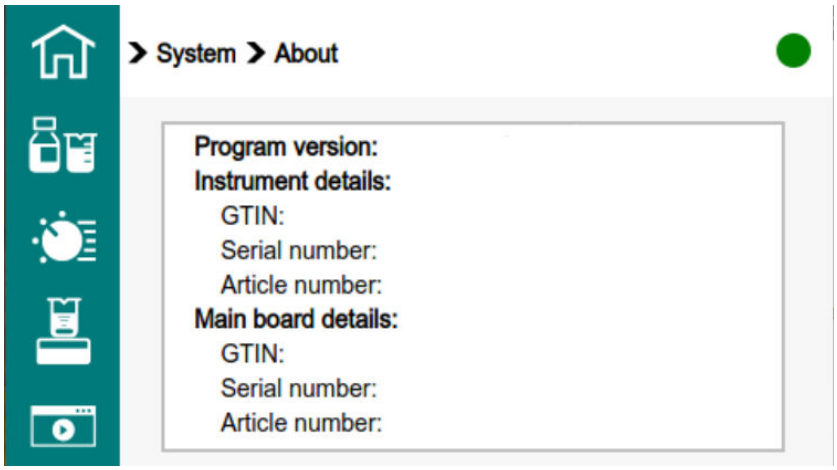


Figure 44 Program version and instrument details (example)

Error log

- Show error log: **Start page** ▶ **System** ▶ **Diagnosis** ▶ **Logs**
- Exporting an error log to the USB flash drive:

6.8 Dosing (DOS and XDOS)

Dosing in steps (DOS) of a solution into a sample

The dosing mode **DOS** is particularly suited for carrying out semi-automatic titrations with an indicator. A result can be calculated automatically and a result report can be printed from the dosed volume. Various variables of the calculation can be defined as parameters in advance. The parameters in their entirety can be saved as methods and then used if needed. We recommend creating various methods based on the type of titration or sample.

1 Loading the method

Load the required DOS method.

Specify the dosing mode and the parameters in the dosing parameters:

- **Volume**
  The dosing rate and a fixed volume per dosing step are specified.
- **Dosing ramp**
  The dosing rate and the dosing ramp are specified.

2 Preparing the sample (if necessary)

For semi-automatic titrations: Calculate the amount of the sample so that it results in titrant consumption of 10 to 90% of the cylinder volume.

- Weigh in or measure the sample in a sample vessel.
- Add solvent if necessary.
- Add the stirring bar to the sample vessel.
- Place the sample vessel on the magnetic stirrer.
- Immerse the buret tip in the solution.

3 Entering the sample data (if necessary)

Open the work area. Enter sample data.

4 Switching the magnetic stirrer on

Turn on the stirrer in the work area if required.

5 Starting the dosing

Make sure that the buret tip points into a sample vessel or dosing vessel.

Depending on the dosing parameter, dosing is carried out in steps or continuously.

- **Dosing in steps**
  (Dosing parameter **Mode = Volume**)

  Press the key on the instrument or on the Manual Dosing Controller. Repeat in steps.
- **Dosing continuously**
  (Dosing parameter **Mode = Dosing ramp**)

  Press the key on the instrument or on the Manual Dosing Controller for as long as dosing should take place.

  Pausing the dosing: Release the key.

  Continuing the dosing: Press the key again for as long as dosing should take place.
  With the dosing parameter **Dosing ramp > 0 s**, the dosing rate increases continuously until the set dosing rate is reached in the set time. After each interruption, dosing is started again with a low dosing rate.

Dosing is in progress. The instrument shows the **Live status** work area:

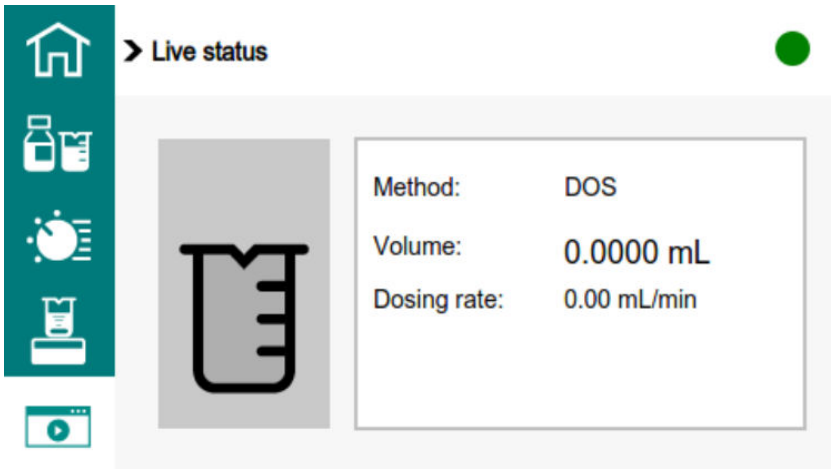


Figure 45 Live status – Dosing mode DOS

The dosed volume is shown on the screen.

The instrument fills the dosing cylinder automatically.

6 Live modifications

Make live modifications if necessary:

- Edit the sample data of the ongoing dosing process
- Modify the dosing rate
- Operate the magnetic stirrer

7 Ending the dosing

End the dosing with the key.

After ending, the instrument fills the dosing cylinder.

Depending on the parameter settings, the instrument automatically calculates the result and prints out a report. The report for the current dosing can be printed out manually if necessary: **Start page ▶ Print reports ▶ Results**

The result of the calculation is shown under the volume display. The result and the dosing volume can be deleted by pressing the key once more.

Extended dosing (XDOS)

The dosing mode **XDOS** is suitable for dosing a fixed volume. 2 of the 3 dosing criteria **Volume**, **Rate** and **Time** can be defined.

1 Loading the method

Load the required XDOS method.

Define the dosing criteria and the parameters in the dosing parameters:

- **Volume/rate**
  The volume to be dosed and the dosing rate are specified.
- **Rate/time**
  The dosing rate and the time are specified.
- **Volume/time**
  The volume to be dosed and the time are specified.

2 Preparing the sample (if necessary)

For semi-automatic titrations: Calculate the amount of the sample so that it results in titrant consumption of 10 to 90% of the cylinder volume.

- Weigh in or measure the sample in a sample vessel.
- Add solvent if necessary.
- Add the stirring bar to the sample vessel.
- Place the sample vessel on the magnetic stirrer.
- Immerse the buret tip in the solution.

3 Entering the sample data (if necessary)

Open the  work area. Enter sample data.

4 Switching the magnetic stirrer on

Turn on the stirrer in the  work area if required.

5 Starting the dosing

Make sure that the buret tip points into a sample vessel or dosing vessel.

Press the  key on the instrument or on the Manual Dosing Controller.

Dosing is in progress. The instrument shows the **Live status** work area:

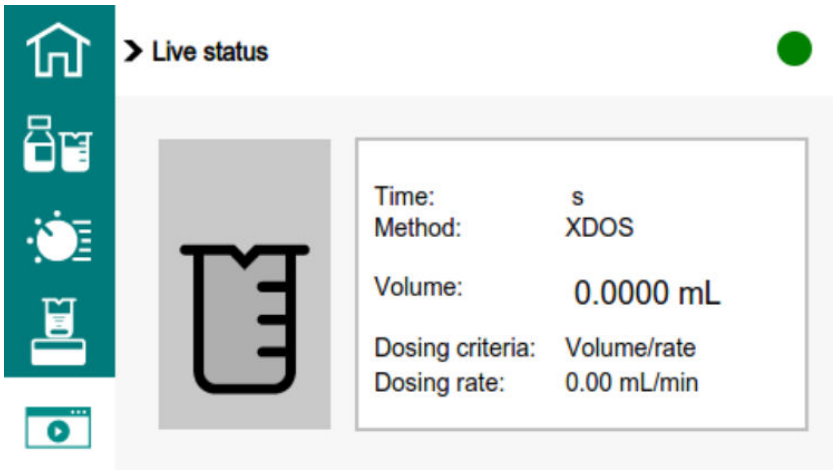


Figure 46 Live-Status – Dosing mode XDOS

The dosed volume is shown on the screen.

The instrument fills the dosing cylinder automatically if necessary.

6 Live modifications

Make live modifications if necessary:

- Edit the sample data of the ongoing dosing process
- Modify the dosing rate
- Operate the magnetic stirrer

7 Ending the dosing

The dosing stops as soon as the volume to be dosed or the specified time has been reached. Dosing can be canceled at any time with the key if necessary.

If the **Auto fill** dosing parameter is switched on, then the instrument fills the dosing cylinder automatically.

If the **Auto fill** dosing parameter is switched off:

- Repeat the dosing: key. The dosing parameter **Clear volume display** determines whether the volume display should continue counting or start at zero again.
- Fill dosing cylinder manually: key

Depending on the parameter settings, the instrument prints out a report. The report for the current dosing can be printed out manually if necessary: **Start page** ▶ **Print reports** ▶ **Results**

The dosed volume is shown on the screen. The dosed volume can be deleted by pressing the key.

Edit the sample data of the ongoing dosing process

The sample data can be entered or modified in the **Samples** work area while dosing is taking place. The sample data entered at the end of dosing in the **Samples** work area is always the one used in calculations.

1 **Opening the Samples work area**

Click the  work area.

2 **Editing sample data**

Enter or edit the sample data.

3 **Continuing the dosing**

Continue the dosing or end it as required.

The result of the calculation takes the newly entered sample data into account.

 The live status can be displayed again at any time with the  key.

 If the ongoing dosing step is finished while an editing dialog is open (e.g. of the sample size), then this will be closed automatically and the live status will be displayed. The value entered must be entered once more.

- Close the editing dialogs before finishing the dosing step.
- We recommend editing the sample data during a dosing pause.

Modifying the dosing rate during dosing

The dosing rate can be changed with the control bar while dosing is carried out:

- For dosing in steps (DOS) with Mode = Volume.
- For extended dosing (XDOS) with Dosing criteria = Volume/rate and Buret setup = Single.

1

- Increase the dosing rate in steps:  key.
- Reduce the dosing rate in steps:  key.

Operating the magnetic stirrer during dosing

The magnetic stirrer can be switched on and off and the stirring rate can be adjusted while dosing is carried out.

1 Opening the Stirrer work area

Click on .

The **Stirrer** work area appears.

2 Operating the stirrer

- Switching the stirrer on and off:
- Adjusting the stirring rate in steps:

The live status can be displayed again at any time with the key.

6.9 Carrying out tandem dosing (XDOS)

If continuous dosing without interruption is required, then tandem operation can be selected. This requires 2 Dosimats.

Two dosing cylinders of the same cylinder volume must be used for tandem operation.

The principle of tandem dosing

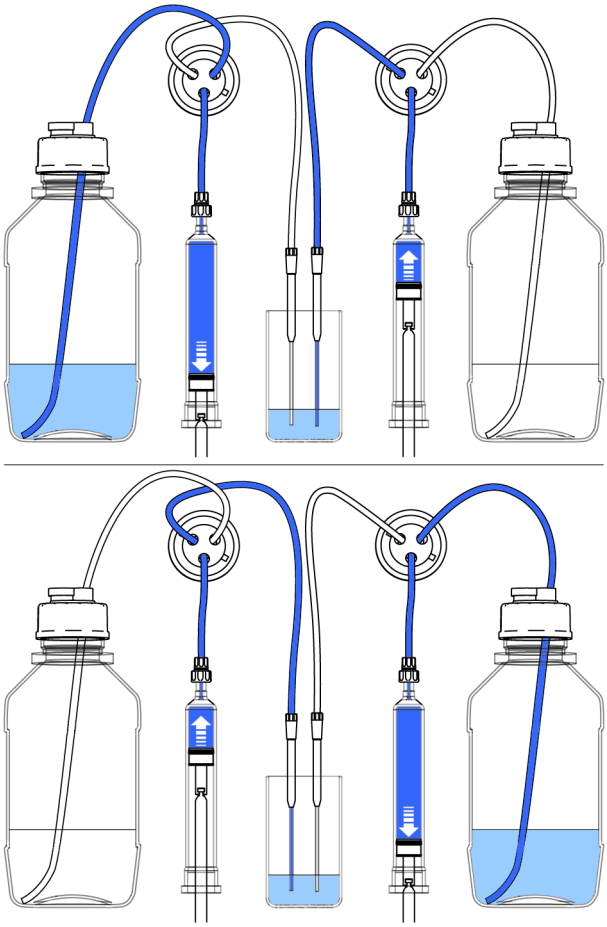


Figure 47 Tandem operation

The two Dosimats operate alternately during dosing. If the dosing cylinder of one Dosimat needs to be filled, then the second Dosimat will take over the control of the dosing. The same dosing rate applies respectively for both Dosimats.

Because it takes the flat stopcock approximately 2 seconds to switch over, the filling rate must be greater than the dosing rate. Dosing without interruption cannot be ensured otherwise.

Maximum applicable dosing rate = 0.75 × filling rate

LAN connection

The two Dosimats communicate using a LAN. One Dosimat is the **tandem master**, the other is the **tandem slave**. The operation (loading the method, starting the dosing etc.) is done by the tandem master.

Establishing a LAN connection

1 Connecting the Dosimats

Prepare 2 Dosimats with the same cylinder volume.

Connect the Ethernet connectors of the two Dosimats with a network cable.

2 Adjusting the Ethernet settings

On the tandem master:

- **Start page** ▶ **System** ▶ **External devices** ▶ **Ethernet settings**
- Mode: **[Static]**
- IP address: 192.168.0.51 (example)
- Subnet mask: 255.255.255.0

On the tandem slave:

- **Start page** ▶ **System** ▶ **External devices** ▶ **Ethernet settings**
- Mode: **[Static]**
- IP address: 192.168.0.50 (example)
- Subnet mask: 255.255.255.0

Carrying out tandem dosing

1 Loading the XDOS methods

Load the required XDOS method on the tandem master.

Load the required XDOS method on the tandem slave.

2 Configuring the XDOS methods for tandem operation

On the tandem master:

- Open the **Parameters** work area: 
- Click on the **Buret setup** button.
- Buret setup: **[Tandem master]**

On the tandem slave:

- Open the **Parameters** work area: 
- Click on the **Buret setup** button.
- Buret setup: **[Tandem slave]**

- If the **Invalid tandem master IP address** warning appears: **Continue**
- Enter the valid tandem master IP address:
  Tandem master IP address: 192.168.0.51 (example)

The tandem slave establishes a connection with the tandem master. Once the connection has been established, the following message appears for a brief moment: Connected to tandem master.

3 Setting dosing parameters

On the tandem master: Define the dosing rate, the filling rate and volume to be dosed in the dosing parameters.

4 Preparing the sample (if necessary)

- Weigh in or measure the sample in a sample vessel.
- Add solvent if necessary.
- Add the stirring bar to the sample vessel.
- Place the sample vessel on one of the two magnetic stirrers.

5 Entering the sample data (if necessary)

On the tandem master: Open the  work area. Enter sample data.

6 Starting tandem dosing

Both buret tips of the two Dosimats should point into the common sample vessel or dosing vessel.

Press the  key on the instrument or on the Manual Dosing Controller.

Dosing is in progress. The tandem master shows the **Live status** work area:

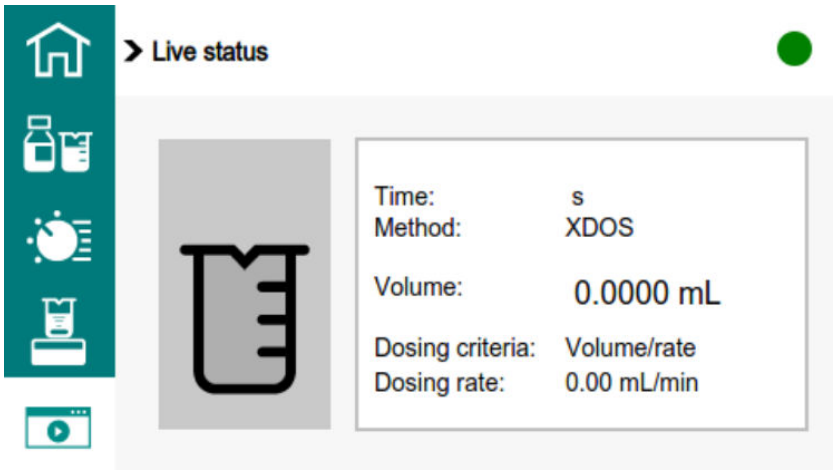


Figure 48 Live-Status – Dosing mode XDOS

The two Dosimats operate alternately during dosing. The instrument that is currently dosing displays the respective total dosed volume.

7 Live modifications

Make live modifications if necessary:

- Edit the sample data of the ongoing dosing process
- Operate the magnetic stirrer

8 Ending the dosing

The dosing stops as soon as the volume to be dosed has been reached.

Dosing can be canceled on the tandem master at any time with the key if necessary.

After ending, the instrument fills the dosing cylinder.

Depending on the parameter settings, the instrument prints out a report. The report for the current dosing can be printed out manually if necessary: **Start page ▶ Print reports ▶ Results**

The dosed volume is shown on the screen. The dosed volume can be deleted by pressing the key.

6.10 Creating solutions (CNTD)

The dosing mode **CNTD** (content dosing) is suitable for producing standard solutions and other solutions. Based on the sample size of the starting substance (solid or stock solution) and the specified target concentration, the instrument automatically determines the volume of solvent to be dosed.

Creating a solution (CNTD)

1 Loading the method

Load the required CNTD method.

Define the method parameters:

- **Solutions**
  Metrohm always recommends selecting the solution.
- **Content definitions**
  Define the target solution.

2 Preparing the sample

- Weigh in or measure the sample in a sample vessel.
- Add the stirring bar to the sample vessel.
- Place the sample vessel on the magnetic stirrer.
- Immerse the buret tip in the solution.

3 Entering sample data

Open the  work area. Enter sample data.

The sample size is converted to g before actually calculating the volume to be dosed. If necessary, the density of the solvent is also taken into account.

4 Calculating the target volume

Make sure that the buret tip points into a sample vessel or dosing vessel.

Press the  key on the instrument or on the Manual Dosing Controller.

The Dosimat displays the calculated target volume.

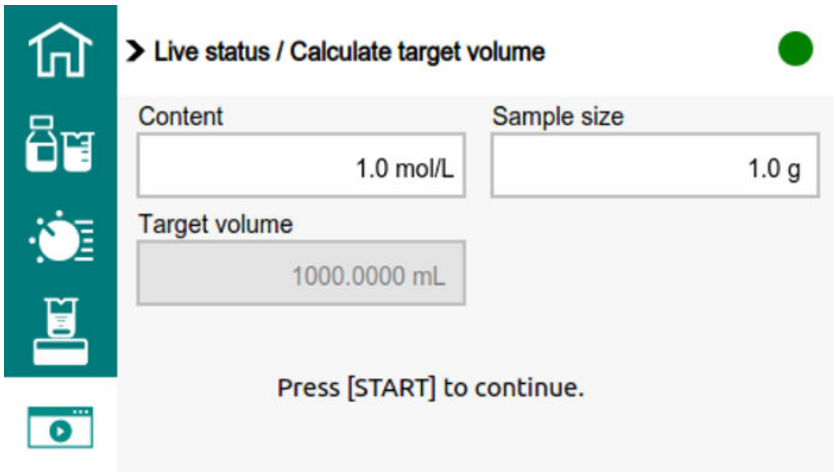


Figure 49 Calculated target volume

5 Starting the dosing

Press the ▶ key on the instrument or on the Manual Dosing Controller once more if the calculated target volume seems plausible.

Dosing is in progress. The instrument shows the **Live status** work area:

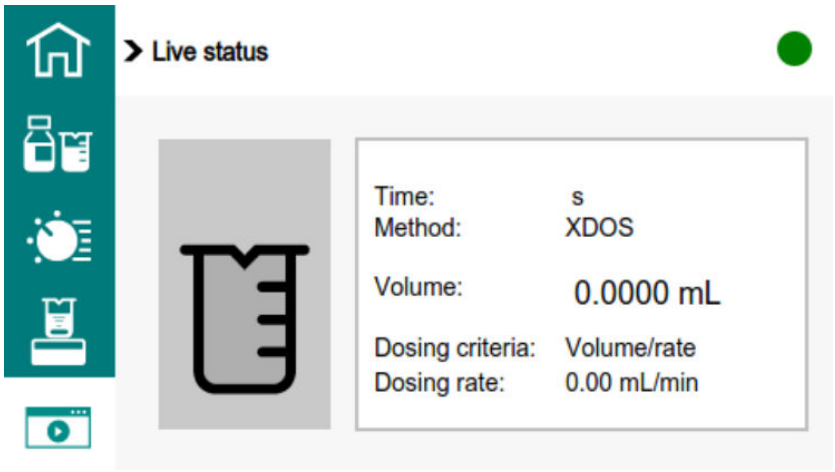


Figure 50 Live-Status – Dosing mode CNTD

The dosed volume is shown on the screen.

The instrument fills the dosing cylinder automatically.

6 Live modifications

Make live modifications if necessary:

- Operate the magnetic stirrer

7 **Ending the dosing**

The dosing stops as soon as the target volume has been reached.

Dosing can be canceled at any time with the key if necessary.

After ending, the instrument fills the dosing cylinder.

Depending on the parameter settings, the instrument automatically prints a report. The report for the current dosing can be printed out manually if necessary: **Start page** ▶ **Print reports** ▶ **Results**

The dosed volume is shown on the screen. The dosed volume can be reset to zero by pressing the key.

6.11 Printing reports

The following reports can be printed out:

Results — Result report with determination properties, sample data, calculated results, etc.

Parameter — Report with all method parameters of the loaded method.

System — System report with system settings, solution list, external devices, etc.

Preparing to print

1 On the start page, open **System** ▶ **External devices**.

Click on the **Printer** button.

The printer list opens:

- With **Custom printer**, you can print out on a Q3X printer.
- With **PDF**, you can save a PDF file on the USB flash drive. If no USB flash drive is connected, an error message will appear.

2 Select the desired printer.

If the command **Print reports** is executed, then the reports will be printed out on the Custom printer or saved in PDF form on the connected USB flash drive.

Printing reports

1 On the **Start page**, click on the **Print reports** button.

A list with the following options opens:

- Results
- Parameter
- System

2 Select the desired report.

The report data is recorded and printed.

6.12 Parameters

Each method uses one dosing mode (DOS, XDOS or CNTD). Depending on the dosing mode, various different method parameters are available.

Dosing in steps (DOS)

The dosing mode **DOS** is particularly suited for carrying out semi-automatic titrations with an indicator. A result can be calculated automatically and a result report can be printed from the dosed volume. Various variables of the calculation can be defined as parameters in advance.

Extended dosing (XDOS)

The dosing mode **XDOS** is suitable for dosing a fixed volume. 2 of the 3 dosing criteria **Volume**, **Rate** and **Time** can be defined.

If continuous dosing without interruption is required, then 2 Dosimats can be operated in tandem mode.

Creating solutions (CNTD)

The dosing mode **CNTD** (content dosing) is suitable for producing standard solutions and other solutions. Based on the sample size of the starting substance (solid or stock solution) and the specified target concentration, the Eco Dosimat automatically determines the volume of solvent to be dosed.

6.12.1 Dosing in steps (DOS)

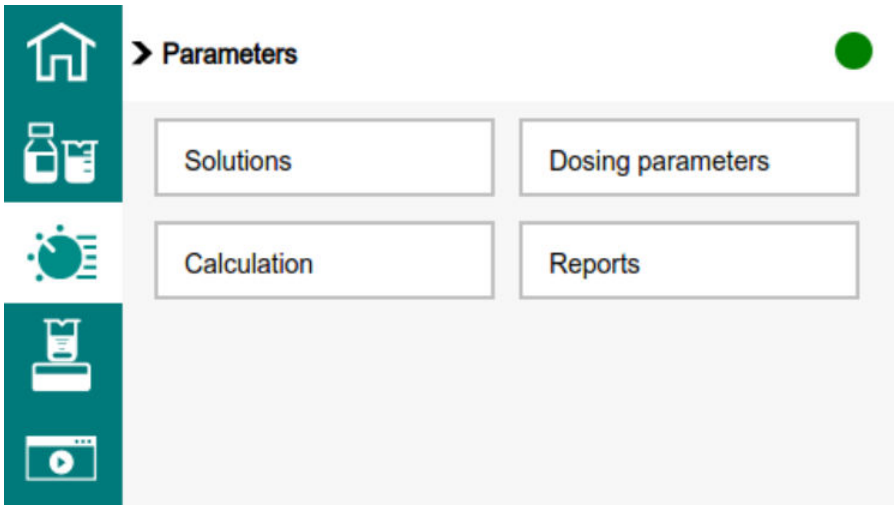


Figure 51 DOS parameters

Parameter settings for a method with the DOS dosing mode.

6.12.1.1 Solutions

Parameters ▶ Solutions

Select solution

Selection of the solution from the solution list. We, at Metrohm, always recommend selecting the solution.

At the start of the determination, the instrument checks whether the cylinder volume of the selected solution corresponds to the cylinder volume of the mounted buret.

Selection:

- Selection of configured solutions
- Not defined

Default value: **Not defined**

Not defined: No check is carried out at the start of determination.

Solutions are created and defined under **System ▶ Solutions**.

6.12.1.2 Dosing parameters

Parameters ▶ Dosing parameters

Under **[Dosing parameters]**, you can control the dosing procedure of the loaded DOS method.

The maximum dosing rate and maximum filling rate depend on the cylinder volume (see table).
If volatile solvents/solutions or solutions with a high viscosity are used, the dosing rate must be reduced accordingly so that the dosing unit is not overloaded.

Table 8 Maximum dosing rate / filling rate

Cylinder volume	maximum dosing rate / filling rate
5 mL	15.00 mL/min
10 mL	30.00 mL/min
20 mL	60.00 mL/min
50 mL	150.00 mL/min

If the defined dosing rate or fill rate is above the maximum value after changing the dosing cylinder, the setting is automatically adjusted.

Dosing rate

The rate at which dosing takes place.

Input range **0.01** to **Max. mL/min**
Additional selection: **Max.** = maximum dosing rate.

Default value: **Max.**

Filling rate

Rate at which the dosing cylinder is filled.

Input range **0.01** to **Max. mL/min**
Additional selection: **Max.** = maximum dosing rate.

Default value: **Max.**

Mode

Method of dosing.

Selection:

- **Dosing ramp**: Dosing with uniform dosing rate (**Dosing ramp** = 0 s) or with slowly increasing dosing rate.
- **Volume**: Dosing a fixed volume per dosing step.

Default value: **Dosing ramp**

Dosing ramp

This parameter is active only if **Mode = Dosing ramp**.

The dosing ramp is a gentle increase in the dosing rate at the time of the start of a dosing step. It is advantageous primarily for semi-automatic titrations with indicator, if small volume steps are to be dosed before the equivalence point.

The selectable delay time determines after which amount of time (in seconds) the defined dosing rate is to be reached.

Input range	**0** to **10 s**
Default value	**0 s**

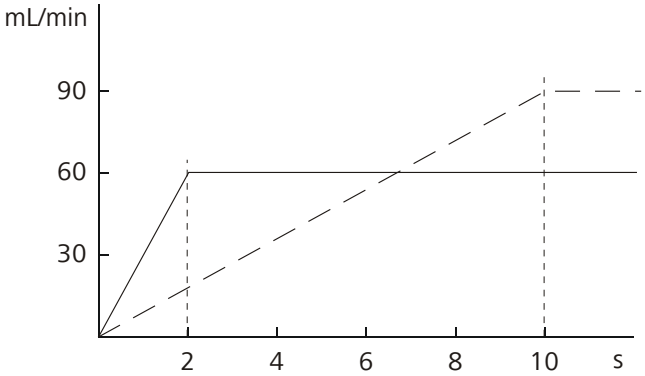


Figure 52 Dosing ramp, two examples

Volume

This parameter is active only if **Mode = Volume**.

Volume dosed at each dosing step.

Input range	**0.001** to **999.999 mL**
Default value	**0.100 mL**

6.12.1.3 Calculation

Parameters ▶ Calculation

The calculation formula is predefined and cannot be modified.

Calculation formula

(Volume - Blank) × Titer × Conc. × Factor / (Sample size × Divisor)

where:

Volume	Dosed volume
Blank	Blank value
Titer	Titer of the solution used
Conc.	Concentration of the solution used
Factor	Factor

Sample size	Sample size. The sample size and associated unit can be specified under **Sample data**.
Divisor	Divisor

If a solution is selected in **Parameters** ▶ **Solution**, the corresponding titer and the concentration from the solution data in **System** ▶ **Solutions** is read out and used for the calculation. If this is not the case, the default value **1** is used for the calculation.

Calculation status

Activating the calculation.

Selection:

- **On**: The settings for the calculation can be entered as soon as the calculation has been activated.
- **Off**

Default value: **Off**

Result unit

The result unit is displayed and saved along with the result.

Selection:

- **%**
- **/pc**
- **L**
- **g**
- **g/L**
- **mL**
- **mg**
- **mg/mL**
- **mol**
- **mol/L**
- **ppm**
- **User-defined**: A user-defined unit can be created. This will be added to the selection list. The previous entry will be overwritten as soon as the new unit has been defined.

Default value: **%**

Decimal places

Number of decimal places used to display the result.

Input range **0** to **5**
Default value: **2**

Result name

The result name will be shown in the result view and in the report.

Input: max. 12 characters

Default value: empty

Factor

Factor for the calculation formula, e.g. the molar mass of the substance to be determined.

Input range	**0.1** to **9,999,999,999**
Default value: **1.0**	

Divisor

Divisor for the calculation formula, e.g. the stoichiometric factor of the reaction.

Input range	**0.1** to **9,999,999,999**
Default value: **1.0**	

Blank

The blank value is subtracted from the dosing volume.

Input range	**0** to **1,000,000 mL**
Default value	**0.0000 mL**

6.12.1.4 Reports

Parameters ▶ Reports

The reports that will be printed out automatically or saved as a PDF report after a determination are defined under **[Reports]**.

Results

The result report contains the calculated result and additional specifications.

Selection: **Off** / **On**

Default value: **Off**

Parameters

All of the parameters of the current method are shown in the parameter report.

Selection: **Off** / **On**

Default value: **Off**

The printer for the report data from above is defined under **Start page ▶ System ▶ External devices ▶ Printer**.

- If **[PDF]** is selected as printer and at least one option is activated, then the report contains the complete data.
- If a different printer is selected, then the report contains the data defined by the options above.

6.12.2 Extended dosing (XDOS)

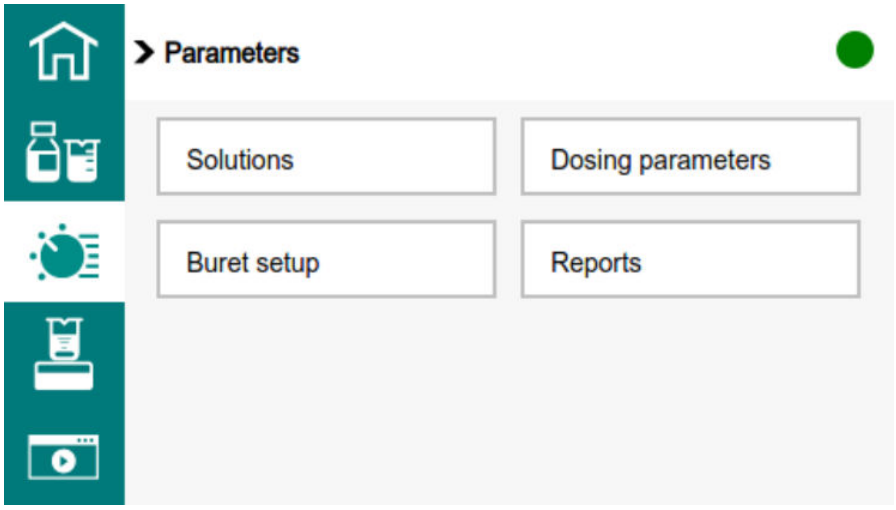


Figure 53 XDOS parameters

Parameter settings for a method with the XDOS dosing mode.

6.12.2.1 Solutions

Parameters ▶ Solutions

Select solution

Selection of the solution from the solution list. We, at Metrohm, always recommend selecting the solution.

At the start of the determination, the instrument checks whether the cylinder volume of the selected solution corresponds to the cylinder volume of the mounted buret.

Selection:

- Selection of configured solutions
- Not defined

Default value: **Not defined**

Not defined: No check is carried out at the start of determination.

Solutions are created and defined under **System ▶ Solutions**.

6.12.2.2 Dosing parameters

Parameters ▶ Dosing parameters

Under **[Dosing parameters]**, you can control the dosing procedure of the loaded XDOS method.

Dosing criteria

Selection of the preset dosing criteria. If dosing without interruption is required, the instrument needs to be operated in tandem mode.

Selection:

- **Volume/rate**: The volume specified is dosed at the selected dosing rate.
- **Rate/time**: Dosing is carried out at the selected dosing rate for the amount of time specified. The time is also running while the cylinder is being filled.
- **Volume/time**: The volume specified is dosed for the time period selected. The dosing rate necessary for this is calculated according to these specifications. The time needed for filling the dosing cylinder and for switching over the flat stopcock is taken into account thereby.

Default value: **Volume/rate**

The maximum dosing rate and maximum filling rate depend on the cylinder volume (see table).
If volatile solvents/solutions or solutions with a high viscosity are used, the dosing rate must be reduced accordingly so that the dosing unit is not overloaded.

Table 9 Maximum dosing rate / filling rate

Cylinder volume	maximum dosing rate / filling rate
5 mL	15.00 mL/min
10 mL	30.00 mL/min
20 mL	60.00 mL/min
50 mL	150.00 mL/min

If the defined dosing rate or fill rate is above the maximum value after changing the dosing cylinder, the setting is automatically adjusted.

Dosing rate

This parameter is only active if **Dosing criteria = Volume/rate** or **Rate/time**.

The rate at which dosing takes place.

Input range **0.020** to **Max. mL/min**
Additional selection: **Max.** = maximum dosing rate.

Default value: **Max.**

Filling rate

Rate at which the dosing cylinder is filled.

Input range **0.020** to **Max. mL/min**
Additional selection: **Max.** = maximum dosing rate.

Default value: **Max.**

Volume

This parameter is only active if **Dosing criteria = Volume/rate** or **Volume/time**.

The volume to be dosed.

Input range	**0.0000** to **99,999.9 mL**
Default value	**10.0000 mL**

Dosing time

This parameter is only active if **Dosing criteria = Rate/time** or **Volume/time**.

Time during which dosing should take place.

Input range	**0** to **999,999 s**
Default value	**100 s**

Volume limit

Safety limit for limiting the maximum volume to be dosed.

Input range **0.01** to **99,999.9 mL**
Additional selection: **Off** = no volume limit.

Default value: **Off**

Auto fill

Automatic filling of the cylinder after the dosing.

Selection: **Off** / **On**

Default value: **On**

Clear the volume display

This parameter is active only when **Auto fill = Off**.

Selection:

- **Off**: The volume display continues the counting during repeated dosing. The volume display only starts at 0.0000 mL again after the dosing cylinder has been filled manually.
- **On**: The volume display starts at 0.0000 mL for every dosing.

The automatic intermediate fillings do not affect the volume display.

Default value: **On**

6.12.2.3 Operating mode

Parameters ▶ Buret setup

If continuous dosing without interruption is required, then tandem operation can be selected. This requires 2 Dosimats. One Dosimat is the **tandem master**, the other is the **tandem slave**.

Buret setup

Method of dosing.

Selection:

- **Single**: Dosing with one instrument.
- **Tandem master**: Tandem dosing as tandem master.
- **Tandem slave**: Tandem dosing as tandem slave.

Default value: **Single**

Tandem master IP address

This parameter is active only if **Buret setup = Tandem slave**.

Entry of the tandem master IP address. This IP address can be found on the tandem master under **Start page ▶ System ▶ External devices ▶ Ethernet settings**.

6.12.2.4 Reports

Parameters ▶ Reports

The reports that will be printed out automatically or saved as a PDF report after a determination are defined under **[Reports]**.

Results

The result report contains the calculated result and additional specifications.

Selection: **Off** / **On**

Default value: **Off**

Parameters

All of the parameters of the current method are shown in the parameter report.

Selection: **Off** / **On**

Default value: **Off**

The printer for the report data from above is defined under **Start page** ▶ **System** ▶ **External devices** ▶ **Printer**.

- If **[PDF]** is selected as printer and at least one option is activated, then the report contains the complete data.
- If a different printer is selected, then the report contains the data defined by the options above.

6.12.3 Creating solutions (CNTD)

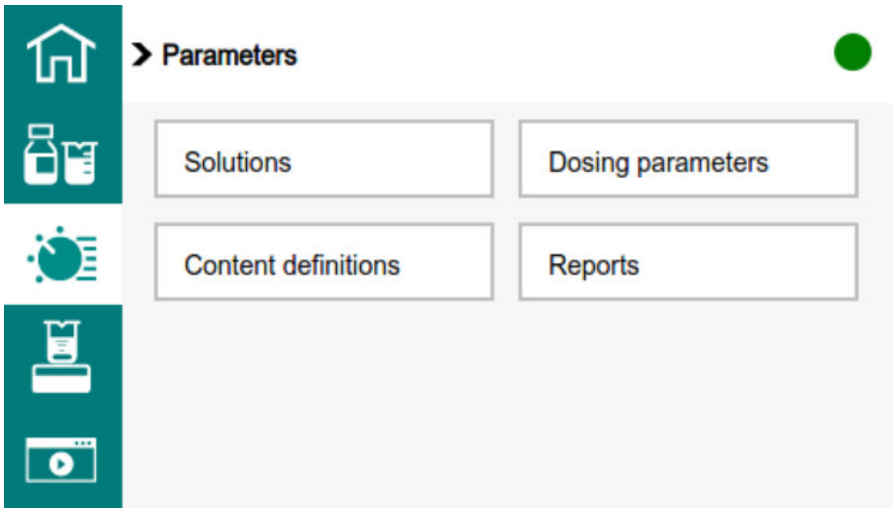


Figure 54 CNTD parameters

Parameter settings for a method with the CNTD dosing mode.

The dosing mode **CNTD** (content dosing) is suitable for producing standard solutions and other solutions. Based on the sample size of the starting substance (solid or stock solution) and the specified target concentration, the instrument automatically determines the volume of solvent to be dosed. After dosing, a report can be printed with all relevant specifications for the created solution. The parameters in their entirety can be saved as methods and then used if needed.

The sample size is converted to g before actually calculating the volume to be dosed. If necessary, the density of the solvent is also taken into account.

Calculation formulas

Formula for calculating the volume (applies for mass fraction):

$$V = \frac{m_{sample} \cdot f\,(f_{conv} - c_{target})}{c_{target} \cdot M \cdot \rho}$$

Formula for calculating the volume (applies for substance concentration, mass concentration and molality):

$$V = \frac{m_{sample} \cdot f \cdot f_{conv}}{c_{target} \cdot M \cdot \rho}$$

V = dosed volume in mL

m_{sample} = sample size in g

f = optional factor, e.g. for non-100% samples

f_{conv} = conversion factor, depending on unit

c_{target} = target concentration in the selected unit

M = molar mass in g/mol

ρ = density of the solvent dosed in g/mL

Table 10 Variables and constant values in the CNTD mode

Type of calculation	Unit	f_{conv}	f	M	ρ
Substance concentration	mol/L	10^3	.	.	1
Substance concentration	mmol/L	10^6	.	.	1
Mass concentration	g/L	10^3	.	1	1
Mass concentration	mg/L	10^6	.	1	1
Mass fraction	%	10^2	.	1	.
Mass fraction	ppm	10^6	.	1	.
Molality	mol/kg	10^3	.	.	.
Molality	mmol/kg	10^6	.	.	.

. = input possible (default **1**)

6.12.3.1 Solutions

Parameters ▶ Solutions

Select solution

Selection of the solution from the solution list. We, at Metrohm, always recommend selecting the solution.

At the start of the determination, the instrument checks whether the cylinder volume of the selected solution corresponds to the cylinder volume of the mounted buret.

Selection:

- Selection of configured solutions
- Not defined

Default value: **Not defined**

Not defined: No check is carried out at the start of determination.

Solutions are created and defined under **System** ▶ **Solutions**.

6.12.3.2 Dosing parameters

Parameters ▶ **Dosing parameters**

Under **[Dosing parameters]**, you can control the dosing procedure of the loaded CNTD method.

The maximum dosing rate and maximum filling rate depend on the cylinder volume (see table).
If volatile solvents/solutions or solutions with a high viscosity are used, the dosing rate must be reduced accordingly so that the dosing unit is not overloaded.

Table 11 Maximum dosing rate / filling rate

Cylinder volume	maximum dosing rate / filling rate
5 mL	15.00 mL/min
10 mL	30.00 mL/min
20 mL	60.00 mL/min
50 mL	150.00 mL/min

If the defined dosing rate or fill rate is above the maximum value after changing the dosing cylinder, the setting is automatically adjusted.

Dosing rate

The rate at which dosing takes place. The maximum dosing rate depends on the cylinder volume.

Input range **0.020** to **Max. mL/min**
Additional selection: **Max.** = maximum dosing rate.

Default value: **Max.**

Filling rate

Rate at which the dosing cylinder is filled. The maximum filling rate depends on the cylinder volume.

Input range **0.020** to **Max. mL/min**
Additional selection: **Max.** = maximum dosing rate.

Default value: **Max.**

Volume limit

Safety limit for limiting the maximum volume to be dosed.

Input range **0.01** to **99,999.9 mL**
Additional selection: **Off** = no volume limit.

Default value: **Off**

6.12.3.3 Definition of the target solution

Parameters ▶ Content definitions

The required target solution of the loaded CNTD method can be defined under **[Content definitions]**.

Content

Target concentration of the solution.

Input range **0.000000001** to **9,999,999,999**
Default value: **1.0**

Content unit

Unit of the target concentration.

The unit of the target concentration determines the calculation formula for determining the volume to be dosed.

Selection:

- **mol/L**
- **mmol/L**
- **g/L**
- **mg/L**
- **%**
- **ppm**
- **mol/kg**
- **mmol/kg**

Default value: **mol/L**

Molar mass

This parameter is only active if **Content unit = mol/L**, **mmol/L**, **mol/kg** or **mmol/kg**.

Molar mass of the starting substance.

Input range **0.000000001** to **9,999,999,999 g/mol**
Default value: **1.0 g/mol**

Density

This parameter is active only when **Content unit = %**, **ppm**, **mol/kg** or **mmol/kg**.

Density of the solvent to be dosed.

Input range **0.000000001** to **9,999,999,999 g/mL**
Default value: **1.0 g/mL**

Factor

Multiplication factor for the calculation of the volume to be dosed. The factor can be used in general as a correction factor, e.g. for compensating for volume contraction or for specifying the starting concentration.

Input range **0.000000001** to **9,999,999,999**
Default value: **1.0**

6.12.3.4 Reports

Parameters ▶ Reports

The reports that will be printed out automatically or saved as a PDF report after a determination are defined under **[Reports]**.

Results

The result report contains the calculated result and additional specifications.

Selection:

- **Label 1**: A result report is printed out in a simple label format.
- **On**
- **Off**

Default value: **Off**

Parameters

All of the parameters of the current method are shown in the parameter report.

Selection:

- **On**
- **Off**

Default value: **Off**

The printer for the report data from above is defined under **Start page** ► **System** ► **External devices** ► **Printer**.

- If **[PDF]** is selected as printer and at least one option is activated, then the report contains the complete data.
- If a different printer is selected, then the report contains the data defined by the options above.

7 Maintenance

Regularly perform maintenance work on the product to prevent malfunctions and to ensure a long service life.

- Metrohm recommends having the products maintained by the regional Metrohm service representative as part of an annual service. Shorter maintenance intervals may be necessary if you frequently work with caustic and corrosive chemicals.
- Only perform maintenance work that is described in this instruction. Contact your regional Metrohm service representative for further maintenance work and repairs. The regional Metrohm service representative offers every form of technical advice for maintenance and service of all Metrohm products.
- Only use spare parts that meet the technical requirements of the manufacturer. Original spare parts always meet these requirements.

7.1 Performing maintenance on the cylinder unit

In the **Manual control** ▶ **Exchange cylinder unit** function, the drive moves the push rod into the exchange position.

NOTICE

Material damage caused by incorrect handling of the cylinder unit

The cylinder unit is blocked or damaged in some other way and must be replaced.

- Follow strictly the instructions for assembly, disassembly, and maintenance of the cylinder unit.
- Use only the tools specified.

NOTICE

Material damage from aggressive chemical hazardous substances

If the product comes into contact with aggressive chemical substances, this can lead to malfunctions or the product may be damaged and must be replaced.

- 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 penetrated the product, disconnect the product from the energy supply immediately. Then notify the regional Metrohm service representative.

Taking the cylinder unit apart

Prerequisite:

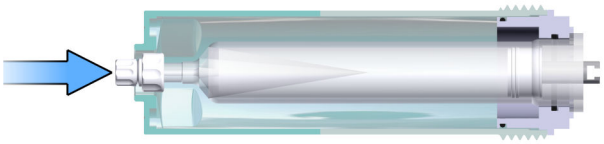
- The cylinder unit has been disassembled: *(see "Emptying and removing the cylinder unit", page 41)*

Required accessories:

- 6.1546.040 piston tool

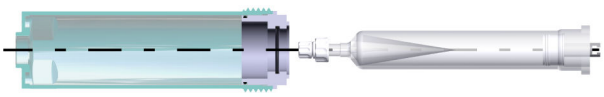
It is normally not necessary to remove the mounting ring out of the light protection or the screw nipple on the dosing cylinder for cleaning. The parts can be cleaned while still in their pre-mounted state.

1



Push the dosing cylinder out of the light protection from above.

2



Remaining liquid can be emptied out of the dosing cylinder through the dosing cylinder tip.

3

Lift the piston carefully out of the dosing cylinder. Use the 6.1546.040 piston tool to accomplish this.

The individual parts can now be cleaned and checked.

Cleaning the disassembled cylinder unit

Prerequisite:

- The cylinder unit has been taken apart.

Required accessories:

- Deionized water
- Dishwashing detergent

1 Clean the single parts of the cylinder unit with deionized water.

2 In the event of severe contamination, place the individual parts in warm water with a little dishwashing detergent and then rinse off with deionized water.

3 Check the individual parts of the cylinder unit (dosing cylinder, piston, sealing lips and piston rod) for the following defects:

- Are rough areas or scratches visible on the dosing cylinder?
- Are scratches visible on the piston surface?
- Is any unevenness visible on the sealing lips of the piston?

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

Assembling the cylinder unit

Prerequisite:

- The cylinder unit has been taken apart.
- The single parts of the cylinder unit have been cleaned and checked.
- The single parts of the cylinder unit show no defects.

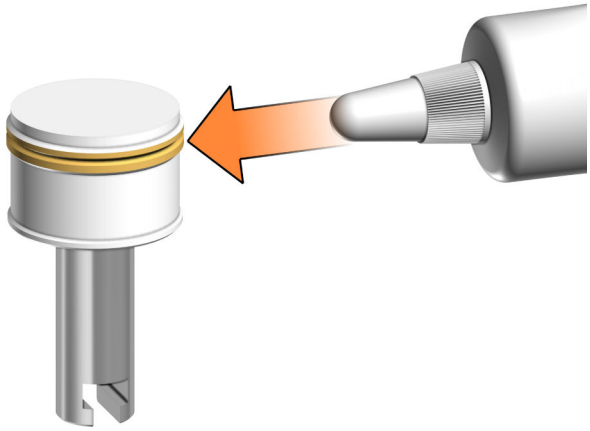
Required accessories:

- 6.2803.010 paraffin grease

- Lint-free cloth

1 **Greasing the piston**

- Grease the piston.



- Using your finger, carefully apply a trace of paraffin grease (6.2803.010) to the exterior of the sealing lips (orange marking) of the piston.
- Wipe off excess grease with the lint-free cloth.

The tip of the piston (area above the sealing lips) must be **free of grease**.

2 Carefully slide the piston far enough into the dosing cylinder that the piston rod still protrudes out of it by approximately 6 mm.

3 Push the dosing cylinder far enough into the light protection so that its flange is securely up against the mounting ring (gray plastic ring).

The cylinder unit can now be mounted: *(see "Mounting the cylinder unit", page 42)*

7.2 Cleaning the product surface

Regularly clean the product to prevent malfunctions and to ensure a long service life.

- Remove spilled chemicals immediately.
- Protect plug connections against contamination.

WARNING

Chemical hazardous substances

Contact with aggressive chemical substances may cause poisoning or chemical burns.

- Wear personal protective equipment (e.g. protective glasses, gloves).
- Use exhaust equipment when working with vaporizing hazardous substances.
- Clean 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.

WARNING

Health hazards from electrical potential.

Severe injuries with possibly fatal consequences.

- Operate the product only if it is in perfect condition. The housing must also be intact.
- Only use the product with the covers fitted.
- 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.

Prerequisite:

- The product is switched off and disconnected from the energy supply.

Required accessories:

- Cleaning cloth (soft, lint-free)
- Water or ethanol

1 Clean the surface with a damp cloth. Remove persistent contamination with ethanol.

2 Wipe the surface with a dry cloth.

3 Clean the connectors with a dry cloth.

8 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).

See also

Signals (chapter 3.4, page 20)

8.1 Resetting the system

In very rare instances, a faulty file system (e.g. because of a program crash) may lead to an impairment of program functioning. The internal file system must be initialized in such cases.

If the system is reset, all user data (methods, solutions, etc.) will be deleted. The instrument will be reset to factory settings. The password for the **Expert** dialog type is then: **METROHM9100**

Metrohm recommends creating a backup of the system at regular intervals in order to avoid data losses.

The program version does not change when resetting the system.

Resetting the system

Prerequisite:

- The instrument is switched off.

1 Resetting the system

- Switch on the instrument.
- Wait until the following text is displayed in the bottom line of the screen: **Initialization, please wait...**

- Press the 3 keys  simultaneously and hold them down for approx. 4 s.

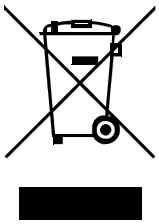
The **Factory reset** warning appears: All information (including saved methods, determination results, etc.) is deleted. Do you want to continue?

2 Confirming the reset

Confirm the warning with **[Continue]**.

The device deletes the user data and restarts.

9 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.

10 Technical specifications

10.1 Ambient conditions

Nominal function range	+5 to +45 °C	at max. 80% relative humidity, non-condensing
Storage	+5 to +45 °C	at max. 80% relative humidity, non-condensing
Altitude / Pressure range	max. 2,000 m. above sea level / min. 780 mbar	
Overvoltage category	II	
Pollution degree	2	

10.2 Energy supply

External power supply unit

Inlet

Nominal voltage range	100–240 V AC	±10%
Frequency range	50–60 Hz	
Current	max. 1.5 A	

Outlet

Nominal voltage	24 V DC	
Current	max. 2.7 A	
Power output	65 W	

Instrument

Inlet

Nominal voltage	24 V DC	

Power consumption	max. 65 W	
Outlet		
Nominal voltage	24 V DC	
Power output	max. 45 W	

USB connector

Nominal voltage	5 V	
Current at the power supply unit	500 mA	max. output current per channel

Protection

Internal fuse	1.5 A	cannot be replaced by the user

10.3 Measurements and weight

Measurements

Width	286 mm	
Height		
without cylinder unit	220 mm	
with cylinder unit	358 mm	
with support rod	508 mm	
Depth	286 mm	

Weight

	3.4 kg	without accessories and power supply unit

10.4 Housing

Materials

Cover	PP	20% filled with talc
Back panel	1.4301	stainless steel
Base	PP	20% filled with talc
Front foils	PET	EBA 180, anti-glare

IP degree of protection IP 21

10.5 Connectors specifications

Power IN

Socket	Round plug	4-pin

Power OUT

Socket	Round plug	4-pin

Remote

Socket	D-Sub	9-pin

Ethernet

Type	CAT 6	
Socket	RJ-45	
Cable type	min. FFTP	shielded
Cable length	max. 10 m	

USB

Type	2.0	
Socket	Type A	
Cable type	shielded	
Cable length	max. 5 m	

10.6 Display specifications

Display		
Type	LCD	VGA color display
Size	approx. 4.3"	diagonal
Resolution	480 × 272	pixels
Status display	LED	green

10.7 Operation specifications

Touch screen	
Type	resistive
Resistance to chemicals	Ethanol
	Methanol
	Water
Keys	5 keys

10.8 Stirrer specifications

Version	magnetic	
Rotational speed range	+1 to +15	120–1,800 rpm
Rotational speed change per step	115–125 rpm	
Maximum rotational speed	1,700–1,900 rpm	

Lengths of stirring bar

The stirrer is designed for stirring bars in the following lengths:

- 8 mm
- 12 mm
- 16 mm
- 25 mm
- 30 mm

10.9 Liquid handling specifications

Cylinder unit

Cylinder volume	5, 10, 20, 50 mL	

Dosing drive

Dosing resolution	20,000	steps per cylinder volume
Dosing accuracy	according to ISO/DIN 8655-3	

Tubing

Tubing nipple outer thread	M6	
Inner diameter	2 mm	
Material	FEP	fluorinated ethylene propylene