865 Dosimat plus

Manual

8.865.8005EN / v7 / 2023-12-01

Metrohm

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Technical Communication
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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.

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1 Introduction

1.1 Device description

The 865 Dosimat plus is an all-purpose dosing device. Methods can be created and saved under a new name. If a USB flash drive is connected as an external storage medium, the methods can be exported to a connected USB flash drive. This function enables you to copy methods quickly and easily from one instrument to another. The remote connector makes it possible to integrate the device into a Metrohm automation system.

1.1.1 Dosing modes

The following dosing modes are supported:

- **DOS**
  Manual dosing.
- **XDOS**
  Fixed volume dosing, with user-selectable dosing criteria.
- **CONT D**
  Creating solutions.
- **LQT**
  Pipetting and diluting.

1.1.2 Connectors

The instrument is equipped with the following connectors:

- **MSB connector (Metrohm Serial Bus)**
  For connecting a stirrer and an 805 Dosimat for tandem dosings.
- **USB (OTG) connector**
  The 6.2151.100 adapter can be used to connect, for example, a printer, a USB flash drive or a USB keyboard. The 6.2151.120 cable can be used to connect a printer directly.
- **Remote connector**
  To connect the Manual Dosing Controller, a Titrino plus or a sample changer.

1.2 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**.

NOTE

Metrohm recommends keeping the accessories list for reference purposes.

1.3 About the documentation

CAUTION

Please read through this documentation carefully before putting the device into operation. The documentation contains information and warnings which the user must follow in order to ensure safe operation of the device.

1.3.1 Symbols and conventions

The following symbols and formatting may appear in this documentation:

*(5-**12**)*	**Cross-reference to figure legend** The first number refers to the figure number, the second to the instrument part in the figure.
1	**Instruction step** Perform the steps one after the other.
Method	**Dialog text**, **parameter** in the software
File ► New	Menu or menu item
[Continue]	**Button** or **key**
	**WARNING** This symbol draws attention to a possible life-threatening hazard or risk of injury.
	**WARNING** This symbol draws attention to a possible hazard due to electrical current.
	**WARNING** This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	**WARNING** This symbol draws attention to a possible biological hazard.
	**WARNING** Warning of optical radiation

CAUTION

This symbol draws attention to possible damage to instruments or instrument parts.

NOTICE

This symbol highlights additional information and tips.

2 Safety

WARNING

Operate this instrument only according to the information contained in this documentation.

This instrument exhibited no flaws in terms of technical safety at the time it left the factory. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

2.1 Intended use

The 865 Dosimat plus has been designed for use in laboratories and production companies. Its main area of use is the precise dosing of liquids. This includes simple dosing according to specific criteria, creating solutions, pipetting liquid samples and manual titrations.

This device is suitable for dosing chemicals and flammable solvents. Therefore, the use of the 865 Dosimat plus requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge with respect to the application of the fire prevention measures prescribed for laboratories or production plants is also mandatory.

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 Electrical safety

The electrical safety when working with the instrument is ensured as part of the international standard IEC 61010.

WARNING

Only personnel qualified by Metrohm are authorized to carry out service work on electronic components.

WARNING

Never open the housing of the instrument. The instrument could be damaged by this. There is also a risk of serious injury if live components are touched.

There are no parts inside the housing which can be serviced or replaced by the user.

Supply voltage

WARNING

An incorrect supply voltage can damage the instrument.

Only operate this instrument with a supply voltage specified for it (see rear panel of the instrument).

Protection against electrostatic charges

WARNING

Electronic components are sensitive to electrostatic charges and can be destroyed by discharges.

Do not fail to pull the power cord out of the power socket before you set up or disconnect electrical plug connections at the rear of the instrument.

2.5 Tubing and capillary connections

CAUTION

Leaks in tubing and capillary connections are a safety risk. Tighten all connections well by hand. Avoid applying excessive force to tubing connections. Damaged tubing ends lead to leakage. Appropriate tools can be used to loosen connections.

Check the connections regularly for leakage. If the instrument is used mainly in unattended operation, then weekly inspections are mandatory.

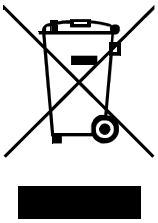
2.6 Flammable solvents and chemicals

WARNING

All relevant safety measures are to be observed when working with flammable solvents and chemicals.

- Set up the instrument in a well-ventilated location (e.g. fume cupboard).
- Keep all sources of flame far from the workplace.
- Clean up spilled liquids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.

2.7 Recycling and disposal



This product is covered by European Directive 2012/19/EU, WEEE – Waste Electrical and Electronic Equipment.

The correct disposal of your old instrument will help to prevent negative effects on the environment and public health.

More details about the disposal of your old instrument can be obtained from your local authorities, from waste disposal companies or from your local dealer.

3 Overview of the instrument

3.1 865 Dosimat plus

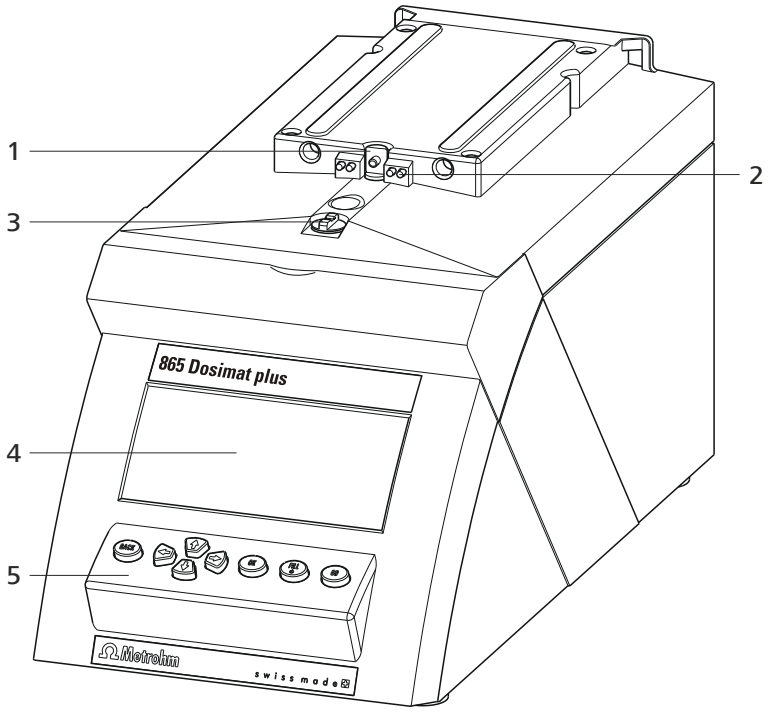


Figure 1 Front 865 Dosimat plus

1	**Piston rod** Of the dosing drive.	**2**	**Contact pins** For the data chip.
3	**Coupling** For switching the flat stopcock.	**4**	**Display**
5	**Keypad**		

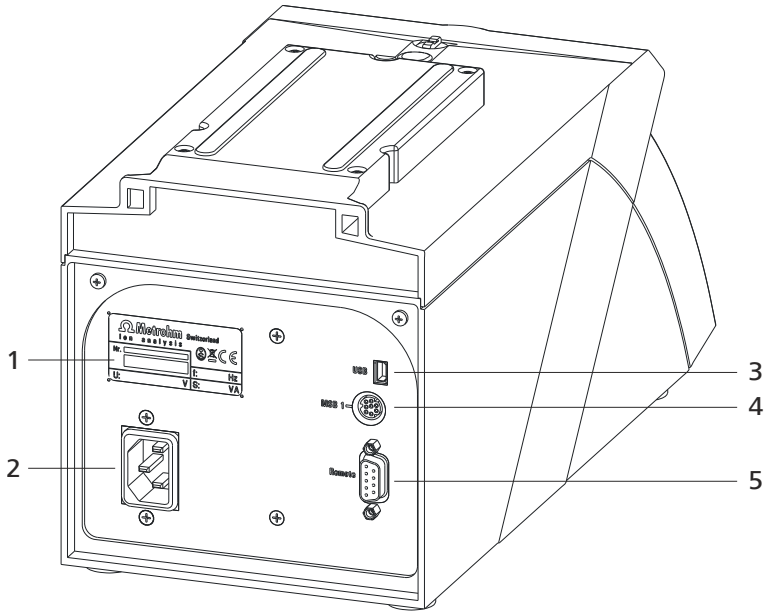


Figure 2 Rear 865 Dosimat plus

1 Type plate
Contains specifications concerning mains voltage and serial number.

2 Mains connection socket

3 USB (OTG) connector
For connecting printers, USB sticks, USB hubs, etc.

4 MSB connector
Metrohm Serial Bus.
For connecting a stirrer or an 805 Dosimat.
Mini DIN, 9-pin.

5 Remote connector
For connecting the Manual Dosing Controller or instruments with a remote interface.
D-Sub, 9-pin.

3.2 Manual Dosing Controller

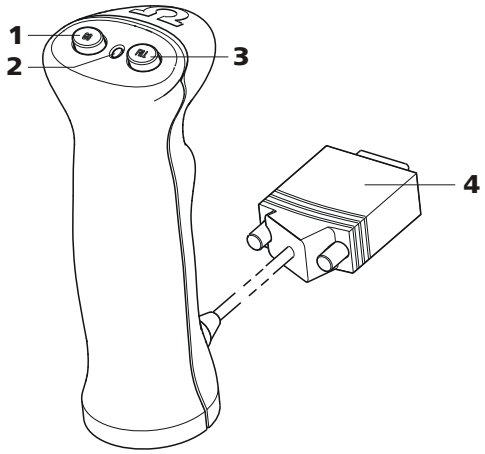


Figure 3 Manual Dosing Controller 6.2107.100

1 **Dosing key** To start the dosing.	**2** **Status LED** Indicates the readiness of the instrument.
3 **Stop key/Fill key** For stopping and filling the dosing cylinder.	**4** **Connection cable** With 9-pin D-Sub plug.

4 Installation

4.1 Setting up the instrument

4.1.1 Packaging

The instrument is supplied in protective packaging together with the separately packed accessories. Keep this packaging, as only this ensures safe transportation of the instrument.

4.1.2 Checks

Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing it with the delivery note.

4.1.3 Location

The instrument has been developed for operation indoors and may not be used in explosive environments.

Place the instrument in a location of the laboratory which is suitable for operation and free of vibrations and which provides protection against corrosive atmosphere and contamination by chemicals.

The instrument should be protected against excessive temperature fluctuations and direct sunlight.

4.2 Connecting a stirrer

You can connect the following stirrers:

- 801 Stirrer
- 803 Ti Stand
- 804 Ti Stand (requires rod stirrer)

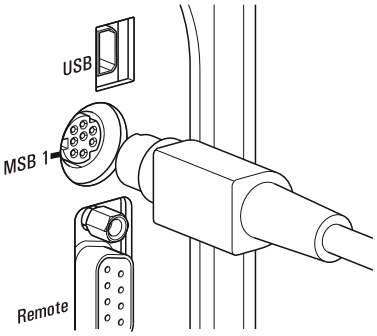


Figure 4 Connecting a stirrer

CAUTION

Make sure that the flat side of the plug matches the marking on the socket.

4.3 Connecting the Manual Dosing Controller

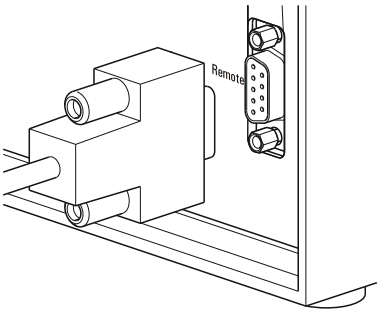


Figure 5 Connecting the Manual Dosing Controller

The Manual Dosing Controller is connected to the remote connector on the rear of the instrument.

4.4 Connecting a balance

As a rule, balances are equipped with a serial RS-232 interface. To connect a balance, you need a 6.2148.030 RS-232/USB Box.

NOTE

There are 2 versions of the RS-232/USB Box 6.2148.030. Version 2.0 of the RS-232/USB Box is identified with a sticker accordingly.

Starting with program version **5.865.0030**, **Version 2.0** of the RS-232/USB Box must be used.

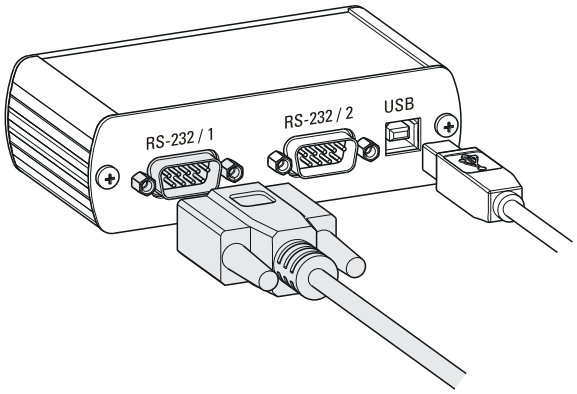


Figure 6 Connecting a balance

When a 6.2151.020 connecting cable (USB A - USB B) is used, then the 6.2148.030 RS-232/USB Box can be connected to the *(see chapter 4.5, page 14)* on the 865 Dosimat plus by means of a USB hub or a 6.2151.100 adapter.

Connect the 9-pin plug of the respective balance connecting cable to the **RS-232/1** connector. Consult the manual for the balance to select the correct connecting cable.

The parameters for the RS-232 interfaces on the 865 Dosimat plus must match those on the balance *(see "Editing the COM1 settings", page 42)*. In addition, consult the manual for the balance.

4.5 Connecting a keyboard, printer and other USB devices

The 865 Dosimat plus has a USB (OTG) connector. Use the provided 6.2151.100 adapter USB MINI (OTG) - USB A for connecting USB devices as e.g. printers, keyboards or USB sticks, see the following figure.

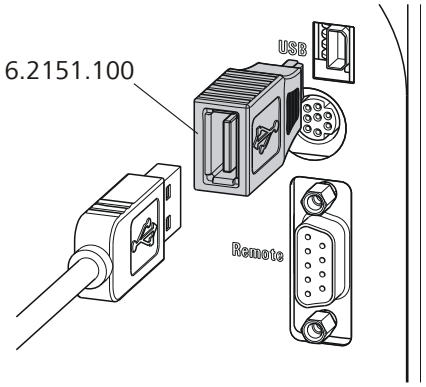


Figure 7 Connecting USB devices

NOTE

Up to and including program version 5.865.0026:

Switch the device off before connecting or removing a USB device or a USB flash drive.

The 865 Dosimat plus can only recognize the device immediately after switching on.

Starting with program version 5.865.0030:

USB flash drives and printers can be connected or removed at any time.

A double beep is heard when connecting and removing a USB stick.

The following devices can be operated **directly on the USB connector with the 6.2151.100 adapter**:

- USB flash drives (for the backup or storing of methods)
- 6.2147.000 numerical USB keypad
  The **6.2147.000 numerical USB keypad** is used for convenient numerical input and for navigating in the dialog. In addition, it provides two USB connectors. Connect additional USB devices to the keyboard.
- 6.2148.030 RS-232/USB Box (for connecting balances or for the RS-232 remote control)
  Starting with program version **5.865.0030**, **Version 2.0** of the RS-232/USB Box must be used.
  Version 2.0 of the RS-232/USB Box is identified with a sticker accordingly.
- USB hub (with or without its own power supply)

NOTE

Most of the USB devices need a so-called hub in order to work correctly.

A USB hub is a distributor to which several USB devices can be connected. USB hubs are available in specialty stores in a number of different models.

The USB (OTG) connector of the 865 Dosimat plus has no such hub. The 6.2147.000 numerical USB keypad has a USB hub and two USB connectors.

The following devices can **only be connected to a 6.2147.000 numerical keypad or to a USB hub**:

- Printer (with USB connector, use the 6.2151.020 connecting cable)
- Barcode scanner (with USB cable)

- Mouse (PC mouse with USB cable, for navigating in the dialog)

The following devices can **only be connected to a USB hub**:

- PC keyboard (with USB cable, for the comfortable input of letters and numbers)
- Keypad with numerical keypad (with USB cable)

If you wish to connect **several different instruments without own power supply**, then you must possibly use a USB hub with own power supply (*self powered*). The USB (OTG) connector of the 865 Dosimat plus is not designed for supplying power to several devices with elevated electricity requirements.

Also observe the instructions in *chapter 9.4, page 69*.

Examples:

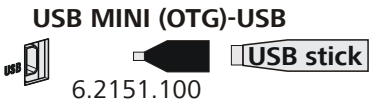


Figure 8 Connecting the USB flash drive

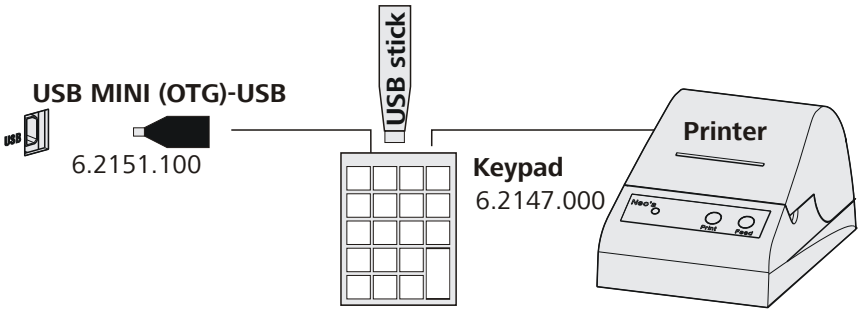


Figure 9 Connecting the 6.2147.000 USB keyboard with USB flash drive and printer

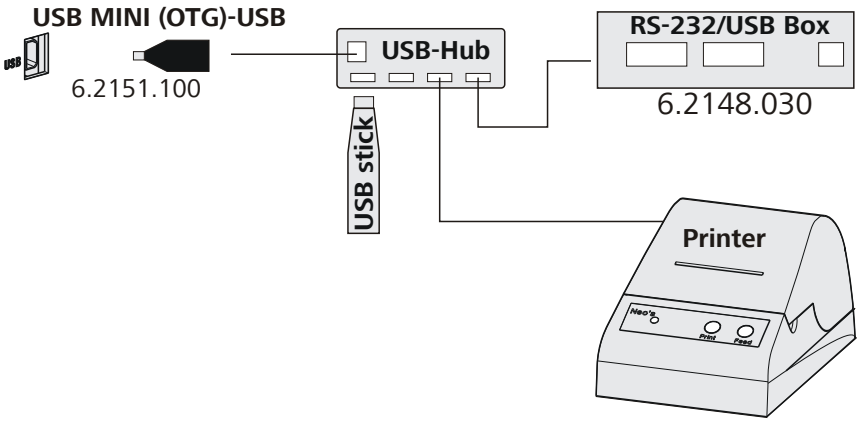


Figure 10 Connecting the USB hub with USB flash drive, printer and the 6.2148.030 RS-232/USB Box (for connecting balances)

4.6 Connecting devices on the remote connector

The 865 Dosimat plus can be integrated in an automation system with the help of a remote cable.

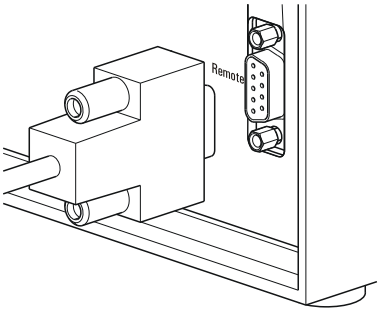


Figure 11 Connecting a remote cable

A variety of different connecting cables are available as connectors for Metrohm devices (e.g. sample changers). The connecting cables can be viewed on the *Metrohm website*. For additional information regarding the display of accessories on the Metrohm website, see *chapter 1.2, page 2*.

4.7 Connecting the 805 Dosimat

For tandem operation (XDOS mode), an 805 Dosimat can be connected to the **MSB 1** socket on the rear of the 865 Dosimat plus.

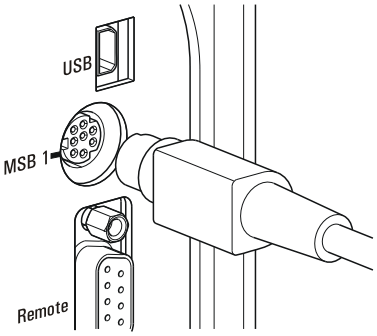


Figure 12 Connecting the 805 Dosimat

CAUTION

Make sure that the flat side of the plug matches the marking on the socket.

If the **MSB 1** connector is already occupied by a stirrer (e.g. 801 Stirrer), then the 805 Dosimat can be connected to the MSB socket of the stirrer.

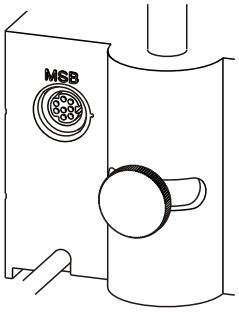


Figure 13 MSB connector on the 801 Stirrer

CAUTION

Make sure that the flat side of the plug matches the marking on the socket.

The 865 Dosimat plus must be switched off and then on again after connection.

4.8 Attaching the exchange unit

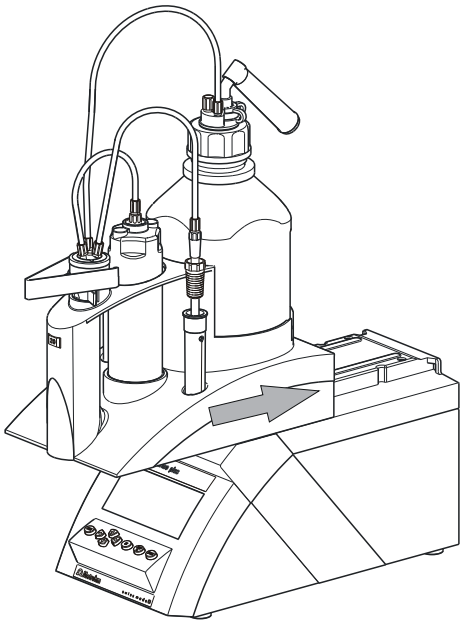


Figure 14 Attaching the exchange unit

To attach the exchange unit, proceed as follows:

1 Slide the exchange unit from the front onto the 865 Dosimat plus and push all the way to the rear.

It must snap in audibly.

4.9 Connecting the instrument to the power grid

WARNING

Electric shock from electrical potential

Risk of injury by touching live components or through moisture on live parts.

- Never open the housing of the instrument while the power cord is still connected.
- Protect live parts (e.g. power supply unit, power cord, connection sockets) against moisture.
- Unplug the power plug immediately if you suspect that moisture has gotten inside the instrument.
- Only personnel who have been issued Metrohm qualifications may perform service and repair work on electrical and electronic parts.

Connecting the power cord

Accessories

Power cord with the following specifications:

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

NOTE

Do not use a not permitted power cord!

1 Plugging in the power cord

- Plug the power cord into the instrument's power socket.
- Connect the power cord to the power grid.

5 Operation

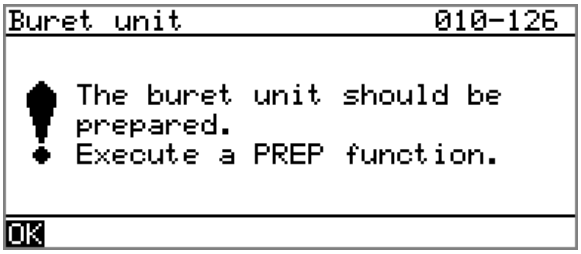
5.1 Switching the instrument on and off

Switching on the instrument

Proceed as follows:

1 ▪ Press the red **[FILL]** key.
The instrument is initialized and a system test performed. This process takes some time.

▪ If a buret unit has been attached, then a request appears to carry out the **PREP** function:



All tubings and the cylinder are rinsed with the **PREP** (Preparing) function. The preparing of the buret unit is described in chapter *"Preparing the buret unit (PREP)", page 31*.

▪ Confirm the message with **[OK]**.
The display of this message can be deactivated in the system settings *(see "PREP warning", page 36)*.

The main dialog is displayed:

Switching off the instrument

The instrument is switched off with the **[FILL]** key. The fact that the key needs to be pressed down for an extended time prevents accidental switch off.

Proceed as follows:

1 ▪ Keep the red **[FILL]** key pressed down for at least 3 s.

A progress bar is displayed. If the key is released during this time, then the instrument will not be switched off.

5.2 Fundamentals of operation

5.2.1 The keypad

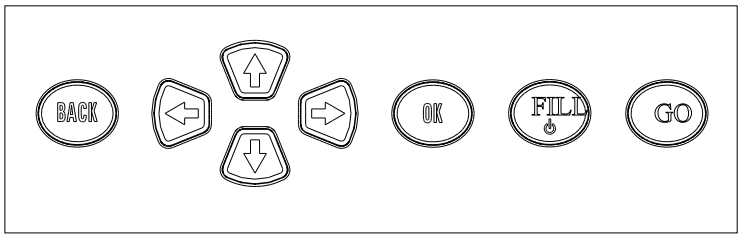
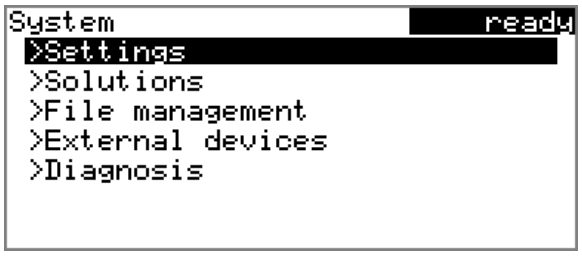


Figure 15 Keypad 865 Dosimat plus

BACK	Apply the input and exit the dialog.
⇧ ⇩	Move the selection bar either up or down by one line at a time. Select the character to be entered in the text editor.
⇦ ⇨	Select the character to be entered in the text and number editor. Select the individual functions in the function bar.
OK	Confirm the selection.
FILL	Stop an ongoing method run or a manual function. Switch the instrument on or off.
GO	Start a method run or a manual function.

5.2.2 Structure of the dialog windows



The current dialog title is displayed on the left-hand side of the title bar. The current status of the system is displayed in the upper right-hand corner:

ready	The instrument is in normal status.

busy A method has been started.

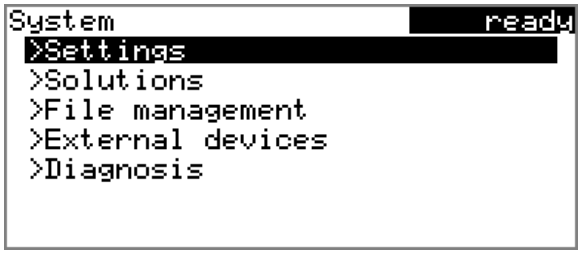
hold A method has been paused.

Some dialogs have a so-called function bar on the bottom line. The functions contained therein can be selected with the arrow keys **[⇦]** or **[⇨]** and executed with **[OK]**.

5.2.3 Navigating in the dialog

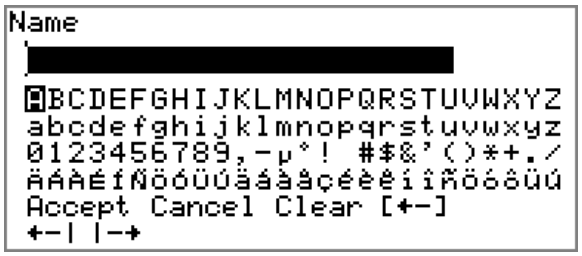
The selection bar is displayed in inverted style. Use the arrow keys **[⇧]** and **[⇩]** to move the selection bar upward or downward one line at a time. If a dialog text is marked with ">", then additional settings are available in a subordinate dialog. Use **[OK]** to access this dialog.

Example: System settings



Use the **[BACK]** key to return to the next higher level.

5.2.4 Entering text and numbers



In the editing dialog for text input or numerical input, select the individual characters with the arrow keys. Use **[OK]** to apply the character in the input field. The following functions are available:

Editing function	Description
Accept	The modification is applied and the editing dialog is exited.
Cancel	The editing dialog is exited without applying the modification.
Clear	The content of the input field is deleted completely.
[←–]	The character left of the cursor is deleted (backspace).
←–|	Text editor only The cursor within the input field is shifted to the left by one character each time that **[OK]** is pressed.
|–→	Text editor only The cursor within the input field is shifted to the right by one character each time that **[OK]** is pressed.
[BACK]	The modification is applied and the editing dialog is exited.

The **[BACK]** key has the same function as **Accept**.

A commercially available USB keyboard can be connected to make it easier to enter text and numbers. The assignment of the keys on the PC keyboard is described in *chapter 9.4.2, page 70*.

5.2.5 Selecting from a selection list

In a selection list, select the individual entries with the arrow keys **[⇧]** and **[⇩]**. Accept the selection with **[OK]** or **[BACK]**.

5.3 Methods

NOTE

Methods which were created on a program version starting with **5.865.0030** are not reverse-compatible with program versions **5.865.0026** and earlier.

5.3.1 Method templates

The 865 Dosimat plus contains method templates which are already configured and which can be adapted for individual requirements.

The following method templates can be selected:

DOS Manual interactive dosing with optional result calculation.

For manual titrations.

XDOS Automatic dosing with freely selectable guidelines to choose from.

The following specifications are possible:

- Volume and time
- Volume and dosing rate
- Dosing rate and time

CNT D Automatic creation of solutions with specified content.

For standard solutions, sample solutions, or dilutions.

LQT Liquid handling - sample transfer.

Pipetting with or without after-flushing or dilution.

You can find a detailed description of the methods in chapter *7 Parameters and dosing modes, page 46and subsequent pages*.

5.3.2 Creating a new method

Proceed as follows to create a new method:

1 Open the method table

- In the main dialog, select **Method** and press **[OK]**.

The method table opens:

2 Select the method template

- In the function bar, select **New** and press **[OK]**.

The list of method templates opens:

3 Load the method template

- Select the desired template and press **[OK]**.

The method template is now loaded and is displayed in the main dialog under **Method**.

If a new method has been created, then the individual parameters can be modified under **Menu ► Parameters**.

5.3.3 Saving a method

If you modify method parameters, then you can save these as your own method. A maximum of 100 methods can be saved.

To save a method, proceed as follows:

1 Opening the method table

- In the main dialog, select **Method** and press **[OK]**.

The method table opens:

2 Modifying/applying the method name

- In the function bar, select **Store** and press **[OK]**.
  A method name will be suggested for new methods. If the method has already been saved once, then the method name will be displayed:

Applying the name:

- Press **[BACK]**.

The method will be saved and the method table is displayed.

Entering a new name:

- Press **[OK]**.
  The text editor opens.
- Enter a method name (max. 12 characters) and apply with **Accept** or **[BACK]**.
- Press **[BACK]**.

The method will be saved and the method table is displayed.

5.3.4 Loading a method

To load a method, proceed as follows:

1 Open the method table

- In the main dialog, select **Method** and press **[OK]**.

The method table with the stored methods opens:

2 Select a method

- Select the desired method.

3 Load the method

- In the function bar, select **Load** and press **[OK]**.

The method is now loaded and is displayed in the main dialog under **Method**.

5.3.5 Exporting a method

The methods can be exported to a connected USB flash drive.

NOTE

This function is possible only if a USB flash drive is connected as an external storage medium.

To export a method, proceed as follows:

1 Opening the method table

- In the main dialog, select **Method** and press **[OK]**.

The method table with the stored methods opens:

2 Selecting the method

- Select the desired method.

3 Exporting the method

- In the function bar, select **Export** and press **[OK]**.

The method is being exported. The directory structure on the USB flash drive is listed in *chapter 6.3, page 39*.

5.4 Stirrer operation

You can control a connected stirrer directly in the main dialog.

Proceed as follows:

1 Set the stirring rate

- Use the arrow key **[↓]** to select the **Stirrer** entry.
- In the function bar, select the **Stir-** or **Stir+** function.
  The stirring rate will be increased or decreased by one step each time the **[OK]** key is pressed.
  The algebraic sign changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:
  - "+": counterclockwise rotation
  - "–": clockwise rotation

2 Switch on the stirrer

- In the function bar, select the **on** function and press **[OK]**.

The stirrer is started and stirs at the rate which has been set. **Off** is now displayed in the function bar.

3 Switch off the stirrer

- In the function bar, select the **off** function and confirm with **[OK]**.

The stirrer is stopped.

5.5 Entering sample data

Menu ► Sample data

The sample identifications are documented in the result report, unless they are empty:

- Starting with program version **5.865.0026** in **DOS** dosing mode
- Starting with program version **5.865.0030** in all dosing modes

ID1

Sample identification. Text field used to specify the sample with free selection of information.

Entry	**max. 10 characters**
Default value	**Empty**

ID2

Sample identification. Text field used to specify the sample with free selection of information.

Entry	**max. 10 characters**
Default value	**Empty**

Sample size

Sample size.

In the dosing modes DOS and CNT D, a sample size can be used for calculation.

The sample size can be entered using the keypad (in the main menu under **Sample data**) or transferred directly from a balance by means of a cable connection. When using direct data transfer from a balance, care must be taken to ensure that the settings for data transmission on the 865 Dosimat plus match those on the balance *(see page 41)*.

Input range	**–999,999,999 to 9,999,999,999**
Default value	**1.0**

Unit

Unit of the sample size.

Selection	**g** | **mg** | **µg** | **mL** | **µL** | **pieces** | **User-defined**
Default value	**g**

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.

5.6 Preparing the buret unit (PREP)

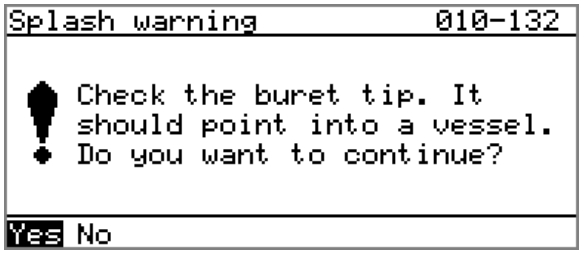
The **PREP** function is used to rinse the cylinder and tubings of the buret unit and fill them air bubble-free. You should carry out this function once per day.

Proceed as follows:

1

- In the main dialog, select **Menu** and press **[OK]**.
  The main menu opens.
- Select the menu item **Prepare buret unit** and press **[OK]**.
  If an 805 Dosimat for tandem dosing is connected to the instrument, select the first or second Dosimat afterwards.

The following message is displayed:



2 Start the preparing

CAUTION

Make sure that the buret tip is directed into a vessel that can accommodate the cylinder volume of your buret unit several times over.

- Select **Yes** and confirm the message with **[OK]**.

Preparing is carried out.

5.7 Printing a report manually

Menu ► Print reports

Proceed as follows to print a report manually:

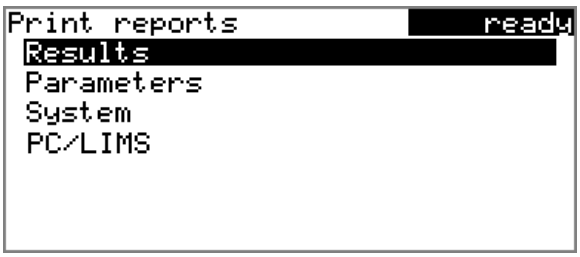
1 Opening the main menu

- In the main dialog, select **Menu** and press **[OK]**.

2 Opening the print dialog

- Select the menu item **Print reports** and press **[OK]**.

The dialog window with the available reports opens:



3 Selecting the report

- Select the desired report and press **[OK]**.

The report is printed out.

The following reports can be printed out manually:

Results	Result report with determination properties, sample data, calculated results, etc.
Parameters	Report with all method parameters of the loaded method.
System	System report with system settings, solution list, external devices, etc.

PC/LIMS

Machine-readable report with all of the data for a determination. This report can be saved as a TXT file to a connected USB flash drive or sent to a terminal program or a LIMS via an RS-232 interface. The definition is made in the system settings *(see "PC/LIMS report", page 40)*.

6 System settings

6.1 Basic settings

Menu ▶ System ▶ Settings

This chapter contains a description of general instrument settings.

User name

A user name can be entered here for the report. This parameter will only be printed if a user has been defined.

Entry	**max. 12 characters**
Default value	**Empty**

Instrument name

An instrument name can be entered here for the report. This parameter will only be printed if a designation has been defined.

Entry	**max. 10 characters**
Default value	**Empty**

Serial number

Serial number of the device. This is printed as a part of the instrument identification in the report header.

Program version

Version number of the instrument software. This is printed as a part of the instrument identification in the report header.

Time

Current time. Only numbers that make sense can be entered.

Format: hh:mm:ss

Date

Current date. Only numbers that make sense can be entered.

Format: YYYY:MM:DD

Language

Set the dialog language.

Up to and including program version 5.865.0026:

One additional language can be selected besides English.

NOTE

In order to ensure that a second language can be selected, it must first be installed. This installation must be carried out by specialist personnel. In chapter *Loading program versions and language files, page 43*, you will find details regarding the installation of a second language.

Starting with program version 5.865.0030:

All available languages are installed on the device. No additional languages can be installed.

Dialog type

The user dialog can be limited for routine operations. One can operate normally with methods in the limited dialog. However, no settings can be made or methods deleted.

The resetting of the dialog will take effect as soon as you exit the main menu.

The limitation of the dialog results in the following:

- The menu items **System** and **Parameters** are not shown in the main menu.
- Methods can only be loaded, but not deleted, exported or created.

NOTE

If the limited dialog for routine operation is activated, then the expert dialog cannot be activated during ongoing operation. To change the dialog type, the 865 Dosimat plus must be switched off and then back on again. The expert dialog can be forced as soon as the instrument is started up again. Then it is possible to enter whatever settings one wishes, e.g. the changing of the dialog type. If the instrument is switched off again without changing the dialog type, then the routine dialog will remain activated.

Forcing the expert dialog:

- Switch on the instrument.
- Wait for the display of the instrument logo with the lettering **easy, safe, precise**.
- Press the **[STOP]** key once again and hold it down while also briefly pressing the **[BACK]** key.
- Release both keys once again.

Selection	**Expert** | **Routine**
Default value	**Expert**

Expert
Complete dialog.

Routine
Limited dialog for routine operations.

Contrast

The contrast of the display can be adjusted with the arrow keys **[⇦]** and **[⇨]**.

- **[⇦]**: the contrast will be decreased by one step each time the key is pressed.
- **[⇨]**: the contrast will be increased by one step each time the key is pressed.

Input range	**150 to 240**
Default value	**212**

NOTE

Alternatively, the contrast can also be modified in the following manner:

Keep the red **[STOP]** key pressed down. As soon as the progress bar appears, also press the arrow key **[⇩]** or **[⇧]** repeatedly.

This method will, however, cause the contrast to be modified by several steps.

Beep

If this parameter is enabled, then a short beep will sound at the press of a key.

Selection	**on** | **off**
Default value	**on**

PREP warning

If this parameter is activated, then the recommendation will be made to carry out the function **PREP** (Preparing):

- After the instrument is switched on.
- Each time a buret unit is attached.

All tubing and the cylinder are rinsed with this function *(see chapter 9.1.2, page 67)*.

Selection	**on** | **off**
Default value	**on**

6.2 Managing solutions

6.2.1 General

Menu ▶ System ▶ Solutions

Solutions can be used in intelligent buret units or in non-intelligent buret units. Intelligent buret units have a built-in data chip on which the data for the reagent is stored. This data is automatically read out during attachment and entered in the solution list.

The name and the type are specified for each solution in the solution list. The asterisk (*****) on the right-hand side indicates that this buret unit is attached (only for intelligent buret units). An unlimited number of solutions in buret units with data chip can be added to the solution list. The number of solutions in buret units without data chip is limited to 10 items.

Meaning of the type:

- **EU**: exchange unit without data chip
- **IEU**: exchange unit with integrated data chip

Edit

Edit the data of the selected solution, see following chapter.

New

Add a new solution to the list, see following chapter.

Delete

Delete the selected solution from the list.

6.2.2 Editing the solution data

Name

The designation of the solution is used for unambiguous identification.

Entry	**max. 24 characters**
Default value	**empty**

Type

The model of the buret unit is displayed.

Cylinder volume

Cylinder volume of the buret unit in mL. The cylinder volume is automatically read out with intelligent buret units.

Selection	**1** | **5** | **10** | **20** | **50**
Default value	**20**

Concentration

Concentration of the solution.

Input range	**–999999999 to 9999999999**
Default value	**1.000**

Concentration unit

Unit of the concentration.

Selection	**µmol/mL** | **mmol/L** | **mol/L** | **g/L** | **mg/L** | **mg/mL** | **µg/L** | **ppm** | **%** | **mEq/L** | **User-defined**
Default value	**mol/L**

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. A blank entry can be generated this way as well.

Titer

Titer of the solution.

Input range	**–999999999 to 9999999999**
Default value	**1.000**

Titer unit

Unit of the titer.

Selection	**µmol/mL** | **mmol/L** | **mol/L** | **g/L** | **mg/L** | **mg/mL** | **µg/L** | **ppm** | **%** | **mEq/L** | **empty** | **User-defined**
Default value	**empty**

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. A blank entry can be generated this way as well.

Date titer det.

Date of the last titer determination.

Monitoring

Activating and deactivating the titer monitoring.

Selection	**on** | **off**
Default value	**off**

Time interval

This parameter is visible only when **Monitoring** = **on**.

You will be notified that this time interval (in days) has elapsed when starting a method. You can then select whether or not you would still like to start the method.

Input range	**1 to 999 d**
Default value	**999 d**

6.3 File management

Menu ► System ► File management

NOTE

This menu item is visible only if a USB flash drive has been connected as an external storage medium.

Methods can be imported and deleted from a USB flash drive in this dialog. Only methods located in the **Files** directory are displayed in the list *(see "Directory structure on the USB flash drive", page 40)*.

A backup of the system can be created (all data and settings). Also, an existing backup can be reloaded.

NOTE

Methods and backups which were created on a program version starting with **5.865.0030** are not reverse-compatible with program versions **5.865.0026** and earlier.

Import

Import the selected method.

Delete

Delete the selected method.

Backup

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

NOTE

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 as soon as the function is executed again.

Restore

Load the backup from a connected USB flash drive.

Directory structure on the USB flash drive

A directory with the instrument number will be created on the USB flash drive. The structure within this directory appears as follows:

Figure 16 Directory structure on the USB flash drive

Backup All of the files of the backup are stored in this directory. The directory is created as soon as a backup is created for the first time.

Files Exported methods are stored in this directory. The directory is created as soon as a method is exported for the first time.

Only methods located in this directory can be imported.

6.4 Configuring external devices

Menu ► System ► External devices

PC/LIMS report

Specification of the storage location for the PC/LIMS report. The PC/LIMS report is a machine-readable report with all of the important data for a determination. It can be saved as follows:

- as a TXT file on a USB flash drive.
- to a LIMS via an RS-232 interface. The 6.2148.030 RS-232/USB Box is required for this purpose.

NOTE

There are 2 versions of the RS-232/USB Box 6.2148.030. Version 2.0 of the RS-232/USB Box is identified with a sticker accordingly.

Starting with program version **5.865.0030**, **Version 2.0** of the RS-232/USB Box must be used.

Selection	**COM2** | **USB Stick**
Default value	**USB Stick**

COM2
The report is sent via the serial COM2 interface. The interface parameters set in the dialog **COM2 settings** are used *(see "Editing the COM2 settings", page 43)*.

USB Stick
The report will be saved as a TXT file on the USB flash drive in the folder **pc_lims_report**.

Printer

If a printer is connected, then the printer type needs to be defined here in order for the reports to be printed out correctly.

The printers that have the designation **ESC-POS** are so-called POS printers (point-of-sale printers), i.e. they print on continuous paper.

Selection	**Citizen (ESC-POS)** | **Custom (ESC-POS)** | **Epson** | **Epson (ESC-POS)** | **HP DeskJet** | **HP LaserJet** | **Seiko (ESC-POS)**
Default value	**HP DeskJet**

Keyboard layout

A commercially available USB keyboard can be connected to make it easier to enter text and numbers. Specify the country-specific keyboard layout.

Selection	**English US** | **French FR** | **German CH** | **German DE** | **Spanish ES**
Default value	**English US**

Balance

If you have connected a balance, then you must define the balance type here.

Selection	**AND** | **Mettler** | **Mettler AT** | **Mettler AX** | **Ohaus** | **Precisa** | **Sartorius** | **Shimadzu**
Default value	**Sartorius**

The following table indicates the balance type that needs to be selected for the balance model:

Balance	Balance type
AND	**AND**
Mettler AB, AE, AG, AM, AJ, PE, PM, PJ, PR, XP, XS	**Mettler**
Mettler AT	**Mettler AT**
Mettler AX, MX, UMX, PG, AB-S, PB-S	**Mettler AX**
Ohaus Voyager, Explorer, Analytical Plus	**Ohaus**
Precisa	**Precisa**
Sartorius	**Sartorius**
Shimadzu BX, BW	**Shimadzu**

Editing the COM1 settings

Menu ► System ► External devices ► COM1 settings

The interface parameters for the connected balance are set under **COM1 settings**.

Baud rate

Transfer rate in characters per second.

Selection	**1,200** | **2,400** | **4,800** | **9,600** | **19,200** | **38,400** | **57,600** | **115,200**
Default value	**9,600**

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 data transfer protocol.

Selection	**hardware** | **software** | **none**
Default value	**hardware**

NOTE

If communications problems occur, set the parameter **Handshake** to **software**, and make another attempt.

Editing the COM2 settings

Menu ► System ► External devices ► COM2 settings

Under **COM2 settings**, the interface parameters for devices connected to the **RS-232/2** connector of the RS-232/USB Box are set (e.g. PC). The parameters and input ranges are identical to those for the COM1 interface.

6.5 Instrument diagnosis

6.5.1 Loading program versions and language files

Menu ► System ► Diagnosis

New program versions or language files can be loaded from a USB flash drive. The corresponding file must be saved on the USB flash drive in the following directory:

- Program file
  - Up to and including program version **5.865.0026**:
    Directory **865**
  - Starting with program version **5.865.0030:**
    Directory **865 ► SwUpdates**
- Language file
  - Up to and including program version **5.865.0026**:
    Directory **865**
  - Starting with program version **5.865.0030:**
    All available languages are installed on the device. No additional languages can be installed.

You can distinguish between language files and program files by noting how the file name is constructed.

Program files

Program files are device-specific. The file name has the following structure:

5XXXyyyy.bin where

XXX = Instrument type (e.g. 848 for the 848 Titrino plus)

yyyy = Program version

Language files

Language files can be recognized by means of the two-digit language code in the file name. A language file contains the dialog texts for various device types. It is not instrument-specific. The file name has the following structure:

5848xxxxYY.bin where

xxxx = Version number

YY = Language, e.g. DE (German), FR (French), ES (Spanish)

Loading a file

Proceed as follows:

1 Connecting the USB flash drive

- Plug in the USB flash drive with the 6.2151.100 adapter (USB MINI (OTG) - USB A) at the instrument's USB port.
- Switch on the instrument.

2 Opening the update dialog

- Under **Menu ► System ► Diagnosis**, select the menu item **Software update**.
- Press **[OK]**.

3 Opening the file selection

- Press **[OK]**.

The selection list with the program and language files present on the USB flash drive opens.

4 Selecting the file

- Use the arrow keys to select the required file.
- Press **[OK]**.

5 Starting the update

- Press **[START]**.

The update process is started, it runs automatically. At the end of the process, the instrument will be switched off automatically and switched back on again. No user intervention is required.

6.5.2 Diagnosis functions

The electronic and mechanical functional groups of Metrohm devices can and should be checked by specialist personnel from Metrohm as part of a regular maintenance schedule. Please ask your regional Metrohm representative regarding the precise terms and conditions involved in concluding a corresponding maintenance agreement.

7 Parameters and dosing modes

7.1 Manual dosing (DOS)

7.1.1 General description

Use

The dosing mode **DOS** is particularly suited for carrying out manual 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.

Solutions and buret units

For dosing, buret units with or without integrated data chip can be used. The solution data (e.g. the concentration and the titer) is managed by the 865 Dosimat plus and can be used for the result calculation. This requires the solution name to be specified under **Menu ► Parameters**.

Entering sample data

The sample data Sample size and Unit can be entered before and during a determination in **Menu ► Sample data**.

If a balance is connected, a sample size and unit can be taken directly from the balance before or during the determination. Usually, this is done by pressing the **[Print]** key on the balance. Note that this requires that the configuration of the balance's data transmission matches the settings in the 865 Dosimat plus, see *(see page 41)*. Details on configuring and sending the sample size can be found in the operating instructions of your balance.

Performing a determination

Dosing is carried out in steps in dosing mode **DOS** by pressing the **[GO]** key on the device or on the dosing handle. The parameter **Dosing ramp** can be used to define whether dosing is to be carried out with uniform dosing rates or whether a dosing step is to begin with a slowly increasing dosing rate. The **Volume** parameter allows you define a fixed volume per dosing step.

At the end of a determination, you can use the **[FILL]** key to re-fill the dosing cylinder. This automatically calculates the result and prints a result

report if the corresponding settings have been carried out, see the following Chapter.

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

7.1.2 Selecting a solution

Menu ▶ Parameters

Solution

Selection of the solution from the solution list. We recommend always selecting the solution. Solutions are defined under **System ▶ Solutions**.

For exchange units with integrated data chip, a check is made in the method run to verify whether the correct solution has been attached. For exchange units without integrated data chip, only the cylinder volume is checked. The validity of the titer is checked for the selected solution at the start of the determination.

Selection	**Selection of configured solutions** | **not defined**
Default value	**not defined**

not defined
No check takes place.

7.1.3 Dosing parameters

Menu ▶ Parameters ▶ Dosing parameters

Dosing rate

The rate at which dosing takes place. The maximum dosing rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Input range	**0.01 to 150.00 mL/min**
Selection	**max.**
Default value	**max.**

Filling rate

Rate at which the dosing cylinder is to be refilled. The maximum filling rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Input range	**0.01 to 150.00 mL/min**
Selection	**max.**
Default value	**max.**

Mode

Method of dosing.

Selection	**Dosing ramp** | **Volume**
Default value	**Dosing ramp**

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.

NOTE

If the 865 Dosimat plus is controlled via pulse control *(see chapter 9.7, page 76)*, then use the **Mode Dosing ramp**.

The pulse control is used, for example, in order to use the 865 Dosimat plus with the 781 pH/Ion Meter for the controlled dosing of standard solutions or sample solutions.

Dosing ramp

This parameter is visible only when **Mode** = **Dosing ramp**.

The dosing ramp is a delay in the dosing rate at the time of the start of a dosing step. It is advantageous primarily for manual titrations with indicator, when 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**

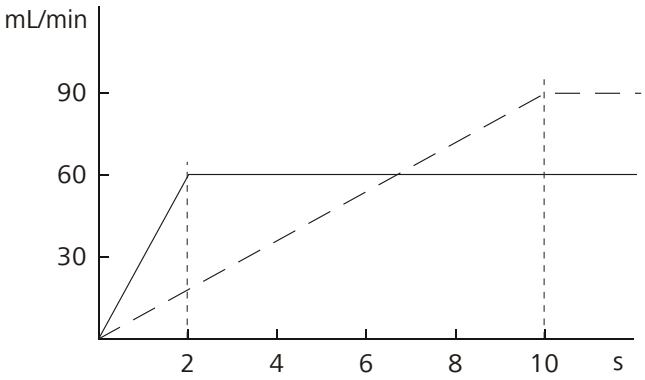


Figure 17 Dosing ramp, two examples

Volume

This parameter is visible only when **Mode** = **Volume**.

The volume defined here is declared per dosing step.

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

7.1.4 Calculation

Menu ► 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 **Menu ► Sample data**. If a balance is connected, the sample size (with unit) can also be applied directly from the balance.
Divisor	Divisor

NOTE

If a solution is selected in **Parameters**, 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, **Default value 1** is used for the calculation.

Calculation status

Activating the calculation.

Selection	**on** | **off**
Default value	**off**

on
The settings for the calculation can be entered as soon as the calculation has been activated.

Result name

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

Entry	**12 characters**

Decimal places

Number of decimal places used to display the result.

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

Result unit

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

Proceed as follows if you wish to delete a selected unit:

Delete the unit entered under **User-defined**. A blank entry will be generated in the selection list.

Selection	**%** | **/pc** | **L** | **g** | **g/L** | **mL** | **mg** | **mg/mL** | **mol** | **mol/L** | **ppm** | **User-defined**
Default value	**%**

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.

Factor

Factor for the calculation formula.

Entry	**10 digits**
Default value	**1.0**

Divisor

Divisor for the calculation formula.

Entry	**10 digits**
Default value	**1.0**

Blank

The blank value is subtracted from the dosing volume.

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

7.1.5 Reports

Menu ► Parameters ► Reports

The reports that will be printed out automatically in connection with a determination are defined under **Reports**.

Results

The result report contains the calculated result and additional specifications.

Selection	**off** | **on**
Default value	**off**

PC/LIMS

The PC/LIMS report is a machine-readable report with all of the data important for a determination. The PC/LIMS report can be saved as a TXT file on a USB storage medium or sent via an RS-232 interface to a LIMS. The output location is defined in the system settings *(see "PC/LIMS report", page 40)*.

The file name of the TXT file is constructed as follows: *PC_LIMS_Report-ID1-YYYYMMDD-hhmmss.txt*.

Selection	**on** | **off**
Default value	**off**

7.1.6 Pulse control

Menu ► Parameters ► Pulse control

Pulse control

Activates/deactivates the pulse control. For details about the pulse control, see *chapter Pulse control, page 76*.

Selection	**off** | **on**
Default value	**off**

on
If the pulse control is activated, dosing is controlled via the remote interface. The **[GO]** key starts the pulse control and is deactivated afterwards.

Autostart at power-on

If this setting is activated, the pulse control is activated upon switching on the device or loading the method. Thus, it is not required to start the corresponding method manually.

Selection	**off** | **on**
Default value	**off**

Reset volume

If this setting is activated, the volume display is reset to 0.0000 mL after filling the dosing cylinder. This setting does not apply to automatic intermediate filling.

Selection	**off** | **on**
Default value	**off**

7.2 Extended dosing (XDOS)

7.2.1 General description

Use

The **XDOS** dosing mode can be used for a variety of purposes.

Fixed volume dosing	The volume and the dosing rate are specified.
Time-controlled dosing	The volume and the time are specified.
Dosing according to dosing rate	The dosing rate and the time are specified.

If continuous dosing without interruption is required, then the 865 Dosimat plus can be operated together with an 805 Dosimat in tandem mode.

The parameters in their entirety can be saved as methods and then used if needed.

Solutions and buret units

For dosing, buret units with or without integrated data chip can be used. The solution data, such as the concentration and the titer of the solution, are managed by the 865 Dosimat plus and are documented at the time of the output of the report. This requires that the name of the solution be specified under **Menu ► Parameters**.

Performing a dosing

Pressing the **[GO]** key causes the dosing to run automatically. Three dosing criteria are applied for this process. The specified dosing criteria are observed in all cases. The dosing criterion that is not defined in a specific case (volume, time or dosing rate) is calculated by the instrument and shown on the display. The dosing is optimized according to the specifications. Continuous dosing is ensured in tandem operation, if the dosing and filling rates have been set accordingly.

The dosing can be canceled with the **[FILL]** key. If the **Auto fill** parameter is switched on, then the dosing cylinder will be filled.

The dosing criteria are shown on the display. They can be deleted by pressing the **[FILL]** key once again.

7.2.2 Selecting a solution

Menu ▶ Parameters

Solution

Selection of the solution from the solution list. We recommend always selecting the solution. Solutions are defined under **System ▶ Solutions**.

For exchange units with integrated data chip, a check is made in the method run to verify whether the correct solution has been attached. For exchange units without integrated data chip, only the cylinder volume is checked. The validity of the titer is checked for the selected solution at the start of the determination.

Selection	**Selection of configured solutions** | **not defined**
Default value	**not defined**

not defined
No check takes place.

7.2.3 Selecting the operating mode

Menu ▶ Parameters

Buret setup

If continuous dosing without interruption is required, then the tandem mode can be selected. An additional 805 Dosimat is required for this purpose.

Selection	**Single** | **Tandem**
Default value	**Single**

Single
Dosing with one instrument.

Tandem
Dosing with two Dosimats.

Tandem operation

An 805 Dosimat is connected to the MSB connector of the 865 Dosimat plus for tandem operation.

NOTE

Two exchange units with the same cylinder size must be used for tandem operation.

The principle of tandem dosing:

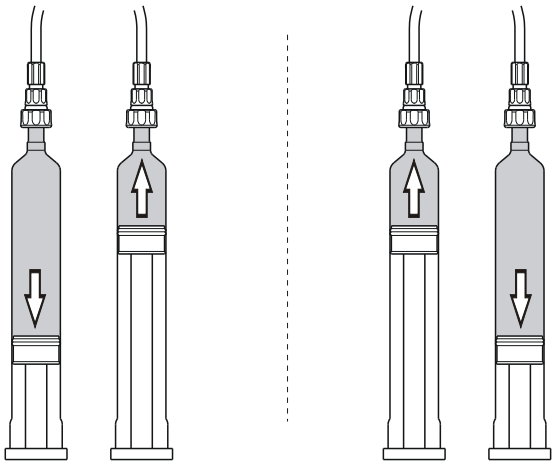


Figure 18 Tandem operation

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 and filling rates apply respectively for both Dosimats.

Because it takes the stopcock approximately 2 seconds to switch over, the filling rate must be greater than the dosing rate. Continuous dosing cannot be ensured otherwise.

NOTE

Maximum applicable dosing rate = 0.85 x filling rate

7.2.4 Dosing parameters

Menu ▶ Parameters ▶ Dosing parameters

Dosing criteria

Selection of the preset dosing criteria.

Selection	**Rate/Time** | **Volume/Rate** | **Volume/Time**
Default value	**Volume/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/Rate
The volume specified is dosed at the selected dosing rate.

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.

Volume

The volume to be dosed.

Enabled for dosing criteria **Volume/Rate** and **Volume/Time**.

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

Dosing time

Time during which dosing takes place.

Enabled for dosing criteria **Rate/Time** and **Volume/Time**.

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

Dosing rate

The rate at which dosing takes place. The maximum dosing rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Enabled for dosing criteria **Volume/Rate** and **Rate/Time**.

Input range	**0.01 to 150.00 mL/min**
Selection	**max.**
Default value	**max.**

Filling rate

Rate at which the dosing cylinder is to be refilled. The maximum filling rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Input range	**0.01 to 150.00 mL/min**
Selection	**max.**
Default value	**max.**

Volume limit

Safety limit for limiting the maximum volume to be dosed.

Dosing criteria **Volume/Rate** and **Volume/Time**:

The **Volume** must be smaller than the **Volume limit**. Otherwise the dosing cannot be started.

Dosing criterion **Rate/Time**:

The dosing is canceled as soon as the **Volume limit** is reached.

Input range	**0.01 to 99,999.9 mL**
Selection	**off**
Default value	**off**

off
No safety limit.

Auto fill

Automatic filling of the cylinder after the dosing.

Selection	**off** | **on**
Default value	**on**

7.2.5 Reports

Menu ► Parameters ► Reports

The reports that will be printed out automatically in connection with a determination are defined under **Reports**.

Results

The result report contains the calculated result and additional specifications.

Selection	**off** | **on**
Default value	**off**

PC/LIMS

The PC/LIMS report is a machine-readable report with all of the data important for a determination. The PC/LIMS report can be saved as a TXT file on a USB storage medium or sent via an RS-232 interface to a LIMS. The output location is defined in the system settings *(see "PC/LIMS report", page 40)*.

The file name of the TXT file is constructed as follows: *PC_LIMS_Report-ID1-YYYYMMDD-hhmmss.txt*.

Selection	**on** | **off**
Default value	**off**

7.3 Creating solutions (CNT D)

7.3.1 General description

Use

The dosing mode **CNT D** (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 865 Dosimat plus 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 can be saved in their entirety as methods and then used as needed.

Solutions and buret units

For dosing, buret units with or without integrated data chip can be used. The solution data (e.g. the concentration and the titer) is managed by the 865 Dosimat plus and documented during the report output. This requires the solution name to be specified under **Menu ► Parameters**.

Entering sample data

The sample data Sample size and Unit can be entered before a determination in **Menu ► Sample data**. After starting the dosing, the sample data is queried once more.

NOTE

The sample size can be entered in µg, mg, g or kg. The sample size is converted to g before actually calculating the volume to be dosed. If necessary, the density of the solvent is also included.

If a balance is connected, a sample size and unit can be taken directly from the balance before or during the determination. Usually, this is done by pressing the **[Print]** key on the balance. Note that this requires that the configuration of the balance's data transmission matches the settings in the 865 Dosimat plus, see *(see page 41)*. Details on configuring and sending the sample size can be found in the operating instructions of your balance.

Calculation formula

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 1 Variables and constant values in the CNT D 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**)

Performing a dosing

Pressing the **[GO]** key causes the dosing to run automatically. The sample data is requested first. The calculated target volume is displayed. Pressing the **[GO]** key again starts the dosing process.

The dosing can be canceled with the **[FILL]** key. The dosing cylinder is filled automatically.

7.3.2 Selecting a solution

Menu ► Parameters

Solution

Selection of the solution from the solution list. We recommend always selecting the solution. Solutions are defined under **System ► Solutions**.

For exchange units with integrated data chip, a check is made in the method run to verify whether the correct solution has been attached. For exchange units without integrated data chip, only the cylinder volume is checked. The validity of the titer is checked for the selected solution at the start of the determination.

Selection	**Selection of configured solutions** | **not defined**
Default value	**not defined**

not defined
No check takes place.

7.3.3 Definition of the target solution

Menu ► Parameters ► Content definitions

Content

Target concentration of the solution.

Entry	**10 characters**
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	**%** | **g/L** | **mg/L** | **mmol/L** | **mmol/kg** | **mol/L** | **mol/kg** | **ppm**
Default value	**mol/L**

Molar mass

Molar mass of the starting substance.

If selected unit is: mmol/L, mmol/kg, mol/L or mol/kg.

Entry	**10 digits**
Input range	**0.000000001 to 9,999,999,999 g/mol**
Default value	**1.0 g/mol**

Density

Density of the solvent to be dosed.

If selecting unit is: %, mmol/kg, mol/kg or ppm.

Entry	**10 digits**
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.

Entry	**10 digits**

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

7.3.4 Dosing parameters

Menu ▶ Parameters ▶ Dosing parameters

Dosing rate

The rate at which dosing takes place. The maximum dosing rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Input range	**0.01 to 150.00 mL/min**
Selection	**max.**
Default value	**max.**

Filling rate

Rate at which the dosing cylinder is to be refilled. The maximum filling rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Input range	**0.01 to 150.00 mL/min**
Selection	**max.**
Default value	**max.**

Volume limit

Safety limit for limiting the maximum volume to be dosed.

Input range	**0.01 to 99,999.9 mL**
Selection	**off**
Default value	**off**

off
No safety limit.

7.3.5 Reports

Menu ▶ Parameters ▶ Reports

The reports that will be printed out automatically in connection with a determination are defined under **Reports**.

Results

The result report contains the calculated result and additional specifications.

Selection	**Label 1** | **off** | **on**
Default value	**off**

Label 1
A result report is printed out in a simple label format.

Example of a label:

```
_____________________________________________
Solution                          Method0012
_____________________________________________

Content                            1.000 mol/L
Prepared at:                 08-02-05 14:15:01
Prepared by:                             User1

Expires:              ____________________
```

PC/LIMS

The PC/LIMS report is a machine-readable report with all of the data important for a determination. The PC/LIMS report can be saved as a TXT file on a USB storage medium or sent via an RS-232 interface to a LIMS. The output location is defined in the system settings *(see "PC/LIMS report", page 40)*.

The file name of the TXT file is constructed as follows: *PC_LIMS_Report-ID1-YYYYMMDD-hhmmss.txt*.

Selection	**on** | **off**
Default value	**off**

7.4 Pipetting and diluting (LQT)

7.4.1 General description

Usage

The dosing mode **LQT** (liquid transfer) is suitable for the pipetting and diluting of liquids. The set parameters can be saved as a method and then later used where required.

Pipetting

Pipetting is the transferring of a particular volume of a sample from one vessel to another. The sample is aspirated into a tubing for this purpose, without the sample actually entering the dosing cylinder. A "hydraulic liquid" is required in the exchange unit for the aspiration and expelling of the sample. In normal cases, this is degassed, pure water.

An air bubble (air gap or separating bubble) at least 0.5 cm in length must be located between the sample and the hydraulic liquid in order to prevent any mixing of the two liquids.

Because of the fact that the tip of the pipetting tubing is moved during the entire procedure, an additional air bubble may be aspirated into the tip after the sample has been aspirated. This prevents the sample from being able to drip out of the tubing.

Exchange units with 1 mL to 5 mL dosing cylinders and a 10 mL pipetting tubing (6.1562.100) or a 2 mL pipetting tubing (6.1562.110) are suitable for the pipetting.

Diluting

The diluting of a sample involves the pipetting of a sample (see above) with subsequent rinsing of the tubing, which simultaneously causes the sample to be diluted. The solvent that is to be used for dilution is therefore used in the exchange unit as the "hydraulic liquid".

The air gap between sample and hydraulic liquid, and the air bubble at the tip (safety air gap) are also recommended during dilutions.

Exchange units with 10 mL to 20 mL dosing cylinders and a 10 mL pipetting tubing (6.1562.140) are suitable for performing the dilution.

Performing a pipetting or dilution

We recommend using the Manual Dosing Controller.

The pipetting proceeds semi-automatically in several stages after the **[GO]** key is pressed. Each subsequent step in the run is started by pressing the **[GO]** key on the Manual Dosing Controller.

The run can be canceled with the **[FILL]** key. The dosing cylinder is filled automatically.

Up to five steps are carried out. A text is displayed on the instrument as a demand note with each step. The readiness for carrying out the next step is indicated by the green light of the LED on the Manual Dosing Controller. Advance to the next step with the green **[GO]** key. If no **Safety air gap** or **Diluting volume** has been selected (0 mL), then the corresponding steps will not be carried out.

Display	
Step 1 (of 5)	▪ Hold the pipetting tip in a waste vessel and press **[Go]**.
Hold tip into waste vessel.	*The pipetting volume will be expelled in order to make room in the pipetting tubing.*
Step 2 (of 5)	▪ Raise the pipetting tip and press **[Go]**.
Lift tip above surface for aspiration of air gap.	*The air gap will be aspirated.*
Step 3 (of 5)	▪ Immerse the pipetting tip in the sample and press **[Go]**.
Immerse tip into sample.	*The sample will be aspirated.*

Step 4 (of 5) **Lift tip above surface for safety air gap.**	▪ Raise the pipetting tip and press **[Go]**. *The air gap will be aspirated.*
Step 5 (of 5) **Hold tip into target vessel. Sample will be ejected.**	▪ Hold the pipetting tip in an empty vessel and press **[Go]**. *The sample will be expelled.* *The dilution volume will be expelled.*

Solutions and buret units

Buret units with or without an integrated data chip can be used for dosing.

7.4.2 Selecting a solution

Menu ► Parameters

Solution

Selection of the solution from the solution list. We recommend always selecting the solution. Solutions are defined under **System ► Solutions**.

For exchange units with integrated data chip, a check is made in the method run to verify whether the correct solution has been attached. For exchange units without integrated data chip, only the cylinder volume is checked. The validity of the titer is checked for the selected solution at the start of the determination.

Selection	**Selection of configured solutions** | **not defined**
Default value	**not defined**

not defined
No check takes place.

7.4.3 Definitions of the sample transfer

Menu ► Parameters ► Transfer definitions

Transfer volume

Sample volume to be transferred.

The sample volume selected must not be too large in size. The sum of the transfer volume and the air bubbles must be less than 98 % of the cylinder volume used. If this value is exceeded, then no precise sample transfer is possible.

Input range	**0.0100 to 49.5000 mL**
Default value	**1.0000 mL**

Air gap

Volume of the air gap between sample and carrier liquid.

The air gap in the pipetting tubing should have a length of at least 5 mm. It should however also not be too large in size.

Input range	**0.0100 to 49.5000 mL**
Default value	**0.0500 mL**

Safety air gap

Volume of an air bubble at the dosing tip after the aspiration of the sample. Do not define an air bubble too large in size.

Input range	**0.0000 to 49.5000 mL**
Default value	**0.0000 mL**

Diluting volume

Volume of liquid for after rinsing or diluting the sample.

Input range	**0.0000 to 9999.99 mL**
Default value	**0.0000 mL**

7.4.4 Dosing parameters

Menu ▶ Parameters ▶ Dosing parameters

Dosing rate

The rate at which dosing takes place. The maximum dosing rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Input range	**0.01 to 150.00 mL/min**
Selection	**max.**
Default value	**max.**

Filling rate

Rate at which the dosing cylinder is to be refilled. The maximum filling rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Input range	**0.01 to 150.00 mL/min**
Selection	**max.**
Default value	**max.**

Aspiration rate

The rate at which the sample is aspirated. The maximum rate depends on the cylinder volume *(see chapter 9.1.1, page 67)*.

Input range	**0.01 to 150.00 mL/min**

Selection	**1.0**
Default value	**1.0**

7.4.5 Reports

Menu ► Parameters ► Reports

The reports that will be printed out automatically in connection with a determination are defined under **Reports**.

Results

The result report contains the calculated result and additional specifications.

Selection	**off** | **on**
Default value	**off**

PC/LIMS

The PC/LIMS report is a machine-readable report with all of the data important for a determination. The PC/LIMS report can be saved as a TXT file on a USB storage medium or sent via an RS-232 interface to a LIMS. The output location is defined in the system settings *(see "PC/LIMS report", page 40)*.

The file name of the TXT file is constructed as follows: *PC_LIMS_Report-ID1-YYYYMMDD-hhmmss.txt*.

Selection	**on** | **off**
Default value	**off**

8 Operation and maintenance

The 865 Dosimat plus requires appropriate care. Excess contamination of the instrument may result in functional disruptions and a reduction in the service life of the sturdy mechanics and electronics of the instrument.

Severe contamination can also have an influence on the measured results. Regular cleaning of exposed parts can prevent this to a large extent.

Spilled chemicals and solvents must be removed immediately. In particular, the plug connections (particularly the power plug) must be protected against contamination.

Check all tubing connections regularly for leaks.

9 Appendix

9.1 Exchange unit

9.1.1 Maximum dosing and filling rate

The maximum dosing rate and maximum filling rate for the exchange unit depend on the cylinder volume:

Cylinder volume	Maximum rate
1 mL	3.00 mL/min
5 mL	15.00 mL/min
10 mL	30.00 mL/min
20 mL	60.00 mL/min
50 mL	150.00 mL/min

Independent of the cylinder volume, values ranging from 0.01 to 150.00 mL/min can always be entered. When the function is carried out the rate will be, if necessary, decreased automatically to the highest possible value.

9.1.2 Parameters for the preparing (PREP)

The **PREP** function (Preparing) is used to rinse the cylinder and tubings of the exchange unit and fill them air bubble-free. You should carry out this function before the first determination or once per day.

Preparing is carried out with the following, non-alterable settings:

- The entire cylinder volume is dosed twice with the maximum dosing rate.

9.2 Stirring rate

The stirring rate can be adjusted in steps from –15 to +15.

The approximate rotational speed for the internal magnetic stirrer (depends on the product version) can be calculated with the following formula:

Rotational speed/min (r/min) = 125 · Stirring rate

Example:

Configured stirring rate: 8

Rotational speed in revolutions per minutes = 125 · 8 = 1,000

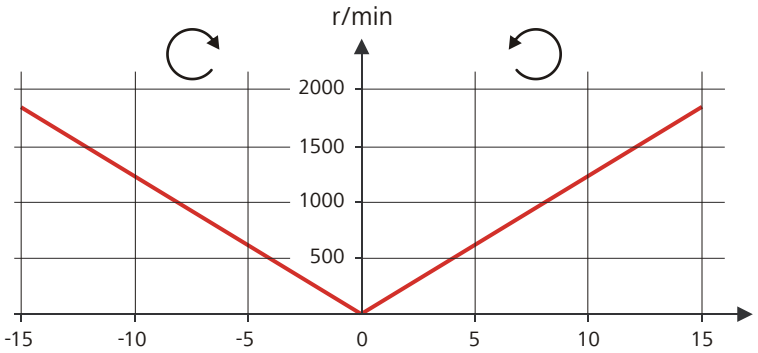


Figure 19 Rotational speed depending on the stirring rate

The information on the separately connectable 802 propeller stirrer can be found in the "802 Stirrer" manual.

9.3 Balance

The sample size and the associated unit can be sent from a connected balance. The sample size is transmitted as a number with up to ten characters (including algebraic sign and decimal point).

Sample size and unit are sent as a single character string. They are separated by a space character. The string is terminated with the ASCII characters **CR** and **LF**.

If the balance sends a negative sample size (e.g. when you are reweighing a sample), then the algebraic sign is adopted. The algebraic sign is, however, ignored for the calculations.

NOTE

With some balances, the sample identification and the method can be sent in addition to the sample size.

Make sure that the balance does not send the sample size until the end.

Mettler AX

For the Mettler AX balance, the fields that contain the sample identification or the method must be designated as follows:

- Designation for the field with the method name: **METHOD**
- Designation for the field with sample identification 1: **ID1**
- Designation for the field with sample identification 2: **ID2**

9.4 USB devices

NOTE

USB peripheral devices that are to be connected must support either the *USB 1.0/1.1 (Full Speed)* or the *USB 2.0 (High Speed)* standard. The maximum data transfer rate is however in any case 12 MBit/s.

Keyboards, PC mice and barcode readers are so-called HID devices (**H**uman **I**nterface **D**evice) and can be connected via a USB hub only.

Printers should also be connected via a USB hub. Depending on the manufacturer or printer type a direct connection is however possible.

9.4.1 6.2147.000 numerical USB keypad

The **[Num Lock]** key must be pressed for navigating in the dialog. The arrow keys are effective in conjunction with it.

The respective editing dialog must be opened for the numerical input.

Table 2 Key assignment

Key of the 865 Dosimat plus or function in the editing dialog	Key on the numerical USB keypad
[BACK]	**[Home]**
[⇧] [⇩]	**[↑] [↓]**
[⇦] [⇨]	**[←] [→]**

Key of the 865 Dosimat plus or function in the editing dialog	Key on the numerical USB keypad
[OK]	**[Enter]**
[←]	**[BS]** (backspace)
Clear	**[Del]**
Accept	**[Home]**

9.4.2 Key assignment of a USB keyboard

A commercially available USB keyboard can be connected to make it easier to enter text and numbers.

The respective editing dialog must be opened for the text input and numerical input.

Table 3 Key assignment

Key of the 865 Dosimat plus or function in the editing dialog	Key on the USB keyboard
[BACK]	**[Esc]**
[⇧] [⇩]	**[↑] [↓]**
[⇦] [⇨]	**[←] [→]**
[OK]	**[↲]** (enter key) *or* **[Enter]** on the numerical keypad
[STOP]	**[Ctrl]** + **[S]**
[START]	**[Ctrl]** + **[G]**
[←]	**[←]** (backspace)
Clear	**[Delete]**
Cancel	**[Ctrl]** + **[Q]**
Accept	**[Esc]**

NOTE

The lettering of the USB keyboard may differ from above lettering, depending on the country-specific keyboard used.

9.4.3 Printer

The range of USB printers available is extremely varied and constantly changing. The following points must be taken into account when selecting a printer:

- USB interface necessary
- Printer language: HP-PCL, Canon BJL Commands, Epson ESC P/2 or ESC/POS

NOTE

Inexpensive printers are often designed solely for use with a PC and may not be equipped with one of the printer languages listed above. Such models are not suitable for this reason.

9.5 System initialization

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.

CAUTION

All user data (methods, solutions, etc.) are deleted if a system initialization is carried out. Afterwards, the instrument will have the factory settings again.

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

After a system initialization the program versions and language files do not have to be reloaded. Only the selection of the dialog language may have to be reset in the system settings.

Proceed as follows for the system initialization:

1 Switching off the instrument

- Keep the red **[FILL]** key pressed down for at least 3 s.

A progress bar is displayed. If the key is released during this time, then the instrument will not be switched off.

2 Switching on the instrument

- Keep the red **[FILL]** key pressed down for approx. 10 s.

The dialog for confirmation of the initialization is displayed for 8 s. The initialization must be confirmed during this time.

```
System reset request detected.
>> Press [BACK] key twice
   to confirm !
>> Time remaining: 8 sec
```

3 Confirming the initialization

NOTE

If the request is not confirmed within 8 s, then the procedure will be canceled.

- Press **[BACK]** twice.

Initialization is started. The process takes approximately 80 s. The instrument will be automatically restarted after successful initialization.

9.6 Remote interface

9.6.1 Pin assignment of the remote interface

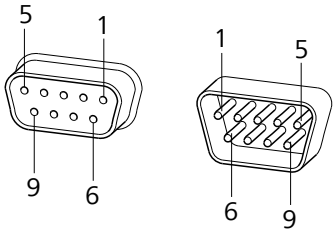


Figure 20 Pin assignment of remote socket and remote plug

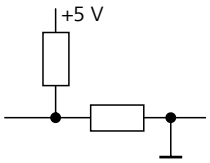
The above figure of the pin assignment applies to all Metrohm instruments with 9-pin D-Sub remote connector.

Table 4 Inputs and outputs of the remote interface

Pin no.	Assignment	Function
1	Output 0	Ready/EOD
2	Output 1	-
3	Output 2	-

Pin no.	Assignment	Function
4	Output 3	-
5	Output 4	Error
6	0 volt (GND)	
7	+5 volt	
8	Input 0	Start/Go
9	Input 1	Stop/Fill

Inputs

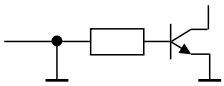


approx. 5 kΩ Pull-up

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

9.6.2 Status diagram of the remote interface

Dosing mode DOS

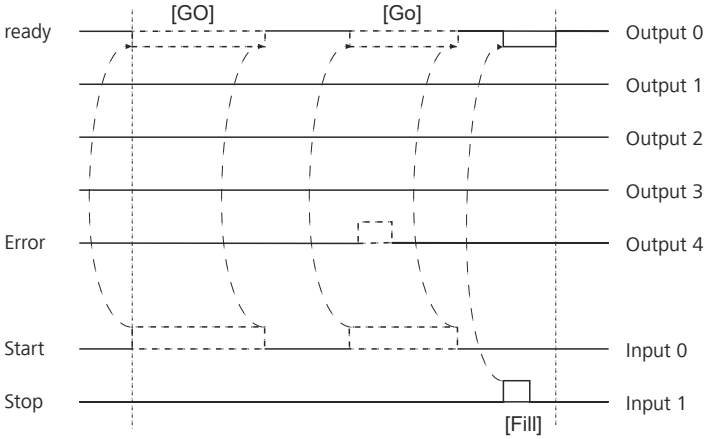


Figure 21 Remote status diagram DOS

Dosing mode DOS with pulse control

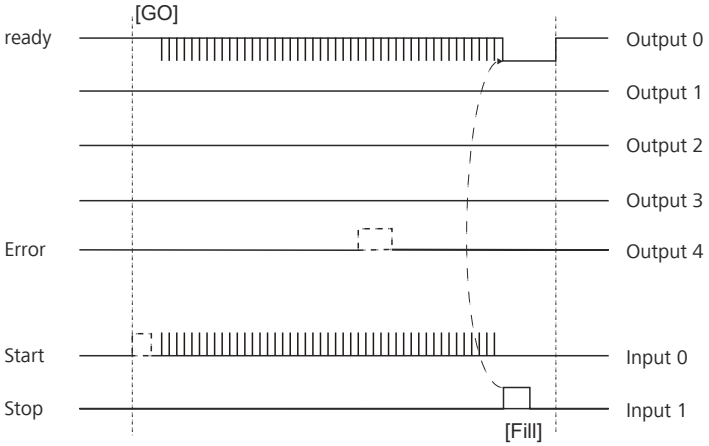


Figure 22 Remote status diagram DOS with pulse control

Dosing mode XDOS

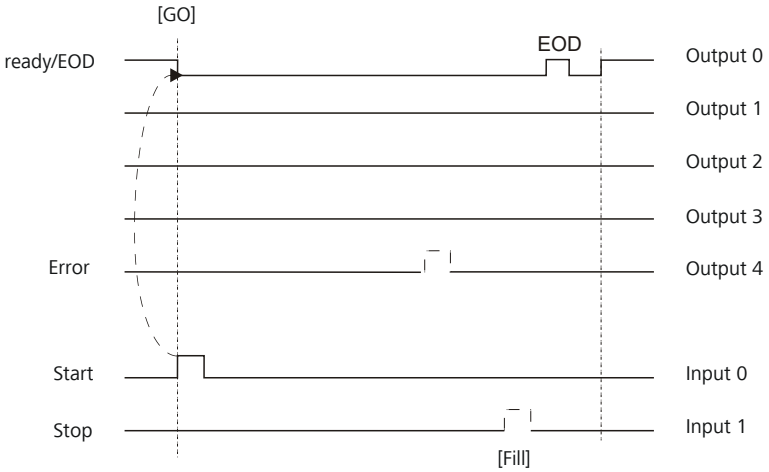


Figure 23 Remote status diagram XDOS

Dosing mode CNT_D

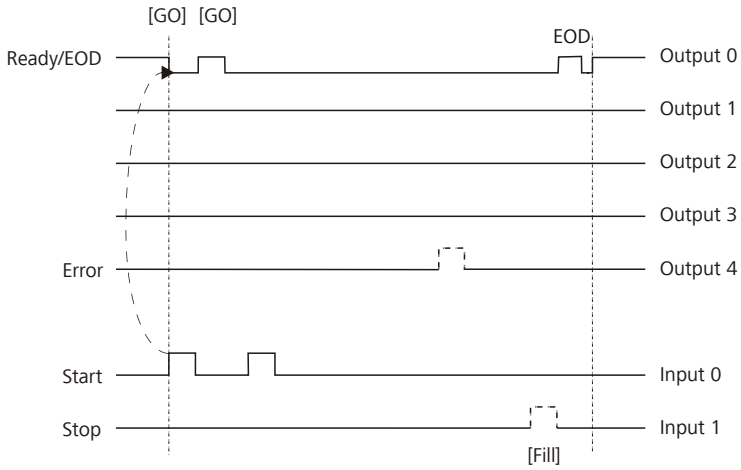


Figure 24 Remote status diagram CNT_D

Dosing mode LQT

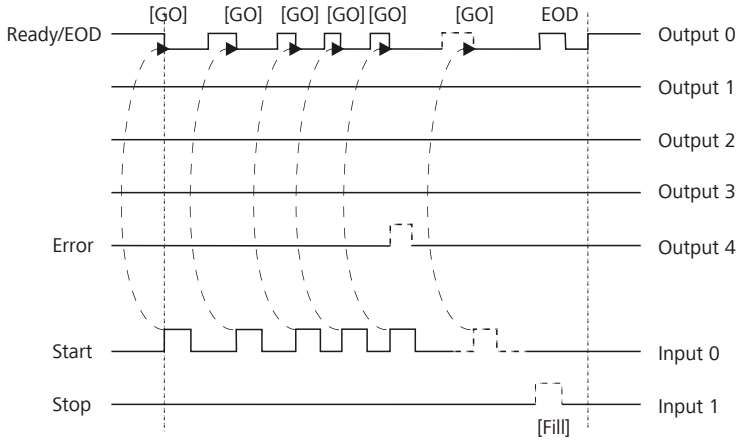


Figure 25 Remote status diagram LQT

EOD = End of Determination

9.7 Pulse control

The 865 Dosimat plus can be controlled by a control instrument via an electronic pulse control for simple dosing. Controlling is carried out via the 9-pin remote interface. The pulse control is integrated in the DOS method (manual dosing), whereby the pulse control replaces the manual dosing. However, all functions of the method (result calculation, report output, etc.) are available.

NOTE

If the 865 Dosimat plus is controlled via pulse control, then use the **Mode Dosing ramp** *(see page 47)* in the dosing parameters.

The pulse control is used, for example, in order to use the 865 Dosimat plus with the 781 pH/Ion Meter for the controlled dosing of standard solutions or sample solutions.

Remote control

A pulse (≥1 ms) on the remote line **Input 0** triggers a single dosing step of 1/10000 of the cylinder volume. The smallest volume of a dosing step always depends on the cylinder volume of the exchange unit used.

The filling of the dosing cylinder can be triggered on the remote line **Input 1**.

Functional assignment of the remote interface:

Pin no.	Assignment	Function
1	Output 0	Ready (low)
5	Output 4	Error (low)
6	GND	
8	Input 0	Dosing (low)
9	Input 1	Fill (low)

Further details about the remote interface see *Remote interface, page 72*.

Autostart pulse control

In order to guarantee an unattended remote control of the 865 Dosimat plus, the parameter "Autostart at power-on" can be activated. The instrument thus starts the loaded method immediately after switching on and is ready to receive and carry out dosing pulses. Pressing the **[GO]** key for starting the method is therefore not necessary.

Manual interventions

Manual dosing is not possible with activated pulse control. The **[GO]** key is deactivated. The **[FILL]** key triggers the filling of the cylinder and at the same time finishes the method.

During a method run, modifying certain parameters is possible as it is in manual dosing.

The instrument shows the **"Hold" status** during pulse control.

Deactivated parameters

Parameters which directly affect the dosing are inactive during pulse control operation. This includes:

- Dosing rate
- Dosing ramp (prerequisite: Dosing parameter **Mode** = **Dosing ramp**)

9.8 Remote control via an RS-232 connection

The 865 Dosimat plus can be remote controlled via an RS-232 connection. For this, a **6.2148.030 RS-232/USB Box** is necessary. Connect the RS-232/USB Box to the USB interface of the instrument.

The RS-232/USB Box has two connectors for RS-232 instruments. The RS-232 remote control only works via the **RS-232/2** connector. The RS-232/1 connector is provided for a connection to a balance. Connect the **RS-232/2** connector of the RS-232/USB Box to a serial interface (COM interface marked with the symbol **IOIOI**) of a PC. Use a **6.2134.040 connection cable**.

NOTE

There are 2 versions of the RS-232/USB Box 6.2148.030. Version 2.0 of the RS-232/USB Box is identified with a sticker accordingly.

Starting with program version **5.865.0030**, **Version 2.0** of the RS-232/USB Box must be used.

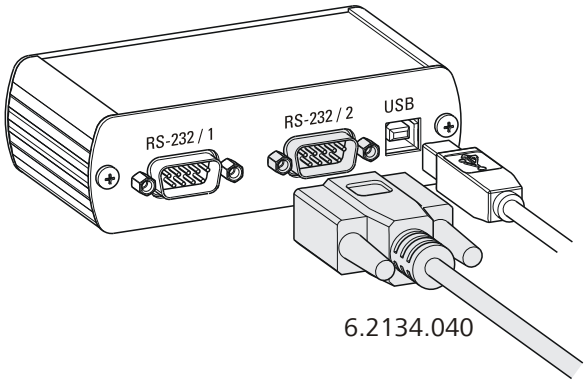


Figure 26 Connecting the RS-232/USB Box to the PC

Interface parameters

We recommend the following parameters for the RS-232 interface **COM2**:

- Baud rate: **19200**
- Data bits: **8**
- Stop bits: **1**
- Parity: **none**
- Handshake: **software**

On the 865 Dosimat plus, adjust the interface parameters under **Menu ► System ► External devices ► COM2 settings**.

Transfer protocol

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

A command must be sent to the instrument with the control characters **CR LF** as terminator. The acknowledgements of the instrument will also be transferred with **CR LF** as terminator.

The instrument does not send spontaneous messages.

9.8.1 Commands and variables

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

Command	Function	Comment
$D	Scan instrument status	Acknowledgements: *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 = **010-119 Check buret unit** The message can be confirmed 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.
$A(OK), **$A(CANCEL)**	Confirm message	Confirm the message with **[OK]** or **[Cancel]**
$A(YES), **$A(NO)**	Confirm message	Confirm the message with **[Yes]** or **[No]**
$L(*method name*)	Load method	The method name has to be known and unique.
$Q(*variable*)	Request variable value	List of variables, see below.

Variable	Comment
VOLUME	Dosed volume
TITER	Titer of selected solution
CONC	Concentration of selected solution
C00	Sample size (DOS only)
RESULT	Result (DOS only)
RATE	Dosing rate (XDOS only)
TIME	Dosing time (XDOS only)
CONTENT	Content (CNT only)

The values of the variables are only available after the end of a determination (in the status 'ready').

Acknowledgement of the instrument	Comment
OK	Command executed
E1	Method not found
E2	Invalid variable
E3	Invalid command

10 Technical specifications

10.1 Dosing drive

Resolution	10,000 steps per cylinder volume
Exchange unit	
Cylinder volume	▪ 1 mL ▪ 5 mL ▪ 10 mL ▪ 20 mL ▪ 50 mL
Accuracy	Fulfills ISO/DIN standard 8655-3

10.2 Interfaces

USB (OTG) connector	For connecting USB devices.
MSB connector	For connecting a stirrer or an 805 Dosimat.
Remote connector	For connecting instruments with a remote interface.

10.3 Power connection

Supply voltage	100–240 V (±10%)
Frequency	50–60 Hz (± 3%)
Power consumption	45 W
Fuse	2 × 2.0 ATH, electronic overload protection

10.4 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.a.s.l. sea level / min. 800 mbar
Overvoltage category	II
Pollution degree	2

10.5 Reference conditions

Ambient temperature	+25 °C (±3 °C)
Relative moisture	≤ 60%
Operating temperature status	Instrument in operation at least 30 min
Validity of the data	After adjustment

10.6 Dimensions

Material of the housing	Poly(butylene terephthalate) (PBT)
Material of display cover	Glass
Width	142 mm
Height	164 mm
Depth	310 mm
Weight	2850 g

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