916 Ti-Touch

Manual

8.916.8005EN

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Manual

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Although all the information given in this documentation has been checked with great care, errors cannot be entirely excluded. Should you notice any mistakes please send us your comments using the address given above.

Documentation in additional languages can be found on *http://documents.metrohm.com*.

Melody for the BEEP command: excerpt from "En Altfrentsche", with kind permission of the Laseyer Quartett, Appenzell.

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1 Introduction

1.1 Instrument description

The 916 Ti-Touch is a compact titration system for volumetric titration. This newly designed titrator combines in a single device the touch-sensitive color monitor for convenient and efficient operation, the titration unit and an integrated stirrer interface for a propeller stirrer. The upper side of the housing offers space for the titrant and the titration vessel. The titrator is standard-equipped for operation with an external dosing drive of the *800 Dosino* type with a dosing unit. You can however also use a *805 Dosimat* with an exchange unit. Thanks to its compact construction, you can use the 916 Ti-Touch in a small space as a stand-alone titrator.

You manage titrants, sensors, methods, etc. conveniently in the internal memory of the 916 Ti-Touch. You can also save your files externally through the USB connector, e.g. on a USB flash drive. On this storage medium you can not only store your methods and determinations, but also create a backup together with all of the data and settings of your system.

The integrated Ethernet connection is available to you should you wish to connect your 916 Ti-Touch to a network. The network connection offers you the following advantages:

- Saving data to a PC within the network
- Printing reports on a network printer
- Sending displayed messages as e-mails

1.1.1 Titration and measuring modes

The 916 Ti-Touch supports the following titration and measuring modes.

- **DET**
  Dynamic equivalence point titration. The reagent is added in variable volume steps.
  Measuring modes:
  - **pH** (pH measurement)
  - **U** (potentiometric voltage measurement)
  - **Ipol** (voltametric measurement with selectable polarization current)
  - **Upol** (amperometric measurement with selectable polarization voltage)

- **MET**
  Monotonic equivalence point titration. The reagent is added in constant volume steps.
  Measuring modes:
  - **pH** (pH measurement)
  - **U** (potentiometric voltage measurement)
  - **Ipol** (voltametric measurement with selectable polarization current)
  - **Upol** (amperometric measurement with selectable polarization voltage)
- **SET**
  Endpoint titration at one or two specified endpoints.
  Measuring modes:
  - **pH** (pH measurement)
  - **U** (potentiometric voltage measurement)
  - **Ipol** (voltametric measurement with selectable polarization current)
  - **Upol** (amperometric measurement with selectable polarization voltage)
- **MEAS**
  Measuring modes:
  - **pH** (pH measurement)
  - **U** (potentiometric voltage measurement)
  - **Ipol** (voltametric measurement with selectable polarization current)
  - **Upol** (amperometric measurement with selectable polarization voltage)
  - **T** (temperature measurement)
- **CAL**
  pH electrode calibration.
  Measuring mode:
  - **pH** (calibration of pH electrodes)
  - **ELT** (Electrode test for pH electrodes)

1.1.2 Connectors

The 916 Ti-Touch is equipped with the following connectors:

- **Mains connection**
  For connecting to the mains supply with the aid of the power supply unit provided.
- **Two MSB connectors (Metrohm Serial Bus)**
  For connecting dosing devices, stirrers or a Remote Box.
- **USB connector**
  For connecting peripheral devices (printer, PC keyboard, etc.), a USB Sample Processor, a USB flash drive or a USB hub.

- **Sensor connectors**
  One connection each for:
  - potentiometric electrodes (pH, ISE, metal)
  - reference electrodes
  - polarizable electrodes
  - intelligent electrodes (iTrodes)
  - temperature sensors (Pt1000 or NTC)
- **Stirrer connector**
  For connecting a propeller stirrer.
- **Ethernet connector**
  For connecting the Ti-Touch to a network.

1.1.3 Intended use

The 916 Ti-Touch is designed for usage as a titrator in analytical laboratories. Its main application field is volumetric titration.

This instrument is suitable for processing chemicals and flammable samples. The usage of the 916 Ti-Touch therefore requires that the user has basic knowledge and experience in the handling of toxic and caustic substances. Knowledge with respect to the application of the fire prevention measures prescribed for laboratories is also mandatory.

1.2 About the documentation

CAUTION

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

1.2.1 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** Carry out these steps in the sequence shown.
Method	**Dialog text**, **parameter** in the software
File ▸ New	Menu or menu item

[Next]	**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.
	**CAUTION** This symbol draws attention to possible damage to instruments or instrument parts.
	**NOTE** This symbol highlights additional information and tips.

2 Safety instructions

2.1 General notes on safety

WARNING

This instrument may only be operated in accordance with the specifications in this documentation.

This instrument has left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

2.2 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.

Mains voltage

WARNING

An incorrect mains voltage can damage the instrument.

Only operate this instrument with a mains 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 mains cable out of the mains connection socket before you set up or disconnect electrical plug connections at the rear of the instrument.

2.3 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.

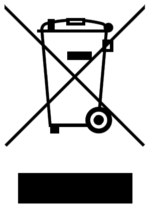
2.4 Flammable solvents and chemicals

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.

2.5 Recycling and disposal



This product is covered by European Directive 2002/96/EC, WEEE – Waste from Electrical and Electronic Equipment.

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

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

3 Overview of the instrument

3.1 Front of the instrument

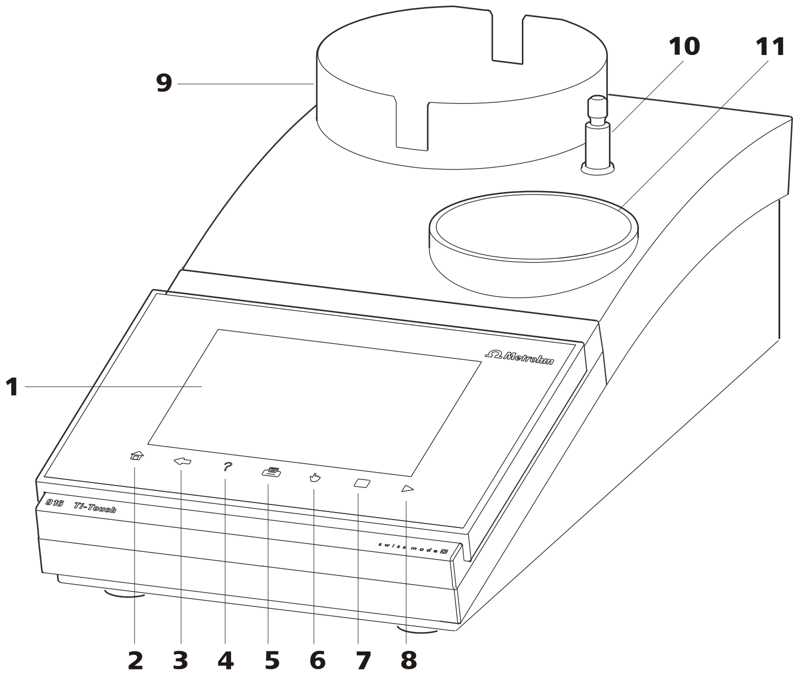


Figure 1 Front 916 Ti-Touch

1	**Display** Touch-sensitive screen.	**2**	**Fixed key [Home]** Opens the main dialog.
3	**Fixed key [Back]** Saves the entry and opens the next-higher dialog page.	**4**	**Fixed key [Help]** Opens the online help for the dialog displayed.
5	**Fixed key [Print]** Opens the print dialog.	**6**	**Fixed key [Manual]** Opens the manual control.
7	**Fixed key [STOP]** Cancels the running determination.	**8**	**Fixed key [START]** Starts a determination.
9	**Bottle holder** With holding clamps, for reagent bottle.	**10**	**Support rod (lower part)** For mounting the support rod (upper part).
11	**Titration stand** For placement of the titration vessel.		

3.2 Rear of the instrument

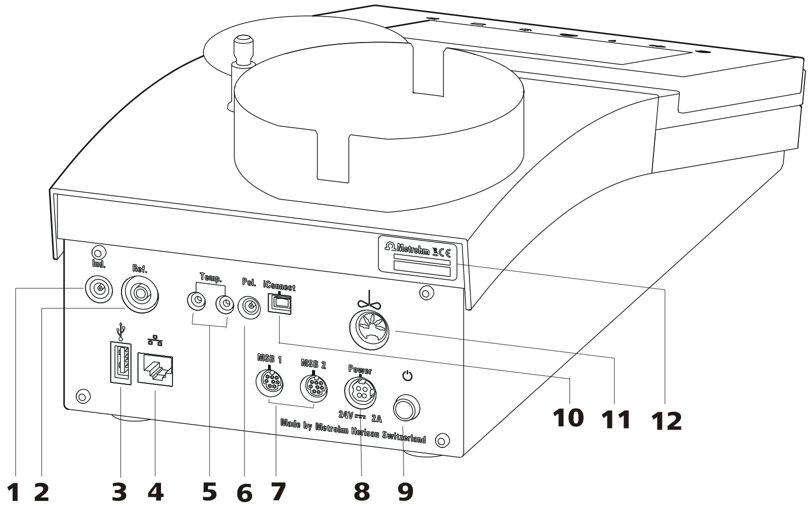


Figure 2 Rear 916 Ti-Touch

1	**Electrode connector (Ind.)** For connecting pH, metal or ion-selective electrodes with integrated or separated reference electrode. Socket F.	**2**	**Electrode connector (Ref.)** For connecting reference electrodes, e.g. Ag/AgCl reference electrode. Socket B, 4 mm.
3	**USB connector (type A)** For connecting a printer, USB flash drive, USB hub, USB Sample Processor etc.	**4**	**Ethernet connector (RJ-45)** For connecting to a network.
5	**Temperature sensor connector (Temp.)** For connecting temperature sensors (Pt1000 or NTC). Two B sockets, 2 mm.	**6**	**Electrode connector (Pol.)** For connecting polarizable electrodes, e.g. Pt wire electrodes. Socket F.
7	**MSB connector (MSB 1 and MSB 2)** Metrohm Serial Bus. For connecting external dosing devices, stirrers or a Remote Box. Mini DIN, 8-pin.	**8**	**Mains connection socket (Power)** For connecting the external power supply unit.
9	**Mains switch** Switch the instrument on/off.	**10**	**iConnect connector (iConnect)** For connecting electrodes with integrated data chip (iTrodes).
11	**Stirrer connector** For connecting the propeller stirrer (802 Stirrer).	**12**	**Type plate** Contains the serial number.

4 Installation

4.1 Setting up the instrument

4.1.1 Packaging

The instrument is supplied in highly protective special 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, free of vibrations, protected from corrosive atmosphere, and contamination by chemicals.

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

4.2 Connecting the power supply unit

The 916 Ti-Touch has an external power supply unit for a 24 V power supply (DC). This is connected to the mains connection of the Ti-Touch.

WARNING

An incorrect mains voltage can damage the device.

Operate the device only with the mains voltage specified for it. Use the supplied power supply unit exclusively.

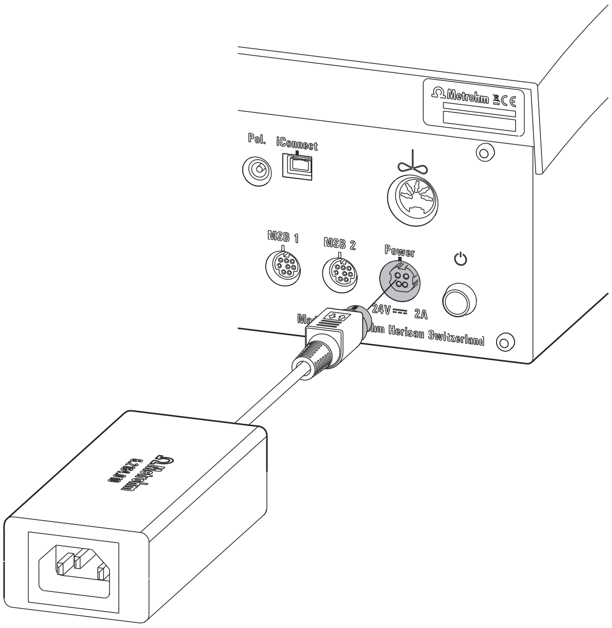


Figure 3 Connecting the power supply unit

Proceed as follows:

1 Connect the plug of the external power supply unit with the mains connection of the Ti-Touch *(see Figure 3, page 11)*.

NOTE

The plug of the power supply unit is protected against accidental disconnection of the cable by means of a pull-out protection feature. If you wish to pull out the plug, you will first need to pull back the outer plug sleeve marked with arrows.

2 Connect the mains cable with the external power supply unit of the Ti-Touch and with the mains supply.

CAUTION

Switch off the Ti-Touch correctly by pressing the mains switch before you disconnect the electricity supply. If this is not done, then there is a danger of data loss.

4.3 Connecting the propeller stirrer

The 916 Ti-Touch has a built-in stirrer connector. You can connect the 802 Stirrer propeller stirrer to it.

Proceed as follows:

1 Plug in the connection cable of the 802 Stirrer propeller stirrer to the stirrer connector of the Ti-Touch *(2-**11**)*.

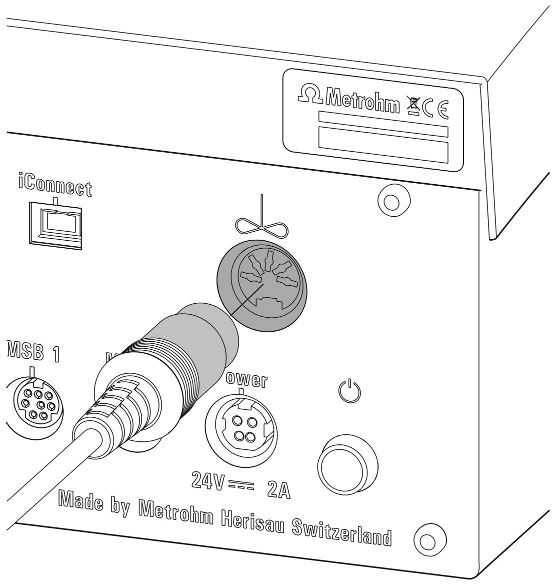


Figure 4 Connecting the propeller stirrer

2 Attach the electrode holder (6.2021.020) to the mounted support rod (6.2016.050).

3 Insert the propeller stirrer 802 Stirrer without the stirring propeller from above into the center opening of the electrode holder.

4 Plug the stirring propeller (6.1909.010) from below to the propeller stirrer.

4.4 Connecting MSB devices

In order to connect MSB devices, e.g. dosing device or Remote-Box, the Ti-Touch has two connectors at what is referred to as the *Metrohm Serial Bus* (MSB). Various peripheral devices can be connected in sequence (Daisy Chain) at a single MSB connector (8-pin Mini DIN socket) and be controlled simultaneously by the Ti-Touch. In addition to the connection cable, stirrers and the Remote Box are each equipped with their own MSB socket for this purpose.

The following figure provides an overview of the devices that can be connected to an MSB socket, along with a number of different cabling variations.

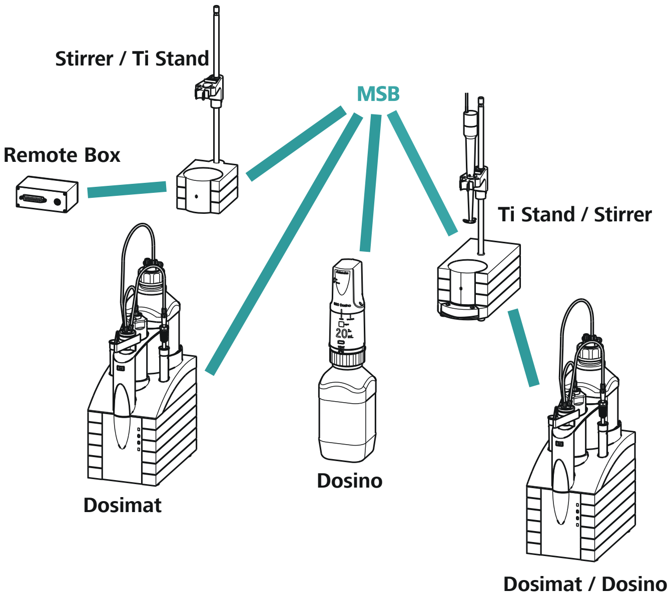


Figure 5 MSB connections

NOTE

When connecting MSB devices together, the following must be observed:

- Only one device of the same type can be used at a single MSB connector at one time.
- When making the connection, take care to ensure that the flat part of the MSB plug marked with arrows is pointing in the direction of the marking on the MSB connector *(see Figure 6, page 14)*.

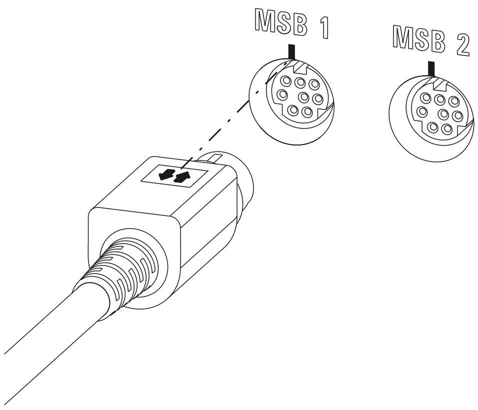


Figure 6 MSB connector

CAUTION

Switch off the Ti-Touch before you plug in MSB devices. When it is switched on, the Ti-Touch automatically recognizes which device is connected to which MSB connector. The connected MSB devices are entered automatically in the device manager.

MSB connections can be extended with the 6.2151.010 cable. The maximum connection length permitted is 6 m.

4.4.1 Connecting dosing devices

You can connect two dosing devices to the Ti-Touch.

The types of dosing devices that are supported are:

- 800 Dosino
- 805 Dosimat

Proceed as follows:

1 Switch off the Ti-Touch.

2 Connect the dosing device connection cable to an MSB connector *(2-**7**)* on the rear side of the Ti-Touch.

3 Switch on the Ti-Touch.

4.4.2 Connecting an additional stirrer or titration stand

In addition to the built-in stirrer connector for the propeller stirrer 802 Stirrer, you can use the magnetic stirrers 801 Stirrer, 803 Ti Stand or the 804 Ti Stand with the propeller stirrer 802 Stirrer.

Proceed as follows:

1 Switch off the Ti-Touch.

2 Connect the connection cable of the magnetic stirrer or of the titration stand to MSB 2 *(2-**7**)* on the rear of the Ti-Touch.

3 Connect the propeller stirrer, if desired, to the stirrer connector of the titration stand.

4 Switch on the Ti-Touch.

4.4.3 Connecting a Remote Box

Instruments that are controlled via remote lines and/or which send control signals via remote lines can be connected using the 6.2148.010 Remote Box. In addition to Metrohm, other instrument manufacturers also use similar connectors that make it possible to connect different instruments together. These interfaces are also frequently given the designations "TTL Logic", "I/O Control" or "Relay Control" and generally have a signal level of 5 volts.

Control signals are understood to be electrical line statuses or brief (> 200 ms) electrical pulses which display the operational state of an instrument or which trigger or report an event. Sequences on a variety of instruments can thus be coordinated in a single complex automation system. No exchange of data is possible, however.

Proceed as follows:

1 Switch off the Ti-Touch.

2 Connect the Remote Box connection cable to an MSB connector *(2-**7**)* on the rear side of the Ti-Touch.

3 Switch on the Ti-Touch.

You can connect an 869 Compact Sample Changer. The Remote Box also has an MSB socket at which a further MSB device, e.g. a dosing device, can be connected.

You will find precise information concerning the pin assignment of the interface on the Remote Box in Appendix *(see Chapter 31.5, page 408)*.

4.5 Connecting USB devices

4.5.1 General

The 916 Ti-Touch has a USB connector (Type A socket) for peripheral devices with USB interface and for USB Sample Processors. If you wish to connect more than one device to the USB, you can also use an additional commercially available USB hub.

NOTE

We recommend that the Ti-Touch be switched off while you set up or disconnect connections between the devices.

4.5.2 Connecting a USB hub

Use a USB hub with its own power supply.

Connect the USB hub as follows:

1 With the help of the 6.2151.030 cable (length 0.6 m) or the 6.2151.020 cable (length 1.8 m), connect the USB connector of the Ti-Touch (Type A) with the USB connector of the hub (Type B, see manual for the USB hub).

The USB hub is recognized automatically.

4.5.3 Connecting a printer

Printers that are connected to the 916 Ti-Touch must meet the following requirements:

- Printer languages: HP-PCL, HP-PCL-GUI, Canon BJL Commands or Epson ESC P/2
- Paper format: A4 or Letter, single-sheet feed.

Connect the printer as follows:

1 With the aid of the 6.2151.020 cable, connect the USB connector of the Ti-Touch (type A) with the USB connector of the printer (type B, see manual for the printer).

2 Configure the printer in the device manager of the Ti-Touch *(see Chapter 11.7, page 114)*.

4.5.4 Connecting a balance

If you wish to connect a balance to the Ti-Touch, you will require a USB/RS-232 adapter (6.2148.050).

The following table offers an overview of the balances that you can use together with the Ti-Touch and of which cable you will need for connection to the RS-232 interface:

Balance	Cable
AND ER, FR, FX with RS-232 interface (OP-03)	6.2125.020 + 6.2125.010
Mettler AB, AG, PR (LC-RS9)	In the scope of delivery for the balance
Mettler AM, PM, PE with interface option 016 or Mettler AJ, PJ with interface option 018	6.2146.020 + 6.2125.010 also from Mettler: ME 47473 adapter and either ME 42500 hand switch or ME 46278 foot switch
Mettler AT	6.2146.020 + 6.2125.010 also from Mettler: ME 42500 hand switch or ME 46278 foot switch
Mettler AX, MX, UMX, PG, AB-S, PB-S, XP, XS	6.2134.120
Mettler AE with interface option 011 or 012	6.2125.020 + 6.2125.010 also from Mettler: ME 42500 hand switch or ME 46278 foot switch
Ohaus Voyager, Explorer, Analytical Plus	Cable AS017-09 from Ohaus
Precisa balances with RS-232-C interface	6.2125.080 + 6.2125.010
Sartorius MP8, MC, LA, Genius, Cubis	6.2134.060
Shimadzu BX, BW	6.2125.080 + 6.2125.010

Connect the balance as follows:

1 Connect the USB plug of the USB/RS-232 adapter with the USB connector of the Ti-Touch (Type A).

The USB/RS-232 adapter will be recognized automatically and entered in the device manager of the Ti-Touch.

2 Connect the RS-232 interface of the USB/RS-232 adapter with the RS-232 interface of the balance (see table for cable).

3 Switch on the balance.

4 If necessary, switch on the RS-232 interface of the balance.

5 Configure the RS-232 interface of the USB/RS-232 adapter in the device manager of the Ti-Touch *(see Chapter 11.9, page 119)*.

6 Enter and configure the balance in the device manager of the Ti-Touch *(see Chapter 11.8, page 118)*.

7 Make sure that the parameters of the USB/RS-232 adapter configured in the device manager match those of the balance.

4.5.5 Connecting a PC keyboard

The PC keyboard is used as an aid for text and numerical input.

Connect the PC keyboard as follows:

1 Connect the USB plug of the keyboard with the USB connector of the Ti-Touch (Type A).

2 Enter and configure the keyboard in the device manager of the Ti-Touch *(see Chapter 11.10, page 121)*.

4.5.6 Connecting a barcode reader

The barcode reader is used as an aid for text and numerical input. You can connect a barcode reader with USB interface.

Connect the barcode reader as follows:

1 Connect the USB plug of the barcode reader with the USB connector of the Ti-Touch (Type A).

2 Enter and configure the barcode reader in the device manager of the *(see Chapter 11.11, page 122)*.

Settings on the barcode reader:

Program the barcode reader as follows (also see manual for the barcode reader):

1 Switch the barcode reader to programming mode.

2 Specify the desired layout for the keyboard (USA, Germany, France, Spain, German-speaking Switzerland).

This setting must match the setting in the device manager.

3 Make sure that the barcode reader is set in such a way that Ctrl characters (ASCII 00 to 31) can be sent.

4 Program the barcode reader in such a way that the ASCII character 02 (STX or Ctrl B) is sent as the first character. This first character is normally referred to as the "Preamble" or "Prefix Code".

5 Program the barcode reader in such a way that the ASCII character 04 (EOT or Ctrl D) is sent as the last character. This last character is normally referred to as the "Postamble", "Record Suffix" or "Postfix Code".

6 Exit the programming mode.

4.5.7 Connecting a Sample Processor

If you wish to integrate your Ti-Touch in an automation system, then you can connect the following Sample Processors to the USB connector:

- 814 USB Sample Processor
- 815 Robotic USB Sample Processor XL

The 6.2151.000 controller cable is required for connecting a USB Sample Processor.

Connect the USB Sample Processor as follows:

1 Connect the USB Sample Processor to the mains supply.

2 Connect the USB Sample Processor to the Ti-Touch with the controller cable.

The USB Sample Processor will be recognized automatically and entered in the device manager of the Ti-Touch.

NOTE

The plug on the controller cable is protected against accidental disconnection by means of a pull-out protection feature. If you wish to pull out the plug, you will first need to pull back the outer plug sleeve marked with arrows.

3 Configure the USB Sample Processor in the device manager *(see Chapter 11.11, page 122)*.

4.6 Connecting sensors

4.6.1 General

The measuring interface includes one high-ohm measuring input (**Ind.**) for a pH, metal or ion-selective electrode, one input (**Ref.**) for a separate reference electrode, one measuring input (**Temp.**) for a temperature sensor (Pt1000 or NTC), one measuring input (**Pol.**) for a polarizable electrode and one connector (**iConnect**) for an iConnect. This contains a measuring interface for electrodes with integrated data chip, referred to as iTrodes.

4.6.2 Connecting a pH, metal or ion-selective electrode

Connect the pH, metal or ion-selective electrode as follows:

1 Plug the electrode plug into the **Ind.** socket of the Ti-Touch.

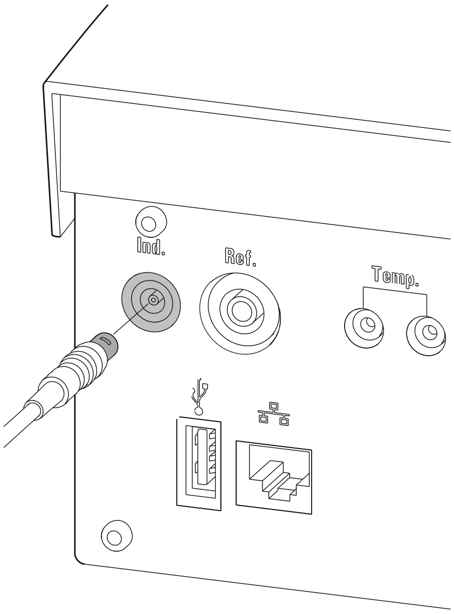


Figure 7 Connecting a pH, metal or ion-selective electrode

NOTE

The electrode cable is protected against accidental disconnection of the cable by means of a pull-out protection. If you wish to remove the plug, you will first need to pull back the outer plug sleeve.

4.6.3 Connecting a reference electrode

Connect the reference electrode as follows:

1 Plug the electrode plug into the **Ref.** socket of the Ti-Touch.

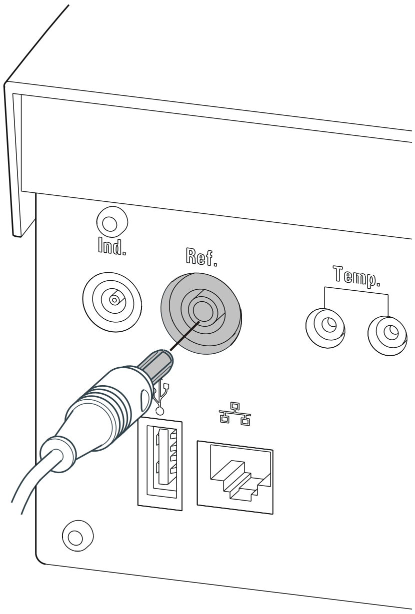


Figure 8 Connecting a reference electrode

4.6.4 Connecting a polarizable electrode

Connect the polarizable electrode as follows:

1 Plug the electrode plug into the **Pol.** socket of the Ti-Touch.

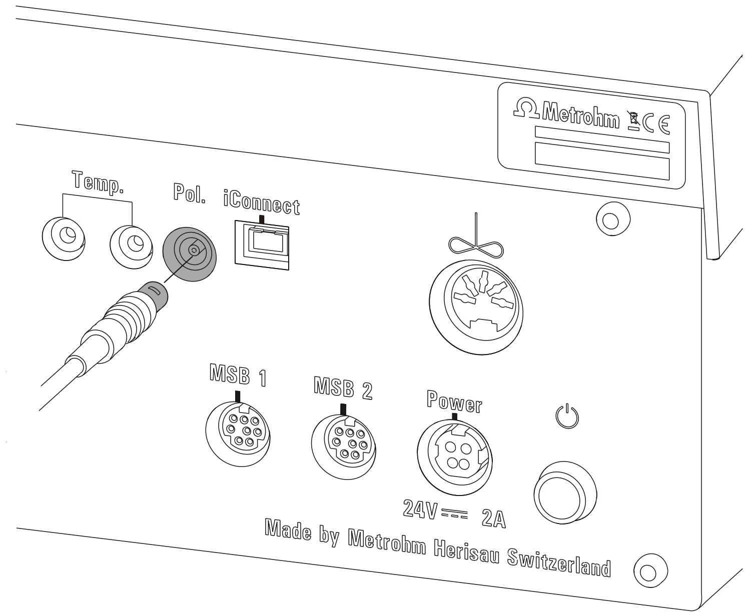


Figure 9 Connecting a polarizable electrode

NOTE

The electrode cable is protected against accidental disconnection of the cable by means of a pull-out protection. If you wish to remove the plug, you will first need to pull back the outer plug sleeve.

4.6.5 Connecting a temperature sensor or an electrode with integrated temperature sensor

A temperature sensor of the Pt1000 or NTC type can be connected to the **Temp.** connector.

Connect the temperature sensor or the electrode with integrated temperature sensor as follows:

1 Plug the temperature sensor plugs into the **Temp.** sockets of the Ti-Touch.

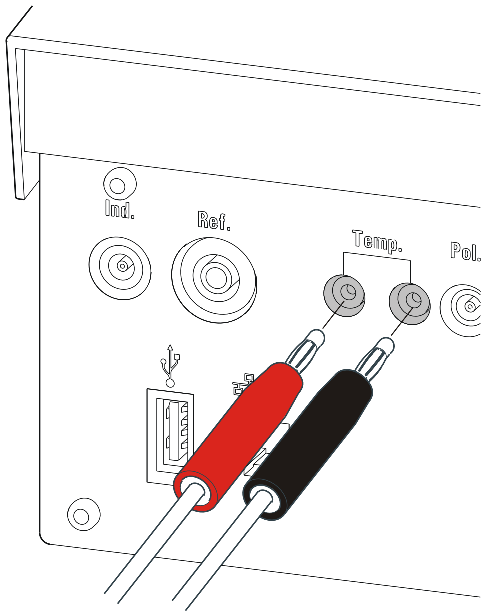


Figure 10 Connecting a temperature sensor or an electrode with integrated temperature sensor

NOTE

The red plug must always be plugged into the red socket for the purpose of shielding against disruptions.

If you use an electrode with an integrated NTC sensor, then you must plug the red plug into the red socket.

4.6.6 Connecting an iConnect

An external 854 iConnect measuring interface can be connected to the 916 Ti-Touch.

Connect the iConnect as follows:

1 Plug the iConnect plug into the **iConnect** socket of the Ti-Touch.

Take care to ensure that the marking on the plug matches the marking on the Ti-Touch as shown in the figure.

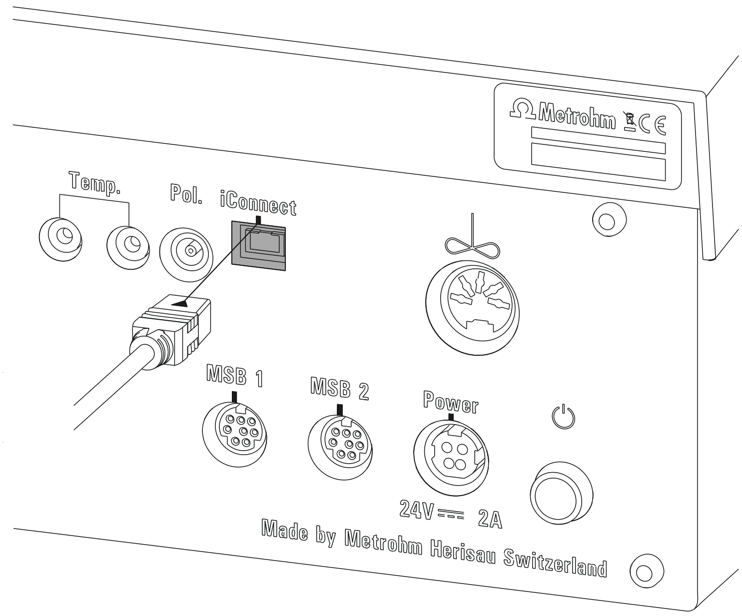


Figure 11 Connecting the iConnect

The iConnect is detected automatically and entered as measuring input into the device properties of the Ti-Touch. If an electrode is connected to the iConnect that is not yet included in the list of sensors for the Ti-Touch, then a corresponding message will be displayed.

The iConnect can be plugged in and unplugged while the Ti-Touch is switched on.

An electrode with integrated data chip, referred to as iTrode, is connected to the iConnect.

Connect the electrode as follows:

1 Remove the protective caps on the iConnect and the electrode.

2 Plug in the electrode on the iConnect as illustrated in *Fig. 12, page 25*.

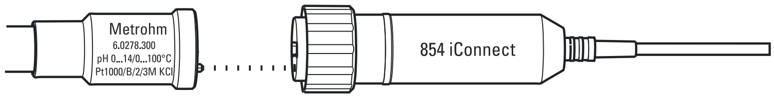


Figure 12 Connecting an electrode to the iConnect

The guide pin guarantees correct connection in such a way that the contact pins cannot be damaged.

3 Screw the iConnect tightly.

4.6.7 Differential potentiometry

Potentiometric measurements with high-ohm measuring chains can be disrupted by electrostatic and electromagnetic fields in media with low conductivity. Use our 6.0229.100 Solvotrode or other special electrodes for pH measurements in organic solvents. If no reliable measurements are possible with these, then a 6.5104.030 (230 V) or 6.5104.040 (115 V) differential amplifier can be used. The differential amplifier is connected to the high-ohm measuring input (**Ind.**).

4.7 Connecting the Ti-Touch to a network

The 916 Ti-Touch has a network connection (Ethernet). This can be used to integrate your Ti-Touch in your network. You can, for example, store data on a PC within the network or print reports on a network printer. In *Chapter 11, page 86*, you will find information as to which settings are necessary for the network connection.

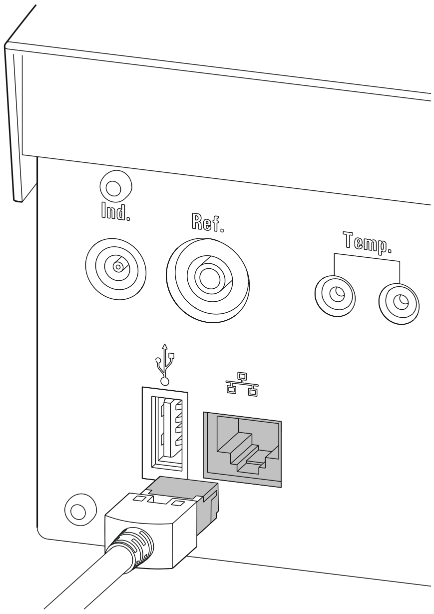


Figure 13 Connecting the Ti-Touch to a network

5 Titrations

5.1 Dynamic equivalence point titration (DET)

Dynamic equivalence point titration is a titration mode for all standard titrations. The reagent is added in variable volume steps. The volume increments vary as a function of the slope of the curve. An attempt is made to achieve constant measured value alterations with each dosing. The optimal volume for dosing is determined from the measured value alterations of the previous dosings. Measured value acceptance is drift-controlled (equilibrium titration) or after a waiting time. Equivalence points are evaluated automatically.

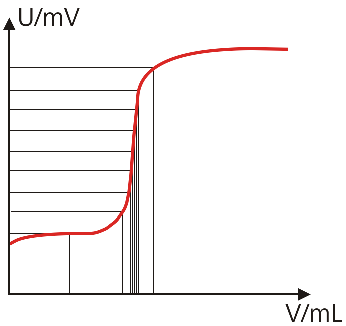


Figure 14 Reagent dosing for DET

5.2 Monotonic equivalence point titration (MET)

Monotonic equivalence point titration is a titration mode for titrations with relatively high signal fluctuations or suddenly occurring potential jumps and for slow titrations or slow-response electrodes. The reagent is added in constant volume steps. Measured value acceptance is drift-controlled (equilibrium titration) or after a waiting time. Equivalence points are evaluated automatically.

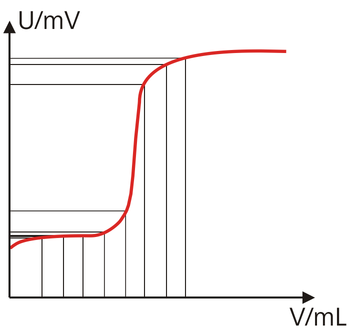


Figure 15 Reagent dosing for MET

5.3 Endpoint titration (SET)

Endpoint titration is a titration mode for rapid routine determinations to a preset endpoint (e.g. titrations in accordance with special norms) and titrations for which reagent overflow must be avoided. The titration termination at the endpoint takes place either drift-controlled or after a waiting period. The volume dosed until the endpoint is used for calculating the content of the sample.

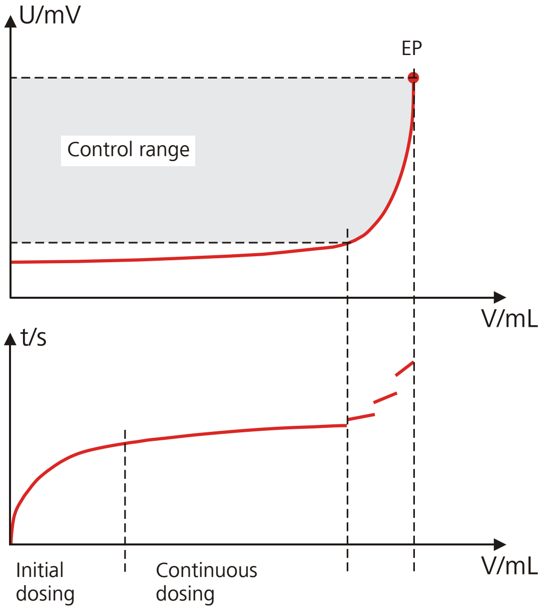


Figure 16 Reagent dosing for SET

6 Operation

6.1 Switching the instrument on and off

Switching on the instrument

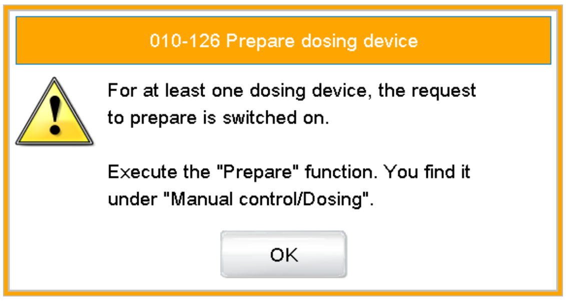
CAUTION

Peripheral devices (e.g. printers) must be switched on before you switch on the 916 Ti-Touch.

Proceed as follows:

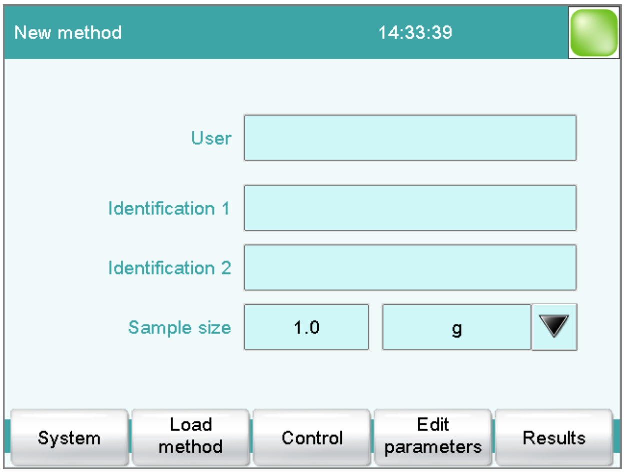
1

- Press the mains switch on the left-hand side of the rear panel of the 916 Ti-Touch.
  The 916 Ti-Touch is initialized. A system test is performed. This process takes some time.
- If a buret unit is attached, then a request appears to carry out the **Prepare** function:



  All tubings and the cylinder are rinsed with the **Prepare** function. The preparing of the buret unit is described in *chapter 27.3.3, page 260*.
- Confirm the message with **[OK]**.

The main dialog is displayed:



Switching off the instrument

CAUTION

The 916 Ti-Touch must be switched off by pressing the mains switch on the rear of the instrument before the electricity supply is interrupted. If this is not done, then there is a danger of data loss.

Proceed as follows:

1 ■ Press the mains switch on the left-hand side of the rear panel of the 916 Ti-Touch.

The current data is saved and the system is shut down. This process takes just a short time. At the same time, all other devices connected to the 916 Ti-Touch via a USB cable are also being switched off.

6.2 Fundamentals of operation

6.2.1 Touch-sensitive screen

The entire Ti-Touch user interface is touch-sensitive. Simply touch a few of the buttons on the interface to learn how a touch-sensitive screen reacts. You can always return to the main dialog by touching **[ ]**.

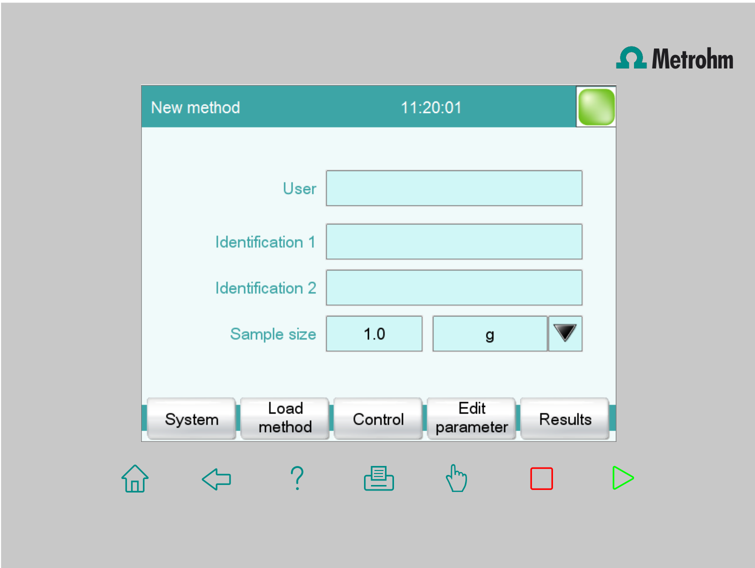
In order to activate an element on the Ti-Touch user interface, just touch the screen with your fingertip, finger nail, the eraser of a pencil or a stylus (special tool for operating instruments with touch-sensitive screens).

CAUTION

Never touch the touch screen with a pointed or sharp object such as a ballpoint pen.

In the default setting, the software is configured in such a way that an acoustic signal will be generated every time an active operating element is touched. This setting can be deactivated in the system settings *(see Chapter 7.5, page 50)*.

6.2.2 Display and operating elements



The following display and operating elements are available:

Table 1 Fixed keys which are always available

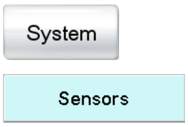
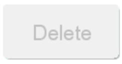
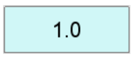
	[Home] always opens the main dialog.

	**[Back]** saves the entry and opens the next-higher dialog page.
	**[Help]** opens the online help feature for the dialog displayed.
	**[Print]** opens the printing dialog.
	**[Manual]** opens the manual control.
	**[Stop]** cancels the ongoing determination.
	**[Start]** starts a determination.

The method loaded, the time and the system status are displayed in the main dialog in the **Title bar**.

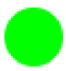
In the other dialogs, the title bar shows the headings of the next upper level and of the displayed dialog. This is an aid for orientation during navigation through the user dialog.

Table 2 Screen elements

	**Buttons** open a new dialog when they are tapped.
	**Inactive buttons** with gray lettering indicate that the respective function is not available at the moment.
	**Input fields** open an input dialog when tapped with the finger.
	Tapping on the **selection symbol** opens a selection list.
	A **check box** can also be activated or deactivated by tapping on it.

6.2.3 Status display

The current status of the system is displayed in the upper right-hand corner of the title bar:

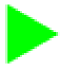


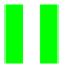
The instrument is in normal status.

 The working medium is being conditioned.

 Conditioning has been paused.

 The working medium is conditioned.

 A method has been started.

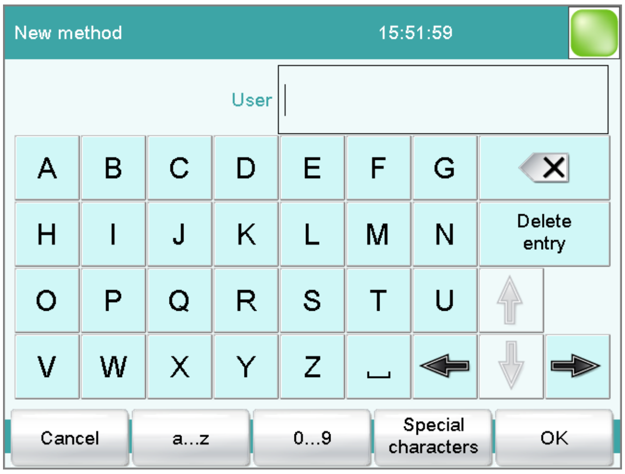
 A method has been paused.

 An action has been started in manual control.

6.2.4 Entering text and numbers

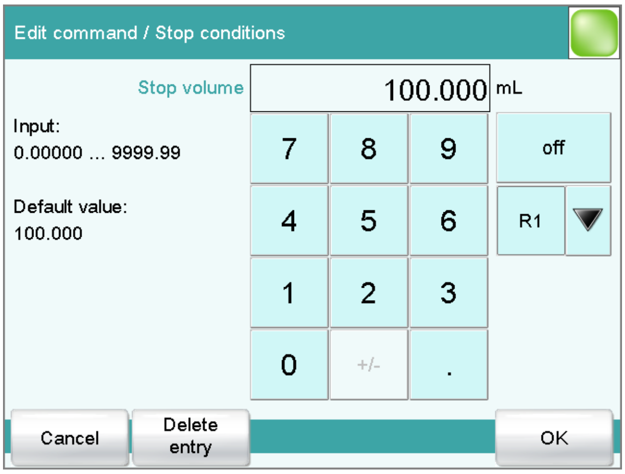
In the editing dialog for text or numerical input, enter the individual characters by tapping in the input field. The following functions are available:

Text editor



Editing function	Description
[OK]	The modification is applied and the editing dialog is exited.
[Cancel]	The editing dialog is exited without applying the modification.
[Delete entry]	The content of the input field is deleted completely.
[⌫]	The character in front of the cursor is deleted.
[⇦]	The cursor within the input field is shifted to the left by one character.
[⇨]	The cursor within the input field is shifted to the right by one character.
[a…z]	The lower-case letters are displayed. The label changes to **[A…Z]**. The upper case letters are displayed by tapping again.
[0…9]	Numbers and mathematical characters are displayed.
[Special characters]	Special characters are displayed. You can use the button **[More]** to navigate through all available characters.

Number editor



Editing function	Description
[OK]	The modification is applied and the editing dialog is exited.

Editing function	Description
[Cancel]	The editing dialog is exited without applying the modification.
[Delete entry]	The content of the input field is deleted completely.
[off]	If not only numbers but also special values (e.g. **off**) can be entered, then the corresponding buttons will be shown to the right of the numerical keypad.
[R1]	For many parameters, a result previously defined in the method can also be entered in place of a number *(see Chapter 31.6, page 411)*. You can select the result variable by touching **[R1]**.

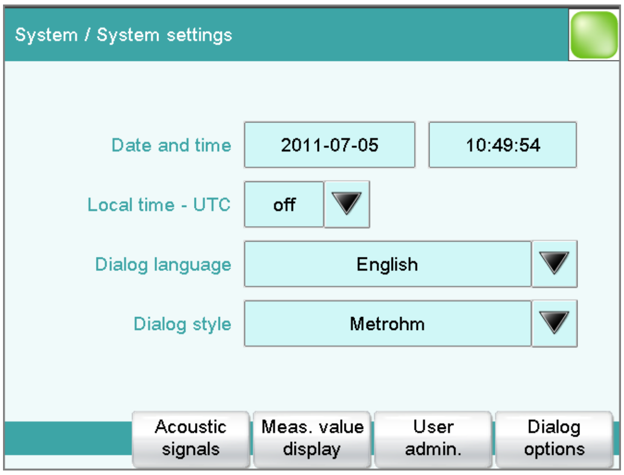
NOTE

A commercially available USB keyboard can be connected to make it easier to enter text and numbers. The key assignment is described in *Chapter 11.10, page 121*.

7 System settings

Main dialog: **System** ▶ **System settings**

This chapter describes the various system settings and configurations.



- Selecting the dialog language *(see Chapter 7.1.1, page 36)*.
- Setting the date and time *(see Chapter 7.1.2, page 37)*.
- Defining system-specific dialog options *(see Chapter 7.2, page 38)*.
- User administration *(see Chapter 7.3, page 42)*.
- Defining settings for the measured value display *(see Chapter 7.4, page 50)*.
- Configuring settings for acoustic signals *(see Chapter 7.5, page 50)*.

7.1 General system settings

7.1.1 Selecting the dialog language

The user interface is available in several languages. In addition to the two default dialog languages *English* and *German*, additional languages can be selected.

Proceed as follows to select the dialog language:

1 Open the system settings

- In the main dialog, tap on **[System]**.
- Tap on **[System settings]**.

The dialog **System / System settings** is displayed.

2 Select the dialog language

- Tap on the list box **Dialog language** and select the desired language.

3 Save the settings

Tap on the fixed keys **[⇦]** or **[⌂]**.

The main dialog is displayed in the respective dialog language.

7.1.2 Setting the date, time and local time

The Ti-Touch displays the date and time in accordance with ISO standard 8601.

Proceed as follows to set the date and time:

1 Open the system settings

- In the main dialog, tap on **[System]**.
- Tap on **[System settings]**.

The dialog **System / System settings** is displayed.

2 Enter the date

- Tap on the input field for the date.
  The editor opens.
- Enter the current date in the format **YYYY-MM-DD** and confirm with **[OK]**.
  The arrow keys **[⇦]** and **[⇨]** are used to move the cursor to the left or to the right by one character.

The input is saved and the editor is closed.

3 Enter the time

- Tap on the input field for the time.
  The editor opens.
- Enter the current time in the format **hh:mm:ss** (24-hour format) and confirm with **[OK]**.
  The arrow keys **[⇦]** and **[⇨]** are used to move the cursor to the left or to the right by one character.

The input is saved and the editor is closed.

4 Enter the local time

- Tap on the list box **Local time - UTC** and select the difference from the UTC (Coordinated Universal Time).
  The selection **off** means that the time is saved with no difference from the UTC.

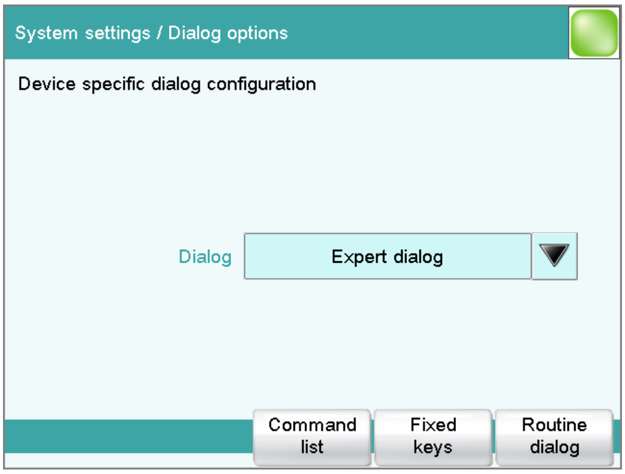
5 Save the settings

Tap on the fixed keys **[⇦]** or **[⌂]**.

The time settings are saved.

7.2 System-specific dialog options

Main dialog: **System ▸ System settings ▸ Dialog options**



If you work without a login function, in this dialog you can define whether the system should generally be operated in expert mode or in routine mode. If you work with the login function activated, you must define this setting separately for each user *(see Chapter 7.3.1, page 43)*.

Dialog

Dialog mode in which the user may operate the system.

Selection	**Expert dialog | Routine dialog**

Expert dialog
All functions that are supported by the system are available.

Routine dialog
The user dialog can be limited for routine operations. Only selected functions are available *(see Configuring the routine dialog, page 40)*.

[Command list]

Block unneeded method commands *(see "Blocking unneeded commands and fixed keys", page 39)*.

[Fixed keys]

Block unneeded fixed keys *(see "Blocking unneeded commands and fixed keys", page 39)*.

[Routine dialog]

Configure functions for the routine dialog *(see "Configuring the routine dialog", page 40)*.

Selecting the dialog mode

Proceed as follows to change the dialog mode:

1 Select the dialog mode

Open the selection list **Dialog** and select either **Expert dialog** or **Routine dialog**.

2 Save the settings

Tap on the fixed keys **[⇦]** or **[⌂]**.

The setting will apply to all dialogs.

NOTE

If you have selected **Routine dialog** and if the routine dialog was configured in such a way that the dialog **System settings / Dialog options** is blocked, then you can switch back over to the expert dialog as follows:

- Operation without login function:
  In the main dialog, enter **User** = **Metrohm**.
- Operation with login function:
  A user who works with expert dialog must log in.

Blocking unneeded commands and fixed keys

This following configurations apply for **both** dialog modes: routine dialog and expert dialog.

Blocking commands

Proceed as follows to block unneeded commands:

1 Display the command list

Tap on the button **[Command list]**.

The list of all command groups is displayed.

2 Deactivate command groups

Deactivate those command groups which are not permitted to be used.

3 Save the settings

Tap on the fixed keys **[⇦]** or **[⌂]**.

All deactivated commands appear grayed out in the method editor and cannot be used for creating methods.

Blocking fixed keys

Proceed as follows to block unneeded fixed keys:

1 Display fixed keys which can be blocked

Tap on the button **[Fixed keys]**.

All fixed keys which can be blocked are displayed.

2 Deactivate fixed keys

Deactivate those fixed keys which are not permitted to be used.

3 Save the settings

Tap on the fixed keys **[⇦]** or **[⌂]**.

Deactivated fixed keys cannot be used.

Configuring the routine dialog

A suitable **Standard configuration** has already been saved for routine operations.

- Methods can only be loaded, but not modified or created.
- Determinations cannot be recalculated.

You can readjust this standard configuration by disabling additional functions or re-enabling disabled functions.

NOTE

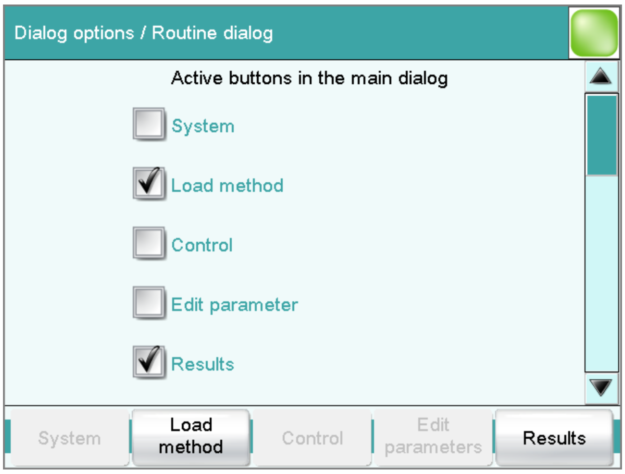
The configuration of the routine dialog applies for all routine users. You also have the option of defining user-specific routine settings. To do this, you must work with the login function activated and create an identification profile for each user *(see Chapter 7.3.2, page 45)*.

Proceed as follows to modify the configuration for the routine dialog:

1 Open the dialog

Tap on the button **[Routine dialog]**.

The list of all buttons in the main dialog, in the manual control, etc. is displayed:



2 Deactivate buttons

Deactivate those buttons which are not permitted to be used.

All deactivated buttons will appear grayed-out, i.e. they are inactive.

3 Deactivate other functions

Many additional buttons and parameters can be disabled in the dialogs of **[System]**, **[Load method]**, **[Control]**, **[Edit parameters]** and **[Results]**. The corresponding option must be activated in order to enable these buttons.

4 Save the settings

Tap on the fixed keys **[⇦]** or **[⌂]**.

All deactivated functions will appear grayed-out, i.e. they are inactive.

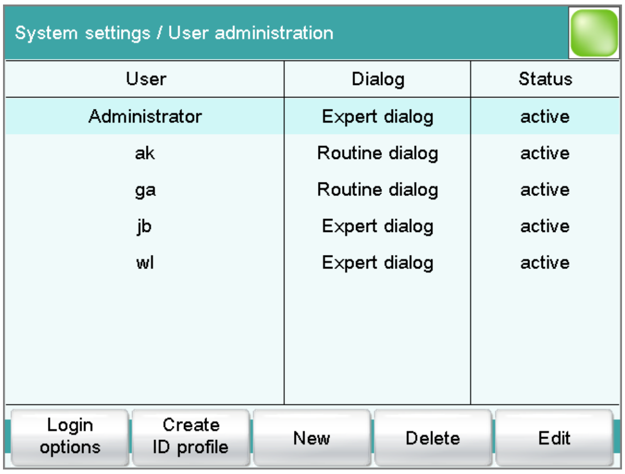
7.3 User administration

Main dialog: **System ▶ System settings ▶ User admin.**

All of the functions of the user administration are described in this chapter. No user administration is mandatory for the simple operation of a titration system.

NOTE

If you work with the login function activated, then the user administration is accessible only for users with administrator rights. This means that you must ensure that at least two users have administrator rights so at least one of them will be available. Keep the access rights for a user with administrator rights in a safe place so that they are accessible in an emergency.



The following data is displayed in the user list for each user:

- Name
- Dialog mode in which the user may operate the system.
- Status

You can use the user list two different ways:

- Operation with login function:
  If you work with the login function activated, i.e. if each user must log into the system before starting work, then only those users entered in the list can log in. The user who is currently logged in is shown in the main dialog.

- Operation without login function:
  If you work without the login function, the users whose names are entered in the list can be selected in the main dialog or a user name can be entered. This makes it possible to document who has operated the titration system.

[Login options]

Define the settings for the login *(see Chapter 7.3.3, page 46)*.

[Create ID profile]

Create an identification profile for the selected user on a storage medium *(see Chapter 7.3.2, page 45)*.

[New]

Add a new user to the list *(see Chapter 7.3.1, page 43)*.

[Delete]

Delete the selected user from the list.

> **NOTE**
>
> Once you have worked with the login function and password protection, users can no longer be deleted, even if the password protection is disabled again. The status of these users must be set to **inactive**.
>
> The last user with administrator rights cannot be deleted.

[Edit]

Edit the data of the selected user *(see Chapter 7.3.1, page 43)*.

7.3.1 Editing the user configuration

User list: **User ▸ New / Edit**

User

The designation of the user is used for unambiguous identification, e.g. the company internal shorthand symbol or the personal number. The user name is printed out in all reports containing determination data and stored in the determination file. Each file always contains the name of the user who created it and the name of the last user to edit it.

Entry	**24 characters maximum**
Default value	**empty**

Full name

Complete name of the user.

Entry	**24 characters maximum**
Default value	**empty**

Dialog

Dialog mode in which the user may operate the system.

Selection	**Expert dialog** | **Routine dialog**

Expert dialog
All functions that are supported by the system are available.

Routine dialog
The user dialog can be limited for routine operations. Only selected functions are available *(see Configuring the routine dialog, page 40)*.

Status

Status of the user. Users can be deactivated. This function is useful, for instance, if the user is no longer authorized to operate the system or no longer works for the company.

Selection	**active** | **inactive**
Default value	**active**

active
The user is authorized to operate the system.

inactive
The user is not authorized to operate the system and can no longer log in.

Admin. rights

on | off (Default value: **off**)

If this option is activated, then the user has administrator rights.

NOTE

The last user with administrator rights cannot be deleted anymore.

[Favorites]

Save methods and sample tables as user specific favorites *(see Chapter 18, page 191)*.

7.3.2 Creating an identification profile

User list: **User** ▶ **Create ID profile**

If you plan to carry out the login with an identification profile *(see Chapter 7.3.3, page 46)*, then you must first create an identification profile on a storage medium for each user. A check can then be made at the time of login as to whether or not the user does exist and whether or not he or she is working in the expert dialog or in the routine dialog. After a successful login the routine dialog settings stored on the card are loaded.

NOTE

In addition to the user name, the current routine dialog settings are also stored in this identification profile. This means you can define user-specific routine dialog settings for each user. However, you must configure them *(see "Configuring the routine dialog", page 40)*, **before** you create the identification profile.

Before you create the identification profile, check whether the desired routine dialog settings are active.

1 Plug in a storage medium

Plug in the USB storage medium.

2 Select a user

In the user list, select the user for whom the profile is to be created.

3 Create the identification profile

Tap on **[Create ID profile]**.

The user configuration and the current routine dialog settings are saved.

7.3.3 Defining login options

Main dialog: **System ▶ System settings ▶ User admin. ▶ Login options**

There are a number of different ways to log onto the system:

- Without login
- Login via user name
- Login via user name and password
- Login via identification profile
- Login via identification profile and password

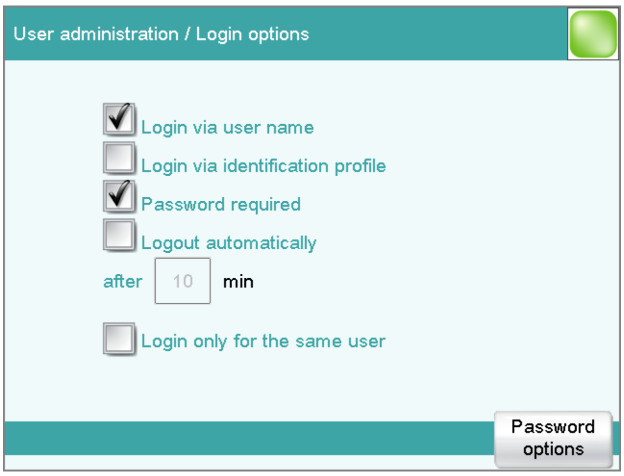
NOTE

If you work with the login function activated, then the user administration is accessible only for users with administrator rights. This means that you must ensure that at least two users have administrator rights so at least one of them will be available. Keep the access rights for a user with administrator rights in a safe place so that they are accessible in an emergency.

NOTE

If you exit this dialog with **[⇦]** or **[⌂]**, and if you have selected one of the login variants **Login via user name** or **Login via identification profile**, then the login dialog will open automatically and you must also log in to the system.

This means that you must make sure that you have first defined all the users and created the identification profiles before you activate the login function.



Login via user name

on | off (Default value: **off**)

If this option is activated, then the user must log in with his or her unambiguous identification.

Login via identification profile

on | off (Default value: **off**)

If this option is activated, then the login will take place via USB storage medium with the identification profile stored on it.

Password required

on | off (Default value: **off**)

If this option is activated, then the user must enter a password in addition to his or her user name or identification profile.

Logout automatically

on | off (Default value: **off**)

If this option is activated, then the user will be logged out automatically after the specified time.

Input range	**1 - 60 min**

Login only for the same user

on | off (Default value: **off**)

If this option is activated, then only the same user may log in again after he or she has logged out. Users with administrator rights can, however, log in at any time.

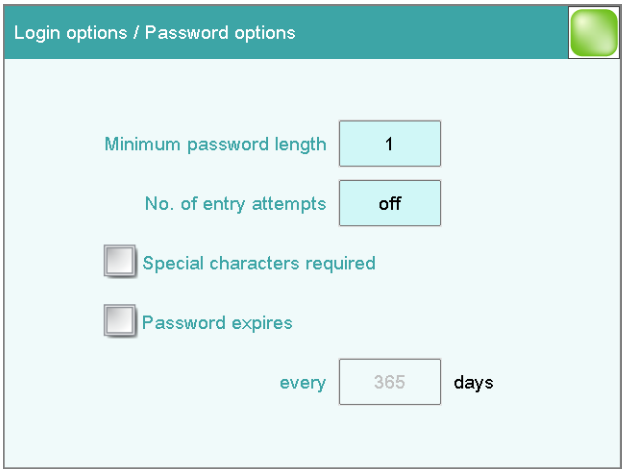
[Password options]

Define the settings for the password, see following chapter.

7.3.4 Password options

Main dialog: **System** ▸ **System settings** ▸ **User admin.** ▸ **Login options** ▸ **Password options**

You can make various settings for password entry in the password options.



Minimum password length

Minimum number of characters of the passwords.

Input range	**1 - 10**
Default value	**1**

No. of entry attempts

If the user has logged in incorrectly this many times, then it will automatically be deactivated. It can only be reactivated by a user with administrator rights.

Input range	**2 - 5**
Selection	**off**
Default value	**off**

Special characters required

on | off (Default value: **off**)

If this option is activated, then the password must contain one of the following special characters: ° § + ¦ @ * # ç % & ¬ ( ) = ' ^ ` ~] [} { - _ : . ; , > < £ !

Password expires

on | off (Default value: **off**)

If this option is activated, then the user must define a new password after the time specified. A password that has already been used cannot be used again.

Input range	**1 - 999 days**
Default value	**365 days**

Forgotten password

CAUTION

If a user has forgotten his password, a new user name must be defined. The same user name can only be used again after a re-installation and re-creating the user list.

Proceed as follows:

1 Create a backup

Create a backup *(see Chapter 12.3, page 131)*.

2 Initialize the system

Switch off the Ti-Touch and carry out a system initialization *(see Chapter 29.1, page 399)*.

3 Restore backed-up data

Use the function **Restore** to reload the data from the backup into your system *(see Chapter 12.3.1, page 131)*.

Deactivate the options **User list** and **System settings / User admin.**.

4 Switch on the Ti-Touch

Switch the Ti-Touch back on again after a few seconds.

5 Restore the user list

Create the user list again and redefine the login options.

7.4 Measured value display

Main dialog: **System** ▶ **System settings** ▶ **Meas. value display**

The number of decimal places can be defined for pH values and voltages. This setting refers exclusively to the display of the measured values in the live display and in the manual control. The values will, however, always be stored with their full accuracy.

7.5 Acoustic signals

Main dialog: **System** ▶ **System settings** ▶ **Acoustic signals**

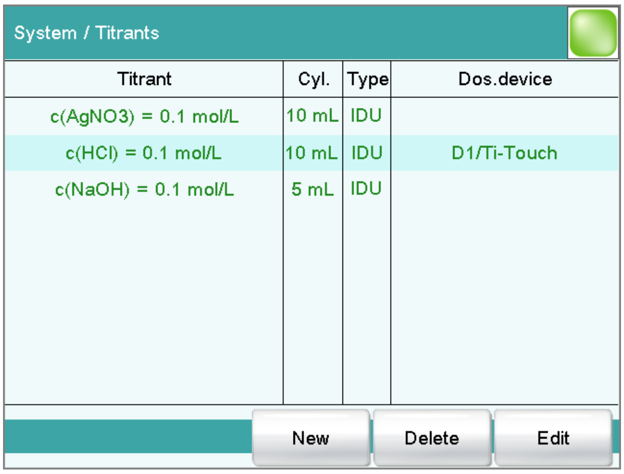
You can define acoustic signals in order to direct attention to particular events. You can define signals for the following events:

- **Wrong manipulation**
  An acoustic signal will sound each time an invalid action is attempted (e.g. pressing **[?]** again when Help is open).
- **Display a message**
  A short beep will sound each time a message appears on the display. This informs the user that the message must be confirmed.
- **Button contact**
  Each time a button is touched on the touch screen, this will be confirmed by an acoustic signal.
- **External data input**
  An acoustic signal will provide confirmation each time data is received from external devices (e.g. balance, barcode reader).

8 Titrants

Main dialog: **System ▸ Titrants**

This chapter describes how you can create a list of titrants used in the system. Titrants 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 titrant is stored. This data is automatically read out during attachment and entered in the titrant list.



The titrant list can contain a maximum of 30 titrants. The following data is specified for each titrant:

- Designation
- Cylinder volume
- Type
  - **IDU**: dosing unit with integrated data chip
  - **IEU**: exchange unit with integrated data chip
  - **EU**: exchange unit without data chip
- MSB connector of the dosing device/control device (only when exchange unit/dosing unit is attached)

Titrants in exchange units/dosing units with integrated data chips are depicted in green lettering.

The following titrant data is stored in the titrant list:

- Name
  Each titrant in the system is identified by its unambiguous name.
- Concentration
- Current titer
- Working life

- Data on exchange/dosing unit:
  - Parameters for the function **PREP**
  - Length and diameter of the tubings
  - Port assignment of the dosing unit
  - Cylinder volume
  - Serial number
  - etc.
- etc.

NOTE

If data is read out from the data chip, then a check is made whether the titrant list already contains a titrant of the same type with the identical serial number. If this is the case, then the older data set will **always** be overwritten by the new data set, no matter whether the data set in the titrant list or the data set on the data chip is the most recent one.

[New]

Add a new titrant to the list *(see Chapter 8.1, page 52)*.

[Delete]

Delete the selected titrant from the list.

[Edit]

Edit the data of the selected titrant *(see Chapter 8.2, page 53)*.

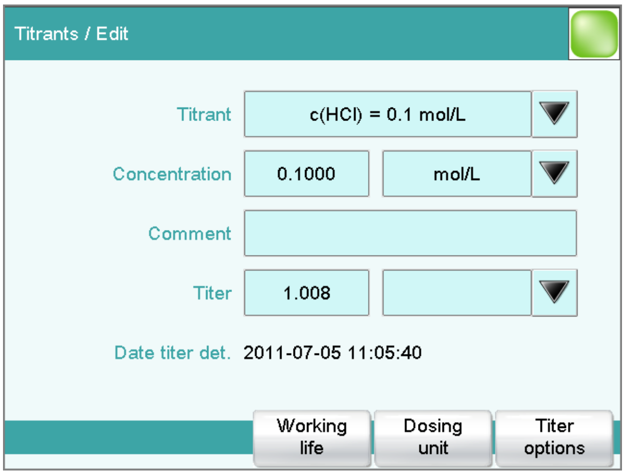
8.1 Adding a new titrant

Before you can use a titrant, you must add it to the titrant list. To do this, use the button **[New]**.

- Exchange unit/dosing unit with data chip:
  The exchange unit or dosing unit must be attached. All dosing devices on which non-configured exchange or dosing units have been detected are included in a selection list. Tapping on the button **[Edit]** opens the properties dialog, see following chapter.
- Exchange unit without data chip:
  The properties dialog is opened after the dosing unit type has been selected, see following chapter.

8.2 Editing titrant data

Titrant list: **Titrants ▶ New / Edit**



All of the data for the selected titrant is displayed in the dialog **Titrants / Edit**.

Titrant

The designation of the titrant is used for unambiguous identification.

Entry	**24 characters maximum**
Selection	**Selection of frequently used titrants**

Concentration

Concentration of the titrant.

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

Unit of the concentration.

Entry	**10 characters maximum**
Selection	**µmol/mL** | **mmol/L** | **mol/L** | **g/L** | **mg/L** | **mg/mL** | **µg/L** | **ppm** | **%** | **mEq/L**
Default value	**mol/L**

Comment

Entry	**24 characters maximum**

Titer

Titer of the titrant.

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

Unit of the titer.

Entry	**10 characters maximum**
Default value	**empty**
Selection	**µmol/mL** | **mmol/L** | **mol/L** | **g/L** | **mg/L** | **mg/mL** | **µg/L** | **ppm** | **%** | **mEq/L**

NOTE

If you modify the titer or the concentration of the titrant in a loaded determination at a later date and would then like to recalculate the determination with the corrected value, then you must modify the value in the determination data under **View data / Titrant data** *(see "Calibration and titrant data", page 219)*.

Date titer det.

Date and time of the last titer determination. For new titrants, the time the preparation was made is specified until after the first time a titer determination has been carried out.

[Working life]

Define the working life of the sensor *(see Chapter 8.3, page 55)*.

[Dosing unit]

This button is only displayed for **Type** = **IDU**.

Define the properties of the dosing unit used *(see Chapter 8.4, page 56)*.

[Exchange unit]

This button is only displayed with **Type** = **IEU** or **EU**.

Define the properties of the exchange unit used *(see Chapter 8.5, page 62)*.

[Titer options]

Display the properties for the titer determination *(see Chapter 8.7, page 68)*.

8.3 Monitoring the working life

Titrant: **Edit ▸ Working life**

In the dialog **Edit titrant / Working life**, you can define the time interval after which the titrant must be replaced. This is particularly important if your titrant has a limited working life. If you do not wish to monitor the working life, then you can enter only the date of manufacture for documentation purposes.

Preparation date

Date on which the reagent was manufactured or the bottle was opened. For new titrants, the time the preparation was made will be specified.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the working life will be monitored.

Working life

If you define a time interval for the working life, then the **Expiry date** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Expiry date

If you define an expiry date, then the **Working life** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

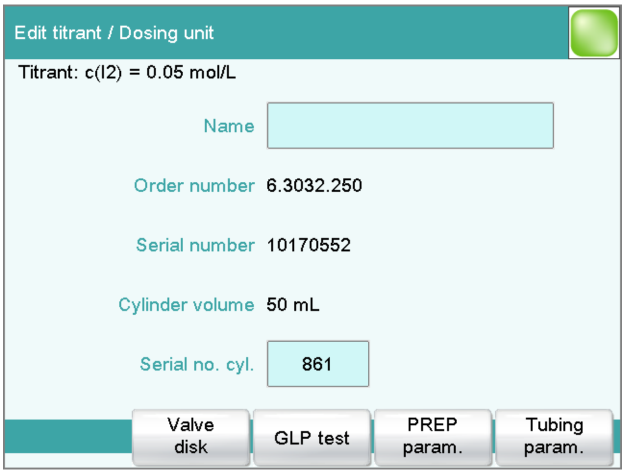
Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

8.4 Dosing unit

Titrant: **Edit ▸ Dosing unit**



You can edit data for the dosing unit of the titrant in this dialog.

Name

Designation of the exchange or dosing unit.

Entry	**24 characters maximum**
Default value	**empty**

Order number

Order number of the exchange or dosing unit. It will be read out automatically on units with integrated data chips.

Entry	**24 characters maximum**
Default value	**empty**

Serial number

Serial number of the exchange or dosing unit. It will be read out automatically on units with integrated data chips.

Entry	**8 digits maximum**

Cylinder volume

Cylinder volume of the dosing unit. It will be read out automatically on dosing units with integrated data chips.

Selection	**2 | 5 | 10 | 20 | 50**
Default value	**20**

Serial no. cyl.

Serial number of the dosing cylinder. It will be read out automatically on exchange or dosing units with integrated data chips. The number can be changed manually at any time, e.g. when a cylinder is replaced.

Entry	**8 digits maximum**

[Valve disk]

Specify the shift direction of the valve disc *(see Chapter 8.4.3, page 61)*.

[GLP test]

Define the time interval for the GLP test *(see Chapter 8.6, page 66)*.

[PREP param.]

Enter the parameters for the preparation *(see Chapter 8.4.1, page 57)*.

[Tubing param.]

Enter the parameters for the connected tubings *(see Chapter 8.4.2, page 58)*.

8.4.1 Parameters for preparing (PREP) and emptying (EMPTY)

Titrant: **Edit ▸ Dosing unit ▸ PREP param.**

In the dialog **Dosing unit / PREP parameters**, you can adjust the parameters for the execution of the **Prepare** (command PREP) and **Empty** (command EMPTY) functions. The **Prepare** function is used to rinse the cylinder and tubing of the dosing unit and fill it air bubble-free. You should carry out this function before the first determination or once per day. The **EMPTY** function empties the cylinder and the tubings of the dosing unit.

Dosing port PREP/EMPTY

Dosing port through which the cylinder contents are ejected.

Selection	**Dosing port 1 | Dosing port 2 | Fill port | Special port**
Default value	**Dosing port 1**

Dosing rate Dos. port 1

Rate used for the aspiration and ejection of the reagent via dosing port 1.

Input range	**0.01 - 166.00 mL/min**

Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31.1, page 405)*.

Dosing rate Dos. port 2

Rate used for the aspiration and ejection of the reagent via dosing port 2.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31.1, page 405)*.

Dosing rate Fill port

Rate used for the aspiration and ejection of the reagent via fill port.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31.1, page 405)*.

Dosing rate Spec.port

Rate used for the aspiration and ejection of the reagent via the special port.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31.1, page 405)*.

8.4.2 Tubing parameters

Titrant: **Edit** ▶ **Dosing unit** ▶ **Tubing param.**

You can enter the length and diameter of the connected tubings in the dialog **Dosing unit / Tubing parameters**. The values which have already been entered correspond to the dimensions of the supplied standard tubings. In addition, the port assignment can be modified.

NOTE

These parameters are important for the correct execution of the **Preparing** (PREP command) and **Emptying** (EMPTY command) functions, because the volumes of the tubing connections are taken into account.

Dosing port 1

Port

Port to be used as dosing port 1 for the **PREP** and **EMPTY** *(see Figure 17, page 61)* functions.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 1**

Length

Length of the tubing.

Input range	**0.0 - 999.9 cm**
Default value	**40.0 cm** The setting **0.0** means that this tubing will neither be rinsed nor emptied.

Diameter

Diameter of the tubing.

Input range	**0.0 - 9.9 mm**
Default value	**2.0 mm**

Dosing port 2

Port

Port to be used as dosing port 2 for the **PREP** and **EMPTY** functions *(see Figure 17, page 61)*.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 3**

Length

Length of the tubing.

Input range	**0.0 - 999.9 cm**
Default value	**0.0 cm** The setting **0.0** means that this tubing will neither be rinsed nor emptied.

Diameter

Diameter of the tubing.

Input range	**0.0 - 9.9 mm**
Default value	**2.0 mm**

Fill port

Port

Port to be used as fill port for the **PREP** and **EMPTY** functions *(see Figure 17, page 61)*.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 2**

Length

Length of the tubing.

Input range	**0.0 - 999.9 cm**
Default value	**25.0 cm** The setting **0.0** means that this tubing will neither be rinsed nor emptied.

Diameter

Diameter of the tubing.

Input range	**0.0 - 9.9 mm**
Default value	**2.0 mm**

Special port

Port

Port to be used as special port for the **PREP** and **EMPTY** functions *(see Figure 17, page 61)*.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 4**

Length

Length of the tubing.

Input range	**0.0 - 999.9 cm**
Default value	**0.0 cm** The setting **0.0** means that this tubing will neither be rinsed nor emptied.

Diameter

Diameter of the tubing.

Input range	**0.0 - 9.9 mm**
Default value	**2.0 mm**

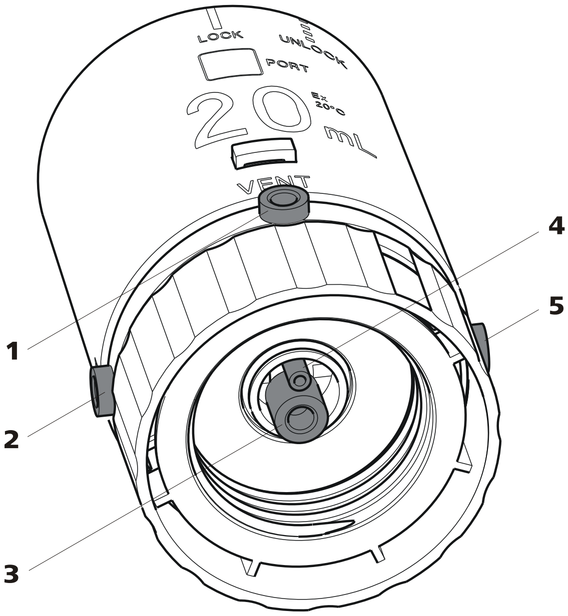


Figure 17 Dosing unit – port assignment

1	**VENT** This port is set up for the deaeration of the reagent bottle. An adsorber tube (filled with desiccant) is usually mounted here.	**2**	**Port 1** The default definition of this port is dosing port 1.
3	**Port 2** The default definition of this port is the filling port. A riser tube is usually mounted to it.	**4**	**Port 4** Air is suctioned through this port during the **Emptying** function.
5	**Port 3** The default definition of this port is dosing port 2.		

8.4.3 Shift direction of the valve disk

Titrant: **Edit ▸ Dosing unit ▸ Valve disk**

In this dialog, you can specify the shift direction of the valve disc.

Direction

Shift direction of the valve disc.

Selection	**descending | ascending | automatic | not over**
Default value	**automatic**

descending
The ports are moved to in descending order.

ascending
The ports are moved to in ascending order.

automatic
The ports are moved to by the shortest path.

not over
Define a protected port.

Not over port

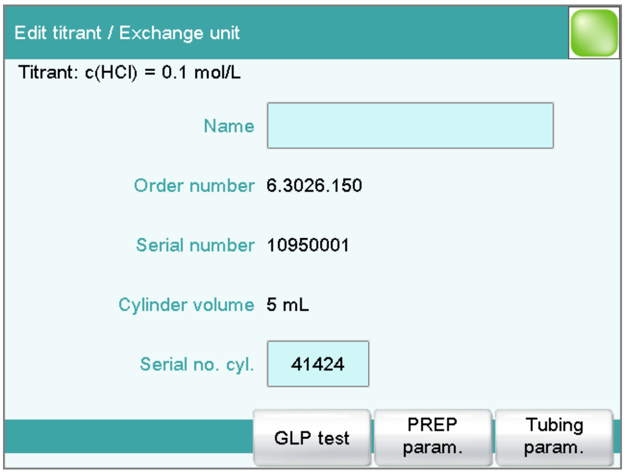
This parameter can only be edited with **Direction** = **not over**.

Define a protected port if the valve disc is not to be rotated over this port (useful with pipetting functions). The protected port can, however, be moved to directly.

Selection	**1 | 2 | 3 | 4**
Default value	**4**

8.5 Exchange unit

Titrant: **Edit** ▸ **Exchange unit**



You can edit data for the exchange unit of the titrant in this dialog.

Name

Designation of the exchange or dosing unit.

Entry	**24 characters maximum**
Default value	**empty**

Order number

Order number of the exchange or dosing unit. It will be read out automatically on units with integrated data chips.

Entry	**24 characters maximum**
Default value	**empty**

Serial number

Serial number of the exchange or dosing unit. It will be read out automatically on units with integrated data chips.

Entry	**8 digits maximum**

Cylinder volume

Cylinder volume of the exchange unit. It will be read out automatically on exchange units with integrated data chips.

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

Serial no. cyl.

Serial number of the dosing cylinder. It will be read out automatically on exchange or dosing units with integrated data chips. The number can be changed manually at any time, e.g. when a cylinder is replaced.

Entry	**8 digits maximum**

[GLP test]

Define the time interval for the GLP test *(see Chapter 8.6, page 66)*.

[PREP param.]

Enter the parameters for the preparation *(see Chapter 8.5.1, page 63)*.

[Tubing param.]

Enter the parameters for the connected tubings *(see Chapter 8.5.2, page 64)*.

8.5.1 Parameters for the preparation (PREP)

Titrant: **Edit ▸ Exchange unit ▸ PREP param.**

In the dialog **Exchange unit / PREP parameters**, you can adjust the parameters for the execution of the **Prepare** function (command PREP). This function is used to rinse the cylinder and tubings of the exchange unit and fill it air bubble-free. You should carry out this function before the first determination or once per day.

Volume

Volume of titrant dosed during a rinsing cycle.

Input range	**0.00000 - 99999.9 mL**
Selection	**Cylinder volume**
Default value	**Cylinder volume**

Cylinder volume
The entire cylinder volume is being dosed.

Cycles

Number of rinsing cycles. We recommend carrying out at least two rinsing cycles in order to remove all air bubbles.

Selection	**1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9**
Default value	**2**

Dosing rate

Rate at which it is dosed.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

8.5.2 Tubing parameters

Titrant: **Edit ▸ Exchange unit ▸ Tubing param.**

You can enter the length and diameter of the connected tubings in the dialog **Exchange unit / Tubing parameters**. The values which have already been entered correspond to the dimensions of the supplied standard tubings.

Dosing tip

Tubing to the dosing tip *(18-**2**)*.

Length

Length of the tubing.

Input range	**0.0 - 999.9 cm**
Default value	**40.0 cm**

Diameter

Diameter of the tubing.

Input range	**0.0 - 9.9 mm**
Default value	**2.0 mm**

Dosing cylinder

Tubing to the dosing cylinder *(18-**3**)*.

Length

Length of the tubing.

Input range	**0.0 - 999.9 cm**
Default value	**13.0 cm**

Diameter

Diameter of the tubing.

Input range	**0.0 - 9.9 mm**
Default value	**2.0 mm**

Reagent bottle

Tubing to the reagent bottle *(18-**1**)*.

Length

Length of the tubing.

Input range	**0.0 - 999.9 cm**
Default value	**25.0 cm**

Diameter

Diameter of the tubing.

Input range	**0.0 - 9.9 mm**
Default value	**2.0 mm**

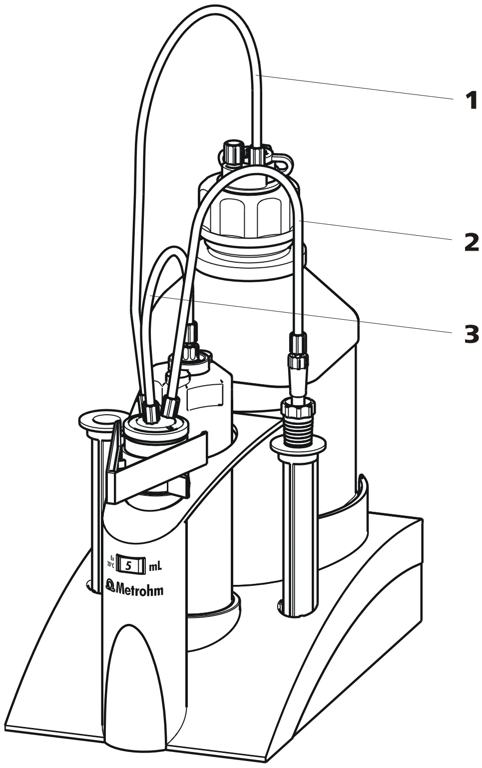


Figure 18 *Exchange unit – tubing connections*

1	**Tubing to the reagent bottle**	**2**	**Tubing to the dosing tip**
3	**Tubing to the dosing cylinder**		

8.6 GLP test for exchange unit and dosing unit

Titrant: **Edit ▸ Dosing unit / Exchange unit ▸ GLP test**

In the dialog **Exchange unit / GLP test** or **Dosing unit / GLP test**, respectively, you can define the time interval after which a GLP test must be carried out again for the exchange unit or dosing unit.

GLP test date

Date on which the last GLP test was carried out.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the time interval after which a GLP test has to be carried out again will be monitored.

GLP test interval

If you define a time interval for the GLP test, then the date in **Next GLP test** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Next GLP test

If you define a date for the next GLP test, then the **GLP test interval** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

8.7 Titer determination options and data

Titrant: **Edit ▸ Titer options**

Detailed information concerning the titer determination is displayed in the dialog **Edit titrant / Titer options**:

- **Titer method**
  Method by which the titer was determined. If the titer was entered manually, then **manual** will be displayed.
- **User**
  User who carried out the titer determination.
- **Statistical data**
  The following information is also displayed for automatically assigned titers if the mean value of the results has been saved as the titer *(see "Save as titer", page 157)*:
  - **n (titer det.)**
    Number of titer determinations.
  - **s abs**
    Absolute standard deviation
  - **s rel**
    Relative standard deviation

[Validity]

Define the time interval for the titer validity *(see Chapter 8.7.1, page 68)*.

[History]

Display information about the last ten titer determinations *(see Chapter 8.7.2, page 69)*.

8.7.1 Titer validity

Titrant: **Edit ▸ Titer options ▸ Validity**

In the dialog **Titer options / Validity**, you can define the time interval after which the titer must be determined again.

Date titer det.

Date and time of the last titer determination. For new titrants, the time the preparation was made is specified until after the first time a titer determination has been carried out.

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the titer validity will be monitored.

Titer validity

If you define a time interval for the validity of the titer, then the date in **Next titer determ.** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Next titer determ.

If you define a date for the next titer determination, then the time interval for the **Titer validity** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

8.7.2 Properties of the previous titer determinations

Dialog "Titer options / History"

Titrant: **Edit** ▸ **Titer options** ▸ **History**

The date, time and titer of the last ten titer determinations are displayed in tabular form in the dialog **Titer options / History**. Titers that were determined automatically will be displayed in green; manually entered titer values will be displayed in black with the designation **(m)**. You can delete these entries, e.g. if you have opened a new bottle.

NOTE

If multiple determinations have been carried out in order to determine the titer, then only one entry will be made in the history.

[Delete History]

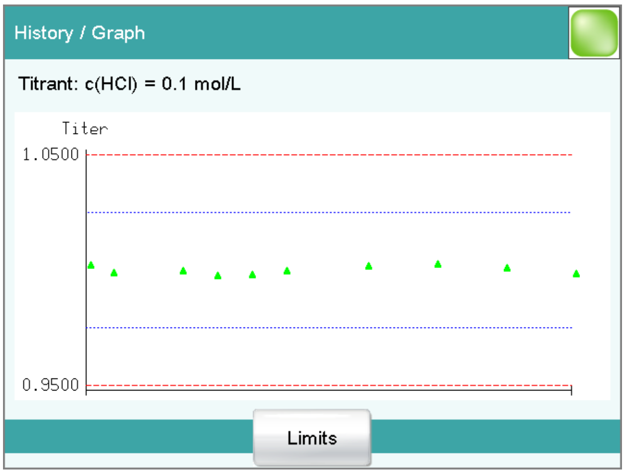
Delete the entire history.

[Graph]

Open the diagram of the titer values, see following chapter.

Dialog "History / Graph"

Titrant: **Edit ▸ Titer options ▸ History ▸ Graph**



In this diagram, titer values are plotted against the date of the titer determination. You can define warning limits (blue dashed lines) and intervention limits (red dashed lines). These limits will not, however, be monitored.

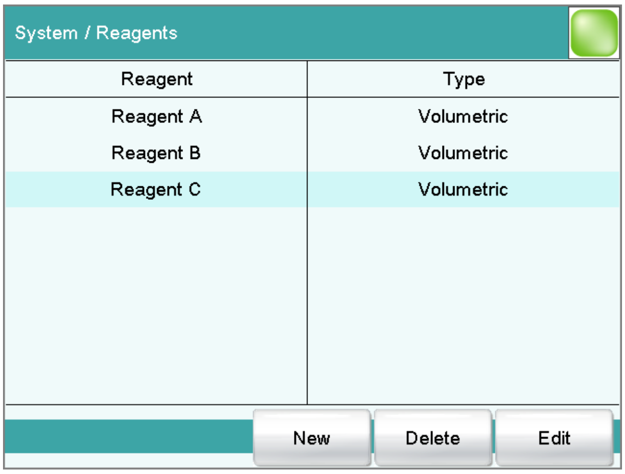
[Limits]

Define warning and intervention limits.

9 Reagents

Main dialog: **System ▸ Reagents**

This chapter describes how you can create a list of the reagents used in the system.



The list of reagents gives the designation and type of each reagent.

[New]

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

[Delete]

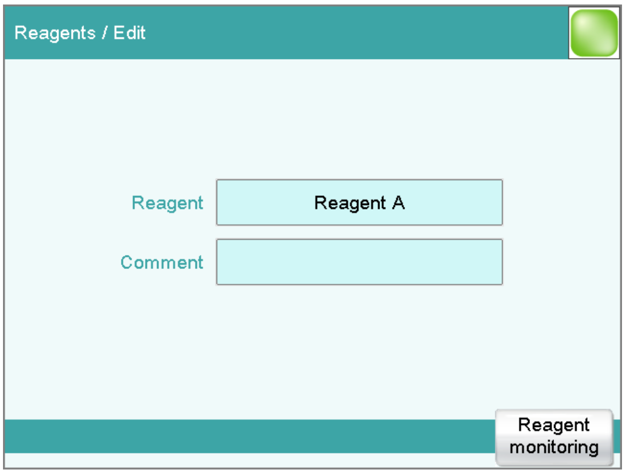
Delete the selected reagent from the list.

[Edit]

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

9.1 Editing reagent data

Main dialog: **System ▸ Reagents ▸ New / Edit**



Reagent

The designation of the reagent is used for unambiguous identification.

Entry	**24 characters maximum**

Comment

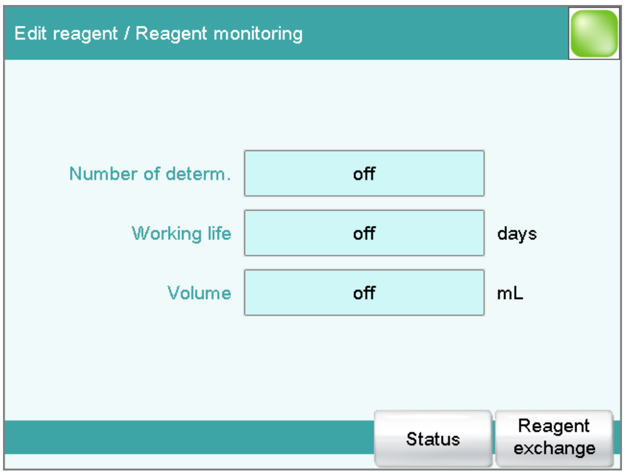
Entry	**24 characters maximum**

[Reagent monitoring]

Set the parameters for the reagent monitoring, see following chapter.

9.2 Reagent monitoring

The conditions for the monitoring of the reagent are defined in the dialog **Edit reagent / Reagent monitoring**.



If one of the following values is reached, then the reagent must be replaced. The values are checked in the following cases:

- at the start of the determination.

- at the end of the determination.

Number of determ.

The number of determinations to be carried out with a certain amount of reagent depends on the type of sample and its amount.

Input range	**1 - 999**
Selection	**off**
Default value	**off**

Working life

Working life of the reagent.

Input range	**1 - 999 days**
Selection	**off**
Default value	**off**

Volume

Volume of titrant dosed.

Input range	**1.0 - 999.9 mL**
Selection	**off**
Default value	**off**

[Status]

Display the status overview of the current values of the reagent monitoring.

[Reagent replacement]

Edit the parameters for the reagent exchange.

Dialog "Reagent monitoring / Status"

The current reagent monitoring values are displayed in this dialog.

[Reset]

Reset the values to zero.

Dialog "Reagent monitoring / Reagent replacement"

The parameters for the reagent exchange are defined in this dialog.

Reagent replacement

The reagent can either be exchanged manually or automatically.

Selection	**manual** | **auto**
Default value	**manual**

manual
If a monitored parameter has reached the limit set, a message is being displayed. Then the reagent has to be exchanged manually.

auto
If a monitored parameter has reached the limit set, the method defined below is started automatically.

Memory

This parameter can only be edited with **Reagent replacement** = **auto**.

Memory location the method is loaded from. All memory locations are selectable, even if they are currently not accessible.

Selection	**Internal memory** | **External memory 1** | **External memory 2** | **Shared memory**
Default value	**Internal memory**

Shared memory
Shared directory in the network.

Method

This parameter can only be edited with **Reagent replacement** = **auto**.

Method used for emptying the titration cell.

NOTE

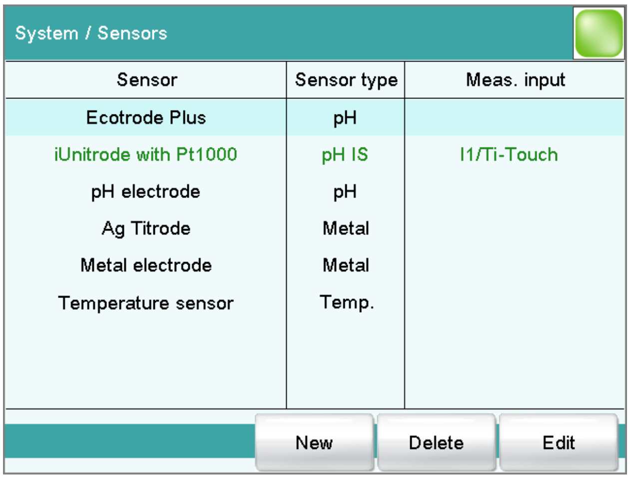
Make sure that the memory is accessible.

Entry	**32 characters maximum**
Selection	**Selection of stored methods**

10 Sensors

Main dialog: **System ▶ Sensors**

This chapter describes how you can create a list of the sensors used in the system.



Three standard sensors are defined in the sensor list: **pH electrode**, **Metal electrode** and **Temperature sensor**. These sensors cannot be deleted or renamed. A maximum of 25 additional sensors can be added to these sensors.

For each sensor, the following data is displayed in the sensor list:

- Designation
- Type
  - **pH**: pH electrode
  - **Metal**: Metal electrode
  - **Temp.**: Temperature sensor
- Measuring input/control device (only for intelligent sensors if they are connected)

Intelligent sensors are also indicated by **IS** and are depicted in green lettering.

The following sensor data is stored in the list of sensors:

- Name
  Each sensor in the system is identified by its unambiguous name.
- Calibration data (for pH sensors only)
- Calibration interval (for pH sensors only)
- Working life
- etc.

NOTE

If data is read out from the data chip of an intelligent sensor, then a check is made whether the sensor list already contains a sensor of the same serial number. If this is the case, then the older data set will **always** be overwritten by the new data set, no matter whether the data set in the sensor list or the data set on the data chip is the most recent one.

[New]

Add a new sensor to the list *(see Chapter 10.1, page 76)*.

[Delete]

Delete the selected sensor from the list.

[Edit]

Edit the data of the selected sensor *(see Chapter 10.2, page 77)*.

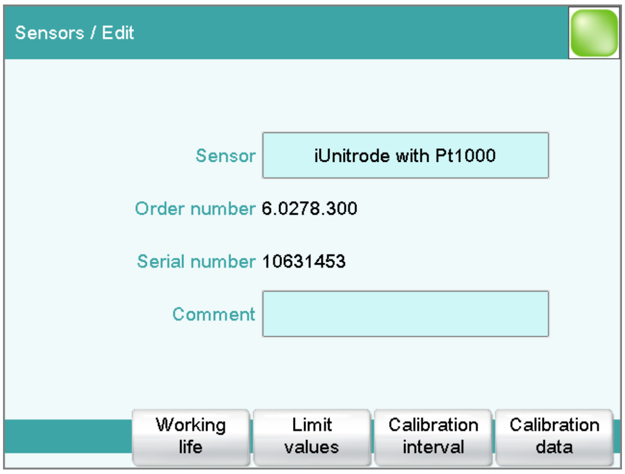
10.1 Adding a new sensor

Before you can use a sensor, you must add it to the sensor list. To do this, use the button **[New]**.

- Conventional sensors:
  The properties dialog is opened after the sensor type has been selected, see following chapter. The following sensor types can be selected:
  - pH electrode
  - Metal electrode (Pt electrode, Ag Titrode, Ag/AgCl reference electrode, etc.)
  - Other sensor, e.g. Spectrosense
  - Temperature sensor
- Intelligent sensors (also known as iTrodes):
  If the 854 iConnect with iTrode is connected to the Ti-Touch, then the sensor is automatically entered in the sensor list and can be configured, see following chapter.

10.2 Editing the sensor data

Sensor list: **Sensor** ▶ **New / Edit**



All of the data for the selected sensor is displayed in the dialog **Sensors / Edit**.

Sensor

The designation of the sensor is used for unambiguous identification.

Entry	**24 characters maximum**

Order number

Order number of the sensor. With intelligent sensors it is read out automatically.

Entry	**24 characters maximum**
Default value	**empty**

Serial number

Serial number of the sensor. With intelligent sensors it is read out automatically.

Entry	**8 digits maximum**

Comment

Entry	**24 characters maximum**

[Working life]

Define the working life of the sensor *(see Chapter 10.3, page 78)*.

[Limit values]

This button is displayed only for pH electrodes.

Define the limit values for monitoring the slope and the electrode zero point *(see Chapter 10.5, page 83)*.

[Calibration interval]

This button is displayed only for pH electrodes.

Define the time interval for the next calibration *(see Chapter 10.6, page 84)*.

[Calibration data]

This button is displayed only for pH electrodes.

Display the properties for titer determination *(see Chapter 10.4, page 79)*.

10.3 Monitoring the working life

Sensor: **Edit ▸ Working life**

In the dialog **Edit sensor / Working life**, you can define the time interval after which the sensor must be replaced. If you do not wish to monitor the working life, then you can enter only the date of manufacture for documentation purposes.

Start-up

Date on which the sensor was used for the first time.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the working life will be monitored.

Working life

If you define a time interval for the working life, then the **Expiry date** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Expiry date

If you define an expiry date, then the **Working life** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message**
	For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

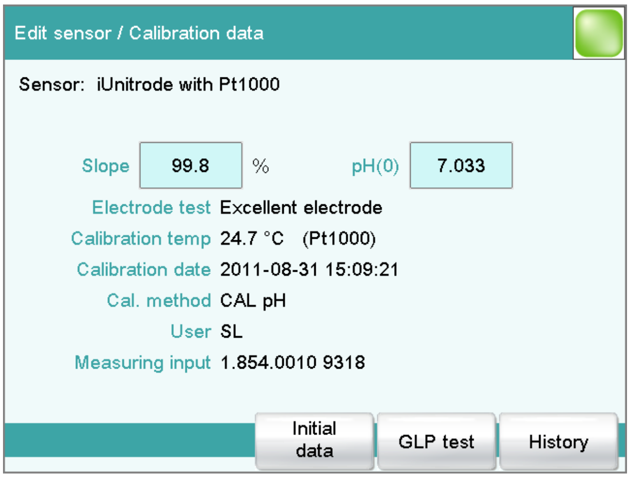
Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

10.4 Calibration data (for pH electrodes only)

Sensor: **Edit** ▶ **Calibration data**



Detailed information concerning calibration is displayed in this dialog **Edit sensor / Calibration data**.

Slope

Slope of the electrode.

pH electrodes:

Input range	**–999.9 - 999.9 %**
Default value	**100.0 %**

pH(0)

This parameter is only visible with pH electrodes.

pH value of the electrode at 0 mV. Apart from the slope, pH(0) is the second characteristic of the calibration curve.

Input range	**–20.000 - 20.000**
Default value	**7.000**

The following data cannot be edited:

- **Electrode test** (only with intelligent sensors)
  Result of the electrode test.
- **Calibration temp**
  Temperature at which the calibration was carried out.
  If the temperature was measured manually during the calibration, then **(manual)** will also be displayed. If the temperature was measured with a connected temperature sensor, then the sensor type (**(Pt1000)** or **(NTC)**) will be displayed.
- **Calibration date**
  Date and time of the last calibration. For new sensors, the time the preparation was made is specified until after the first time a calibration has been carried out.
- **Cal. method**
  Method with which the sensor was calibrated. If the calibration data was entered manually, then **manual** will be displayed.
- **User**
  User who carried out the calibration.
- **Measuring input** (only with intelligent sensors)
  The type and the serial number of the measuring input with which the calibration was carried out.

[Initial data]

This button is only displayed for intelligent sensors.

Display the initial calibration data determined at the time of the Metrohm quality control.

[GLP test]

Define the time interval for the GLP test *(see "Dialog "Calibration data / GLP test"", page 81)*.

[History]

Display information about the last ten calibrations *(see "Dialog "Calibration data / History"", page 81)*.

10.4.1 Properties of the previous calibrations

Dialog "Calibration data / History"

Sensor: **Edit** ▸ **Calibration data** ▸ **History**

The date, time and calibration data of the last ten calibrations are displayed in tabular form in the dialog **Calibration data / History**. Calibrations that were carried out automatically will be displayed in green; manually entered calibration data will be displayed in black with the designation **(m)**.

[Delete History]

Delete the entire history.

[Graph slope]

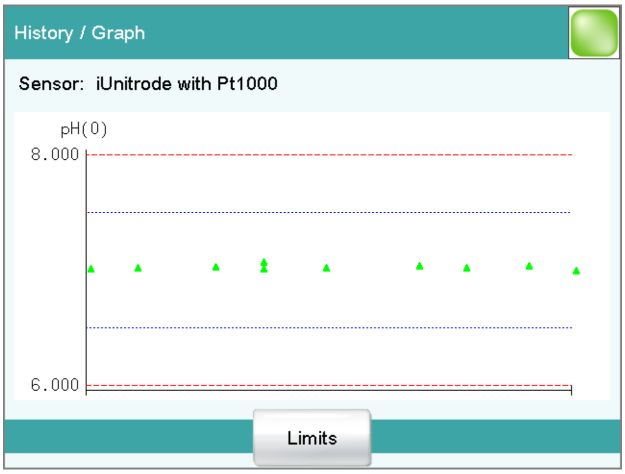
Open the diagram of the electrode slopes, see following chapter.

[Graph pH(0)]

Open the diagram of the electrode zero points, see following chapter.

Dialog "History / Graph"

Sensor: **Edit** ▸ **Calibration data** ▸ **History** ▸ **Graph Slope / pH(0).**



In this diagram, either slope or pH(0) is plotted against the date of the calibration. You can define warning limits (blue dashed lines) and intervention limits (red dashed lines). These limits will not, however, be monitored.

[Limits]

Define warning and intervention limits.

Dialog "Calibration data / GLP test"

Sensor: **Edit** ▸ **Calibration data** ▸ **GLP test**

In the dialog **Calibration data / GLP test**, you can define the time interval after which a GLP test must be carried out again for the sensor.

GLP test date

Date on which the last GLP test was carried out. After you have carried out an electrode test (ELT command), the date of the electrode test is automatically entered into this field. However, you also can enter the date manually.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the time interval after which a GLP test has to be carried out again will be monitored.

GLP test interval

If you define a time interval for the GLP test, then the date in **Next GLP test** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Next GLP test

If you define a date for the next GLP test, then the **GLP test interval** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message | Document message | Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

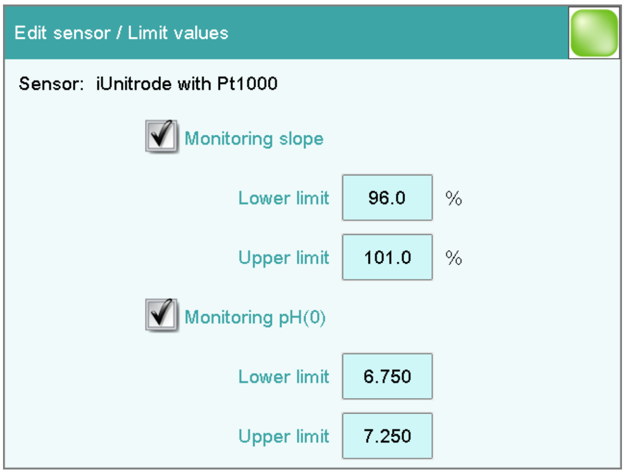
Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

10.5 Limit values for the calibration data

Sensor: **Edit** ▸ **Limit values**



You can define the following limit values in the dialog **Edit sensor / Limit values**:

- Slope (pH electrodes)
- Electrode zero point (pH electrodes)

These values are monitored during the calibration. If these limits are infringed, then a message will be displayed and you can decide whether to accept the calibration data or not.

Monitoring slope

on | off (Default value: **off**)

If this parameter is activated, then the slope will be monitored.

Lower limit

pH electrodes:	
Input range	**–999.9 - 999.9 %**
Default value	**96.0 %**

Upper limit

pH electrodes:	
Input range	**–999.9 - 999.9 %**
Default value	**101.0 %**

Monitoring pH(0)

on | off (Default value: **off**)

This parameter is only available with pH electrodes.

If this parameter is activated, then the electrode zero point pH(0) will be monitored.

Lower limit

Input range	**–20.000 - 20.000**
Default value	**6.750**

Upper limit

Input range	**–20.000 - 20.000**
Default value	**7.250**

10.6 Monitoring the calibration interval (for pH electrodes only)

Sensor: **Edit** ▶ **Calibration interval**

In the dialog **Edit sensor / Calibration interval**, you can define the time interval after which the sensor must be recalibrated.

Calibration date

Date of the last calibration.

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the validity of the calibration will be monitored.

Calibration interval

If you define a time interval for the validity of the calibration, then the date in **Next calibration** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**7 days**

Next calibration

If you define a date for the next calibration, then the **Calibration interval** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

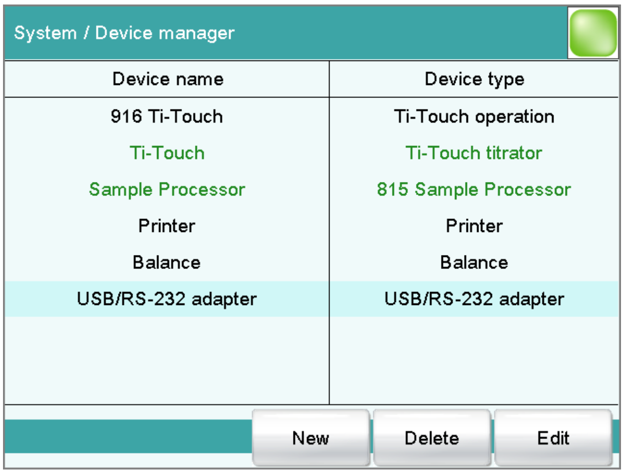
Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

11 Device manager

Main dialog: **System ▸ Device manager**

This chapter describes how you can configure the Ti-Touch, the USB Sample Processor and the connected peripheral devices. A detailed description of the hardware installation of the USB Sample Processor can be found in the corresponding installation manual.



The instrument list gives the name and type of every instrument. The **Ti-Touch titrator** is a component of the 916 Ti-Touch and therefore permanently entered as control device in the device manager. A connected USB Sample Processor with the peripheral devices (dosing devices, stirrers, etc.) connected to the MSB connector is entered in the list automatically. A USB/RS-232 adapter will also be automatically recognized and entered in the instrument list with default settings. A printer is entered in the instrument list in the default settings. You must enter a PC keyboard, a barcode reader or a balance in the instrument list yourself.

[New]

Add a new device to the list *(see Chapter 11.1, page 87)*.

[Delete]

Delete the selected device from the list.

> **NOTE**
>
> Devices which are recognized automatically cannot be deleted from the list while they are still connected.

[Edit]

Configure the selected device *(see Chapter 11.2, page 87)*.

11.1 Adding a new device

Of the following device types, you can enter one device each in the instrument list, even if it is not yet connected:

- USB Sample Processor
- Balance
- Barcode reader
- USB/RS-232 adapter
- PC keyboard

Proceed as follows:

1 Displaying the device selection

Tap on **[New]**.

2 Selecting the device

Tap on the button for the desired device.

The new device is entered in the list.

11.2 Configuring the instrument

Instrument list: **Instrument** ▸ **Edit**

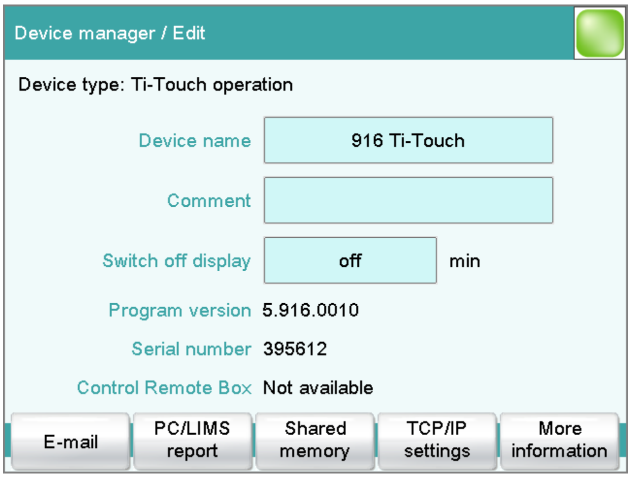
The data stored for an instrument depends on the type of instrument. You can define an instrument name and a comment for each instrument. The instrument name of the Ti-Touch is printed out in the standard report header.

The description of the individual instruments can be found in the following specific chapters:

- Ti-Touch *(see Chapter 11.3, page 88)*
- Metrohm control devices *(see Chapter 11.4, page 94)*
- USB Sample Processor *(see Chapter 11.5, page 97)*
- Printer *(see Chapter 11.7, page 114)*
- Balance *(see Chapter 11.8, page 118)*
- PC keyboard *(see Chapter 11.10, page 121)*
- USB/RS-232 adapter *(see Chapter 11.9, page 119)*
- Barcode reader *(see Chapter 11.11, page 122)*

11.3 Ti-Touch

Instrument list: **916 Ti-Touch ▸ Edit**



Device name

This designation is used for identification purposes when selecting control devices (command, manual control).

Entry	**24 characters maximum**

Comment

Entry	**24 characters maximum**

Switch off display

If this time interval has expired without the Ti-Touch having been operated, then the display will be switched off. Touching the display will switch it back on again at any time.

Input range	**1 - 999 min**
Default value	**60 min**
Selection	**off**

Program version

Program version of the software.

Serial number

Shows the serial number of the device.

Control Remote Box

Shows to which control device and MSB connector the Remote Box is connected.

The "Control Remote Box" is the interface via which the system can be started and stopped externally. If multiple Remote Boxes are connected, then the one that is recognized first when the program starts will be used as the "Control Remote Box."

Selection	**Name of the control device / Number of the MSB connector | Not available**

11.3.1 E-mail

916 Ti-Touch: **Edit ▸ E-mail**

The system allows you to send displayed messages as e-mails. The Ti-Touch must be connected to a network for this to function. The following types of messages can be sent:

- ⚠: general warning messages
- STOP: error messages

Configuring e-mail dispatch

Proceed as follows so that messages can be sent as e-mails:

1 Activating the option

- In the instrument properties of the 916 Ti-Touch, tap on the **[E-mail]** button.
- In the **Edit device / E-mail** dialog, activate the **Send the following messages as e-mail:** option.

2 Configuring e-mail addresses

- Tap on the **[E-mail settings]** button.
  The **E-mail / Settings** dialog is displayed.
- Enter the addresses of the mail server, the sender and the desired recipient.

Parameter description

Send the following messages as e-mail:

on | off (Default value: **off**)

If this parameter is activated, then messages with the following symbols will be sent as e-mails:

- ⚠: General warning messages
- STOP: Error messages

Send only during running determination

on | off (Default value: **on**)

If this parameter is activated, then messages will be sent as e-mails only if a determination is running. Deactivate this parameter if messages are also to be sent in normal status.

Mail server

Address of the mail server for outgoing mail, e.g. mail.metrohm.ch. You can find the address of the mail server either in your e-mail program settings or obtain it from your IT department.

Entry	**24 characters maximum**
Default value	**empty**

Sender

E-mail address of the sender. This address must be formatted as an e-mail address, but need not necessarily correspond to an existing e-mail account, e.g. ti-touch@metrohm.com.

Entry	**24 characters maximum**
Default value	**empty**

Recipient

The messages will be sent to this e-mail address.

Entry	**24 characters maximum**
Default value	**empty**

11.3.2 PC/LIMS report

916 Ti-Touch: **Edit ▸ PC/LIMS report**

You can generate a machine-readable report with all of the important data concerning a determination, which is referred to as a PC/LIMS report. This report can be saved as a TXT file or sent to a terminal program or a LIMS via an RS-232 interface:

- manually with the **[ ]** fixed key *(see Chapter 26, page 242)*.
- automatically at the end of a determination *(see Chapter 16.5.6, page 184)*.

The file name of the TXT file is constructed as follows: *PC_LIMS_Report-ID1-YYYYMMDD-hhmmss.txt*. A detailed description of the contents of the PC/LIMS report can be found in the *PC/LIMS Report Guide*.

Memory

Memory location where the PC/LIMS report is stored as a TXT file. The report will be saved in the directory *pc_lims_report*. This directory will be created the first time a PC/LIMS report is generated. All three memory locations are listed as possible selections, even if they cannot be accessed at the moment.

Selection	**off** | **External memory 1** | **External memory 2** | **Shared memory**
Default value	**off**

off
The report will not be saved as a TXT file.

Shared memory
The report will be saved in a shared directory on the network. The shared directory is selected in the **Edit device / Shared memory** dialog *(see Chapter 11.3.3, page 91)*.

RS-232

The RS-232 interface via which the PC/LIMS report is sent. The interface parameters are adjusted in the **Edit device / Port parameters** dialog *(see Chapter 11.9, page 119)*.

Selection	**off** | **COM 1** | **COM 2**
Default value	**off**

off
The report will not be sent via an RS-232 interface.

COM 2
This interface is inactive.

Coding

Format in which the PC/LIMS report is coded and stored.

Selection	**ISO 8859-1** | **UTF-8**
Default value	**ISO 8859-1**

ISO 8859-1
This format is recommended for all languages that use the extended ASCII code (e.g. German, English, Spanish, etc.).

UTF-8
This format is required for all languages that do not use the extended ASCII code (e.g. Russian, Chinese, Korean, etc.).

11.3.3 Shared memory

916 Ti-Touch: **Edit ▸ Shared memory**

If you have your Ti-Touch connected to your network, then you can specify in this dialog a shared memory location on a PC within your network for the purpose of saving data (methods, determinations, etc.).

CAUTION

If the computer on which you share a memory location does not have the same subnet mask as the Ti-Touch, then a WINS server must be present. The computer must be entered in this server.

Computer

Host name of the computer on which a memory location is to be shared. If you are working with Windows, then you will find the host name of the computer as follows: In the Windows **command prompt** window, enter the command **ipconfig -all**. The host name is listed together with other parameters of the computer.

Do not under any circumstances enter an IP address in this input field.

Entry	**max. 32 characters**
Default value	**empty**

Share name

Share name of the shared memory location (file directory) on the above-specified computer. Please note that the Share name of a file directory often does not match the name of the file directory. The share name can be found on the Release tab in the Properties dialog of the shared file directory.

Entry	**max. 32 characters**
Default value	**empty**

Domain

Network domain in which the above-specified computer is located. If you are working with Windows, then you will find the domain name as follows: In the Windows **command window**, enter the command **ipconfig -all**. The domain is listed together with other parameters of the computer. Leave the field empty if the computer is not located within a domain.

Entry	**max. 32 characters**
Default value	**empty**

User

User name of the user authorized to access the shared memory location.

Entry	**max. 32 characters**
Default value	**empty**

Password

Password of the user configured on the computer.

Entry	**max. 32 characters**
Default value	**empty**

[Connect]

Establish the network connection. If the connection has been set up correctly, then all of the input fields will become inactive and the label switches to **[Disconnect]**. The network connection can be disconnected with this.

11.3.4 TCP/IP settings

916 Ti-Touch: **Edit ▸ TCP/IP settings**

If you have your Ti-Touch connected to your network, then you have to define the network-relevant settings in this dialog. The Ti-Touch requires an IP address so that it is identifiable on the network. The Ti-Touch can acquire the IP address either dynamically from a DHCP server or you can enter the address directly.

Get IP address automatically (DHCP)

on | off (Default value: **on**)

If this parameter is activated, then the Ti-Touch will obtain its IP address directly from a DHCP server. In this case, the remaining parameters can no longer be edited.

IP address

IP address for the Ti-Touch. IP addresses are 32-bit numbers and are written as sequences of four decimals, each separated by a period, e.g. "10.157.212.8".

Entry	**x.x.x.x**
Default value	**empty**
	"x" is a decimal between 0 and 255.

Subnet mask

The net mask or subnet mask, together with the IP address, indicates to which network the device to be connected belongs. Subnet masks are 32-bit numbers and are written as sequences of four decimals, each separated by a period.

Entry	**x.x.x.x**
Default value	**255.255.255.0**

Default gateway

IP address for the standard gateway. A gateway sets up connections to several networks. It is located in the same subnet as the device to be configured.

Entry	**x.x.x.x**
Default value	**empty**

MAC address

Unambiguous address of the network adaptor for identification within a network. This parameter cannot be edited.

NetBIOS name

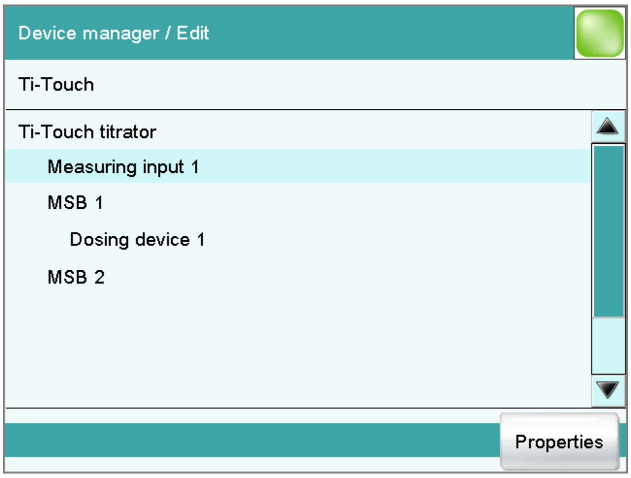
Unambiguous designation of the device within the network. This parameter cannot be edited.

11.4 Metrohm control devices

The following Metrohm devices can be used as control devices:

- Ti-Touch Titrator (permanently entered as control device in the device manager)
- USB Sample Processors

The following specifications apply for all of the control devices mentioned above. Additional device configurations for the USB Sample Processor are described in a separate chapter *(see Chapter 11.5, page 97)*.



The dialog shows the control device with its measuring inputs, the MSB connectors and connected peripheral devices (dosing device, stirrer, Remote Box).

[Properties]

Open the properties dialog of the highlighted entry.

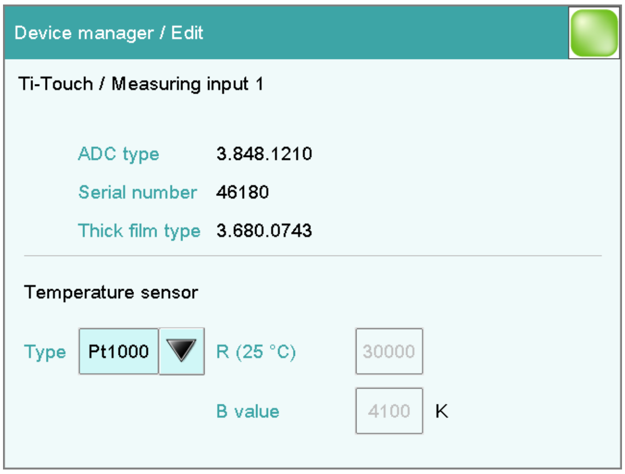
The following properties can be displayed and edited to a certain extent:

- Properties of the measuring inputs *(see Chapter 11.4.1, page 95)*
- Properties of the MSB connectors *(see Chapter 11.4.2, page 96)*

- Properties of the peripheral devices on the MSB connector *(see Chapter 11.4.3, page 97)*

11.4.1 Properties – Measuring input

List of devices: **Control device ▶ Edit ▶ Measuring input 1 ▶ Properties**



In this dialog, you define the type of temperature sensor you have connected to the selected measuring input.

ADC type

Type of analog-digital converter.

Serial number

Serial number of the measuring interface.

Thick film type

Type of the thick film.

Temperature sensor

Type

The instrument supports the use of two different temperature measurement techniques:

- NTC (Negative Temperature Coefficient)
- Pt1000 (Platinum resistance)

Select here the type that has been connected to the instrument. If an NTC sensor is used, then it is also necessary to enter two sensor characteristics. These characteristics are listed in the specifications of the sensor.

Selection	**Pt1000 | NTC**
Default value	**Pt1000**

R (25 °C)

This parameter can only be edited with **Type** = **NTC**.

Nominal resistance of the NTC sensor at 25 °C.

Input range	**1000 - 99999 ohm**
Default value	**30000 ohm** The default value applies to Metrohm sensors with an NTC sensor.

B value

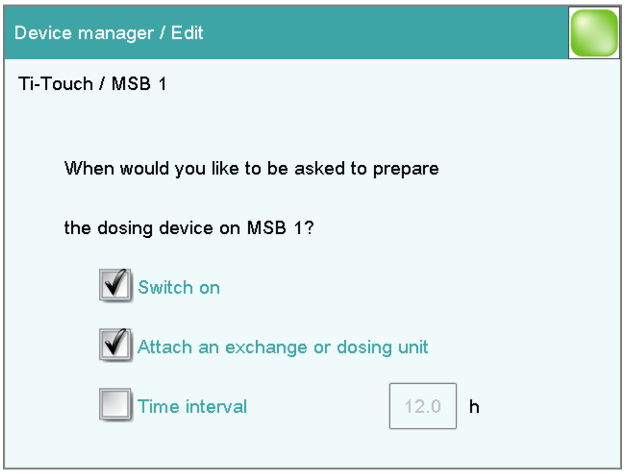
This parameter can only be edited with **Type** = **NTC**.

Material constant of the NTC sensor. B values of NTC sensors are frequently based on different reference temperatures (usually 25 °C and 50…100 °C). When entering the B value the influence of the second reference temperature is negligible in comparison with the measuring accuracy of an NTC sensor.

Input range	**1000 - 9999 K**
Default value	**4100 K** The default value applies to Metrohm sensors with an NTC sensor. If no B value is given for your sensor then you can retain the default value.

11.4.2 Properties – MSB connector

List of devices: **Control device** ▸ **Edit** ▸ **MSB connector 1/2** ▸ **Properties**



In this dialog, you can define when the request to carry out the **Prepare** function for connected dosing devices is to be displayed. This setting applies for all dosing devices of the selected MSB connector. The manual control contains a description of how to prepare the exchange unit and/or the dosing unit *(see Chapter 27.3.3, page 260)*.

Switch on

on | off (Default value: **on**)

If this parameter is activated, then you will be requested to prepare the dosing device when the Ti-Touch is switched on.

Attach an exchange or dosing unit

on | off (Default value: **on**)

If this parameter is activated, then you will be requested to prepare the dosing device when the exchange/dosing unit is attached.

Time interval

on | off (Default value: **off**)

Activate this parameter if you wish to receive a regular request to prepare the dosing unit.

Input range	**0.1 - 999.9 h**
Default value	**12.0 h**

11.4.3 Properties – Peripheral devices

List of devices: **Control device ▸ Edit ▸ Peripheral device ▸ Properties**

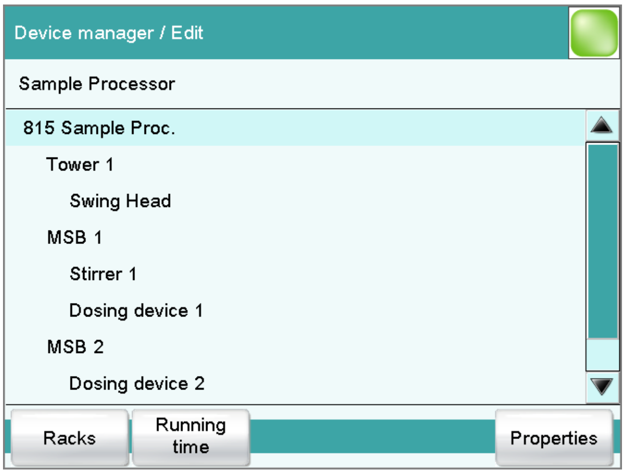
The following data is displayed for the connected dosing devices and stirrers:

- Type
  The display includes the device number, e.g. "800" (Dosino)
- Serial number

11.5 USB Sample Processor

NOTE

The following settings apply to all USB Sample Processors.



The dialog shows the USB Sample Processor with its tower (or towers), the MSB connectors and connected peripheral devices (dosing unit, stirrer, Remote Box). If the control device is not connected, then the properties dialog of the control device will be displayed directly *(see Chapter 11.5.1, page 98)*.

The settings of the MSB connectors and the connected peripheral devices are described in *Chapter "Properties – MSB connector", page 96*.

[Racks]

Configure sample racks *(see Chapter 11.6, page 105)*.

[Running time]

Configure the running time meter.

The running time meter adds together the time while the USB Sample Processor is "busy" i.e. when a single action is being carried out. A message with the prompt to service the device is displayed after expiry of the time limit set here. We recommend to carry out a service after 1000 operating hours. A reset of the running time meter can only be carried out by a Metrohm service technician.

[Properties]

Open the properties dialog of the highlighted entry.

11.5.1 Properties – Sample Processor

List of devices: **Sample Processor ▶ Edit ▶ Properties**

Device name

This designation is used for identification purposes when selecting control devices (command, manual control).

Entry	**24 characters maximum**

Comment

Entry	24 characters maximum

Program version

Program version of the instrument software.

Serial number

Shows the serial number of the device.

Rack name

Name of the currently attached sample rack.

[Adjustment data]

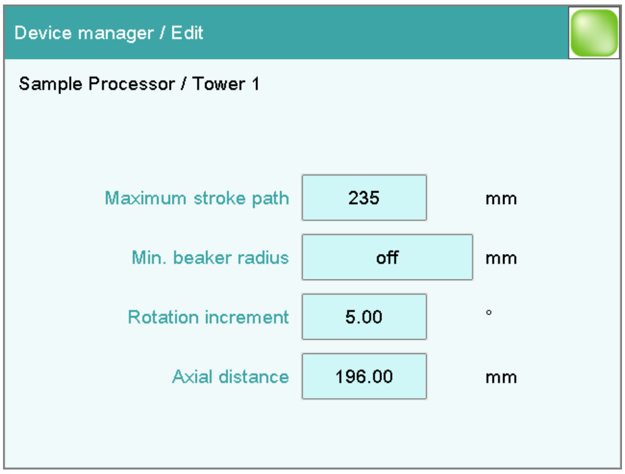
Display the internal adjustment data (EEPROM data) of the USB Sample Processor.

CAUTION

Do not modify and save these settings under any circumstances. This data is required by the service technician in case of positioning problems.

11.5.2 Properties – Tower

List of devices: **Sample Processor** ▸ **Edit** ▸ **Tower 1/2** ▸ **Properties**



NOTE

In the case of a USB Sample Processor with 2 towers, Tower 1 is the tower on the right and Tower 2 is the tower on the left, when viewed from the front.

Maximum stroke path

Lowest permissible lift position for automatic and manual operation.

This is a safety setting. A correct specification of this value can prevent the glass of an electrode from breaking, because a titration head can not be moved below the position specified.

Input range	**1 - 235 mm**
Default value	**235 mm**

Min. beaker radius

Smallest permissible radius of the sample vessels for automatic and manual operation.

This is a safety setting. It is intended to prevent a completely loaded, wide titration head from being moved into a narrow sample vessel.

Input range	**1.0 - 100.0 mm** (Increment: **0.1**) If the lift is to be moved to the work position, a check is made to see whether the beaker radius defined for the attached rack *(see "Beaker radius samples", page 108)* is less than this value.
Selection	**off**
Default value	**off**

off
No check takes place.

Rotation increment

Amount by which the sample rack can be rotated forward or backward relative to its current position. This parameter is required in the command **MOVE** for the settings **Destination** = **rotate +** and **rotate -**.

Input range	**0 - 353.99 °**
Default value	**5.00 °**

Axial distance

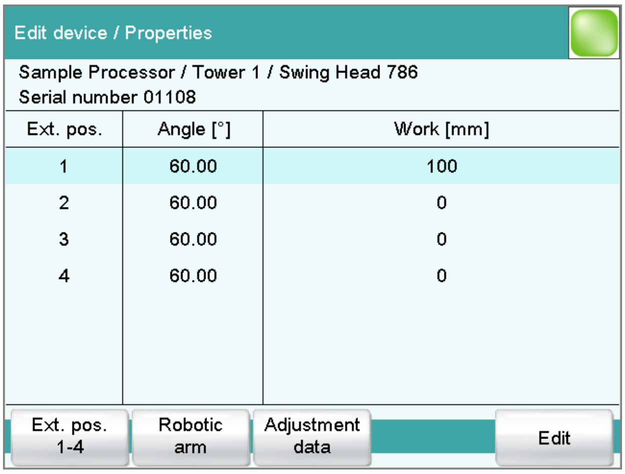
Distance between the axis of rotation of the sample rack and swing axis of the robotic arm.

for 814 USB Sample Processor XL:	
Input range	**100.0 - 300.0 mm**
Default value	**166.0 mm**

for 815 Robotic USB Sample Processor XL:	
Input range	**100.0 - 300.0 mm**
Default value	**196.0 mm**

11.5.3 Properties – Swing Head

List of devices: **Sample Processor ▶ Edit ▶ Swing Head ▶ Properties**



The dialog **Edit device / Properties** shows a list of all external positions with the assigned swing angle and the specific work position for each.

[Ext. pos. 1-4]

Edit the settings that apply for all external positions *(see "Properties – External positions 1-4", page 101)*.

[Robotic arm]

Edit the robotic arm settings *(see "Properties – Robotic arm", page 103)*.

[Adjustment data]

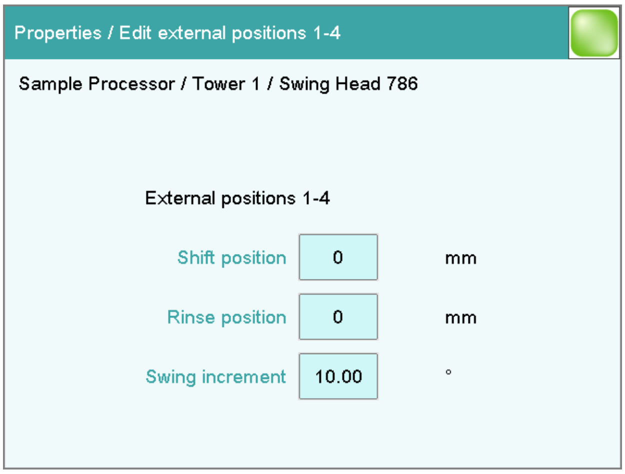
Display the overview of the EEPROM data of the Swing Head. This dialog cannot be edited.

[Edit]

Edit specific settings of the selected external position *(see "Properties – External position", page 104)*.

Properties – External positions 1-4

Swing Head: **Properties ▶ Ext. pos. 1-4**



Properties which apply to all four external positions can be defined in the dialog **Properties / Edit external positions 1-4**.

Shift position

Lift position at which the robotic arm rotates to the external positions.

Input range	**0 - 'Maximum stroke path' mm**
Default value	**0 mm**
	A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*.

Rinse position

Lift position used for rinsing.

Input range	**0 - 'Maximum stroke path' mm**
Default value	**0 mm**
	A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*.

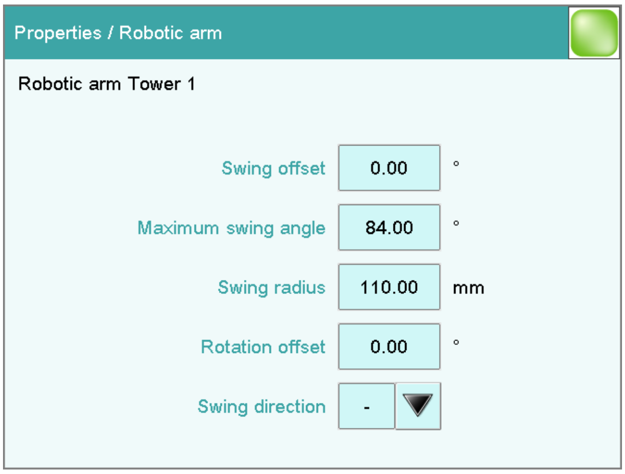
Swing increment

Amount by which the robotic arm can be swung relative to its current position. This parameter is used in the command **MOVE** for the settings **Destination** = **swing +** and **swing -**.

Input range	**0.00 - 180.00 °**
Default value	**10.00 °**

Properties – Robotic arm

Swing Head: **Properties ▸ Robotic arm**



Properties of the robotic arm can be defined in the dialog **Properties / Robotic arm**.

Swing offset

The swing offset is a physical angle offset of a specific robotic arm model. The required values can be found in the leaflet for the robotic arm.

Input range	**–270.00 - 270.00 °**
Default value	**0.00 °**

Maximum swing angle

Useable swing range of the robotic arm. Each robotic arm model displays a different value on the basis of its construction. The range can also be reduced if necessary. You will find the required values in the leaflet for the robotic arm.

Input range	**0.00 - 330.00 °**
Default value	**60.00 °**

Swing radius

Maximum swing radius of the robotic arm. The swing radius is dependent on the length of the robotic arm and is, together with the axial distance *(see "Axial distance," page 100)*, the most important variable for precise movement to a rack position. You will find the required values in the leaf-let for the robotic arm.

Input range	**30.00 - 300.00 mm**
Default value	**110.00 mm**

Rotation offset

The rotation offset is the offset from the center of the tower to the center of the robotic arm. This value does not usually need to be changed. If a Swing Head is to be mounted on the tower with a lateral offset, then this value can be determined by the service technician when the rack is adjusted.

Input range	**–270.00 - 270.00 °**
Default value	**0.00 °**

Swing direction

The swing direction of the robotic arm depends on its type. For a 2-tower model, the robotic arm must be defined as right-swinging on Tower 1 and as left-swinging on Tower 2.

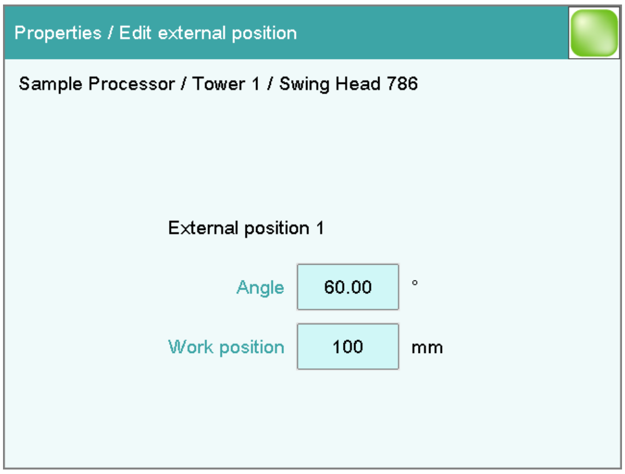
Selection	**+ | -**
Default value	**-**

+
Left-swinging.

-
Right-swinging.

Properties – External position

Swing Head: **Properties** ▸ **Edit**



Properties which apply only to the selected external position can be defined in the dialog **Properties / Edit external position**.

Angle

Swing angle for the selected external position.

Input range	**(Offset) - (Offset + max. swing range) °**
Default value	**60.00 °**
	The offset is made up of a design-dependent angle (approx. 8…9°) together with the robotic arm offset from the robotic arm properties. The maximum swing range is also defined under the robotic arm properties *(see "Properties – Robotic arm", page 103)*.

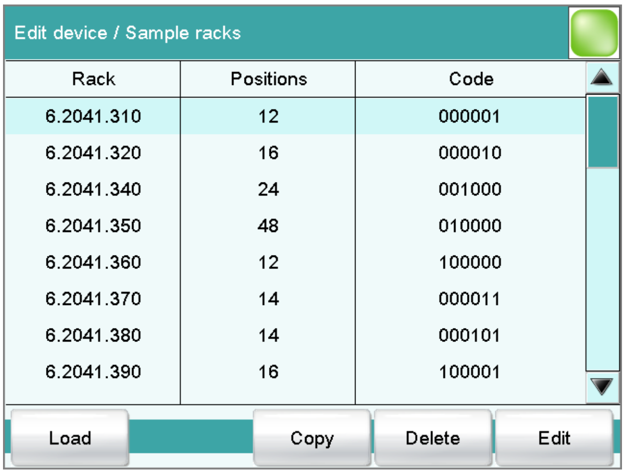
Work position

Work position for the selected external position.

Input range	**0 - 'maximum stroke path' mm**
	A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*.

11.6 Sample racks

List of devices: **Sample Processor ▶ Edit ▶ Racks**



In the dialog **Edit device / Sample racks**, you will find the list of configured racks. The attached rack is displayed in green. New racks can be loaded or created and existing ones can be edited or deleted in this dialog window.

The following data is displayed in the list:

- **Rack**
  Name of the sample rack. Metrohm standard racks are designated by their order numbers.

- **Positions**
  Number of positions on the rack.
- **Code**
  The rack code corresponds to the alignment of magnets on the underside of the rack and is read out by the Sample Processor for rack recognition.

[Load]

Load a new sample rack *(see "Loading the sample rack", page 106)*.

[Copy]

Create a new sample rack by copying an existing rack *(see "Creating a new sample rack", page 107)*.

[Delete]

Delete the selected sample rack from the list.

[Edit]

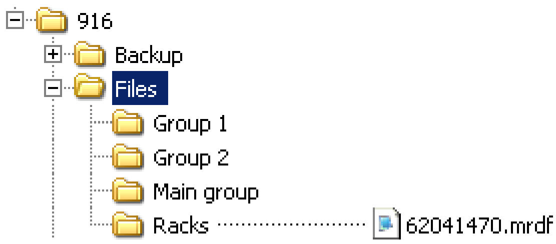
Edit the data of the selected sample rack *(see Chapter 11.6.1, page 107)*.

Loading the sample rack

When you receive the file for a new sample rack from your Metrohm representative, you can easily import this file into your existing system. Proceed as follows:

1 Copy file to an external storage medium

- Copy the file to a sub-directory of "Files".



  If this structure is not maintained, the new rack will not be found because the software directly accesses subdirectories of "Files".
- Plug in the external storage medium at the Ti-Touch.

2 Display the list of saved sample racks

- In the dialog **Edit device / Sample racks**, tap on the button **[Load]**.
  The selection of file groups on the external storage medium is displayed. If only one group is available, then the list of the saved sample rack files will be displayed directly.
- Select the group with the desired sample rack.

- Tap on **[Show files]**.

The list with the saved sample rack files is opened.

3 Load the sample rack file

- Select the desired file.
- Tap on **[Load]**.

The new sample rack is now loaded and appears in the list of available racks.

Creating a new sample rack

Own sample racks can be simply and conveniently created by copying an existing sample rack. Proceed as follows:

1 Copy the existing rack

- In the dialog **Edit device / Sample racks**, select a sample rack which is to be used as a template.
- Tap on **[Copy]**.

The dialog **Sample rack / Copy** is displayed.

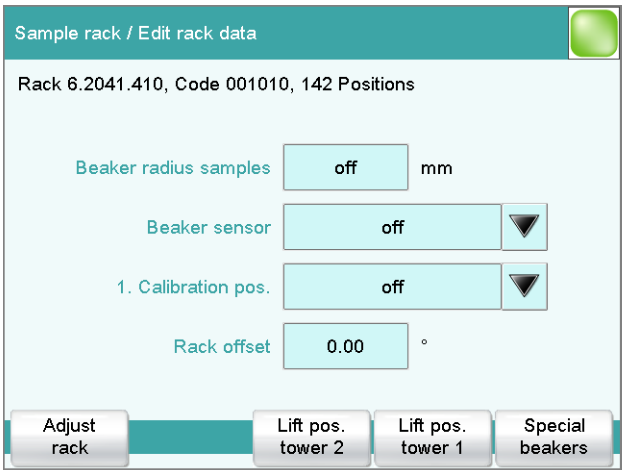
2 Enter the rack name and rack code

- In the field **New rack name**, enter a name for the new rack.
- In the field **New rack code**, **110000** is suggested. As a rule, this rack code is used for special racks. Apply this code or enter a new rack code and confirm with **[OK]**.

The new sample rack appears in the list of available racks.

11.6.1 Editing rack data

Sample rack list: **Rack ▸ Edit**



You can edit the data of the selected rack in the dialog **Sample rack / Edit rack data**.

Beaker radius samples

Actual radius of the sample vessels at the general sample positions of the rack.

This beaker radius may not be less than the minimum beaker radius defined in the tower properties *(see "Min. beaker radius," page 100)*. If the lift is to be moved to the work position, then these two values will be compared with one another.

Input range	**1.0 - 100.0 mm**
Selection	**off**
Default value	**off**

off
No check takes place.

Beaker sensor

Each time a sample position is to be moved to with the **MOVE** command, the beaker sensor checks whether a vessel is present. In the **MOVE** command, you define the action that takes place if the beaker sensor does not detect a vessel at the position being moved to.

Selection	**Tower | Robotic arm | off**
Default value	**off**

Robotic arm
A Swing Head with beaker sensor must be mounted. In addition, a suitable work position must be defined for the lift, so that the robotic arm touches the sample vessel. The work position is moved to for the purpose of beaker detection.

off
No check takes place.

1. Calibration pos.

Position of the first calibration solution for automatic calibration with a USB Sample Processor *(see "Definition of the calibration positions", page 413)*.

Input range	**1 - "highest rack position"** It is imperative that the remaining buffers/standards be placed on the rack positions directly following.
Selection	**Special beaker 1…n | off**
Default value	**off**

Special beaker 1…n

If a special beaker is selected as the first calibration position, then the number of buffers used for calibration will determine the number of special beakers to be defined. Any rack position can be defined as a special beaker. It is, however, preferable to set them at high rack positions in order to be able to begin sample series at rack position 1. The special beakers are moved to in ascending order.

Rack offset

The rack offset is a production-related tolerance value between the upper and lower sections of the rack. This value is determined when the rack is adjusted and is displayed here. It can be changed if necessary.

Input range	**–10.00 - 10.00 °**
Default value	**0.00 °**

[Adjust rack]

Adjust the rack *(see Chapter 11.6.2, page 113)*.

[Lift pos. tower 1]/[Lift pos. tower 2]

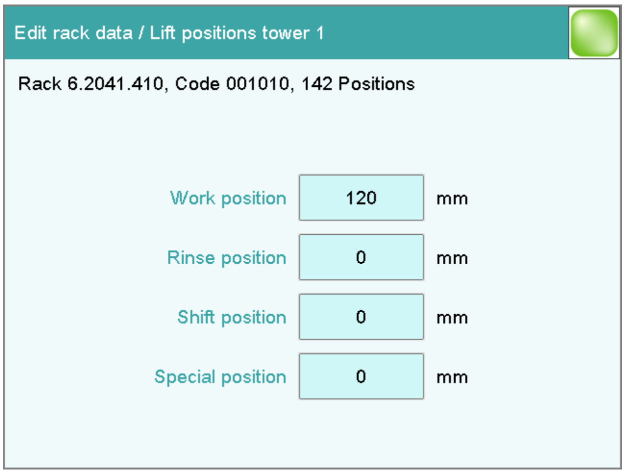
Define rack specific lift positions *(see "Lift positions Tower 1/2", page 109)*.

[Special beakers]

Define rack positions as special beakers *(see "Editing special beakers", page 111)*.

Lift positions Tower 1/2

Sample rack list: **Rack ▸ Edit ▸ Lift pos. tower 1 / Lift pos. tower 2**



You can define rack-specific lift positions in the dialog **Edit rack data / Lift positions tower 1/2**. These then apply for all rack positions except those that have been defined as special beakers.

These positions can be moved to directly under manual control and with the LIFT command. Only lift positions within the maximum stroke path can be entered. This is defined in the device properties of the tower.

NOTE

These lift positions can also be assigned directly in manual control after moving to the desired lift height *(see Chapter 27.6.1, page 267)*.

Work position

At this lift position the electrodes, stirrer and buret tips are optimally positioned for work.

Input range	**0 - 'maximum stroke path' mm** A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*.

Rinse position

Lift position used for rinsing.

Input range	**0 - 'Maximum stroke path' mm**
Default value	**0 mm** A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*.

Shift position

The lift is raised to this position with each rotational movement of the rack whenever it is located at a lower lift position.

Input range	**0 - 'maximum stroke path' mm** A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*.

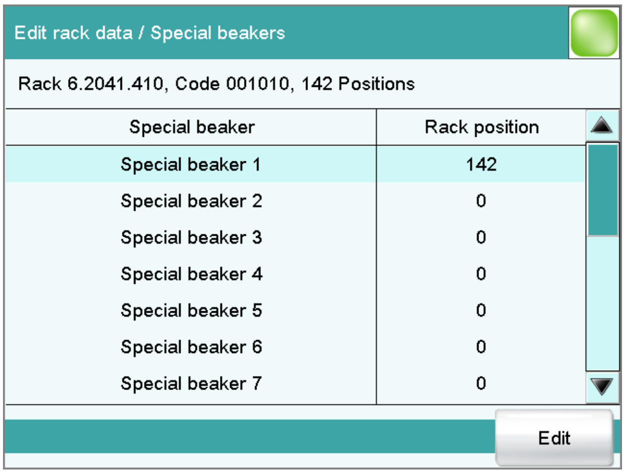
Special position

For sample positions, you can define an additional lift position for special applications.

Input range	**0 - 'maximum stroke path' mm** A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*.

Editing special beakers

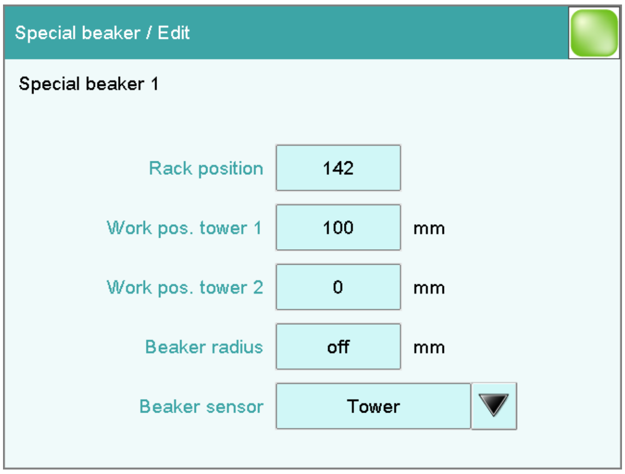
Sample rack list: **Rack** ▸ **Edit** ▸ **Special beakers**



A maximum of 16 rack positions can be defined as special beakers for each sample rack. The dialog **Edit rack data / Special beakers** shows a list of all special beakers with their assigned rack positions.

[Edit]

Edit the data of the selected special beaker, see the following.



You can edit the data of the selected special beaker in the dialog **Special beaker / Edit**.

Rack position

Number of rack position for selected special beaker. Any rack position can be defined as a special beaker. It is, however, preferable to set them at high rack positions in order to be able to begin sample series at rack position 1. Rack positions defined as special beakers can no longer be used as sample positions.

Input range	**0 - 'maximum number of rack positions'**

Work pos. tower 1/2

Work position for the selected special beaker. One specific work position can be defined for tower 1 and tower 2.

Input range	**0 - 'maximum stroke path' mm** A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*.

Beaker radius

Actual radius of the selected special beaker.

This beaker radius may not be less than the minimum beaker radius defined in the tower properties *(see "Min. beaker radius," page 100)*. If the lift is to be moved to the work position, then these two values will be compared with one another.

Input range	**1.0 - 100.0 mm**
Selection	**off**
Default value	**off**

off
No check takes place.

Beaker sensor

Each time this special beaker is to be moved to with the **MOVE** command, the beaker sensor checks whether a vessel is present. In the **MOVE** command, you define the action that takes place if the beaker sensor does not detect a vessel at the position being moved to.

Selection	**Tower | Robotic arm | off**
Default value	**off**

Robotic arm
A Swing Head with beaker sensor must be mounted. In addition, a suitable work position must be defined for the lift, so that the robotic arm touches the sample vessel. The work position is moved to for the purpose of beaker detection.

off

No check takes place.

11.6.2 Rack adjustment

List of devices: **Sample Processor ▸ Edit ▸ Racks ▸ Edit ▸ Adjust rack**

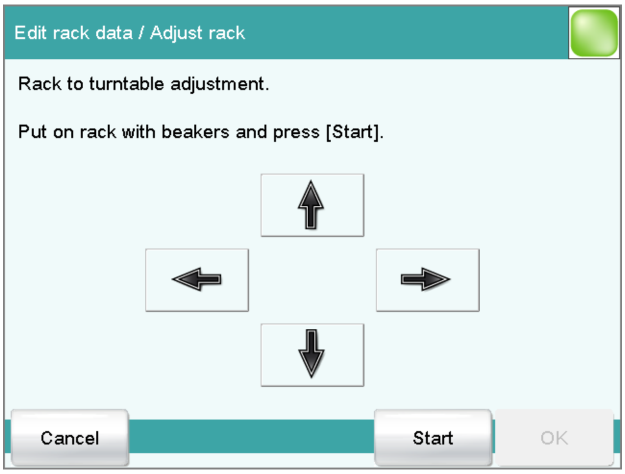
If necessary, each sample rack can be finely adjusted, i.e. the rack offset is determined in the direction of rotation. The adjustment of a rack is usually not necessary. However, if the exact positioning of a robotic arm is necessary for a high degree of accuracy (e.g. for very small sample beakers), then a fine adjustment can be carried out.

Proceed as follows:

1 Open the dialog for rack adjustment

- In the device properties of the Sample Processor, open the list of the configured sample racks.
- Select the attached rack and tap on **[Edit]**.
  The dialog **Sample rack / Edit rack data** is displayed.
- Tap on the button **[Adjust rack]**.

The dialog **Edit rack data / Adjust rack** is displayed:



2 Carry out the adjustment

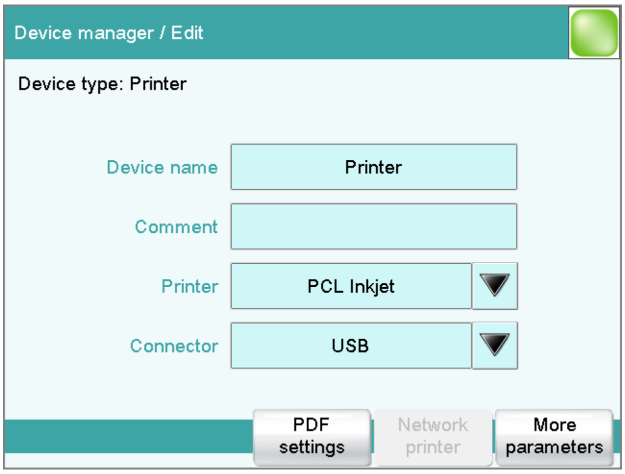
- Tap on the button **[Start]** (NOT on the fixed key **[▷]**).
  The rack is being initialized. The rack then moves to position 1 and the lift is lowered to the work position.
- If necessary, the lift position can be corrected with the arrow keys **[⇧]** and **[⇩]**.
- Now use the arrow keys **[⇦]** and **[⇨]** to rotate the rack so that the robotic arm or the center of the titration head is positioned exactly above the center of rack position 1.

- Finish the adjustment with **[OK]**.

The lift is moved to the uppermost stop.

11.7 Printer

List of devices: **Printer** ▶ **Edit**



The list of devices always includes a printer, even if no corresponding device is connected. In this dialog, you also define when you would like to have a report generated as a PDF file.

Device name

Here you can enter a device name of your choice.

Entry	**24 characters maximum**

Comment

Entry	**24 characters maximum**

Printer

Selection of the printer type.

Selection	**PCL Inkjet** | **PCL Laser** | **HP** | **Epson** | **Epson new** | **Canon** | **off**

PCL Inkjet
for HP DeskJet printers.

PCL Laser
for HP LaserJet printers.

off
The reports will not be printed out on paper.

Connector

Selection of the connection type for the printer.

Selection	**USB** | **Ethernet**
Default value	**USB**

USB
Local printer at a USB interface.

Ethernet
Network printer.

NOTE

The **Ti-Touch** prints the reports with a fixed resolution of 300 dpi. If you are using a printer with a resolution of 360 dpi (or a multiple thereof, e.g. an Epson), then the text will be printed out somewhat smaller than with printers with a resolution of 300 dpi (or a multiple thereof, e.g. a Canon or HP).

11.7.1 PDF settings

Printer: **Edit** ▸ **PDF settings**

The settings for saving a report as a PDF file are defined in this dialog.

Memory

Memory location where the PDF file will be saved. The report will be saved in the directory *PDF_Report*. This directory is created when a PDF file is generated. All three memory locations are listed as possible selections, even if they cannot be accessed at the moment.

Selection	**off** | **External memory 1** | **External memory 2** | **Shared memory**
Default value	**off**

off
The report will not be saved as a PDF file.

Shared memory
The report will be saved in a shared directory on the network. The shared directory is selected in the **Edit device / Shared memory** dialog *(see Chapter 11.3.3, page 91)*.

Copy or extract content allowed

on | off (Default value: **on**)

If this option is activated, then content can be copied or deleted from the PDF file.

Printing allowed

on | off (Default value: **on**)

If this option is activated, then the PDF file can be printed.

Change the document allowed

on | off (Default value: **off**)

If this option is activated, then the PDF file can be edited.

Add or change comments allowed

on | off (Default value: **on**)

If this option is activated, then comments can be added to the PDF file.

11.7.2 Network printer

Printer: **Edit ▸ Network printer**

If you have your Ti-Touch connected to your network, then you can specify a network printer for your reports in this dialog.

NOTE

If you have shared a memory location on a PC within your network and if you have configured the Ti-Touch accordingly *(see Chapter 11.3.3, page 91)*, then the settings for the parameters **Domain**, **User** and **Password** will be applied and can then no longer be modified in this dialog.

CAUTION

If the computer on which the network printer is configured does not have the same subnet mask as the Ti-Touch, then a WINS server must be present. The computer must be entered in this server.

Computer

Host name of the print server or the computer on which the network printer is configured. If you are working with Windows, then you will find the host name of the computer as follows: In the Windows **command prompt** window, enter the command **ipconfig -all**. The host name is listed together with other parameters of the computer.

Do not under any circumstances enter an IP address in this input field.

Entry	**max. 32 characters**
Default value	**empty**

Share name

Share name of the network printer on the above-specified computer. Please note that the Share name of a network printer often does not match the name of the printer. The share name can be found on the Release tab in the Properties dialog of the released network printer.

Entry	**max. 32 characters**
Default value	**empty**

Domain

Network domain in which the above-specified computer is located. If you are working with Windows, then you will find the domain name as follows: In the Windows **command window**, enter the command **ipconfig -all**. The domain is listed together with other parameters of the computer. Leave the field empty if the computer is not located within a domain.

Entry	**max. 32 characters**
Default value	**empty**

User

User name of the user authorized to access the shared network printer.

Entry	**max. 32 characters**
Default value	**empty**

Password

Password of the user configured on the computer.

Entry	**max. 32 characters**
Default value	**empty**

11.7.3 More options

Paper format

Selection of the paper format.

Selection	**A4 (210 mm x 297 mm) | Letter (216 mm x 279 mm)**
Default value	**A4 (210 mm x 297 mm)**

Color

on | off (Default value: **off**)

If this option is activated, then the report will be printed out in color.

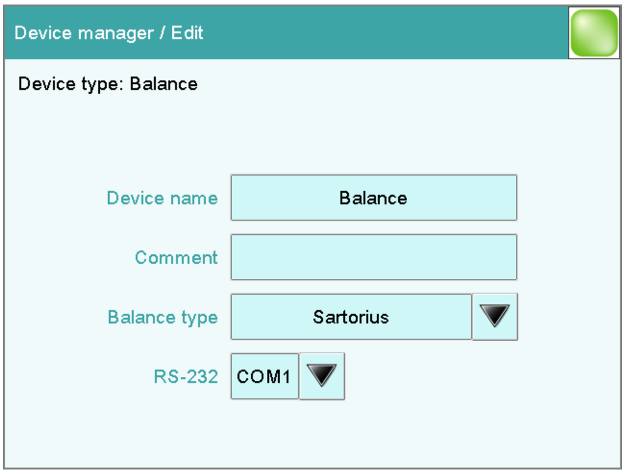
Spooler

on | off (Default value: **on**)

If this option is activated, then you can continue to work while the printer is printing. If this option is deactivated, then the Ti-Touch will be blocked while the printout is being produced.

11.8 Balance

List of devices: **Balance ▸ Edit**



You define the type of balance and its connector in the dialog **Device manager / Edit**.

Device name

Here you can enter a device name of your choice.

Entry	**24 characters maximum**

Comment

Entry	**24 characters maximum**

Balance type

If you have connected a balance, then you have to specify the balance type here.

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

RS-232

RS-232 interface to which the balance is connected. The interface parameters are adjusted in the **Edit device / Port parameters** dialog *(see Chapter 11.9, page 119)*.

Selection	**COM 1 | COM 2**
Default value	**COM 1**

COM 2
The interface is disabled.

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

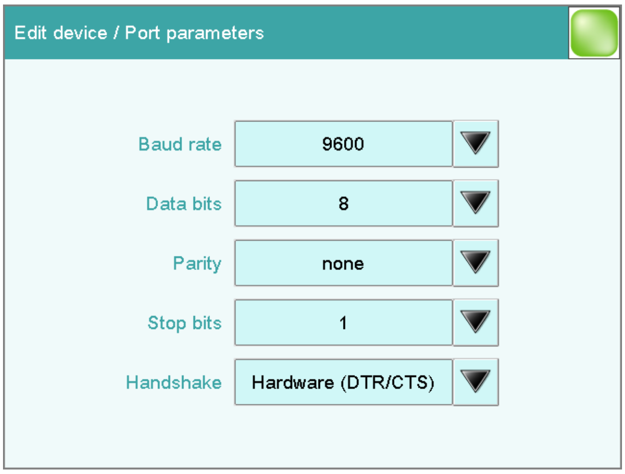
11.9 USB/RS-232 adapter

List of devices: **USB/RS-232 adapter ▸ Edit ▸ COM interface ▸ Edit**

As a rule, balances are equipped with a serial RS-232 interface. To connect a balance, you will require the 6.2148.050 cable. You can adjust the interface parameters in the dialog **Edit device / Port parameters**. These settings must match the settings on the connected device.

NOTE

If you make changes to parameter settings in this dialog, then you must switch the Ti-Touch off and back on in order for the changes to take effect.



Baud rate

Transfer rate in characters per second.

Selection	**1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 57600 | 115200**
Default value	**9600**

Data bits

Number of data bits.

Selection	**7 | 8**
Default value	**8**

Parity

Type of parity testing.

Selection	**even | odd | none**
Default value	**none**

Stop bits

Number of stop bits.

Selection	**1 | 2**
Default value	**1**

Handshake

Type of data transfer protocol.

NOTE

In case of communication problems, try the software handshake (**Software (XON/XOFF)**).

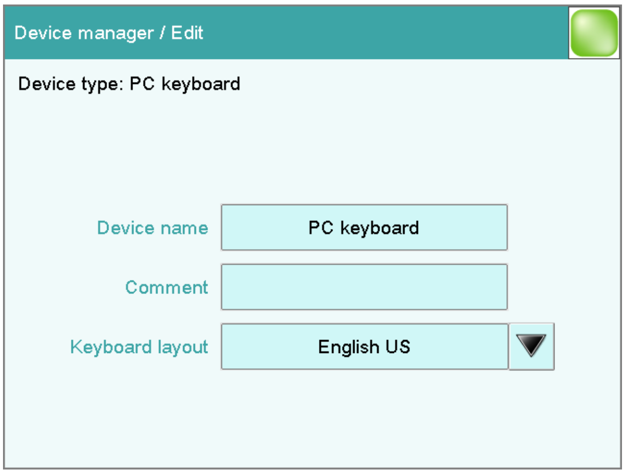
Selection	**none | Software (XON/XOFF) | Hardware (DTR/CTS)**
Default value	**Hardware (DTR/CTS)**

Software (XON/XOFF)
Use the software handshake when you send a PC/LIMS report via an RS-232 interface.

11.10 PC keyboard

List of devices: **PC keyboard ▸ Edit**

A commercially available USB keyboard can be connected to make it easier to enter text and numbers. It will be recognized automatically and entered in the list of devices with default settings.



Device name

Here you can enter a device name of your choice.

Entry	**24 characters maximum**

Comment

Entry	**24 characters maximum**

Keyboard layout

Define the country-specific keyboard layout here.

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

To enter texts and numbers with the PC keyboard, the appropriate text and number input dialog must be opened on the Ti-Touch. Only the following keys on the PC keyboard have a function:

Table 3 Keyboard assignment

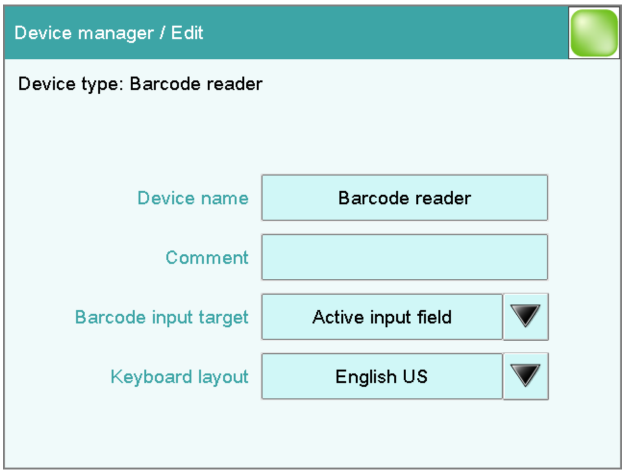
Function in the editing dialog	PC keyboard key
[Cancel]	**[Esc]**
Enter respective character	Numbers, letters and special characters
Enter respective character	Numbers, letters and special characters + Shift
[OK]	**[⇄]** (Tabulator) *or* **[Enter]** on the numerical keypad
[⌫]	**[←]** (backspace)
[Delete entry]	**[Delete]**
Line break (for multi-line text input)	**[↵]** (enter key)
The cursor is moved up or down by one character.	**[↑] [↓]**
The cursor is moved to the left or to the right by one character.	**[←] [→]**

NOTE

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

11.11 Barcode reader

List of devices: **Barcode reader ▸ Edit**



A barcode reader can be connected to read in sample data or other texts. A connected barcode reader will be recognized automatically and entered in the list of devices with default settings.

You will hear an acoustic signal as confirmation that a character string has been transmitted by the barcode reader and accepted.

NOTE

The data will be read only if the system is in normal status, i.e. when no determination is running.

Device name

Here you can enter a device name of your choice.

Entry	**24 characters maximum**

Comment

Entry	**24 characters maximum**

Barcode input target

Selection of the input field for the character string read in by the barcode reader.

Selection	**Active input field** | **Method** | **Identification 1** | **Identification 2** | **Sample size**

Active input field
The character string is entered in the input field of the opened text- or number-input dialog.

Method
The character string is entered in the input field **Method**.

Identification 1
The character string is entered in the input field **Identification 1**.

Identification 2
The character string is entered in the input field **Identification 2**.

Sample size
The character string is entered in the input field **Sample size**. Character strings containing characters other than numbers and decimal separators will be ignored.

Keyboard layout

Specify the country-specific keyboard layout for the emulation of the PC keyboard. This setting must match the setting on the barcode reader (see documentation for the barcode reader).

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

12 File manager

Main dialog: **System ▶ File manager**

The saved methods, determinations, sample tables, etc. are managed in the file manager. You can also create a backup of your system (all data and settings). Similarly, an existing backup can be reloaded.

The file memory is organized as follows:

- **Internal memory**
  The following files can be stored in the internal memory:
  - Methods
- **External memory**
  You can use a USB flash drive as an auxiliary storage medium, for instance. The following files can be stored on an external memory:
  - Backup
  - Methods
  - Determinations
  - Sample tables
  - Result tables

12.1 Managing files

File manager: **Internal memory / External memory 1 / External memory 2**

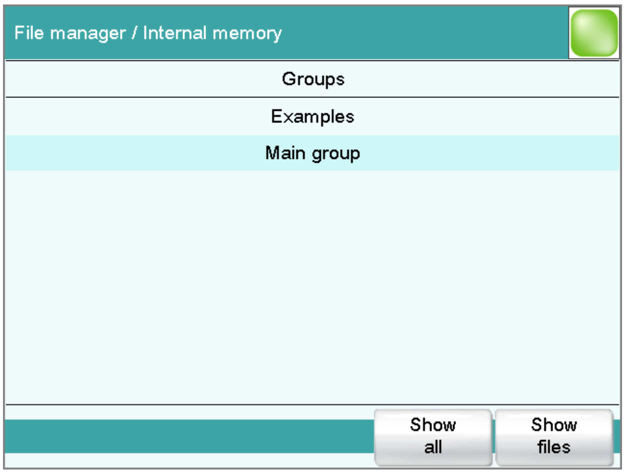
The saved files can be organized into groups. These groups are comparable to file directories on your PC, although unlike your PC, only one level is possible.

NOTE

The file names must be unique for each memory location, i.e. you cannot save two files with the same name, even if they are in different groups.

NOTE

If you use an external storage medium with the FAT or FAT32 file system, then you can save a maximum of 999 files per group. If you find it necessary to store more than 999 files in a single group, then you must reformat the storage medium with the file system **ExFAT** *(see Chapter 31.9.2, page 419)*.

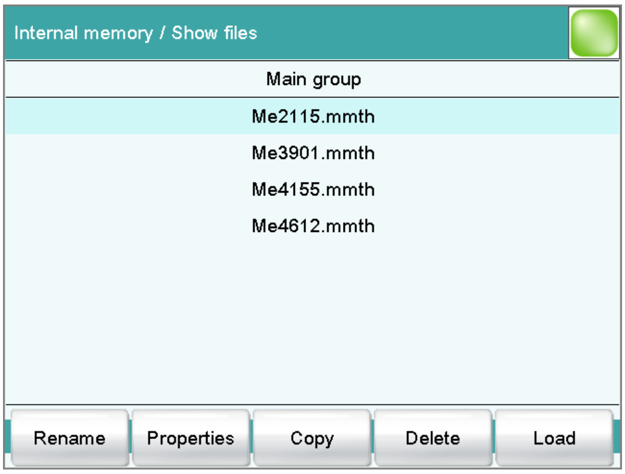


[Show all]

Display the list of all the files in the selected memory location.

[Show files]

Display the list of all the files in the selected group.



[Rename]

Rename the selected file *(see Chapter 12.1.2, page 127)*.

[Properties]

Display the file properties *(see Chapter 12.1.3, page 128)*.

[Copy]

Copy the selected file to a different memory location *(see Chapter 12.1.1, page 127)*.

[Delete]

Delete the selected file.

[Load]

Load the selected file.

12.1.1 Copying a file

Proceed as follows to copy a file:

1 Select the file

- Select the desired file.
- Tap on **[Copy]**.

The selection of memory locations is displayed.

2 Copy the file

- Tap on the desired memory location.
  Only memory locations currently being accessible are active.

The file is copied. The file group is retained, i.e. the group will be created again in the new memory location if it does not already exist there.

12.1.2 Renaming a file

Proceed as follows to rename a file:

1 Select the file

- Select the desired file.
- Tap on **[Rename]**.

The dialog **Show files / Rename** is displayed.

2 Change the file name

- Tap on the input field **File name**.
  The text editor opens.
- Enter a new file name (max. 32 characters) and confirm with **[OK]**.
- Tap on **[OK]**.

The file is saved with the new name.

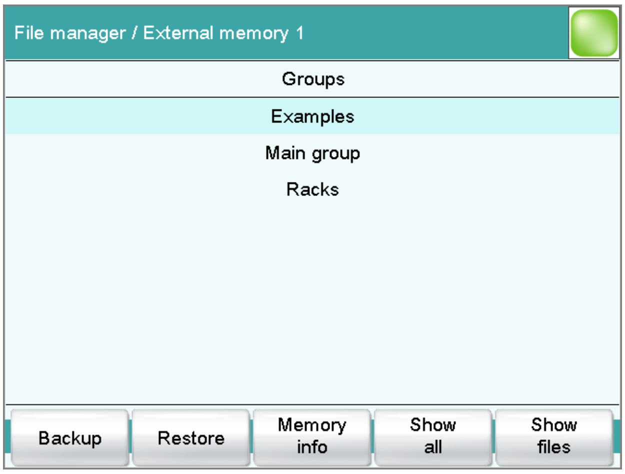
12.1.3 File properties

File manager: **Internal memory / External memory 1 / External memory 2 ▸ Show all / Show files ▸ Properties**

Detailed information concerning the file is displayed in the dialog **Show files / Properties**. They can be edited to a certain extent.

- **File name**
  Name of the file.
- **File group**
  Entry or selection of the group in which the file will be saved. If you enter a new name, then the file will be moved into the new group.
- **Write protection**
  If this option is activated, then the file cannot be saved, deleted, moved or renamed. This is only an internal write protection feature and is independent of the write protection of the operating system on your computer.
- **Created by**
  User who saved the file initially.
- **Created on**
  Date and time at which the file was saved for the first time.
- **Last saved by**
  User who saved the file most recently.
- **Last saved on**
  Date and time at which the file has been saved most recently. Additionally, the version of the file is displayed. The version number will be increased by one each time the file is saved.
- **Size**
  File size.
- **Program version**
  Program version of the software with which the file was last saved.

12.2 External storage medium



[Backup]

Create a backup of all data and settings on this storage medium *(see Chapter 12.3, page 131)*.

[Restore]

Load the backup. This function is active only if a backup is available *(see Chapter 12.3, page 131)*.

[Memory info]

Display information on the storage medium, see following chapter.

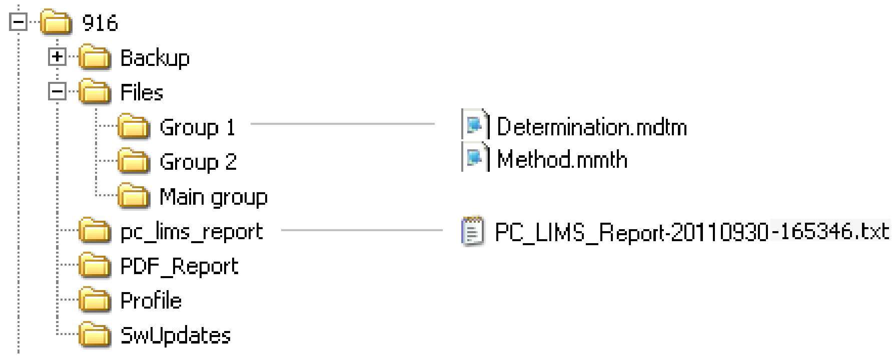
Storage medium – Information

Detailed information about the storage medium is displayed in the dialog **External memory 1/2 / Memory info**:

- **Name**
  Designation of the storage medium.
- **Write protection**
  If this option is activated, then the file cannot be saved, deleted, moved or renamed. This is only an internal write protection feature and is independent of the write protection of the operating system on your computer.
- **Storage capacity**
  Total capacity of the storage medium.
- **Used memory**
  Storage capacity used on the storage medium.
- **Free memory**
  Free storage capacity on the storage medium.

Directory structure

The directory structure appears as follows on the external storage medium:



Backup	All of the files of the backup are stored in this directory. The directory will be created the first time a backup is created.
Files	This directory contains all of the groups as well as the files contained in them (methods, determinations, etc.).
pc_lims_report	PC/LIMS reports are stored in this directory as TXT files. The directory will be created the first time a PC/LIMS report is printed out.
PDF_Report	PDF reports are stored in this directory. The directory will be created the first time a report is saved as a PDF file.
Profiles	The identification profile is stored in this directory. The directory will be created the first time an identification profile is generated.
SwUpdates	Files for software updates must be saved in this directory.

12.3 Creating backups / Restoring data

File manager: **External memory 1 / External memory 2**

You can use the **[Backup]** function to easily create a backup containing all the data and settings of your system. You should make a backup at regular intervals in order to avoid data loss.

NOTE

Only **one** backup can be created on a storage medium.

If a backup has already been stored on the medium, then it will be overwritten when this function is carried out again.

12.3.1 Restoring data

You can use the function **[Restore]** to restore either a complete backup or only certain data.

CAUTION

All of the methods in the internal memory will be deleted.

Backups are not backward compatible, i.e. backups of the latest version cannot be restored using earlier versions.

Proceed as follows to restore backed-up data:

1 Select the storage medium

- Connect the storage medium on which the backup is located.
- Select the storage medium under **System** ▸ **File manager**.

2 Select data

- Tap on **[Backup]**.
  The selection of the data that can be restored separately is displayed (see the following).
- Deselect the data sets which are not to be restored.
- Tap on **[Load data]**.

The selected data blocks are restored.

3 Complete the restoration

- Switch the Ti-Touch off and on again.

Restorable data blocks

The following data blocks can be loaded individually:

- **Methods**
  All of the methods stored in the internal memory.
- **Sample table**
  Current sample table.
- **Result table**
  Current result table.
- **Current determination data**
  All the data for the current determination (including the method with which the determination was carried out).
- **Control**
  Settings in the control dialog.
- **User list**
  Settings for each user under **System settings / User administration**.
- **System settings / User admin.**
  All of the system settings, including device-specific dialog configuration and dialog options for the command list and fixed keys, device-specific settings for the user administration (login options and password options).
- **Titrants**
  All titrants with all their data.
- **Sensors**
  All sensors with all their data.
- **Device data**
  All of the devices configured in the device manager, with all of the data.
- **GLP data**
  All data from the GLP manager.
  Deactivate if the backup is to be loaded onto a different system.
- **Common variables**
  All common variables.
- **Templates**
  All templates for sample data, result calculations, calibration buffers, etc.
- **Routine dialog settings**
  Current routine dialog settings (see **Dialog options / Routine dialog**).
- **Sample racks**
  The sample racks present in the properties of the USB sample processor.
- **Own subsequences**
  All subsequences created and stored by the user.

13 GLP manager

Main dialog: **System** ▸ **GLP manager**

In the GLP manager you can document data for various GLP tests. The results of the automatic system tests carried out after switching on are also documented.

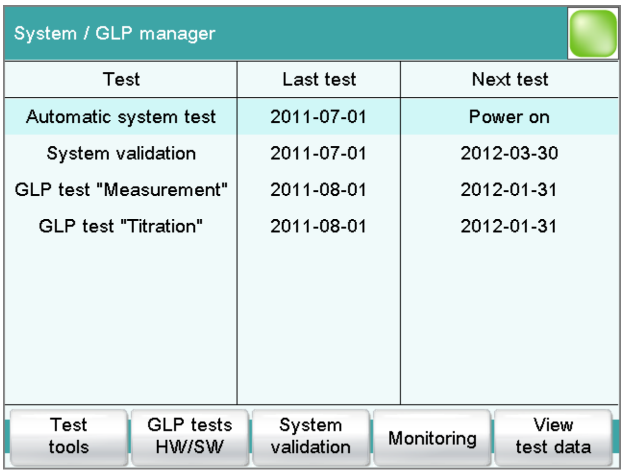
The following tests can be documented:

- GLP test "Measurement" *(see Chapter 13.3, page 135)*
- GLP test "Titration" *(see Chapter 13.3, page 135)*
- System validation *(see Chapter 13.4, page 139)*

In addition, you can also:

- Create a list with your test tools *(see Chapter 13.2, page 134)*.
- Define a service interval for having routine maintenance carried out by a Metrohm service technician *(see Chapter 13.5, page 143)*.
- Define an interval for the regular performance of backups *(see Chapter 13.5, page 143)*.

Further information about quality management and validation is also given in the documentation series **Quality Management with Metrohm** and **Application Bulletin AB 252** (Validation of Metrohm titrators (potentiometric) in accordance with GLP/ISO 9001).



The table shows the last time that each test was carried out and when the next test is to be carried out. A test is entered in the list the first time that it is documented.

[Test tools]

Configure test tools for GLP tests *(see Chapter 13.2, page 134)*.

[GLP tests HW/SW]

Document the GLP tests "Measurement" and "Titration" *(see Chapter 13.3, page 135)*.

[System validation]

Document the system validation *(see Chapter 13.4, page 139)*.

[Monitoring]

Define time intervals for system maintenance and backups *(see Chapter 13.5, page 143)*.

[View test data]

Display the data of the selected test.

13.1 Automatic system test

The system test is carried out automatically when the Ti-Touch is switched on. The result of each individual test is shown in green if no error has occurred. If a result is shown in red, then an error occurred when the respective test was carried out. Switch the Ti-Touch off and back on again. If the error still occurs pleased notify Metrohm Service.

Print report at system start

on | off (Default value: **off**)

If this parameter is activated, then the result of the system test will be printed out automatically when the Ti-Touch is switched on.

13.2 Test tools

Main dialog: **System** ▶ **GLP manager** ▶ **Test tools**

You can create a list of test tools to be used in the tests in the GLP manager.

The following test tools have already been defined:

- **767 Calibrated Reference**: Device for checking measuring inputs and electrode cable.
- **822 Titr.Curve Simulator**: Curve simulator for checking the hardware and software.
- **773 pH/mV Simulator**: Device for checking measuring inputs and electrode cable.
- **868 UR Generator**: Device for checking measuring inputs and electrode cable.

[New]

Add a new test tool to the list.

[Delete]

Delete the selected test tool from the list.

[Edit]

Change the designation of the selected test tool.

13.3 GLP tests for measurement and titration

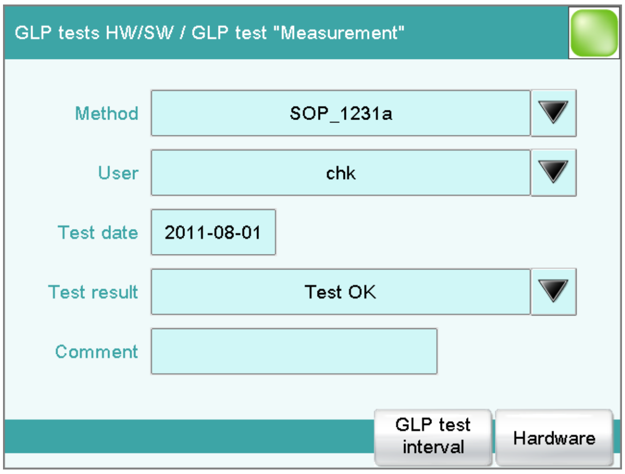
Main dialog: **System** ▸ **GLP manager** ▸ **GLP tests HW/SW** ▸ **GLP test "Measurement" / GLP test "Titration"**

You can document the GLP tests for measurements and titrations in the dialog **GLP manager / GLP tests Hardware/Software** and its subdialogs. The following procedure describes the GLP test "Measurement," but also applies for the GLP test "Titration".

Proceed as follows:

1 Open the properties dialog

- In the dialog **System / GLP manager**, tap on the button **[GLP tests HW/SW]** and then on the button **[GLP test "Measurement"]**.



2 Edit data

- Define the test method, the test results, etc. *(see "Dialogs "GLP tests HW/SW / GLP test "Measurement"" and "GLP tests HW/SW / GLP test "Titration""", page 136)*.

3 Define the hardware used

- Tap on **[Hardware]**.

- Select the hardware used for the test *(see "Dialogs "GLP test "Measurement" / Hardware" and "GLP test "Titration" / Hardware"", page 138)*.
- Tap on the fixed key **[⇦]**.

The dialog **GLP tests HW/SW / GLP test "Measurement"** appears again.

4 **Define the test interval**

- Tap on **[GLP test interval]**.
- Enter the time interval or the date for the next GLP test *(see "Dialogs "GLP test "Measurement" / Test interval" and "GLP test "Titration" / Test interval"", page 137)*.
- Tap on the fixed key **[⇦]**.

13.3.1 Parameter description

Dialogs "GLP tests HW/SW / GLP test "Measurement"" and "GLP tests HW/SW / GLP test "Titration""

Method

Method the GLP test has been carried out with.

Entry	**32 characters maximum**
Selection	**Selection of methods stored in the internal memory**

User

User who carried out the GLP test.

Entry	**24 characters maximum**
Selection	**Selection of configured users**

Test date

Date on which the GLP was carried out.

Format: YYYY:MM:DD

Test result

Result of the test.

Selection	**Test OK | Test not OK**
Default value	**Test OK**

Comment

Entry	**24 characters maximum**

[GLP test interval]

Define the time interval for the GLP test *(see "Dialogs "GLP test "Measurement" / Test interval" and "GLP test "Titration" / Test interval"", page 137)*.

[Hardware]

Document the hardware with which the GLP test has been carried out *(see "Dialogs "GLP test "Measurement" / Hardware" and "GLP test "Titration" / Hardware"", page 138)*.

Dialogs "GLP test "Measurement" / Test interval" and "GLP test "Titration" / Test interval"

Test date

Date on which the GLP was carried out.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the time interval after which a GLP test has to be carried out again will be monitored.

GLP test interval

If you define a time interval for the GLP test, then the date in **Next GLP test** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Next GLP test

If you define a date for the next GLP test, then the **GLP test interval** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

Dialogs "GLP test "Measurement" / Hardware" and "GLP test "Titration" / Hardware"

Test tool

Selection of the test tool. Test tools are defined at **GLP manager ▸ Test tools**.

Selection	**Selection of configured test tools**

Control device

Selection of the control device with which the GLP test has been carried out.

Selection	**Selection of configured control devices**

Measuring input

Selection of the measuring input used for the GLP test. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	**1** | **2**
Default value	**1**

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1** | **2** | **3** | **4**
Default value	**1**

13.4 System validation

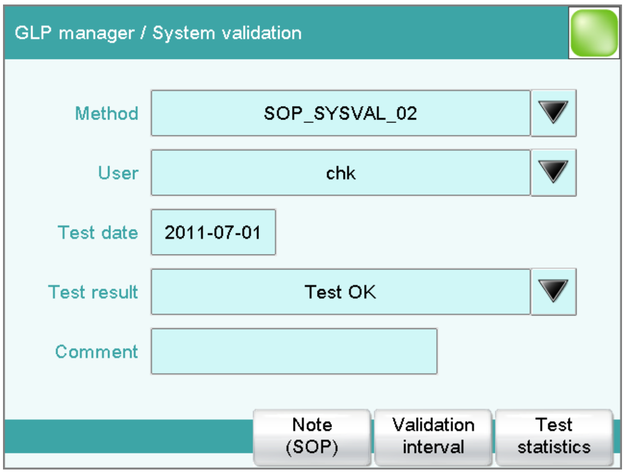
Main dialog: **System ▶ GLP manager ▶ System validation**

In the dialog **GLP manager / System validation** and its subdialogs, you can document the system validation results and define the time interval after which validation must be carried out again.

Proceed as follows:

1 Open the properties dialog

- In the dialog **System / GLP manager**, tap on the button **[System validation]**.



2 Edit data

- Define the method, the result, etc. *(see "Dialog "GLP manager / System validation"", page 140)*.

3 Define the validation interval

- Tap on **[Validation interval]**.
- Enter the time interval or the date for the next system validation *(see "Dialog "System validation / Validation interval"", page 141)*.
- Tap on the fixed key **[⇦]**.

The dialog **GLP manager / System validation** appears again.

4 Enter statistical data

- Tap on **[Test statistics]**.
- Enter the statistical data for the last system validation *(see "Dialog "System validation / Test statistics"", page 142)*.

- Tap on the fixed key **[⇦]**.

The dialog **GLP manager / System validation** appears again.

5 Insert a note

- Tap on **[Note (SOP)]**.
- Enter a brief description, e.g. a summary of the SOP (standard operating procedure) according to which the system validation was carried out *(see "Dialog "System validation / Note (SOP)"", page 141)*.
- Tap on the fixed key **[⇦]**.

13.4.1 Parameter description

Dialog "GLP manager / System validation"

Method

Method with which the system validation has been carried out.

Entry	**32 characters maximum**
Selection	**Selection of methods stored in the internal memory**

User

User who carried out the system validation.

Entry	**24 characters maximum**
Selection	**Selection of configured users**

Test date

Date on which the system validation was carried out.

Format: YYYY:MM:DD

Test result

Result of the test.

Selection	**Test OK | Test not OK**
Default value	**Test OK**

Comment

Entry	**24 characters maximum**

[Note (SOP)]

Enter a brief description, e.g. a summary of the SOP (standard operating procedure) according to which the system validation has been carried out.

[Validation interval]

Define the time interval for the system validation *(see "Dialog "System validation / Validation interval"", page 141)*.

[Test statistics]

Document the statistical data of the system validation *(see "Dialog "System validation / Test statistics"", page 142)*.

Dialog "System validation / Note (SOP)"

In this dialog, you can enter a brief text, e.g. a summary of the SOP (standard operating procedure) according to which the system validation was carried out.

Dialog "System validation / Validation interval"

Last validation

Date on which the last system validation was carried out.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the time interval after which a system validation has to be carried out again will be monitored.

Validation interval

If you define a time interval for the system validation, then the date in **Next validation** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Next validation

If you define a time interval for the next system validation, then the **Validation interval** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

Dialog "System validation / Test statistics"

In the dialog **System validation / Test statistics**, you can document the statistical data for the last system validation.

Number (n)

Number of determinations carried out.

Input range	**1 - 9999999999**
Default value	**empty**

Mean value

Mean value out of single results.

Input range	**–999999999.00000 - 999999999.00000**
Default value	**empty**

s abs

Absolute standard deviation of the results.

Input range	**0.00000 - 999999999.00000**
Default value	**empty**

s rel

Relative standard deviation of the results.

Input range	**0.00000 - 100.00000 %**
Default value	**empty %**

d rel

Systematic deviation of the results.

Input range	**0.00000 - 100.00000 %**
Default value	**empty %**

a sys

Systematic error.

Input range	**0.00000 - 9999999999.00000**
Default value	**empty**

13.5 System monitoring

13.5.1 Service interval

Main dialog: **System** ▶ **GLP manager** ▶ **Monitoring** ▶ **Service interval**

In the dialog **GLP manager / Service interval**, you can define the time interval for the maintenance of the system by the Metrohm Service department. The service interval is checked each time the system is started.

Last service

Date on which the last servicing was carried out.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the time interval after which system maintenance must be carried out again will be monitored.

Service interval

If you define a time interval for the system maintenance, then the date in **Next service** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Next service

If you specify a date for the next system maintenance, then the **Service interval** will be tracked automatically.

Format: YYYY:MM:DD

13.5.2 Backup interval

Main dialog: **System ▸ GLP manager ▸ Monitoring ▸ Backup interval**

In the dialog **GLP manager / Backup interval**, you can define the time interval for backups. The backup interval is checked each time the system is started.

Last backup

Date on which the last backup was created.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the time interval after which a backup has to be created again will be monitored.

Backup interval

If you define a time interval for the creation of backups, then the date in **Next backup** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Next backup

If you specify a date for the next backup, then the **Backup interval** will be tracked automatically.

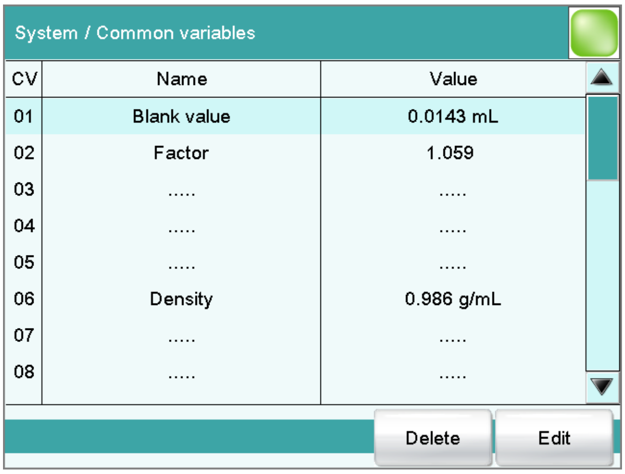
Format: YYYY:MM:DD

14 Common variables

Main dialog: **System** ▸ **Common variables**

You can save 25 **method-independent variables**, or common variables. These variables can be used in future calculations (as variables **CV01…CV25**). Common variables are useful, e.g. for the following applications:

- Determination of a blank value which will be taken into account during the content determination of the sample.
- Determination of the content of a standard solution, which will be taken into account during the content determination of the sample.



The designation and the value (including the unit) are displayed for every common variable in the list.

[Delete]

Delete the selected common variable from the list.

[Edit]

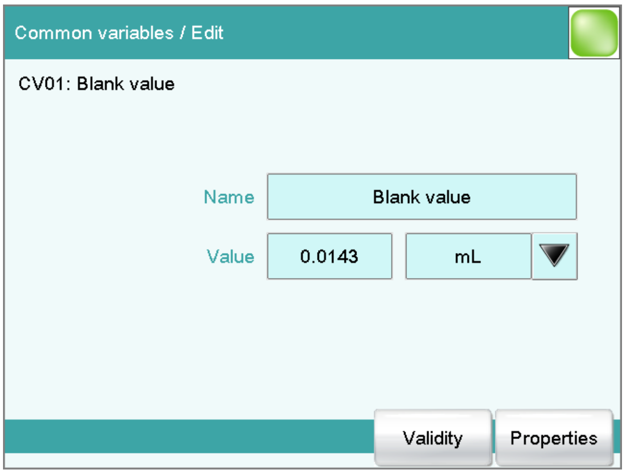
Edit the data of the selected common variable, see following chapter.

14.1 Editing common variables

List of common variables: **Common Variable ▸ Edit**

The common variables can be modified as follows:

- Edit manually, see the following.
- Automatic assignment from the determination run. A calculation result must be configured accordingly for this purpose *(see Chapter 14.4, page 149)*.



Name

Designation of the common variable.

Entry	**24 characters maximum**
Default value	**empty**

Value

Value of the common variable.

Input range	**–999999999 - 9999999999**
Default value	**empty**

Unit of the common variable.

Entry	**10 characters maximum**
Default value	**empty**
Selection	**% | mol/L | mmol/L | g/L | mg/L | mg/mL | mg/100 g | ppm | g | mg | µg | mL | µL | mg/piece | °C | µg/min | mL/min | µL/min**
Default value	**%**

Next assignment

This parameter is displayed only if a validity has been defined for the common variable.

Date on which the validity of the common variable expires.

Format: YYYY:MM:DD

[Validity]

Define the time interval for the validity of the common variable *(see Chapter 14.3, page 148)*.

[Properties]

Display the properties of the common variable, see following chapter.

14.2 Properties of common variables

Common variable: **Edit ▸ Properties**

Detailed information concerning the common variable are displayed in the dialog **Edit common variables / Properties**.

- **Status**
  Status of the common variable. If the time interval for the validity has expired, then **invalid** will be displayed.
- **Method**
  Method with which the value has been assigned to the common variable. If the value was entered manually, then **manual** will be displayed.
- **Method status** (only for automatic assignment from the determination run)
- **Determination status** (only for automatic assignment from the determination run)
- **Last assignment**
  Date and time of the last assignment.
- **User**
  User who assigned the value to the common variable.

14.3 Monitoring validity

Common variable: **Edit** ▶ **Validity**

In the dialog **Edit common variables / Validity**, you can define the time interval after which a new value must be assigned to the common variable.

Last assignment

Date on which the common variable was last assigned a value.

Format: YYYY:MM:DD

Monitoring

on | off (Default value: **off**)

If this parameter is activated, then the time interval after which the common variable must be assigned a new value will be monitored.

Validity

If you define a time interval for the validity of the common variable, then the date in **Next assignment** will be tracked automatically.

Input range	**1 - 999 days**
Default value	**999 days**

Next assignment

If you specify a date for the next assignment, then the time interval for the **Validity** will be tracked automatically.

Format: YYYY:MM:DD

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message | Document message | Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

14.4 Assigning a result automatically to a common variable

NOTE

This instruction is based on the assumption that the method contains a calculation command with a calculation.

Proceed as follows to assign a result to a common variable:

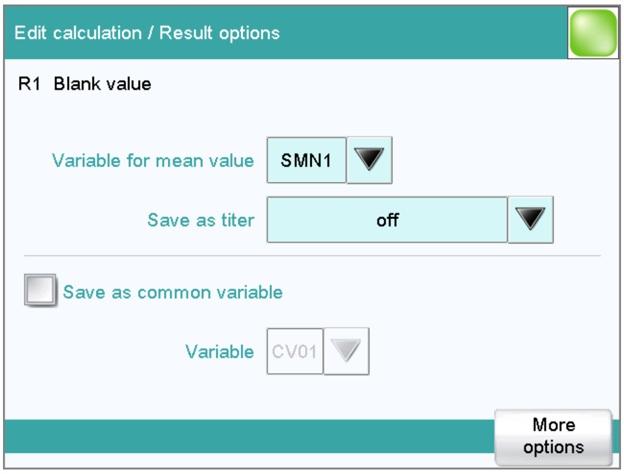
1 Open the editing dialog of the result

- In the command list, select the command **CALC**.
- Tap on the button **[Edit command]**.
- Select the result whose value is to be assigned to a common variable and tap on **[Edit]**.

The editing dialog of the result is displayed.

2 Define result options

- Tap on the button **[Result options]**.



- Activate the parameter **Save as common variable**.
- Define **Variable** = **CV01…CV25**.

3 Save the settings

Tap on the fixed keys **[⇦]** or **[⌂]**.

In the future, the calculated result will be assigned to the selected common variable (result name, value and unit).

15 Templates

Main dialog: **System ▶ Templates**

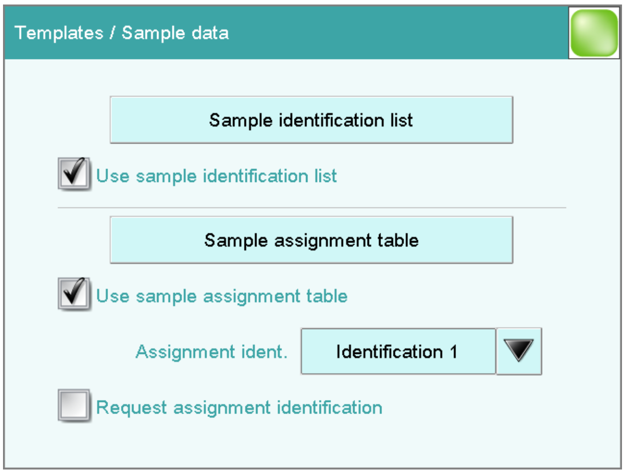
You have the option of defining **system-specific templates**. You can use these templates when editing the respective data.

You can create the following templates:

- **Sample data** *(see Chapter 15.1, page 151)*
  Create sample identifications and sample assignments.
- **Custom result templates** *(see Chapter 15.2, page 155)*
  Define formulas for result calculations.
- **Input lines** *(see Chapter 15.3, page 159)*
  Define input signals on the remote interface.
- **Output lines** *(see Chapter 15.4, page 161)*
  Define output signals on the remote interface.
- **Custom calib. buffers** *(see Chapter 15.5, page 164)*
  Define a buffer series for the calibration of pH electrodes.
- **Report header** *(see Chapter 15.6, page 166)*
  Create a system-specific report header that contains information concerning the laboratory, for example.
- **Custom electrode type** *(see Chapter 15.7, page 167)*
  Define customized limit values for the electrode test of pH electrodes.

15.1 Sample data

Main dialog: **System ▶ Templates ▶ Sample data**



You can create the following templates in the dialog **Templates / Sample data**:

- Sample identifications*(see Chapter 15.1.1, page 152)*
  List with sample identifications. If you must enter the sample identification before starting a determination, then you can select the entries contained in this list.
- Sample assignments *(see Chapter 15.1.2, page 153)*
  You can assign a particular method to a sample identification.

Use sample identification list

on | off (Default value: **off**)

Activate this parameter so that the sample identifications defined in the list will be displayed as selections.

Use sample assignment table

on | off (Default value: **off**)

Activating/deactivating the use of the sample assignment table.

NOTE

If this parameter is activated, the following will no longer be possible:

- Carrying out determinations without their sample identification being defined in the sample assignment table.
- Defining a method in the sample table. Previously defined methods will be ignored.

Assignment ident.

Identification which is used as assignment identification to load the correct method.

Selection	**Identification 1** | **Identification 2**
Default value	**Identification 1**

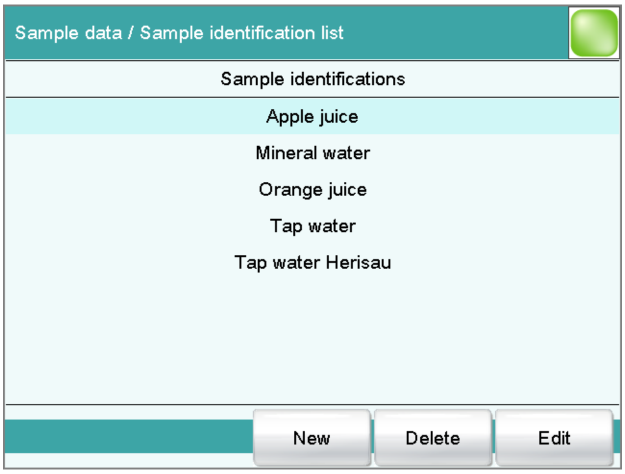
Request assignment identification

on | off (Default value: **off**)

If this parameter is activated, then the sample identification will be requested automatically at the start of a determination.

15.1.1 Sample identification list

Main dialog: **System ▸ Templates ▸ Sample data ▸ Sample identification list**



You can create a system-specific list with sample identifications in the dialog **Sample data / Sample identification list**. This list makes it easier for you to enter frequently used sample identifications, i.e. this list is available to you for entering them (main dialog, command **REQUEST**, etc.). It may be a good idea to define the unchanging part of the identification as a template and to add the variable part during sample data input.

[New]

Add a new sample identification to the list.

[Delete]

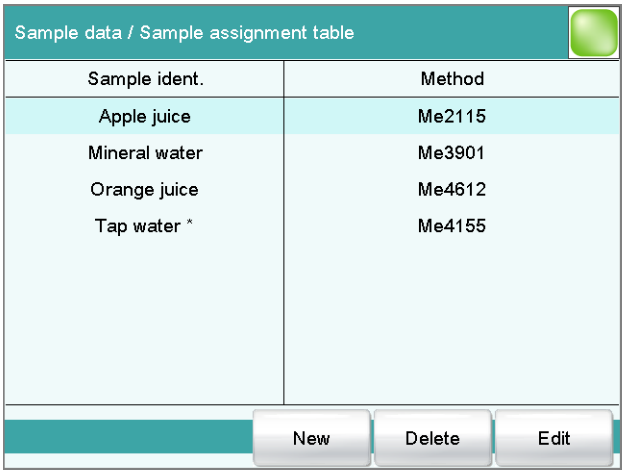
Delete the selected sample identification from the list.

[Edit]

Change the designation of the selected sample identification.

15.1.2 Sample assignment table

Main dialog: **System** ▸ **Templates** ▸ **Sample data** ▸ **Sample assignment table**



In the sample assignment table, a particular method is assigned to a sample identification. In this way, you ensure that your samples will be processed with the correct method; mix-ups are not longer possible. When you start a determination, you need only enter the sample identification; the method is loaded automatically.

[New]

Add a new sample assignment to the list, see following chapter.

[Delete]

Delete the selected sample assignment.

[Edit]

Edit the selected sample assignment, see following chapter.

Editing the sample assignment

Identification

Identification of the sample.

> **NOTE**
>
> You can place an ***** as a wildcard at the beginning or end of the character string. Doing so allows you to prefix or suffix a sequential number, for example, to the identification, which will be ignored when methods are being assigned.

Entry	**24 characters maximum**
Selection	**Selection of defined identifications in the sample identification list**

Memory

Memory location the method is loaded from. All memory locations are selectable, even if they are currently not accessible.

Selection	**Internal memory | External memory 1 | External memory 2 | Shared memory**
Default value	**Internal memory**

Shared memory
Shared directory in the network.

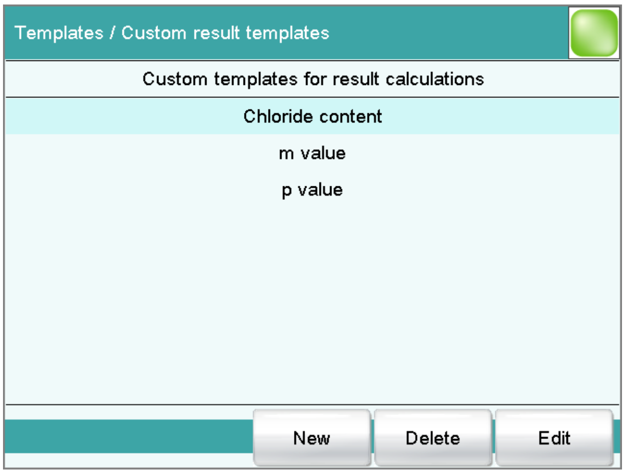
Method

Method that is loaded when a sample with the above-specified identification is processed. You can also enter a method that does not yet exist in the selected memory. When a determination is started there is a check whether the method is available.

Entry	**32 characters maximum**
Selection	**Selection of methods stored in the selected memory**

15.2 Custom result templates

Main dialog: **System ▸ Templates ▸ Custom result templates**



In the dialog **Templates / Custom result templates**, you can define the result calculations which can be loaded in the calculation command **CALC**. With the exception of the following points, creating a result template is identical to editing a calculation in the command CALC *(see Chapter 28.9.1.2, page 355)*:

- No result variable can be assigned to the template.
- The definition of limit values is not possible.

NOTE

Up to nine **wildcards** can be inserted in the calculation formula, the **Variables F1…F9**. Use these variables, e.g. for the molar mass of your analyte. If you have loaded a result template with these wildcards in the calculation command, then you will automatically be prompted to enter the numerical values.

[New]

Add a new result template to the list, see following chapter.

[Delete]

Delete the selected result template from the list.

[Edit]

Edit the data of the selected result template, see following chapter.

15.2.1 Editing result templates

List of result templates: **Result template ▸ New / Edit**

Result name

The result name is the text which will be shown in the results display and in the report.

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

Calculation formula

Display of the calculation formula. A special editor is opened for the definition *(see Chapter 28.9.3, page 361)*.

Entry	**max. 100 characters**
Default value	**empty**

Decimal places

Number of decimal places used to display the result.

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

Result unit

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

Entry	**max. 10 characters**
Selection	**% | mol/L | mmol/L | g/L | mg/L | mg/mL | mg/100 g | ppm | g | mg | µg | mL | µL | mg/piece | °C | µg/min | mL/min | µL/min**
Default value	**%**

[Note]

Entering a note on the calculation.

[Note for wizard]

Enter a note on the calculation. This note is displayed when loading the result template.

[Result options]

Defining additional settings for the calculation.

Dialog "Edit result template / Result options"

In the dialog **Edit result template / Result options**, settings for how to process the calculated result are defined.

Variable for mean value

If the statistic calculations have been activated (see method options), the mean value of the single results will be saved as variable SMN1 to SMN9. As default value, always the first free variable is being displayed.

Selection	**SMN1 ... SMN9 | off**

off
For the result not statistic calculations are carried out.

Save as titer

The result can be saved as titer for the selected titrant.

NOTE

The titer is assigned to the titrant defined in the last titration command before the calculation. Please note that the CALC command containing the titer assignment is inserted after the titration command with which the titer is determined.

Selection	**Single value | Mean value | off**
Default value	**off**

Single value
The result of the current determination is saved as titer.

Mean value
If statistic calculations are carried out for the result, the current mean value of the determination series is saved.

off
The result is not saved as titer.

Save as common variable

on | off (Default value: **off**)

The calculated result can be saved as a method-independent variable, a so-called common variable. The result is then also available in other methods for calculations. In all cases, only the single value will be saved, even if the statistics function is enabled.

Variable

Selection of the common variable to which the result is being assigned.

Selection	**CV01 ... CV25**

Display result

on | off (Default value: **on**)

If you deactivate this parameter, the result is neither displayed in the result dialog nor printed in the result report. This can be advisable for intermediate results.

Save result in result table

on | off (Default value: **off**)

The calculated result can be saved in the result table. This may be advisable if e.g. the results of all determinations carried out on a particular day are to be displayed clearly. A maximum of nine results from a determination can be saved in the result table.

Precision

Setting, with which accuracy the result is used in additional calculations.

Selection	**Round | Truncate | Full precision**
Default value	**Round**

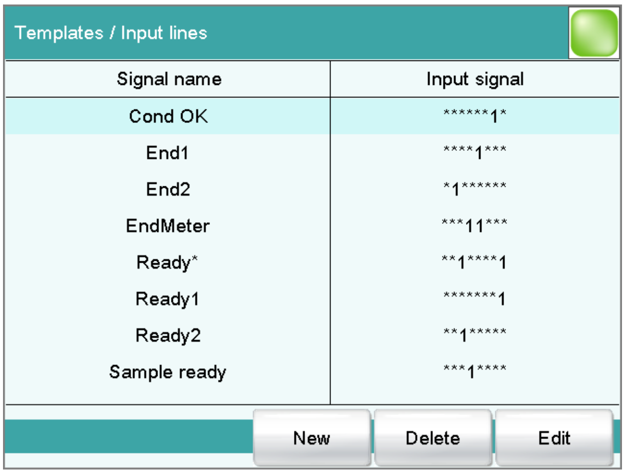
Round
The result is rounded to the defined number of decimal places (commercial rounding, in accordance with the US Pharmacopeia USP). If the digit at the first dropped decimal place is **1, 2, 3 or 4**, then it will be rounded off; if this digit is **5, 6, 7, 8 or 9**, then it will be rounded up. Negative digits will be rounded in accordance with their amount, i.e. away from zero.

Truncate
The result is cut to the number of decimal places defined.

Full precision
The result is used with full accuracy (floating point number either in "single precision" (32 bit) or in "double precision" (64 bit), according to the standard IEEE 754).

15.3 Input lines

Main dialog: **System ▸ Templates ▸ Input lines**



In the dialog **Templates / Input lines**, you can define the input signals at the remote interface as a template. You can select these templates in the command **SCAN**. The list can contain a maximum of 20 templates.

Table 4 List of predefined input signals

Signal name	Input signal	Function
Cond OK	******1*	queries "Cond OK" condition of device.
End1	****1***	waits for the EOD impulse from Device 1 (Titrino, Titrando).
End2	*1******	waits for the EOD impulse from Device 2.
EndMeter	***11***	waits for the EOD impulse from 780/781 pH/Ion meter (stirrer 1 will be switched on during the waiting period).
Ready*	**1****1	queries the "Ready" condition of Devices 1 and 2 (Titrino, Titrando). The status of devices working in parallel can be scanned with this signal. In this case the "Ready" line of both devices must be statically set (i.e. con-stantly) at the end of a determination. Devices which only transmit a brief impulse cannot be controlled in parallel.
Ready1	*******1	queries the "Ready" condition of Device 1.
Ready2	**1*****	queries the "Ready" condition of Device 2.

Signal name	Input signal	Function
Sample ready	***1****	waits for a stepping pulse, of, for instance, a connected Sample Processor, as soon as it is ready.

[New]

Add a new input signal to the list, see following chapter.

[Delete]

Delete the selected input signal from the list.

[Edit]

Edit the data of the selected input signal, see following chapter.

15.3.1 Editing the input signal

List of input signals: **Input signal ▶ New / Edit**

Signal name

Designation of the template.

Entry	**24 characters maximum**

Input signal

Entering the desired bit pattern:

Entering the bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status

The input lines are always numbered from right to left, i.e. with the signal **********1*** line 0 is expected to be active.

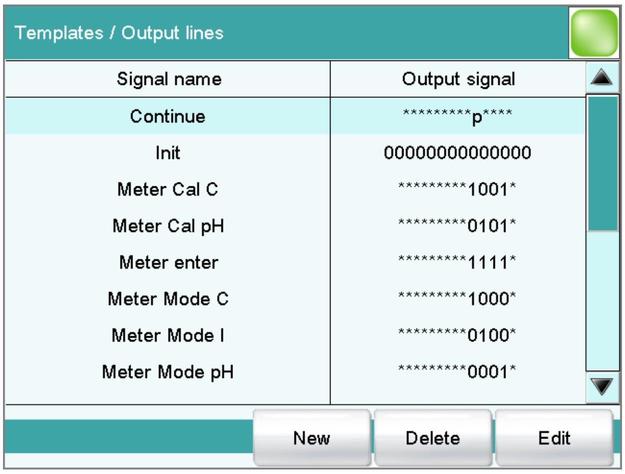
NOTE

We recommend masking lines that are of no interest or for which no defined condition can be predicted with an asterisk (*****).

Entry	**Bit pattern of exactly 8 characters**
Default value	********

15.4 Output lines

Main dialog: **System** ▸ **Templates** ▸ **Output lines**



In the dialog **Templates / Output lines**, you can define the output signals at the remote interface as a template. You can select these templates in the command **CTRL**. The list can contain a maximum of 20 templates.

Table 5 List of predefined output signals

Signal name	Output signal	Function
Continue	*********p****	sends a stepping pulse to the connected Sample Processor.
Init	00000000000000	initializes the remote interface.
Meter Cal C	*********1001*	switches the 781 pH/Ion meter to concentration calibration.
Meter Cal pH	*********0101*	switches the 780/781 pH/Ion meter to pH calibration and starts the calibration.
Meter enter	*********1111*	simulates the **[Enter]** key of the 780/781 pH/Ion meter; mandatory for pH calibration in order to start the measurement of the second buffer.
Meter Mode C	*********1000*	switches the 781 pH/Ion meter to concentration measurement.
Meter Mode I	*********0100*	switches the 780/781 pH/Ion meter to voltametric measurement with polarization current and starts the measurement.
Meter Mode pH	*********0001*	switches the 780/781 pH/Ion meter to pH measurement and starts the measurement.

Signal name	Output signal	Function
Meter Mode T	*********0010*	switches the 780/781 pH/Ion meter to temperature measurement and starts the measurement.
Meter Mode U	*********0011*	switches the 780/781 pH/Ion meter to voltage measurement and starts the measurement.
Start device*	********p****p	starts Devices 1 and 2 (e.g. Titrino, Titrando, etc.) ***)**. The signal is transmitted as a short pulse of 200 ms.
Start device1	*************p	starts Device 1 (e.g. Titrino, Titrando, etc.) ***)**. The signal is transmitted as a short pulse of 200 ms.
Start device2	********p*****	starts Device 2 (e.g. Titrino, Titrando, etc.) ***)**. The signal is transmitted as a short pulse of 200 ms.
Start Dos*	*****p*p******	starts Dosimat at Devices 1 and 2 (Titrino via "activate"). The signal is transmitted as a short pulse of 200 ms.
Start Dos1	*******p******	starts Dosimat at Device 1 (Titrino via "activate"). The signal is transmitted as a short pulse of 200 ms.
Start Dos2	*****p********	starts Dosimat at Device 2 (Titrino via "activate"). The signal is transmitted as a short pulse of 200 ms.

***)** In the case of the 780/781 pH/Ion meter, a result report is triggered.

[New]

Add a new output signal to the list, see following chapter.

[Delete]

Delete the selected output signal from the list.

[Edit]

Edit the data of the selected output signal, see following chapter.

15.4.1 Editing the output signal

List of input signals: **Output signal ▸ New / Edit**

Signal name

Designation of the template.

Entry	**24 characters maximum**

Output signal

Entering the desired bit pattern:

Entering the bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal ***************1** line 0 is set.

NOTE

We recommend masking lines that are of no interest or for which no defined condition can be predicted with an asterisk (*****).

Entry	**Bit pattern of exactly 14 characters**
Default value	******************

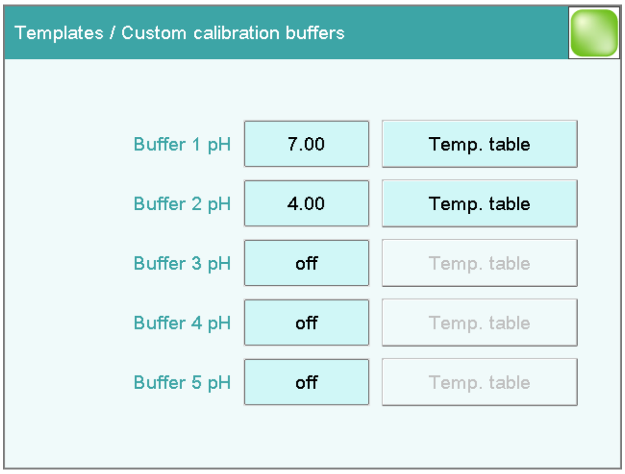
Pulse length

Duration of the sent pulses.

Input range	**100 - 1000 ms**
Default value	**200 ms**

15.5 Custom calibration buffers

Main dialog: **System** ▶ **Templates** ▶ **Custom calib. buffers**



In the **Templates / Custom calibration buffers** dialog, you can define a buffer series of your own for pH calibrations with a maximum of five calibration buffers. Automatic buffer detection is active for this buffer.

Buffer 1 pH

pH value of the first calibration buffer.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Buffer 2...5 pH

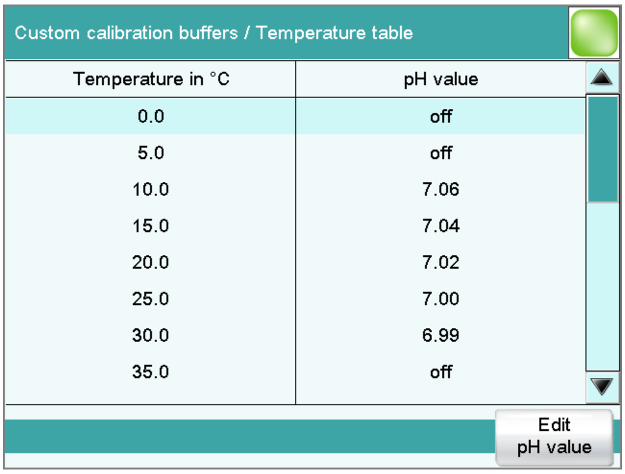
See **Buffer 1 pH**.

[Temp. table]

Display the temperature table for the selected buffer, see following chapter.

15.5.1 Defining calibration buffers

The **Custom calibration buffers / Temperature table** dialog lists the pH values of the buffer in the temperature range 0 - 95 °C.



[Edit pH value]

Enter the pH value for the selected temperature.

"Temperature table / Edit pH value" dialog

In this dialog, the pH values of the buffer are defined at various temperatures. Enter the pH values for the temperature range in which you will carry out your pH calibration and pH measurement. If you do not know the pH values at individual temperatures, they will be calculated automatically by means of linear interpolation.

Temperature in °C

Input range	**0.0 - 95.0 °C** (Increment: **5.0**)

pH value

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

15.6 Report header

Main dialog: **System ▶ Templates ▶ Report header**

In the dialog **Templates / Report header**, you can create a system-specific report header that contains information concerning the laboratory, for example. The report header can contain a maximum of four lines of 46 characters each and will always be printed out in front of the standard report header. The standard report header contains the instrument type, serial number and program version of the software, instrument name and printing date.

Print logo

on | off (Default value: **off**)

If this parameter is activated, then the logo defined below will be printed out in the right margin.

Logo

Selection	**Metrohm logo | Custom logo**
Default value	**Metrohm logo**

Custom logo
Select this setting if your logo is to be printed out in the report header. How to create a logo is described below.

Applying the custom logo

You can create a graphics file of your own and use it as a logo in the report header in place of the Metrohm logo.

NOTE

Observe the size of the graphics object. The maximum size of your graphics file is 64 kB. We recommend a maximum of 500 × 200 pixels.

Proceed as follows to create your own logo:

1 Creating the logo

- Create a graphics file with the desired logo in an image processing program.
- Save the graph as a JPG file under the file name "CustomImage.jpg".

2 Copying the file to an external storage medium

- Copy the file "CustomImage.jpg" to the directory "916".
  If this structure is not maintained, the file will not be found because the software directly accesses the "916" directory.
- Plug in the external storage medium at the Ti-Touch.

3 Loading the graphics file

- In the **Templates / Report header** dialog, tap on the **[Load]** button.
  The file is copied to the internal memory.
- Switch the instrument off and back on again.

4 Applying the custom logo

- In the **Templates / Report header** dialog, activate the **Print logo** option.
- Define **Logo** = **Custom logo**.

Your logo will now be printed in the report header of all reports in the future.

15.7 Custom electrode type

Main dialog: **System** ▶ **Templates** ▶ **Custom electrode type**

For the electrode test of pH electrodes, you can define your own values instead of using the limit values that are saved. This can be helpful for special applications, e.g. when other quality requirements are demanded of the pH electrode or when working with a reference electrode that pushes the offset potential Uoff beyond the required –15 to +15 mV (standard electrode).

Limit values can be defined for the following electrode ratings:

- Excellent electrode
- Good electrode
- Usable electrode

Lower limit Uoff

Lower limit value for the offset voltage, i.e. the voltage at pH = 7.0. The value applies for all ratings.

Input range	**–999 - 999 mV**
Default value	**–15 mV**

Upper limit Uoff

Upper limit value for the offset voltage, i.e. the voltage at pH = 7.0. The value applies for all ratings.

Input range	**–999 - 999 mV**
Default value	**15 mV**

15.7.1 Limit values for the electrode rating

You can define limit values for the three electrode ratings **Excellent electrode**, **Good electrode** and **Usable electrode**. These values represent maximum values that may not be exceeded (exception: **Min. slope** = minimum value).

Streaming potential

The streaming potential is the difference between the measured voltages in stirred and unstirred solution.

for very good electrodes:

Input range	**–999.9 - 999.9 mV**
Default value	**2.5 mV**

for good electrodes:

Input range	**–999.9 - 999.9 mV**
Default value	**3.0 mV**

for usable electrodes:

Input range	**–999.9 - 999.9 mV**
Default value	**4.0 mV**

Drift

The drift in stirred solution is determined for each buffer. The sum of these values is compared with this value here.

for very good electrodes:

Input range	**0.1 - 9.9 mV/min**
Default value	**2.0 mV/min**

for good electrodes:

Input range	**0.1 - 9.9 mV/min**
Default value	**2.5 mV/min**

for usable electrodes:

Input range	**0.1 - 9.9 mV/min**
Default value	**3.0 mV/min**

Min. slope

Minimum slope of the pH electrode.

for very good electrodes:

Input range	**0.1 - 999.9 %**
Default value	**96.5 %**

for good electrodes:

Input range	**0.1 - 999.9 %**
Default value	**96.0 %**

for usable electrodes:

Input range	**0.1 - 999.9 %**
Default value	**95.0 %**

Max. slope

Maximum slope of the pH electrode.

for very good electrodes:

Input range	**0.1 - 999.9 %**
Default value	**101.0 %**

for good electrodes:

Input range	**0.1 - 999.9 %**
Default value	**102.0 %**

for usable electrodes:

Input range	**0.1 - 999.9 %**
Default value	**103.0 %**

Response time

The voltage measured after three minutes in stirred solution serves as a comparison value for determining the response time. The response time is the time after which the measured voltage is within ±1 mV of this comparison value.

for very good electrodes:

Input range	**0 - 999 s**
Default value	**45 s**

for good electrodes:

Input range	**0 - 999 s**
Default value	**50 s**

for usable electrodes:

Input range	**0 - 999 s**
Default value	**60 s**

16 Methods

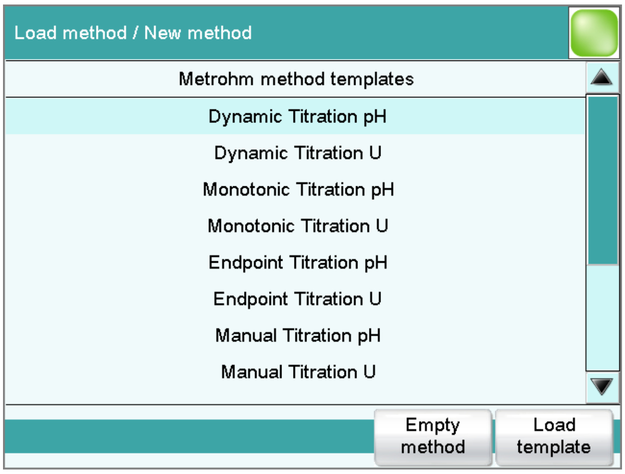
16.1 Creating a new method

Proceed as follows to create a new method:

1 Open the method table

- In the main dialog, tap on **[Load method]**.
- Tap on **[New method]**.

The method table with the stored templates opens:



2 Load the method

- Tap on **[Empty method]**.

or

- Select the desired template and tap on **[Load template]**.

The method is now loaded. **New method** is displayed in the main dialog in the title line.

If a new method has been created, then the individual parameters can be modified with **[Edit parameters]**.

16.2 Saving a method

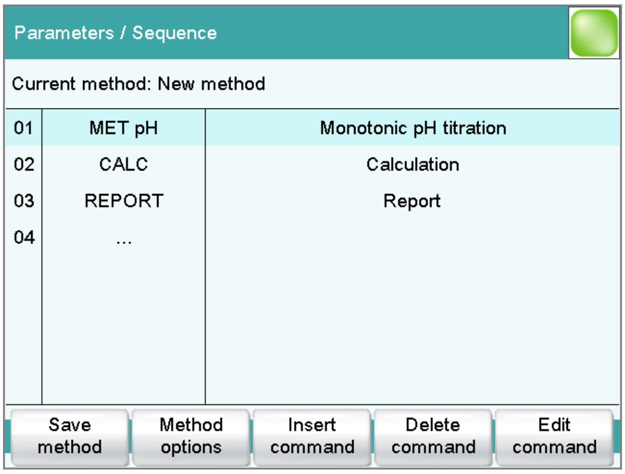
If you modify method parameters, then you can save these as your own method.

To save a method, proceed as follows:

1 Open the command sequence

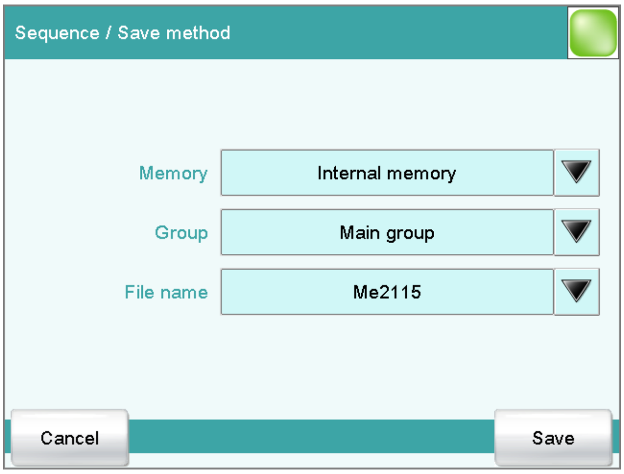
- In the main dialog, tap on **[Edit parameters]**.

The command sequence of the method is displayed:



2 Modify/apply the method name

- Tap on **[Save method]**.
  A method name will be suggested for new methods. If the method has already been saved once, then the method name will be displayed.



Apply the name:

- Tap on **[Save]**.

The method will be saved and the command sequence is displayed.

Enter a new name:

- Tap on the input field **File name**.
  The text editor opens.
- Enter a new file name (max. 32 characters) and confirm with **[OK]**.
- Tap on **[Save]**.

The method will be saved and the command sequence is displayed.

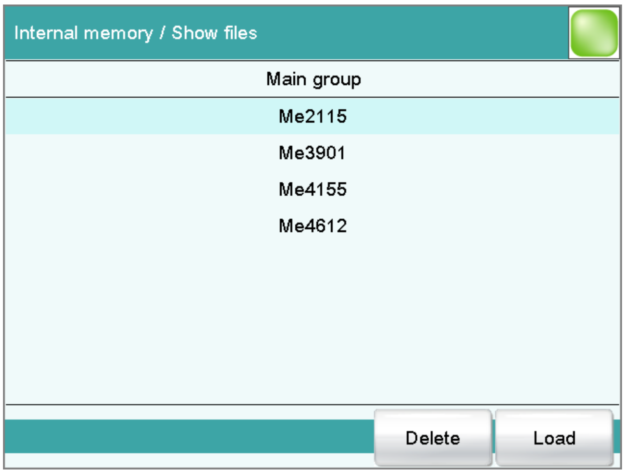
16.3 Loading a method

To load a method, proceed as follows:

1 Open the method table

- In the main dialog, tap on **[Load method]**.
  The selection of memory locations is displayed. This selection will be skipped if only the internal memory is accessible.
- Select the memory location where the desired method is saved.
  The selection of file groups is displayed *(see Chapter 12.1, page 125)*. If only one group is available, then the method table will be displayed directly.
- Select the group with the desired method.
- Tap on **[Show files]**.

The method table with the stored methods opens:



2 Select a method

- Select the desired method.

3 Load the method

- Tap on **[Load]**.

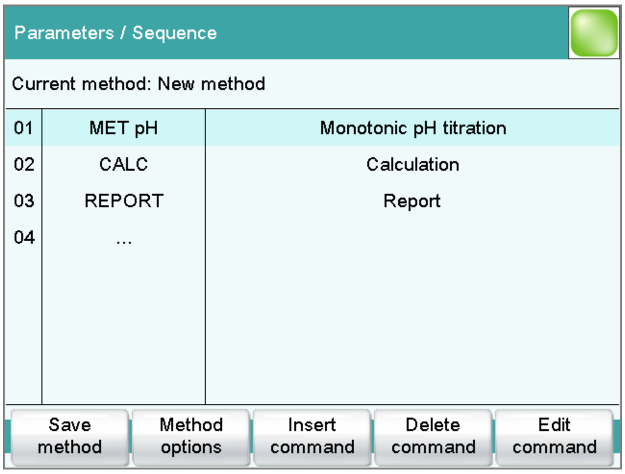
The method is now loaded. The method name is displayed in the main dialog in the title line.

NOTE

The data of the current determination will be deleted when you load a method.

16.4 Editing a method

Main dialog: **Edit parameters**



In the dialog **Parameters / Sequence**, you can define and edit the method commands which are executed successively during a determination.

The following data is displayed in the command list for each command:

- Line number
- Name
- Comment
  You can adjust the comment in accordance with your requirements.

[Save method]

Save the current method *(see Chapter 16.2, page 172)*.

[Method options]

Define various settings which refer to the entire method, e.g. statistics, automatic saving of determinations, settings for sample data, etc. *(see Chapter 16.5, page 176)*.

[Insert command]

Insert a new method command. It is inserted before the selected command.

> **NOTE**
>
> Not all commands are available for subsequences. Commands which cannot be inserted into subsequences are disabled.

[Delete command]

Delete the selected method command.

[Edit command]

Edit the selected method command.

16.4.1 Inserting a command

A method is comprised of individual commands. When you start a determination, the commands are executed one after the other.

The following constraints apply:

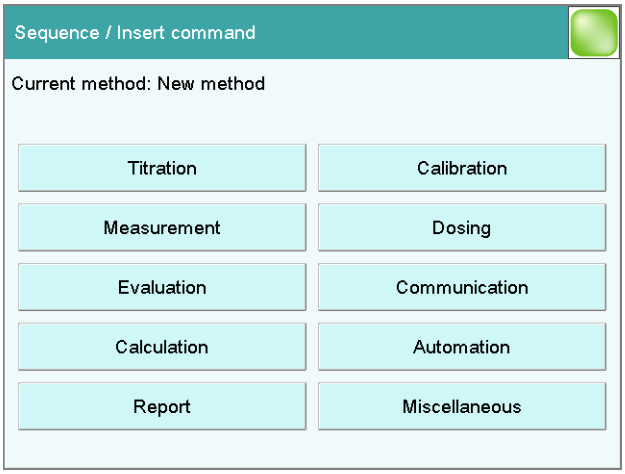
- Maximum of 99 commands
- Maximum of nine commands for titrations, measurements and calibrations

Inserting a command

To insert a command in a method, proceed as follows:

1 Open the command overview

- In the main dialog, tap on **[Edit parameters]**.
- Tap on the button **[Insert command]**.



This dialog contains all of the commands which can be inserted into a method run, organized into thematic groups.

2 Select a command group

- Tap on the desired command group.

In the case of **[Report]**, the command is inserted directly into the command list. For all other command groups, the available commands will be displayed (titration / measuring commands, etc.).

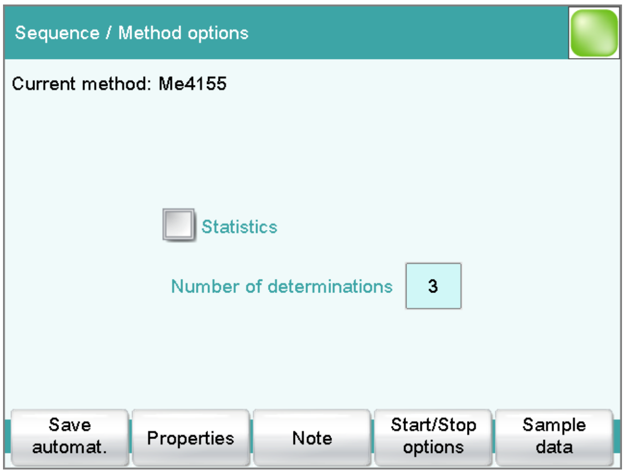
3 Insert the command

Tap on the desired command.

The dialog is closed and the command is displayed in the command list.

16.5 Method options

Main dialog: **Edit parameters ▸ Method options**



Method options are settings which apply to the method as a whole and not to an individual command.

The following settings are available:

- Activate/deactivate statistics calculations
- Save determination automatically
- Check the method when the determination starts
- Define a fixed sample size
- etc.

Statistics

on | off (Default value: **off**)

If this parameter is activated, then statistics calculations will be carried out for all of the defined results. The prerequisite here, however, is that a variable for the mean value is defined in the result options *(see "Dialog "Edit calculation / Result options"", page 357)*.

Number of determinations

The number of determinations that are carried out for the statistics calculations.

If an additional determination has to be added to the determination series, because one determination has been incorrect, for example, then this can be accomplished in the statistical overview *(see Chapter 24, page 231)*.

Input range	**2 - 20**
Default value	**3**

[Save automat.]

Define the settings for automatically saving the determination *(see Chapter 16.5.6, page 184)*.

[Properties]

Display the properties of the current method *(see Chapter 16.5.4, page 184)*.

[Note]

Enter a note on the method *(see Chapter 16.5.5, page 184)*.

[Start/Stop options]

Edit functions which are carried out immediately after the method is started or stopped, *see chapter Start options, page177* and *chapter Stop options, page 179*.

[Sample data]

Specify method-specific settings for the sample data, e.g. designation of the sample identifications, limits for the sample size *(see Chapter 16.5.3, page 180)*.

16.5.1 Start options

Main dialog: **Edit parameters ▸ Method options ▸ Start/Stop options ▸ Start options**

In the dialog **Method options / Start options**, you can configure the functions which are carried out when a determination is started.

Method check at start

on | off (Default value: **on**)

If this option is activated, then the following tests are carried out at the method start.

- Are the required control and peripheral devices connected?
- Are the titrant and the sensor on hand?
- Have the monitoring intervals expired?
- etc.

NOTE

We recommend that the method check only be deactivated if the titration must begin immediately after the start of the determination (e.g. with very rapid reactions such as enzyme-catalyzed reactions). If the method check is deactivated, it could happen that the determination run will be interrupted, e.g. because devices, titrants or sensors are not on hand.

The following settings can be implemented for a connected USB Sample Processor:

Rack reset

on | off (Default value: **off**)

If this option is activated, then the sample rack is initialized at the method start. The following actions are carried out:

- The lift is moved upwards.
- The sample rack is rotated to the starting position.
- The rack code of the rack attached is being read out and the corresponding rack data is transferred to the Sample Processor.
- The sample variable is being reset to the value 1.

Check rack

Definition of the sample rack which must be attached at the time of the method start. This ensures that the method will be carried out only with this sample rack.

NOTE

The sample rack can however only be checked if the**Rack reset** option is activated.

Selection	**no** | **Selection of configured sample racks**
Default value	**no**

Increase sample variable automatically

on | off (Default value: **on**)

The sample variable describes the current position of the sample on the rack of the Sample Processor. If this option is activated, then the sample variable is automatically increased by 1 at the end of each determination.

This option must be deactivated if the sample variable is to be altered specifically with a **SAMPLE** command.

Request rack position at start

on | off (Default value: **off**)

If this option is activated, then the rack position of the first sample to be processed is requested.

16.5.2 Stop options

Main dialog: **Edit parameters ▶ Method options ▶ Start/Stop options ▶ Stop options**

In the dialog **Method options / Stop options**, you can define the actions which are carried out when a method is canceled.

The method can be canceled as follows:

- Manual stop with the fixed key **[☐]**
- Stop because of an error
- Stop by remote signal via the Control Remote Box

Switch off pumps

on | off (Default value: **on**)

If this option is activated, then all of the connected pumps will be switched off.

Switch off stirrers

on | off (Default value: **on**)

If this option is activated, then all of the connected stirrers will be switched off.

Set remote lines

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System ▶ Templates ▶ Output lines**.

> **NOTE**
>
> A line set active is not being reset automatically, not even at the end of the determination.

Entering the bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal ***************1** line 0 is set. With a pulse, the length is set to 200 ms. If you wish to set pulses with other lengths, you have to define a corresponding template.

Entry	**Bit pattern containing exactly 14 characters or a max. of 24 characters for the name of the template**
Default value	**************
Selection	**Selection of the templates defined**

16.5.3 Sample data

Main dialog: **Edit parameters ▸ Method options ▸ Sample data**

You can define the following method-specific settings in the dialog **Method options / Sample data**:

- Modify the designation for the sample identifications
- Define a fixed sample size
- Define limits for the sample size
  If you define limits, these will be monitored at the start and at the end of the determination.

Below you will find an example demonstrating the effects on the main dialog of the settings in this dialog *(see "Modifying sample data", page 182)*.

Identification 1, Identification 2

on | off (Default value: **on**)

If this option is activated, then the input field for the sample identification in the main dialog will be displayed.

Designation

A designation of your own choosing can be defined for the input field for each method.

Entry	**16 characters maximum**

Fixed sample size

on | off (Default value: **off**)

Activate this parameter if the same sample amount is always to be used for all determinations. If this is case, then you can define the sample size here. It will be displayed in the main dialog, but it can no longer be changed there.

Sample size

This parameter can only be edited when **Fixed sample size** is activated.

Input range	**–999999999 - 9999999999**
Default value	**1.0**

Unit of sample size.

Selection	**g | mg | µg | mL | µL | pieces**
Default value	**g**

NOTE

You can also use the parameter **Fixed sample size** if you would like to establish a default for the sample size.

Example: For a particular determination, you require 10 mL of sample. Now and again, however, you have too little sample available and you must perform the determination with 5 mL, for instance. In this case, proceed as follows:

1. Activate the parameter **Fixed sample size**.
2. Define the value and unit for the sample size, in the above example, for instance, **[10 mL]**.
3. Deactivate the parameter **Fixed sample size** again.
4. Save the method.

⇨ Each time you load this method, 10 mL is entered as the sample size, but in the example mentioned you can enter the lesser quantity of 5 mL.

[Sample size limits]

This button is accessible only if**Fixed sample size** is deactivated.

Define the limit values for the sample size *(see "Defining limit values for the sample size", page 183)*.

Modifying sample data

This instruction is for the purpose of clarifying the settings which are possible in this dialog. The following settings should be made:

- Change the designation for the input field of the first sample identification.
- Hide the input field for the second sample identification.
- Define a fixed sample size.

Proceed as follows:

1 Change the designation for the input field

- Tap on the input field **Identification 1**.
  The text editor opens.
- Change the designation in **Batch** and confirm with **[OK]**.
- Deactivate the parameter **Identification 2**.

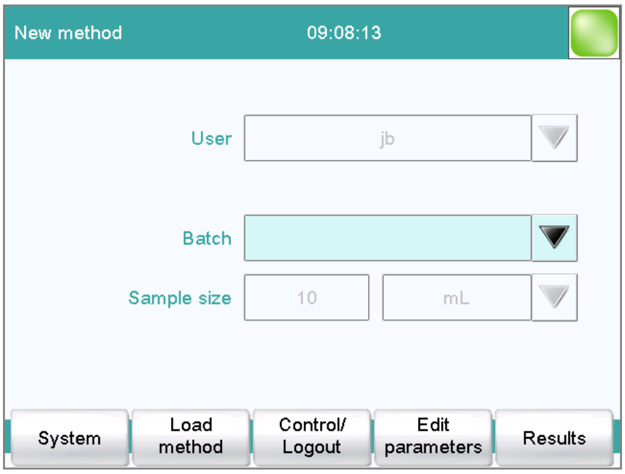
2 Define a fixed sample size

- Activate the parameter **Fixed sample size**.
- Enter the value **10 mL** as **Sample size**.

3 Display the main dialog

Tap on the fixed key **[ ]**.

The data is saved and the adjusted main dialog appears.



Only Identification 1 is shown with the title "Batch." The fixed sample size "10 mL" is shown, but cannot be edited.

Defining limit values for the sample size

In the dialog **Sample data / Sample size limits**, you can define the limit values for the sample size. These values are not monitored during sample data input, but rather:

- when the determination is started.
- when the determination is finished.
- upon automatic sample data query via the command **REQUEST**.
- when the determination is being recalculated.

An entry is made in the message list automatically when these limits are infringed *(see Chapter 23.2, page 219)*.

Monitoring sample size limits

on | off (Default value: **off**)

If this parameter is activated, then the sample size will be monitored.

Lower limit

Input range	**–999999999 - 9999999999**
Default value	**0**

Upper limit

Input range	**–999999999 - 9999999999**
Default value	**9999999999**

Display message

on | off (Default value: **off**)

If this parameter is activated, a message is displayed in case the limits are infringed. You can select whether you want to continue with the determination or cancel the run.

If this parameter is deactivated, then the message will be entered only in the message list of the determination.

Timeout

The message is displayed during this time. Afterwards, the determination is continued automatically.

Input range	**0 - 999999 s**
Default value	**30 s**
Selection	**off**

off
The determination will not be continued until after the message has been confirmed.

16.5.4 Method properties

Main dialog: **Edit parameters ▶ Method options ▶ Properties**

Detailed information concerning the method is displayed in the dialog **Method options / Properties**.

- **Method status**
  Current status of the method.
  - **new**
    The method has been newly created and not yet saved.
  - **saved**
    The current method has been saved.
  - **modified**
    The current method has been modified.
- **Created by**
  User who created the method.
- **Created on**
  Date and time at which the method was created.
- **Last saved by**
  User who saved the method most recently.
- **Last saved on**
  Date and time at which the method was most recently saved. The version of the method is displayed as well. The version number will be increased by one each time the file is saved.

16.5.5 Note

Main dialog: **Edit parameters ▶ Method options ▶ Note**

In this dialog, you can enter a short text, e.g. important information about carrying out the determination.

[Display options]

Definition when the note is being displayed.

Automatically after loading the method

on | off (Default value: **off**)

If this parameter is activated, the note is displayed when loading the method. It can otherwise only be read in this dialog.

16.5.6 Saving a determination automatically

Main dialog: **Edit parameters ▶ Method options ▶ Save automat.**

In the dialog **Method options / Save automatically**, you can specify whether the determination is to be saved automatically and/or whether a PC/LIMS report is to be created.

Save determination automatically

on | off (Default value: **off**)

If this parameter is activated, then the determination will be saved automatically.

Memory

Memory location where the determination will be saved.

Selection	**External memory 1 | External memory 2 | Shared memory**
Default value	**External memory 1**

Shared memory
The determination will be saved in a shared directory on the network. The shared directory is selected in the **Edit device / Shared memory** dialog *(see Chapter 11.3.3, page 91)*.

Group

Directory where the determination will be saved.

Entry	**32 characters maximum**
Selection	**Selection of available directories | empty**
Default value	**empty**

File name

File name of the determination. The file name is always extended to include the date and the time of day (YYYYMMDD-hhmmss) in order to ensure that the file names are unique for all determinations.

Entry	**max. 16 characters**
Selection	**Identification 1 | Identification 2 | Method**
Default value	**Identification 1**

Identification 1
The first 16 characters of the text which was entered in the main dialog for Identification 1 + YYYYMMDD-hhmmss.

Identification 2
The first 16 characters of the text which was entered in the main dialog for Identification 2 + YYYYMMDD-hhmmss.

Method
The first 16 characters of the text, of the method name + YYYYMMDD-hhmmss.

Write protection

on | off (Default value: **on**)

If this parameter is activated, then the file cannot be saved, deleted, or renamed. This is only an internal write protection feature and is independent of the write protection of the operating system on your computer. This write protection feature protects the saved determination data against accidental modifications or modifications by unauthorized persons.

Create PC/LIMS report

on | off (Default value: **off**)

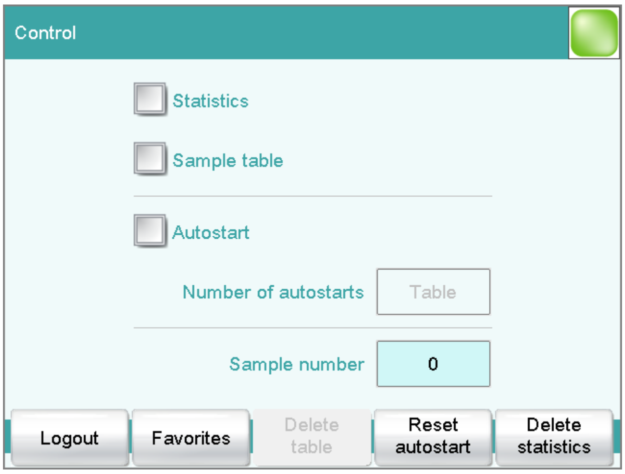
If this parameter is activated, then a machine-readable report with all of the important data for the determination is created, a so-called PC/LIMS report.

The settings are implemented in the device manager *(see Chapter 11.3.2, page 90)*.

When you save the PC/LIMS report as a file, the file name will be generated automatically as follows: **PC_LIMS_Report-**first 16 characters of the value of the parameter **File name-Date-Time.txt**. If the value of the parameter **File name** contains one or more of the following characters, then these will be automatically converted in the file name into the character "_": / \ : * ? " < > |.

17 Control

Main dialog: **Control**



In the dialog **Control**, the settings for the execution of a single determination or of one sample series are defined.

If you work with the login function activated, you can log off the system in this dialog. The login dialog will then be shown immediately.

Statistics

on | off (Default value: **off**)

With this option, you can enable or disable the statistics calculations for individual determinations *(see "Statistics", page 189)*.

NOTE

The parameter **Statistics** in the method options will not be changed as a result. This setting here will be adjusted automatically to match the one in the method options.

Sample table

on | off (Default value: **off**)

If this option is activated, the sample data for a sample series can be entered in a table *(see Chapter 20, page 198)*.

Autostart

on | off (Default value: **off**)

If this option is activated, a new determination is started automatically at the end of a determination. This continues until the number specified has been reached (siehe **Number of autostarts**).

NOTE

If you deactivate this option while a determination is running, then that determination will be ended, although the next one will however also not be started. This can be used to cancel a sample series.

Number of autostarts

Number of automatic starts.

Input range	**1 - 9999**
Selection	**Table**
Default value	**Table**

Table
The number of automatic starts corresponds to the number of samples in the sample table.

Sample number

The sample number is primarily used for documentation. Each time that a determination is started it is increased by one. The sample number can however also be entered manually. Each time the Ti-Touch is switched on, the value is reset to zero.

Input range	**0 - 9999**
Default value	**0**

[Logout]

User logout (visible only when work is done with activated login function).

[Favorites]

Save methods/sample tables as a favorite *(see Chapter 18, page 191)*. Depending on whether you are working with or without login function, user-specific or common favorites can be created. On the main dialog, a button is created for each favorite. This way, a method or a sample table can be started with one single mouse click.

[Delete table]

Delete the sample table completely.

[Reset autostart]

Reset the value of the autostart counter to zero.

[Delete statistics]

Delete all statistics data.

The statistics data should be deleted manually if a sample series has been canceled and a new sample series is to be started.

The statistics data is deleted automatically in following cases:

- when all of the determinations of the determination series have been carried out and a new determination has been started afterwards.
- when a new method is loaded.
- when a determination is loaded (the method with which the determination was carried out is loaded simultaneously with the determination).

Statistics

In the dialog **Control**, you can deactivate the statistics calculations for individual determinations. This option is required primarily in order to insert the processing of an "**urgent sample**" during the processing of a sample series when the urgent sample is not to be included in the statistics calculations.

Interrupting a determination series for an "urgent sample"

If the same method is required for the "urgent sample" as is being used for the sample series, then you need only deactivate the option **Statistics** and then reactivate it after the determination is completed. Proceed as follows if you need to process the "urgent sample" with a different method:

1 Deactivate statistics calculation

- Deactivate the option **Statistics**.

2 Save the determination

- Save the current determination of the sample series *(see Chapter 23.6, page 227)*.

3 Carry out the determination

- Load the method for the "urgent sample".
- Carry out the determination.

4 Load the last determination of the sample series

- Reload the previously saved last determination.

The determination, the method used for it and the current statistical data are loaded. The option **Statistics** is activated again and the value of the statistics counter corresponds to that in effect before the interruption.

5 Continue the sample series

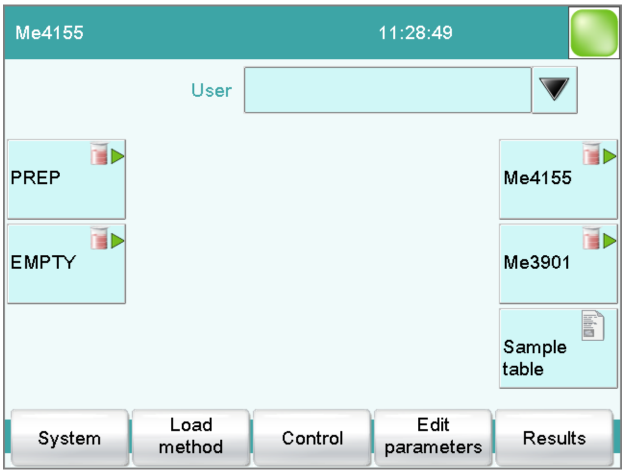
- Carry out the remaining determinations in the sample series.

18 Favorites

Main dialog: **Control ▸ Favorites**

Main dialog: **System ▸ System settings ▸ User admin. ▸ Edit ▸ Favorites**

This chapter describes how you can create favorites. Favorites are comparable to the favorites/bookmarks in your Internet browser. In the main dialog, a button is created for each favorite. By pressing a single key, you can trigger an action without having to navigate through different dialogs.



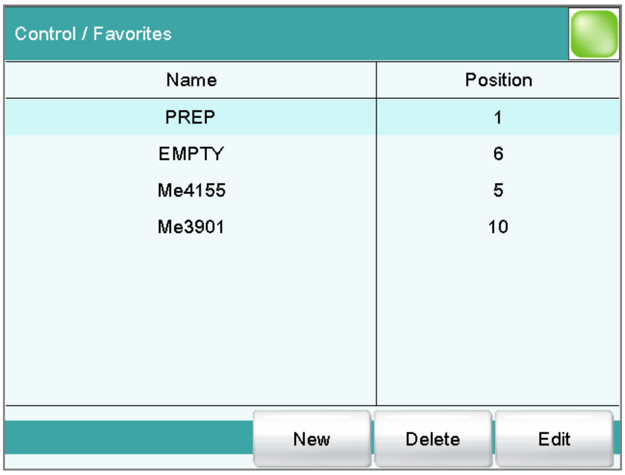
The following objects can be saved as favorites:

- Methods
- Sample tables

User-specific or common favorites can be created, depending on whether you are working with or without the login function.

- Operation with login function:
  If you are working with the login function activated, **user-specific favorites** can be created. These can only be used by a certain user. User-specific favorites are created as follows:
  - in the user administration by a user with administrator rights (**System ▸ System settings ▸ User admin. ▸ Edit**).
  - in the dialog **Control** for the user who is logged in.
- Operation without login function:
  If you are working without the login function, **common favorites** can be created. These favorites are available for all users. Common favorites are created in the **Control** dialog.

18.1 Creating favorites



The list of favorites gives the designation and position of the button on the main dialog of each favorite configured.

[New]

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

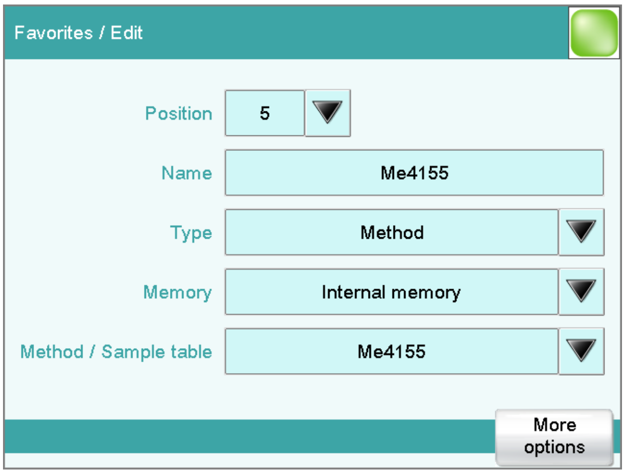
[Delete]

Delete the selected favorite from the list.

[Edit]

Edit the properties of the selected favorite, see following chapter.

18.1.1 Editing favorites



Position

On the main dialog, a button is created for each favorite. These buttons are ordered in three rows at fixed positions. The position 1 can be found top left.

Input range	**1 - 14**
Default value	**1**

Name

The designation of the favorite is used for unambiguous identification.

Entry	**24 characters maximum**

Type

Definition as to whether the favorite represents a single method or a complete sample table.

Selection	**Method | Sample table**
Default value	**Method**

Memory

Memory location the method or the sample table is loaded from. Only the currently accessible memory locations are selectable.

Selection	**Internal memory | External memory 1 | External memory 2 | Shared memory**
Default value	**Internal memory**

Shared memory
The favorite will be saved in a shared directory on the network. The shared directory is selected in the **Edit device / Shared memory** dialog *(see Chapter 11.3.3, page 91)*.

Method / Sample table

Method or sample table of the favorite.

Selection	**Selection of stored methods/sample tables**

[More options]

Parameterize the autostart function, see following chapter.

More options

The autostart function is parameterized under **[More options]**.

Autostart

on | off (Default value: **off**)

If this option is activated, a new determination is started automatically at the end of a determination. This continues until the number specified has been reached (siehe **Number of autostarts**).

Number of autostarts

This option can only be edited when **Autostart** is activated.

Number of automatic starts.

Input range	**1 - 9999**
Default value	**1**
Selection	**Table**

Table
The number of automatic starts corresponds to the number of samples in the sample table.

19 Sample data

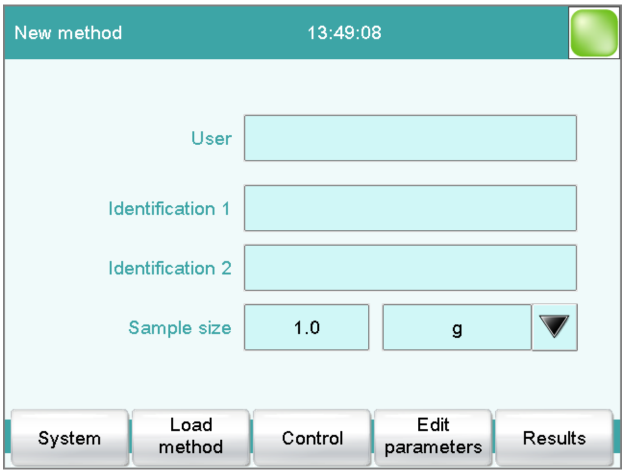
You can enter the sample data (identification, sample size, etc.) in a variety of ways:

- Directly in the main dialog.
- Using the sample table. This is particularly useful with sample series. The sample table is a table in which the sample data for up to 999 samples can be entered *(see Chapter 20, page 198)*.
- Automatic request immediately after the start of the determination *(see Chapter 19.2, page 196)*.

You can also send the sample size and the unit from a connected balance in any case. With some balances, the sample identification and method can be also sent *(see Chapter 31.4, page 407)*.

19.1 Entering sample data in the main dialog

For a sample, you can enter the sample data directly in the main dialog, even while the determination is running *(see Chapter 22, page 209)*.



Identification 1

Sample identification. The sample identification can be used in calculations as the variable **CI1**. If you have defined a sample identification list *(see Chapter 15.1.1, page 152)* then the entries can be selected here.

Entry	**24 characters maximum**
Default value	**empty**

Identification 2

Sample identification. The sample identification can be used in calculations as the variable **CI2**. If you have defined a sample identification list *(see Chapter 15.1.1, page 152)* then the entries can be selected here.

Entry	**24 characters maximum**
Default value	**empty**

Sample size

Sample size. The value of the sample size can be used in calculations as the variable **C00**.

Input range	**–99999999 - 9999999999**
Default value	**1.0**

Unit of sample size.

Entry	**6 characters maximum**
Selection	**g | mg | µg | mL | µL | pieces**
Default value	**g**

Unit defined in method:

The unit defined in the method is ignored. The unit entered in the sample table is used.

Balance connected and configured:

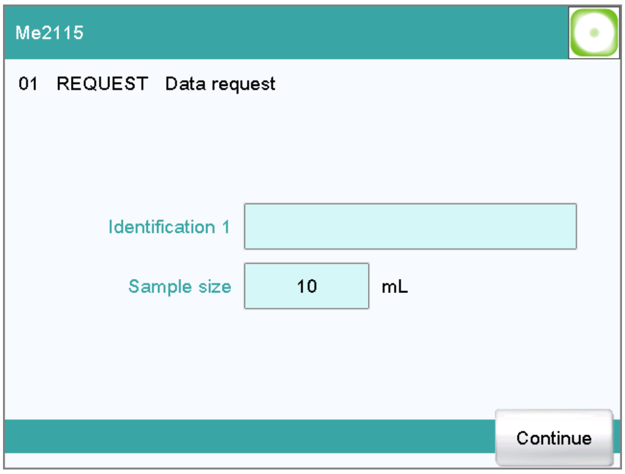
Value from the connected balance.

Fixed sample size defined in method:

The value will be entered in the corresponding line when the method is loaded. The existing entry will be overwritten.

19.2 Requesting sample data at the start of the determination

The sample data can be automatically requested immediately after the start of the determination in order to ensure that the sample data entry is not forgotten. This automatic inquiry is requisite for reweighing.



To accomplish this, you must insert and configure the command **REQUEST** in the method *(see Chapter 28.14.3, page 397)*.

If the **Hold sequence** parameter is activated, then the run will be paused and must be continued with **[Continue]** after the sample data has been entered. If the **Hold sequence** parameter is deactivated, then the determination will continue in the background until the measured data is required for further processing. This dialog will be displayed until the entering of the sample data is confirmed with **[Continue]**, even if the titration/measurement is already completed. This ensures that the sample data is available for calculations.

If a fixed sample size has been defined in the method *(see Chapter 16.5.3, page 180)*, then it will be displayed at the time of the entry but it will not be editable.

20 Sample table

20.1 General

Main dialog: **Sample table**

The sample table is a table in which the sample data for up to 999 samples can be entered. If you are processing larger-sized sample series, it makes sense to enter the sample data in this table.

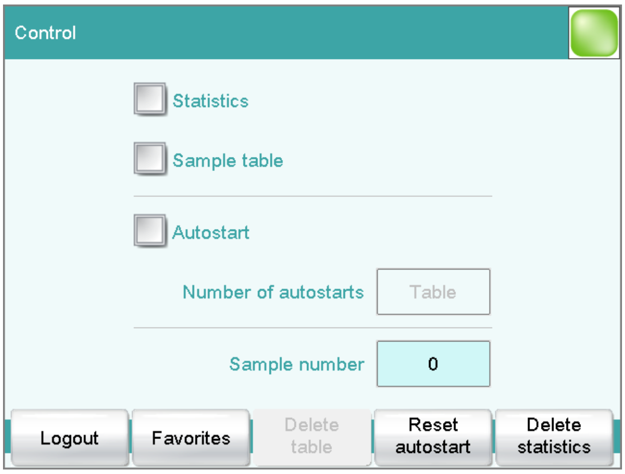
Enabling the sample table

Proceed as follows to enable the sample table:

1 Open the control dialog

- In the main dialog, tap on **[Control]**.

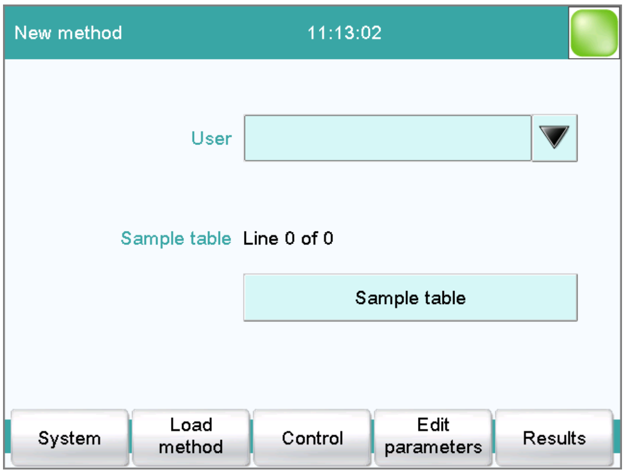
The control dialog is displayed:



2 Enable the sample table

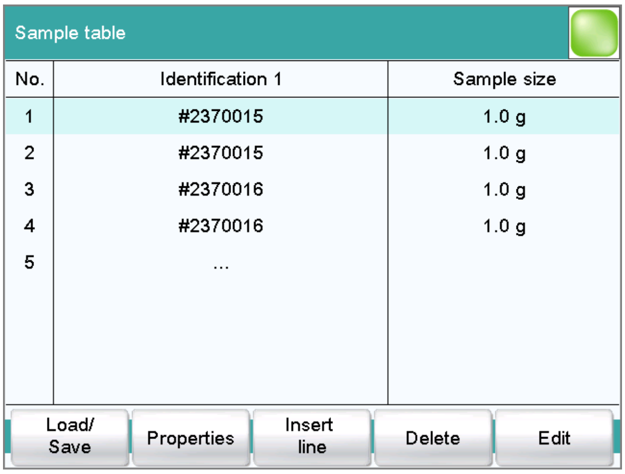
- Enable the option **Sample table**.
- Tap on the fixed key **[ ]**.

The main dialog is displayed:



The display will show the number of determinations already carried out and the total number of sample lines containing data. The sample table is still empty in this example.

The sample table contains numbered lines; each line represents one determination. In the standard settings, the first sample identification and the sample size of each sample are displayed. In the properties, you define the columns to be displayed *(see Chapter 20.3, page 203)*.



[Load/ Save]

Load a saved sample table *(see "Loading a sample table", page 201)* or save the current sample table *(see "Saving a sample table", page 200)*.

[Properties]

Edit the properties of the sample table *(see Chapter 20.3, page 203)*.

[Insert line]

Insert a new line above the line selected.

[Delete]

Delete the selected line from the sample table.

[Edit]

Edit the data of the selected line *(see Chapter 20.2, page 201)*.

Saving a sample table

NOTE

Sample tables can only be saved on external storage media or on a shared file system.

Proceed as follows to save a sample table:

1 Open the dialog

- In the dialog **Sample table**, tap on the button **[Load/ Save]**.

The dialog **Sample table / Load/Save** is displayed.

If no external storage medium is plugged in or if no file system is shared, then **[Save]** is disabled.

2 Modify/apply a name

- Tap on **[Save]**.
  A name is suggested for new sample tables. If the sample table has already been saved, the previous name will be displayed.

Apply the name:

- Tap on **[Save]**.

The sample table is saved.

Enter a new name:

- Tap on the input field **File name**.
  The text editor opens.
- Enter a new file name (max. 32 characters) and confirm with **[OK]**.
- Tap on **[Save]**.

The sample table is saved.

Loading a sample table

Proceed as follows to load a sample table:

1 Display the list of saved sample tables

- In the dialog **Sample table**, tap on the button **[Load/ Save]**.
  The dialog **Sample table / Load/Save** is displayed.
  If no external storage medium is plugged in or if no file system is shared, then **[Load]** is disabled.
- Tap on **[Load]**.
  The selection of memory locations is displayed. This selection will be skipped if only one memory can be accessed.
- Select the memory location where the desired sample table is stored.
  The selection of file groups is displayed *(see Chapter 12.1, page 125)*. If only one group is available, then the list of the saved sample tables will be displayed directly.
- Select the group with the desired sample table.
- Tap on **[Show files]**.

The list with the saved sample table is opened.

2 Select the sample table

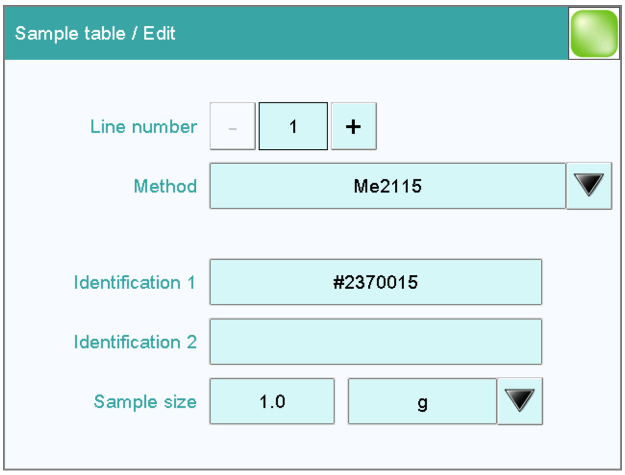
- Select the desired sample table.

3 Load the sample table

- Tap on **[Load]**.

The sample table is now loaded.

20.2 Edit the sample data



At the very top you will see the line number of the selected line. In this example, the sample data of the first line is displayed. You can scroll between individual data sets with the keys **[–]** and **[+]**.

Method

Method used for processing the sample.

If you use the sample assignment table *(see Chapter 15.1.2, page 153)*, then the method can no longer be defined here.

Selection	**Selection of stored methods | empty**
Default value	**empty**

empty
The currently loaded method is used.

Identification 1

Sample identification. The sample identification can be used in calculations as the variable **CI1**. If you have defined a sample identification list *(see Chapter 15.1.1, page 152)* then the entries can be selected here.

Entry	**24 characters maximum**
Default value	**empty**

Identification 2

Sample identification. The sample identification can be used in calculations as the variable **CI2**. If you have defined a sample identification list *(see Chapter 15.1.1, page 152)* then the entries can be selected here.

Entry	**24 characters maximum**
Default value	**empty**

Sample size

Sample size. The value of the sample size can be used in calculations as the variable **C00**.

Input range	**–99999999 - 9999999999**
Default value	**1.0**

Unit of sample size.

Entry	**6 characters maximum**
Selection	**g | mg | µg | mL | µL | pieces**
Default value	**g**

Unit defined in method:

The unit defined in the method is ignored. The unit entered in the sample table is used.

Balance connected and configured:

Value from the connected balance.

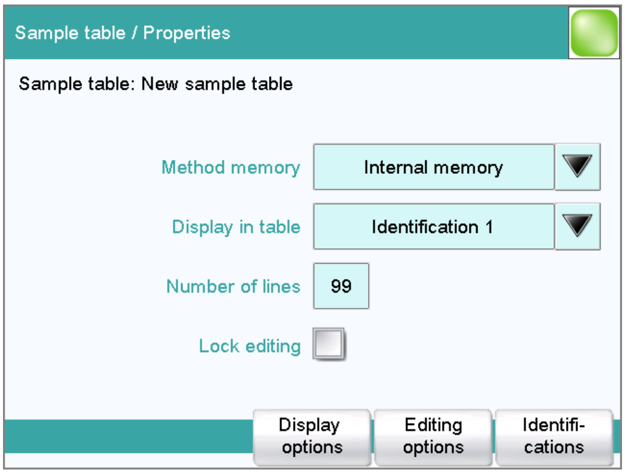
Fixed sample size defined in method:

The value will be entered in the corresponding line when the method is loaded. The existing entry will be overwritten.

NOTE

The sample size limits defined in the method are not monitored when the sample data is being entered in the sample table.

20.3 Properties



Method memory

Memory location the method is loaded from. All memory locations are selectable, even if they are currently not accessible.

Selection	**Internal memory | External memory 1 | External memory 2 | Shared memory**
Default value	**Internal memory**

Shared memory
Shared directory in the network.

Display in table

Selection of the columns to be displayed in the sample table.

Selection	**Method | Identification 1 | Identification 2**
Default value	**Identification 1**

Method
Only the assigned method is displayed for each sample.

Identification 1
The first sample identification and the sample size are displayed for each sample.

Identification 2
The second sample identification and the sample size are displayed for each sample.

Number of lines

Maximum number of lines which can be present in the sample table.

Input range	**2 - 999**
Default value	**99**

Lock editing

on | off (Default value: **off**)

If this option is activated, then the sample data can no longer be altered.

Display options

Configure the sample data to be displayed in the dialog**Sample table / Edit** *(see "Dialog "Properties / Display options"", page 204)*.

Editing options

Specify the settings for the processing of the sample data *(see "Dialog "Properties / Editing options"", page 204)*.

Identifications

Define the designations for the input fields of Identification 1 and Identification 2 *(see "Dialog "Properties / Identifications"", page 205)*.

Dialog "Properties / Display options"

Sample table: **Properties ▶ Display options**

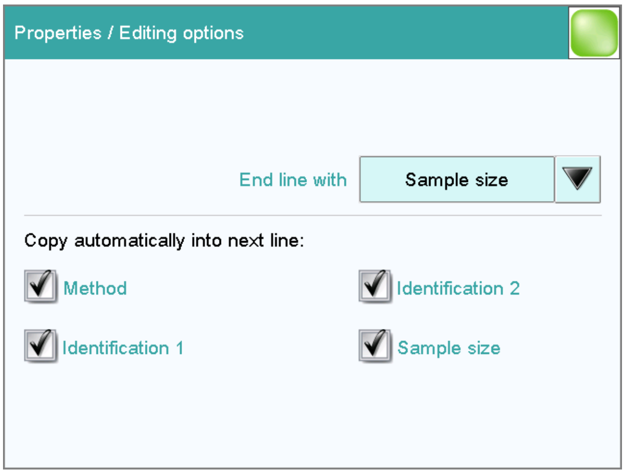
In this dialog, you can configure which of the following sample data can be edited in the sample table:

- **Method**
- **Identification 1**
- **Identification 2**
- **Sample size**

Dialog "Properties / Editing options"

Sample table: **Properties ▶ Editing options**

In this dialog, you can define the settings so that the input of the sample data becomes simpler and faster.



End line with

Selection as to with which input the editing dialog for the next sample is automatically displayed.

Selection	**Sample size** | **Identification 1** | **Identification 2** | **manual**
Default value	**Sample size**

manual
The editing dialog for the next sample can be displayed with the **[New sample]** button in the editing dialog.

If, for example, you have to enter similar data for each sample, then you can automatically copy the data which is identical for each sample into the next line.

- **Method**
- **Identification 1**
- **Identification 2**
- **Sample size**

Dialog "Properties / Identifications"

Sample table: **Properties** ▶ **Identifications**

In the dialog **Properties / Identifications**, you can alter the designations for the sample identifications in accordance with specific methods.

21 Determination run

This chapter provides a description of how to carry out a determination, i.e. how to process a single sample or a sample series. The current sample data is used for calculations.

21.1 Carrying out a single determination

When you carry out a determination, you can enter the sample data in various ways *(see Chapter 19, page 195)*. The following instructions describe how to enter the sample data in the main dialog.

To carry out a single determination, proceed as follows:

1 Load the method

- *See Chapter "Loading a method", Page 173*.

2 Prepare the sample

NOTE

Calculate the amount of the sample in such a way that a titrant consumption of 10…90 % of the cylinder volume will result.

- Weigh in or measure the sample in a sample vessel.
- Add solvent.
- Place the sample vessel on the stirrer.
- Immerse the electrode and buret tip in the solution.

3 Enter the sample size

- In the main dialog, tap on the input field **Sample size**.
  The number editor opens.
- Enter the sample size and confirm with **[OK]**.

4 Start the determination

- Tap on the fixed key **[▷]**.

Sequence of the determination

- After a determination is started, a check is made as to
  - whether all of the devices required are connected and ready for operation.
  - whether all titrants and sensors are present.
  - whether the monitoring intervals for titrants, sensors and common variables are still valid.
  - if a sample assignment table is activated *(see Chapter 15.1.2, page 153)*:
    whether the entered sample identification is defined in the sample assignment table. If this is the case, then the assigned method will be loaded automatically and the actual determination will be started.

NOTE

Manual titrations (MAT command):

Start of titration: Because of the technical implementation involved, a few microliters are already dosed at the start of a manual titration. The possibility of deviation from the actual endpoint volume is excluded, however, because the already dosed volume is taken into account.

End of titration: A manual titration must always be ended with the button **[Skip command]** (NOT with the fixed key **[☐]**). This is the only way to ensure that subsequent method commands will be carried out.

21.2 Performing a sample series

You can use the following functions with sample series:

- **Statistics for multiple determinations**
  The statistics calculations are enabled in the method options *(see Chapter 16.5, page 176)*.
- **Sample table**
  You can enter the sample data for an entire sample series in the sample table *(see Chapter 20, page 198)*.

Sequence of the sample series

- After a determination is started, a check is made as to
  - whether all of the devices required are connected and ready for operation.
  - whether all titrants and sensors are present.
  - whether the monitoring intervals for titrants, sensors and common variables are still valid.
  - if a sample assignment table is activated *(see Chapter 15.1.2, page 153)*:
    whether the entered sample identification appears in the sample assignment table. If this is the case, then the assigned method will be loaded automatically and the actual determination will be started. If a different method has been entered in the sample table, then it will be ignored.
- At the end of the determination,
  - the line in the sample table is deleted.
  - the next determination is started (if you are working with the autostart function enabled *(see Chapter 17, page 187)*).

21.3 Canceling determinations manually

You can cancel a determination at any time with the fixed key **[☐]**. The command being carried out at that moment is canceled and no further commands are executed.

If you are working with the autostart function activated *(see Chapter 17, page 187)*, the entire series will be canceled.

NOTE

If you do not wish to cancel the entire determination, but only a single command, use the function **[Skip command]** in the live display. This is particularly useful if you want to cancel a titration because the sought-after equivalence point has already been determined. All subsequent commands, e.g. calculations and print report, will nevertheless still be carried out.

22 Live modifications

22.1 Editing the sample data of the running determination

The sample data can be entered or modified in the main dialog while a determination is running. The sample data entered at the end of the determination is always used in calculations.

Proceed as follows to edit the sample data:

1 Display the main dialog

- Tap on the fixed key **[⇦]**.

The main dialog is displayed. The determination continues to run in the background.

2 Edit the sample data

- Edit the sample data and apply with **[OK]**.

3 Display the live dialog

- Tap on **[Live display]**.

The live dialog is displayed once again.

NOTE

Make sure that the input dialogs are closed before the determination is ended. Otherwise the determination will have to be recalculated.

22.2 Editing the sample table while a determination is running

You can insert new lines or delete existing ones or edit sample data while a determination is running.

NOTE

To ensure that no problems arise during the run and that the current data is always available for the calculation, we recommend that the input dialogs always be closed.

Editing the sample table

Proceed as follows to edit the sample table:

1 Display the main dialog

- Tap on the fixed key **[⇦]**.

The main dialog is displayed. The determination continues to run in the background.

2 Select the sample data

- Tap on **Sample table**.
  The sample table is displayed. The first line always contains the sample data of the running determination.
- Select the desired line.
- Tap on the button **[Edit]**.

3 Edit the sample data

- Edit the sample data and apply with **[OK]**.

NOTE

In addition to the sample data, the method can also be modified, except in cases where the determination is running.

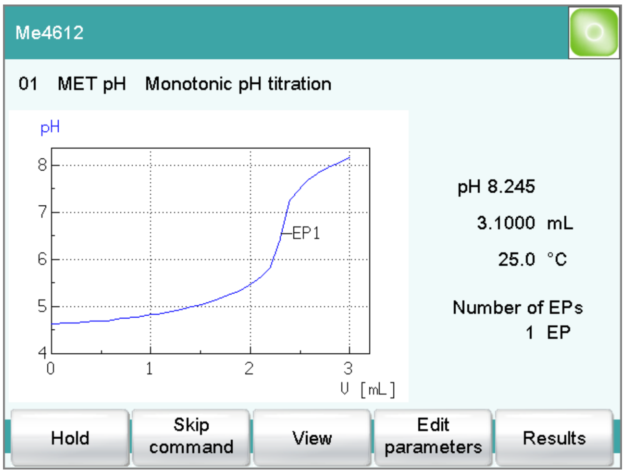
4 Display the live dialog

- Tap on the fixed key **[⇦]**.
  The main dialog is displayed.
- Tap on **[Live display]**.

The live dialog is displayed once again.

22.3 Live display

Main dialog: **Live display**



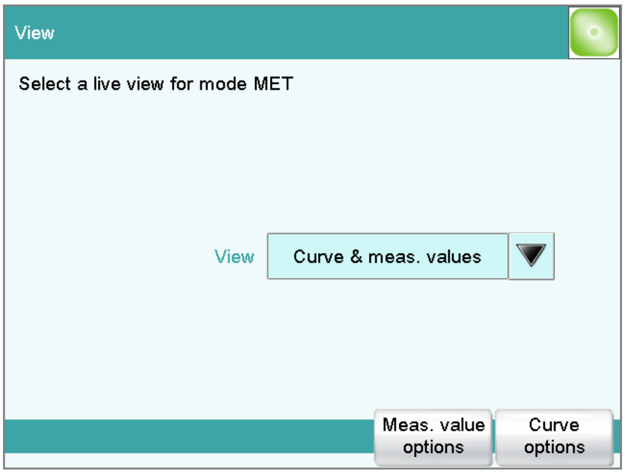
The current method and the system status are displayed in the title line. The currently running command is displayed directly underneath the title line.

The following functions are available to you while a determination is running:

- **[Hold]**
  Pause the determination. The label changes to **[Continue]**. This can be used to continue the run.
- **[Skip command]**
  Cancel the current method command. The next command is started.
- **[View]** (only for titrations/measurements)
  To modify the settings for the curve and measured value display, see below.
- **[Sample data]** (visible only if a titration or a measurement is not currently running)
  Switch to the main dialog in order to edit the sample data.
- **[Edit parameters]**
  Edit the method options and live parameters *(see Chapter 22.4, page 213)*.
- **[Results]**
  Display the results dialog *(see Chapter 23, page 215)*.

Dialog "View"

Main dialog: **Live display ▸ View**



View

Type of curve display.

Selection	**Curve** | **Curve & meas. values** | **Measured values** | **Curve & sample data**
Default value	**Curve & meas. values**

Curve
Only the curve is displayed.

Curve & meas. values
The measured values are displayed to the right next to the curve.

Measured values
Only the measured values are displayed.

Curve & sample data
The sample data is displayed to the right next to the curve.

[Meas. value options]

Define settings for the display of the measured values.

A maximum of three different values can be displayed at the same time. The selection depends on the titration/measuring mode. The settings are saved separately for each mode.

[Curve options]

Define the settings for the curve display *(see "Curve options", page 228)*. The settings are saved separately for each titration/measuring mode and apply not only for the live display but also for the curve display in the results dialog.

22.4 Live parameters

Live display: **Edit parameters**

Certain method parameters can be edited while a determination is being carried out. The modified parameters are taken into account at once. If you modify, for instance, the start conditions after the start volume has been dosed, then these modifications will not be taken into account until the next determination.

NOTE

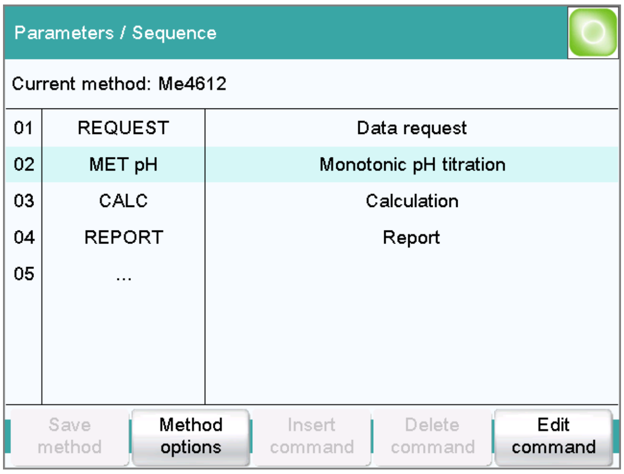
If the live modifications are also to be used in the future, then the method must be saved after the determination has been completed. The live modifications are discarded as soon as you load a new method.

If you are working with the sample table and a different method is used for the next sample, then the live modifications will be discarded.

Proceed as follows to modify method parameters during an ongoing determination:

1 Select the method command

- Tap on **Edit parameters**.
  The command sequence is displayed.



  [Edit command] is enabled only for those commands for which the live parameters can be edited.
  All of the functions except for the method properties can be edited with **[Method options]**.
- Select the desired method command.
- Tap on **[Edit command]**.

2 Edit the method parameters

- Change the desired parameters accordingly.

3 Display the live dialog

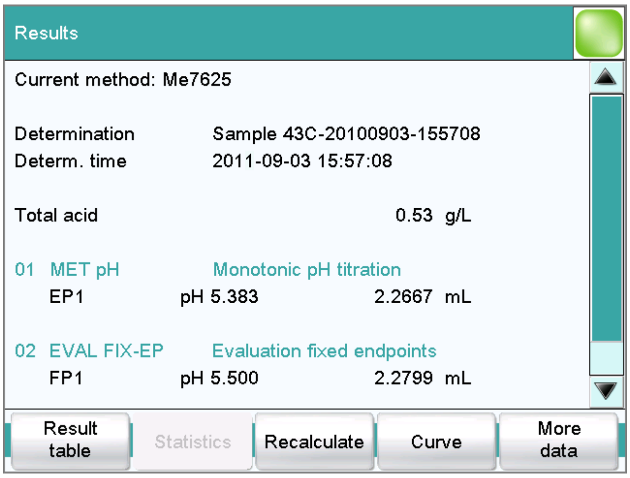
- Tap on the fixed key **[⌂]**.
  The main dialog is displayed.
- Tap on **[Live display]**.

The live dialog is displayed once again.

23 Results and more determination data

Main dialog: **Results**

Detailed specifications concerning the current determination are displayed in the **Results** dialog:



- **Current method**
  Method with which the determination was carried out.
- **Determination**
  Name of the determination. Displayed only if the determination has been saved.
- **Determination time**
  Date and time at which the determination was carried out.
- **Results**
  Calculated results. If monitoring of the result limits is activated, then the result will be highlighted in color:
  - Green lettering: The result is within the limits
  - Red lettering: The result is outside the limits
- **Commands**
  List of the data-generating commands (titrations, measurements, etc.). The most important data is displayed for each command.

[Result table]

Open result table *(see Chapter 25, page 236)*. The result table is a table in which the results for several determinations can be saved.

[Statistics]

Display the statistical overview of a determination series *(see Chapter 24, page 231)*.

[Recalculate]

Recalculate the determination. The procedure will be executed immediately. Recalculation cannot be undone *(see Chapter 23.8, page 229)*.

[Curve]

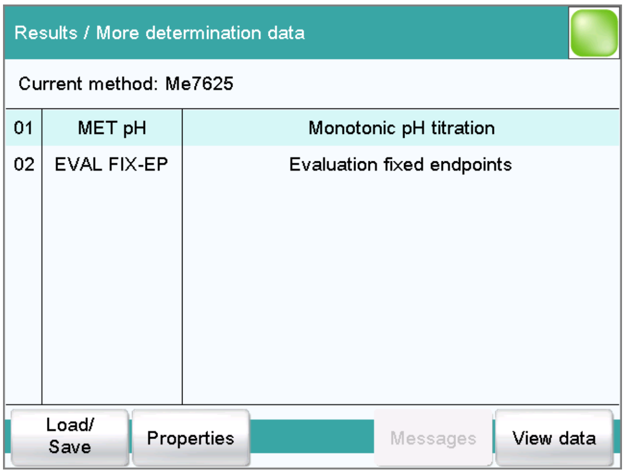
Display the curve of the current determination *(see Chapter 23.7, page 227)*.

[More data]

Display detailed specifications for the determination (determination properties, measuring point list, endpoint details, etc.), save determination *(see Chapter 23.1, page 216)*.

23.1 More determination data

Results dialog: **More data**



All of the commands for which you can display other data (titrations, measurements, evaluations, etc.) are listed in the **Results / More determination data** dialog.

[Load/ Save]

Load saved determinations*(see Chapter 23.5, page 221)* and save current determination *(see Chapter 23.6, page 227)*.

[Properties]

Display the properties of the current determination *(see Chapter 23.4, page 220)*.

[Local com. var.]

(available only with loaded determinations)

Display the list of the common variables defined at the time of the determination *(see Chapter 23.3, page 220)*.

[Messages]

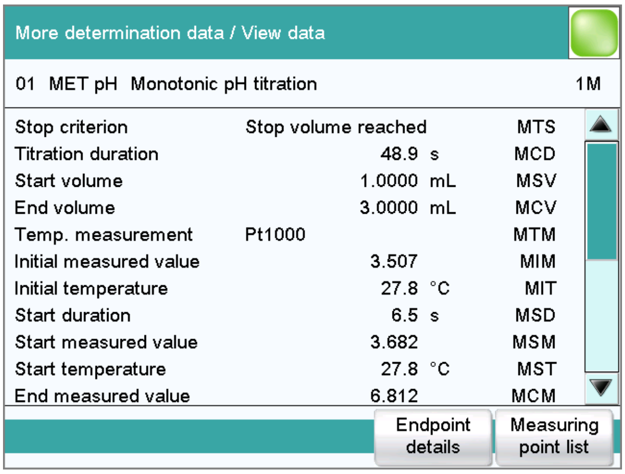
Display list with all of the messages which occurred during the determination *(see Chapter 23.2, page 219)*.

[View data]

Display all of the details for the selected command.

23.1.1 Details

Results dialog: **More data ▸ View data**



All of the variables generated by the determination are listed in the **More determination data / View data** dialog. These can be used in calculations.

[Calibration data]

(available only with loaded determinations)

Display calibration data of the sensor used which was valid at the time of the determination *(see "Calibration and titrant data", page 219)*.

[Titrant data]

(available only with loaded determinations)

Display titrant data which was valid at the time of the determination *(see "Calibration and titrant data", page 219)*.

[Endpoint details]

Display details for each endpoint found *(see "Endpoint details", page 218)*.

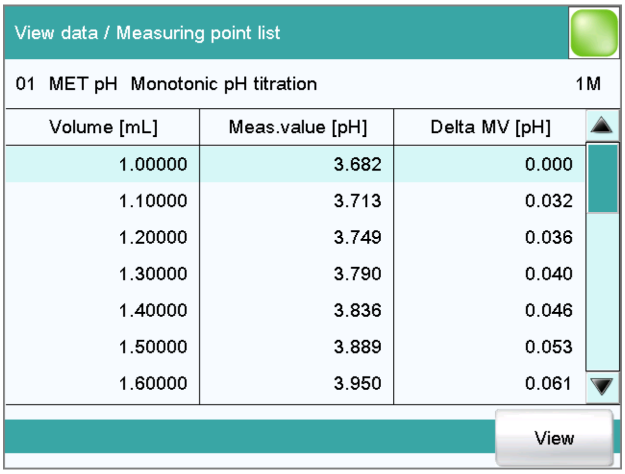
[Measuring point list]

Display measuring point list of titrations and measurements *(see "Measuring point list", page 218)*.

Measuring point list

Results dialog: **More data ▸ View data ▸ Measuring point list**

Results dialog: **Curve ▸ Display curve ▸ Measuring point list**



The individual measured values are listed in the **View data / Measuring point list** dialog. You can configure which columns are displayed (button **[View]**). These settings are saved separately for each mode (DET, MET, etc.).

Column 1 / Column 2 / Column 3

Quantity displayed in the columns 1, 2 and 3. Both the selection of the quantities and the default setting depend on the mode.

Selection	**Volume** | **Measured value** | **ERC** | **Delta meas.value** | **Time** | **Temperature** | **Volume drift** | **Signal drift** | **Index**

Endpoint details

Results dialog: **More data ▸ View data ▸ Endpoint details**

Results dialog: **Curve ▸ Display curve ▸ Endpoint details**

Detailed information concerning each equivalence point or endpoint determined is displayed in the **View data / Endpoint details** dialog.

The volume, the measured value, the equivalence point criterion ERC (only DET, MET), the time and the temperature are specified for each equivalence point or endpoint determined.

The equivalence point criterion determined (ERC = Equivalence point Recognition Criterion) is a measure for the size of the jump in the titration curve. The ERC determined is compared with the EP criterion defined in the method for the evaluation of the titration curve *see "Evaluation and equivalence point criterion with DET", page 287* and *"Evaluation and* *equivalence point criterion with MET", page 303)*. The ERC is thus an important quantity when you need to adjust the parameters for the evaluation of the equivalence points.

Calibration and titrant data

Results dialog: **More data ▸ View data ▸ Calibration data**

Results dialog: **More data ▸ View data ▸ Titrant data**

The calibration data or titrant data which was current at the time the determination was performed is displayed in the dialogs **View data / Calibration data** and **View data / Titrant data**.

NOTE

Recalculation:

The concentration and titer of the titrant can be modified retroactively. The values displayed here are used for the recalculation of a loaded determination. The values saved in the **System / Titrants** dialog are not changed as a result.

23.2 Messages

Results dialog: **More data ▸ Messages**

If messages occurred during a determination, they will be displayed in the **More determination data / Messages** dialog. The following data for the message is indicated under **[Details]**:

- **Message number**
  Unique identification number.
- **Time**
  Moment that the message occurred.
- **Message**
  Message text.

23.3 Local common variables

Results dialog: **More data** ▶ **Local com. var.**

The list of common variables as it existed at the time of the determination is displayed in the **More determination data / Local common variables** dialog.

NOTE

Recalculation:

The common variables can be modified retroactively. The values displayed here are used for the recalculation of a loaded determination. The list of common variables in the **System / Common variables** dialog is not changed as a result.

23.4 Determination properties

Results dialog: **More data** ▶ **Properties**

Detailed information concerning the determination is displayed in the dialog **More determination data / Properties**:

- **User**
  User who carried out the determination.
- **Sample number**
  Number which was entered in the dialog **Control** at the start of the determination.
- **Start counter**
  This value, just like the sample number, is increased by one each time a determination starts. In contrast to the sample number, this value cannot be modified by the user.
- **Duration determ.**
  Duration of the entire determination.
- **Method status**
  Current status of the method.
  - **new**
    The method has been newly created and not yet saved.
  - **saved**
    The current method has been saved.
  - **modified**
    The current method has been modified.
- **Determination**
  Name of the determination. Displayed only with saved determinations.

- **End of determin.**
  Way in which the determination was ended.
  - **Regular without errors**
    The determination was automatically ended at the end of the method.
  - **Manual stop**
    The determination has been canceled with the fixed key **[☐]**.
  - **Error**
    The determination has been canceled due to an error.
- **Status of deter.**
  - **original**
    The determination has not been recalculated.
  - **recalculated**
    The determination has been recalculated.
  - **loaded**
    The determination has been loaded.
  - **saved**
    The determination has been saved. The version number indicates how many times the file has been saved.
- **Used devices**
  Hardware that was used for the determination.
  - Ti-Touch with program version of the software and the serial number.
  - Measuring inputs with ADC type und serial number.
  - MSB connector with peripheral devices connected to it (dosing device, stirrer).

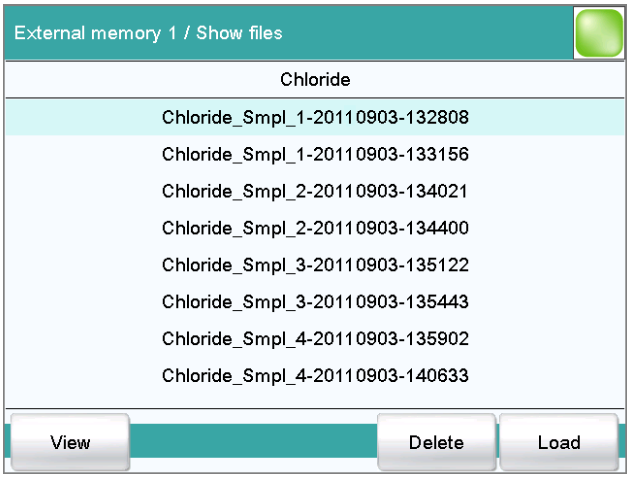
23.5 Loading a determination

Proceed as follows to load a determination:

1 Opening the determination list

- In the results dialog, tap on **[More data]**.
- Tap on **[Load/ Save]**.
- Tap on **[Load]**.
  The selection of memory locations is displayed. This selection will be skipped if only one external storage medium is available.
- Select the memory location where the desired determination is saved.
  The selection of file groups is displayed *(see Chapter 12.1, page 125)*. If only one group is available, then the determination list will be displayed directly.
- Select the group with the desired determination.
- Tap on **[Show files]**.

The determination list with the stored determination opens:



2 Selecting a determination

- Select the desired determination.

3 Loading the determination

- Tap on **[Load]**.

The determination is now loaded. The properties are displayed in the results dialog.

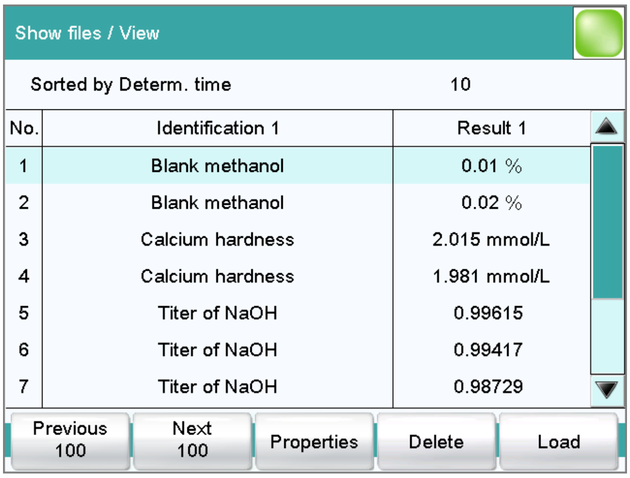
NOTE

When you load a determination, the method with which the determination was carried out will be loaded automatically.

For this reason, save any modifications which may have been made to the method currently loaded before you load a determination.

23.5.1 Determination list

Results dialog: **More data** ▸ **Load/ Save** ▸ **Load** ▸ **Show files** ▸ **View**



In the **Show files / View** dialog you can depict the individual determinations in greater detail. The sorting criterion and the number of saved determinations are displayed at the very top. The list contains numbered lines; each line represents one determination. In the default settings, the first sample identification and the first calculated result of each determination are displayed. In the properties, you define which data is displayed in the columns and the criteria according to which the determinations are sorted *(see "Properties", page 223)*. In addition, you can define search filters to aid you in finding the desired determinations *(see "Filter criteria", page 225)*.

[Previous 100]

Display the previous 100 determinations.

[Next 100]

Display the next 100 determinations.

[Properties]

Configure the display of the columns and define filter criteria.

[Delete]

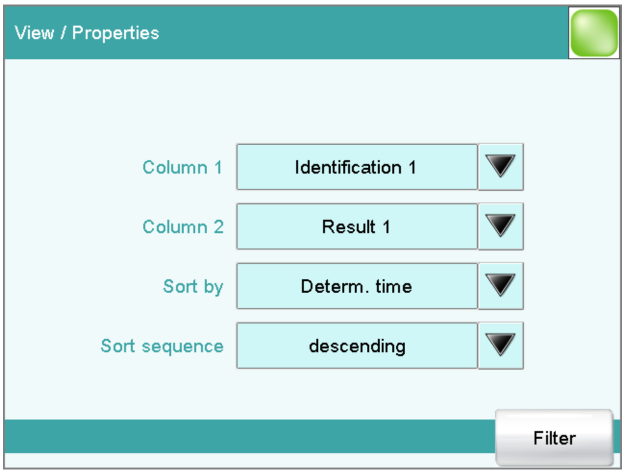
Delete the selected file.

[Load]

Load the selected file.

Properties

Determination list: **Properties**



In the **View / Properties** dialog, you can define which data is displayed in the columns and the criteria according to which the determinations are to be sorted.

Column 1

Selection of what is to be displayed in the first column.

Selection	**Identification 1** | **Identification 2** | **Determ. time** | **Result name** | **Method** | **Sample size** | **User**
Default value	**Identification 1**

Column 2

Selection of what is to be displayed in the second column.

Selection	**Result 1…9** The numbering of the results corresponds to the order in which the results were calculated in the determination run.

Sort by

Selection according to which criterion the list is to be sorted.

Selection	**Identification 1** | **Identification 2** | **Determ. time** | **Result** | **Method** | **Sample size** | **User**
Default value	**Determ. time**

Identification 1
Sort alphabetically according to the first sample identification.

Identification 2
Sort alphabetically according to the second sample identification.

Determ. time
Sort chronologically according to the determination time.

Result
Sort according to the numerical value of the result.

Method
Sort alphabetically according to the method name.

Sample size
Sort according to the numerical value of the sample size.

User
Sort alphabetically according to the user who carried out the determination.

Sort sequence

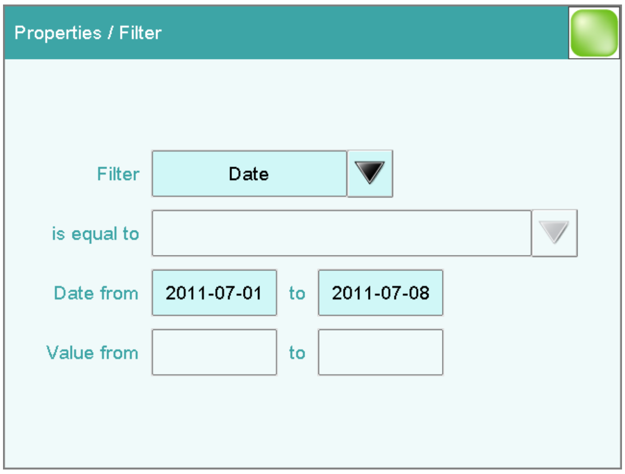
Selection	**ascending** | **descending**
Default value	**descending**

[Filter]

Specify the filter criteria for the list.

Filter criteria

Determination list: **Properties ▸ Filter**



You can set filters in the **Properties / Filter** dialog. A filter is a rule defining what is to be displayed in the determination list. If a filter has been set, this is indicated with a corresponding symbol in the **Show files / View** dialog.

Filter

Define the criterion according to which the list is to be filtered. The only lines which will be displayed are those which fulfil the filter criterion.

Selection	**no filter** | **Identification 1** | **Identification 2** | **Date** | **Result** | **Method** | **Sample size** | **User**
Default value	**no filter**

no filter
The list itself will not be filtered.

Identification 1
In the input field **is equal to**, select or enter the first sample identification according to which filtering is to be carried out.

Identification 2
In the input field **is equal to**, select or enter the second sample identification according to which filtering is to be carried out.

Date
In the input fields **Date from** … **to**, specify the period of time according to which filtering is to be carried out.

Result
In the input fields **Value from** … **to**, specify the value range according to which filtering is to be carried out.

Method
In the field **is equal to**, select or enter the method name according to which filtering is to be carried out.

Sample size
In the input fields **Value from** … **to**, specify the value range according to which filtering is to be carried out.

User
In the field **is equal to**, select or enter the user according to whom filtering is to be carried out.

NOTE

The filter can be applied to empty fields as well, for example, if no sample identification has been entered. In this case, select only the desired filter criterion and leave the fields below empty.

23.6 Saving a determination

Results dialog: **More data** ▸ **Load/ Save** ▸ **Save**

Determinations can be saved as follows:

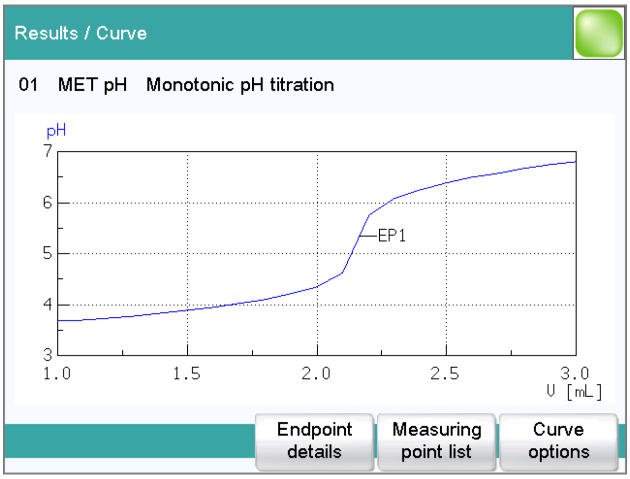
- Manually in this dialog.
  The suggested default setting for file names is the first 16 characters of Identification 1, followed by the determination time in the format YYYYMMDD-hhmmss. Extending the file name with the determination time has the advantage that the file names of all determinations are unique.
- Automatically at the end of the determination *(see Chapter 16.5.6, page 184)*.

The following data is stored for each determination:

- Calculated results
- Measuring point lists, equivalence points, curves and variables which were generated during the determination
- Determination properties
- Statistics (if carried out)
- Method with which the determination was carried out
- Common variables (values and properties of all common variables at the time of the determination)
- Titrant data of the titrant used
- Calibration data of the sensor used

23.7 Curves

Results dialog: **Curve**



The curve of the current determination is displayed in the **Results / Curve** dialog. You can configure the curve display.

[Endpoint details]

Display details for each endpoint found *(see "Endpoint details", page 218)*.

[Measuring point list]

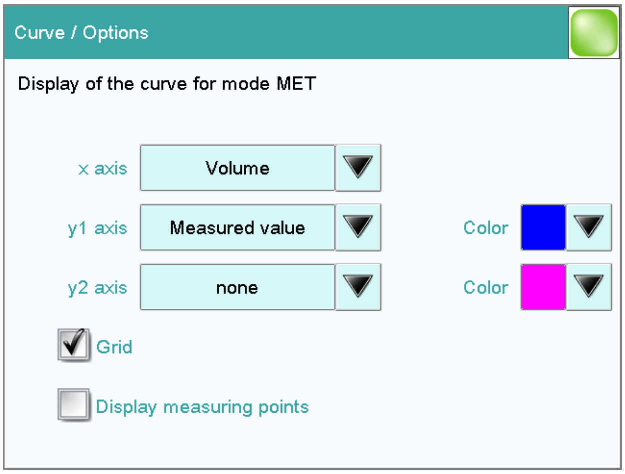
Display measuring point list of titrations and measurements *(see "Measuring point list", page 218)*.

[Curve options]

Define the settings for the curve display *(see "Curve options", page 228)*. The settings are saved separately for each titration/measuring mode and apply not only for the live display but also for the curve display in the results dialog.

Curve options

Results dialog: **Curve** ▶ **Curve options**



You can make the settings for the curve display in the **Curve / Options** dialog. These settings are saved separately for each mode (DET, MET, etc.) and also apply for the live display. Both the selection of the quantities and the default setting depend on the mode.

x axis

Quantity which is shown on the x axis of the graph.

Selection	**Volume** | **Measured value** | **ERC** | **Delta meas.value** | **Time** | **Temperature** | **Volume drift** | **Signal drift**

y1 axis

Quantity which is shown on the y1 axis of the graph.

Selection	**Volume** | **Measured value** | **ERC** | **Delta meas.value** | **Time** | **Temperature** | **Volume drift** | **Signal drift**

y2 axis

Quantity which is shown on the y2 axis of the graph.

Selection	**none** | **Volume** | **Measured value** | **ERC** | **Delta meas.value** | **Time** | **Temperature** | **Volume drift** | **Signal drift**
Default value	**none**

Color

Selection of a color for the curves.

Grid

on | off (Default value: **on**)

If this parameter is activated, grid lines are shown.

Display measuring points

on | off (Default value: **off**)

If this parameter is activated, the curve is shown with the single measured values.

23.8 Recalculation and reevaluation

Results dialog: **Recalculate**

You can use the **[Recalculate]** function to recalculate and reevaluate determinations. This is necessary in the following cases:

- If you have modified the evaluation parameters in a way that changes the recognized endpoints or equivalence points.
- If you have modified the calculations.
- If you have modified the variables used in calculations, e.g. sample size, titer or common variables.

NOTE

Neither the recalculation nor the reevaluation can be undone.

We therefore recommend that the original determination be saved beforehand *(see Chapter 23.6, page 227)*. The best way of doing this is to use the **Save determination automatically** function *(see Chapter 16.5.6, page 184)*.

The following method commands are executed once again with the **[Recalculate]** function:

- DET and MET titrations:
  The potentiometric evaluation will be carried out again.
- EVAL commands:
  All evaluations are carried out again. You can also insert new evaluations retroactively.
- CALC command:
  All calculations are carried out again. You can also define new calculations retroactively.
  If you subsequently modify the titrant in a method, then the variables TITER and CONC of the "new" titrant will be used. If a result is assigned to the variable TITER in a calculation, then the titer of the "new" titrant will also be overwritten.

NOTE

If you modify the calibration data of the sensor used in the **System / Sensors** dialog, these modifications will not be taken into account. Changing the sensor in the method also has no influence on the measured data.

If a determination has been recalculated, this will be documented in the determination properties *(see Chapter 23.4, page 220)*.

Recalculation/reevaluation of loaded determinations

With loaded determinations, it is assumed that they were carried out a long time ago and that the **titrant data** and **common variables** of the system no longer correspond to those of the determination. This is why the most important titrant data of the titrants used and the list of common variables are stored with each determination. This data will be used if you recalculate a loaded determination. If you wish to recalculate the result with a corrected common variable or with a corrected titer, you must therefore modify the respective values in the **More determination data / Local common variables** or **More determination data / View data** dialog.

If a result is assigned to the variable TITER or to a common variable, then the titers or common variables which are currently valid in the system will not be overwritten until after a query has been confirmed.

If you modify the titrant retroactively in the method, this will not be taken into account.

The recalculated results of loaded determinations are not saved in the result table.

24 Statistics

Main dialog: **Results** ▶ **Statistics**

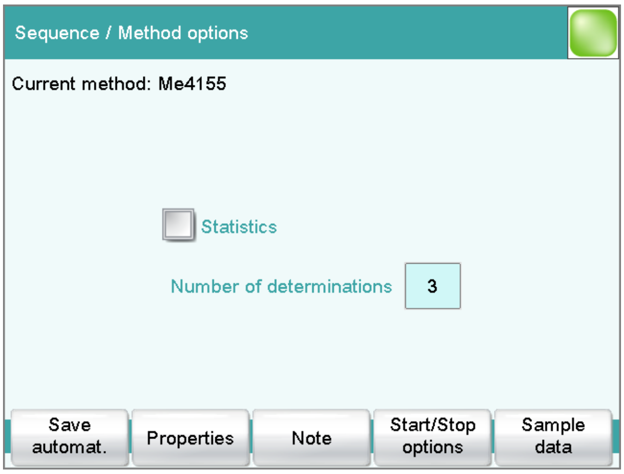
In the dialog **Results**, you can use **[Statistics]** to display the statistical overview of a determination overview. You can statistically evaluate a maximum of nine results calculated in a determination. A statistical series can contain a maximum of 20 determinations.

Activating the statistics function

Proceed as follows to activate the statistics function:

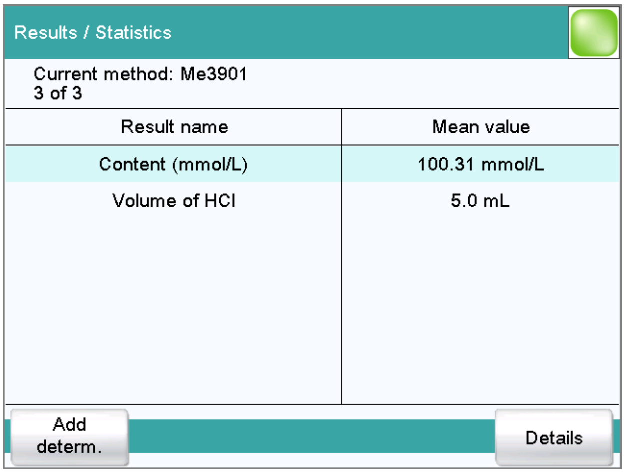
1 Edit the method options

- In the main dialog, tap on **[Edit parameters]**.
- Tap on **[Method options]**.



- Activate the option **Statistics**.
- Under **Number of determinations**, enter the desired number of determinations.

The results for which statistical calculations are performed are defined in the calculation command **CALC** *(see "Variable for mean value", page 157)*.



In this dialog, the method with which the determination was carried out is displayed in the first line. The second line shows how many determinations have already been carried out and the total number of determinations to be carried out. The name of the result and the mean value are shown for each result.

[Add determ.]

Add a further determination to the determination series *(see Chapter 24.3, page 234)*.

[Details]

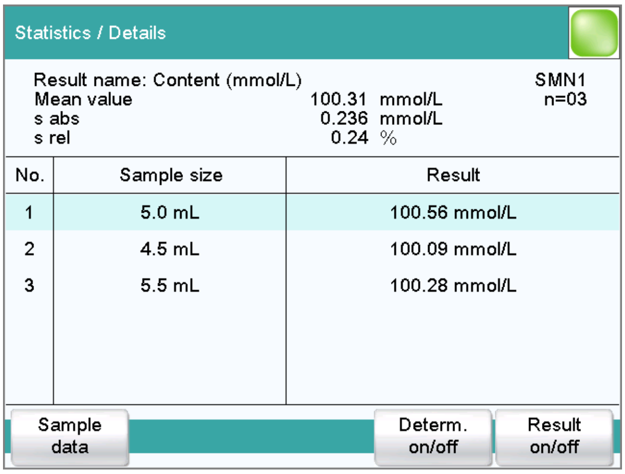
Display the statistics results for the selected result and the single results from all determinations, see next chapter.

NOTE

If you recalculate a determination, the statistics for this determination are also recalculated.

24.1 Displaying details for a result

Results dialog: **Statistics ▶ Details**



In the dialog **Statistics / Details**, the following details are displayed:

- Result name
- Mean value
  On the right-hand side of the dialog is displayed the number of single results from which the mean value was calculated. In this example, it is 3.
- Absolute standard deviation (**s abs**)
- Relative standard deviation (**s rel**)
- Result and sample size of each single determination
  Results that could not be calculated are indicated with **invalid** and ignored.

[Sample data]

Display the sample data of the selected determination.

[Determ. on/off]

Remove all of the results of the selected determination from the statistics. All of the entries of this line are marked with an asterisk (*), the statistics will be recalculated automatically.

[Result on/off]

Remove the selected result from the statistics. The result is marked with an asterisk (*), the statistics will be recalculated automatically.

NOTE

If the mean value has been assigned to a common variable or to the variable TITER (see command **CALC**), then the determination must be recalculated manually *(see Chapter 23.8, page 229)*.

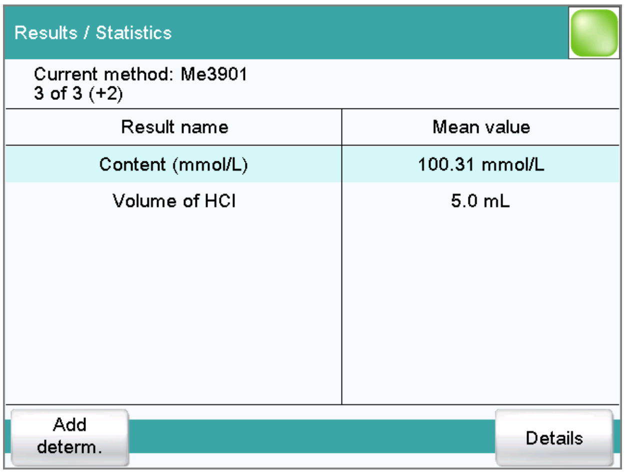
24.2 Deleting statistical data

In the dialog **Control**, you can delete all of the statistics data manually with the function **[Delete statistics]**. The statistics data is deleted automatically in the following cases:

- when all of the determinations of the determination series have been carried out and a new determination has been started afterwards.
- when a new method is loaded (even if it is the same method)
  If the **sample table** or the **sample assignment table** is used, the statistics data is only deleted when another method is loaded.

24.3 Adding a determination to a determination series

You can use the function **[Add determ.]** to add an additional sample to a determination series, e.g. because a determination was faulty and had to be removed from the statistics.



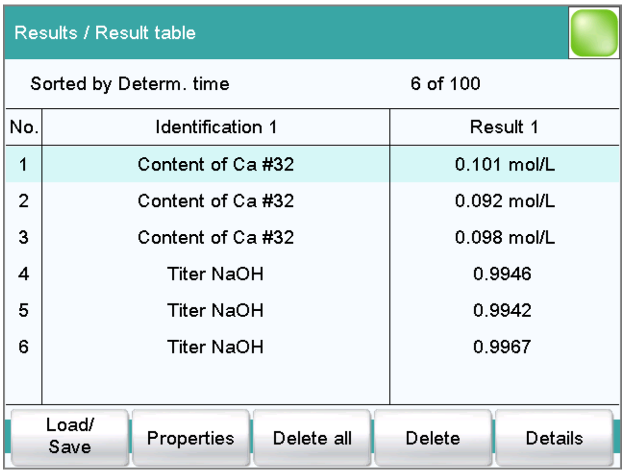
The number of determinations by which the set statistics counter has been increased is shown above the list in brackets. This modification is also displayed in the main dialog and in the statistics report.

NOTE

The number of samples defined in the method options does not, however, change as a result.

25 Result table

Main dialog: **Results ▸ Result table**



The result table is suitable for displaying in detail the results of all of the determinations performed on a single day, for instance. You can save the results of up to 200 determinations. A maximum of 9 results from a single determination can be saved in the result table. You define which results from this table are to be saved using the **CALC** command. Because the size of the display is not sufficient to display all of the data at the same time, it is practical to print out the result table.

The sorting criterion and the number of determinations from which results are saved in the result table are displayed at the top. The list contains numbered lines; each line represents one determination. In the default settings, the first sample identification and the first calculated result of each determination are displayed. In the properties, you define which data is displayed in the columns and the criteria according to which the determinations are sorted *(see Chapter 25.1, page 237)*. In addition, you can define search filters to aid you in finding the desired determinations *(see "Filter criteria", page 239)*.

[Load/ Save]

Load a saved result table *(see Chapter 25.3, page 241)* or save the current result table *(see Chapter 25.2, page 241)*.

[Properties]

Configure the display of the columns and define filter criteria.

[Delete all]

Delete the result table completely.

[Delete]

Delete the selected line from the result table.

[Details]

Display details concerning the selected determination.

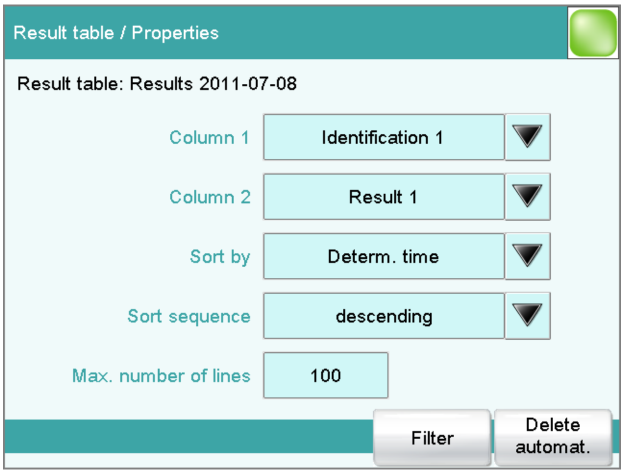
"Result table / Details" dialog

The following determination data is displayed in this dialog:

- **User**
  User who carried out the determination.
- **Method**
  Method with which the determination was carried out.
- **Determ. time**
  Date and time at which the determination was carried out.
- Sample data (Identification 1 and 2 and sample size).
- All of the results of this determination saved in the result table.

25.1 Properties

Result table: **Properties**



In the **Result table / Properties** dialog, you can select the data to be displayed with each determination as well as the sorting criterion for the list.

Column 1

Selection of what is to be displayed in the first column.

Selection	**Identification 1** | **Identification 2** | **Determ. time** | **Result name** | **Method** | **Sample size** | **User**
Default value	**Identification 1**

Column 2

Selection of what is to be displayed in the second column.

Selection	**Result 1…9** The numbering of the results corresponds to the order in which the results were calculated in the determination run.

Sort by

Selection according to which criterion the list is to be sorted.

Selection	**Identification 1** | **Identification 2** | **Determ. time** | **Result** | **Method** | **Sample size** | **User**
Default value	**Determ. time**

Identification 1
Sort alphabetically according to the first sample identification.

Identification 2
Sort alphabetically according to the second sample identification.

Determ. time
Sort chronologically according to the determination time.

Result
Sort according to the numerical value of the result.

Method
Sort alphabetically according to the method name.

Sample size
Sort according to the numerical value of the sample size.

User
Sort alphabetically according to the user who carried out the determination.

Sort sequence

Selection	**ascending** | **descending**
Default value	**descending**

Max. number of lines

If the result table contains the quantity of lines defined here, then no further results can be saved. If this is the case, save the result table and create a new one.

Input range	**10 - 200**
Default value	**100**

[Filter]

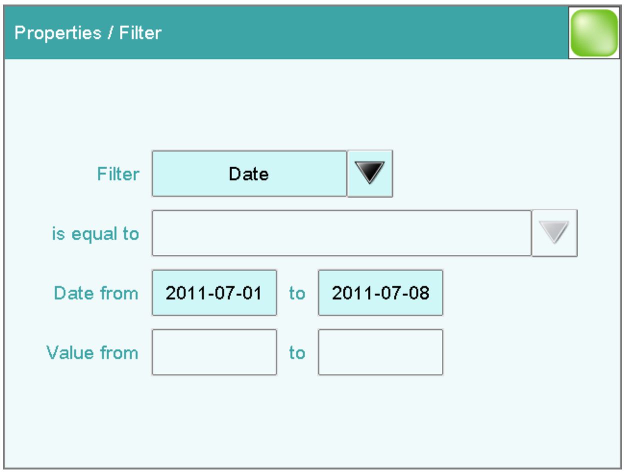
Specify the filter criteria for the list.

[Delete automat.]

Define the settings for the automatic deletion of the result table *(see "Deleting the result table automatically", page 240)*.

Filter criteria

Result table: **Properties ▸ Filter**



You can set filters in the **Properties / Filter** dialog. A filter is a rule defining what is to be displayed in the result table. If a filter has been set, this is indicated with a corresponding symbol in the **Results / Result table** dialog.

Filter

Define the criterion according to which the list is to be filtered. The only lines which will be displayed are those which fulfil the filter criterion.

Selection	**no filter** | **Identification 1** | **Identification 2** | **Date** | **Result** | **Method** | **Sample size** | **User**
Default value	**no filter**

no filter
The list itself will not be filtered.

Identification 1
In the input field **is equal to**, select or enter the first sample identification according to which filtering is to be carried out.

Identification 2
In the input field **is equal to**, select or enter the second sample identification according to which filtering is to be carried out.

Date
In the input fields **Date from** … **to**, specify the period of time according to which filtering is to be carried out.

Result
In the input fields **Value from** … **to**, specify the value range according to which filtering is to be carried out.

Method
In the field **is equal to**, select or enter the method name according to which filtering is to be carried out.

Sample size
In the input fields **Value from** … **to**, specify the value range according to which filtering is to be carried out.

User
In the field **is equal to**, select or enter the user according to whom filtering is to be carried out.

NOTE

The filter can be applied to empty fields as well, for example, if no sample identification has been entered. In this case, select only the desired filter criterion and leave the fields below empty.

Deleting the result table automatically

Result table: **Properties ▸ Delete automat.**

In the **Properties / Delete automatically** dialog, you define when the contents of the result table is to be automatically deleted.

Delete oldest line only

on | off (Default value: **off**)

If this option is activated at the same time that the result table is full, the oldest entry will be deleted as soon as the results of a new determination are saved.

Time when result table is deleted:

Switch on

on | off (Default value: **off**)

If this option is activated, then the result table will be deleted each time you switch on the Ti-Touch.

Start a new sample series

on | off (Default value: **off**)

If this option is activated, then the result table will be deleted when you start a new sample series (with activated autostart function!).

Save result table

on | off (Default value: **on**)

If this option is activated, the result table will be deleted as soon as you have saved it.

25.2 Saving the result table

NOTE

When you save the result table, the complete determination will not be saved with each entry. If you wish to save the determination data for each determination, use the **Save determination automatically** function *(see Chapter 16.5.6, page 184)*.

25.3 Loading the result table

Proceed as follows to load a result table:

1 Opening the current result table

- In the results dialog, tap on **[Result table]**.
- Tap on **[Load/ Save]**.
- Tap on **[Load]**.
  The selection of memory locations is displayed. This selection will be skipped if only one external storage medium is available.
- Select the memory location where the desired result table is saved.
  The selection of file groups is displayed *(see Chapter 12.1, page 125)*. If only one group is available, then the list of the saved result tables will be displayed directly.
- Select the group with the desired result table.
- Tap on **[Show files]**.

The list with the saved result tables opens.

2 Selecting the result table

- Select the desired result table.

3 Loading the result table

- Tap on **[Load]**.

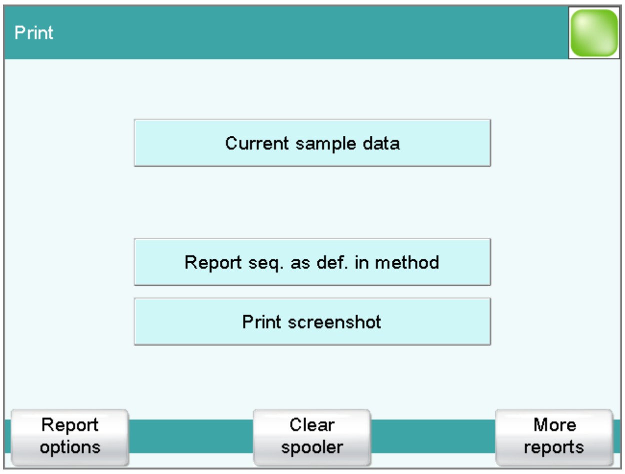
The result table is now loaded and will be displayed immediately.

26 Printing

Reports can be printed out as follows:

- Manually with the fixed key **[ ]** in this dialog.
  The fixed key is disabled while a determination is running.
- Automatically in the determination run with the command **REPORT** *(see Chapter 28.10, page 367)*.

How to configure a printer is described in *Chapter 11.7, page 114*.



This screenshot shows the printing dialog associated with the main dialog. The sample data is entered in the main dialog, which is why you can print out the sample data from there in a context-sensitive manner with **[Current sample data]**.

The following buttons are also available in the other print dialogs:

[Report seq. as def. in method]

Print out all of the reports which are defined in the loaded method.

[Print screenshot]

Activate the "Print Screen" function. The current screen contents will be printed out the next time the fixed key**[ ]** is tapped on.

[Report options]

Defining the general settings for the report output.

[Clear spooler]

Delete all outstanding printing orders.

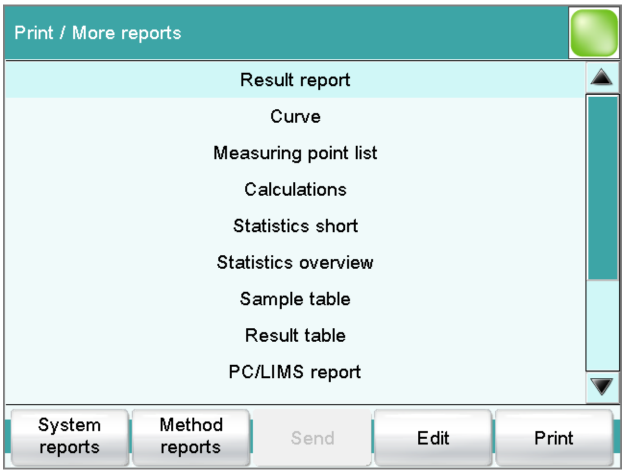
[More reports]

Open the list of available reports.

More reports

Fixed key [🖶]: **More reports**

The dialog **Print / More reports** displays a list of all of the available reports.



[System reports]

Opening the list of reports for the system settings.

[Method reports]

Opening the list of reports for the current method.

[Send]

Create a PC/LIMS report.

[Edit]

Edit the settings of the selected report.

[Print]

Print the selected report.

26.1 General report options

Fixed key **[ ]**: **Report options**

The settings for the report printout can be adjusted in the dialog **Print / Report options** to indicate, for example, whether a report header, a signature line or a frame is to be printed.

Report header

Defining the output of the report header. The report header contains general information such as device type, serial number, program version and the printing date.

NOTE

You can also define your own report header, which is printed in addition to this report header (**System** ▸ **Templates** ▸ **Report header**).

Selection	**off** | **once** | **on each page**
Default value	**on each page**

off
The report header will not be printed.

once
The report header will only be printed on the first page.

on each page
The report header will be printed on every page.

Signature line

Output of a special line for date and signature. This line will be printed at the very bottom of every page.

Selection	**off** | **once** | **on each page**
Default value	**off**

off
No signature line will be printed.

once
The signature line will only be printed on the last page.

on each page
The signature line will be printed on every page.

Frame

on | off (Default value: **on**)

If this parameter is activated, a frame is printed as lateral marking.

26.2 Settings of the individual reports

Fixed key **[ ]**: **More reports ▸ Report ▸ Edit**

Command REPORT: **Report ▸ Edit**

Settings can be edited for the following reports (for details, see online help):

- **Result report**
- **Curve**
  Definition of the curve size, display of the individual measuring points and grid lines, etc.
- **Measuring point list**
  Definition of the method command to which the measuring point list is to be printed.
- **Calculations**
  Definition of the accuracy with which the variables used as well as the results calculated are printed.
- **Statistics short**
  Definition of the time at which the report is to be printed (with each determination or only at the end of a sample series).
- **Statistics overview**
  Definition of the time at which the report is to be printed (with each determination or only at the end of a sample series).
- **Sample table**
- **Result table**
  Definition of the time at which the report is to be printed (with each determination, at the end of a sample series or at the end of the sample table).
- **Used devices**
- **Variables**
- **Monitoring**

26.3 List of all printable reports

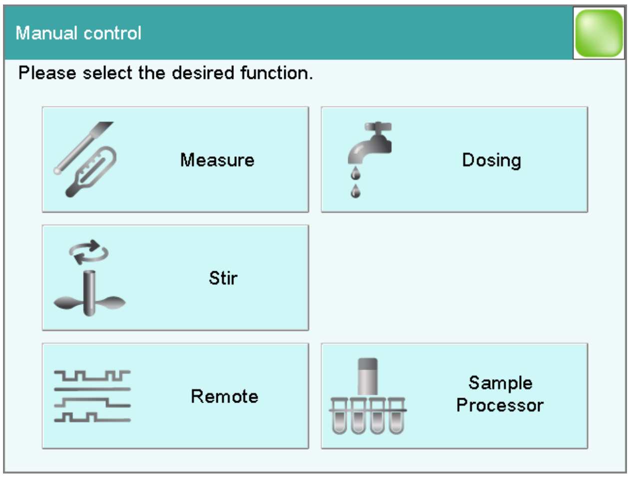
The following reports can be printed out with the fixed key **[ ]**:

Report	Contents
Result report	Report with determination properties, sample data, calculated results, etc. If there are multiple determinations, the statistics will also be printed out.
Curve	Curve report. The settings for the curve print-out are adopted from the curve options of the live display.
Measuring point list	Measuring point list report.
Calculations	Details concerning the calculations carried out (parameter settings in accordance with the CALC command and the calculated results).
Used devices	The devices used for the determination, as displayed in the **More determination data / Properties** dialog.
Variables	All determination variables, as displayed in the results dialog.
Monitoring	Details for the monitored quantities (STAT, DOS only).
Statistics	
Statistics short	Summary of the statistics calculations. The number of determinations, the mean value, and the absolute and relative standard deviations are printed out for each result.
Statistics overview	Detailed statistical overview. The sample data and all individual results are printed out for each determination. The number of determinations, the mean value, and the absolute and relative standard deviations are printed out for each result.
PC/LIMS	
PC/LIMS report	Machine-readable report with all of the important data for a determination. This report can be saved as a TXT file or sent to a terminal program or a LIMS via an RS-232 interface. The definition is carried out in the device manager *(see Chapter 11.3.2, page 90)*.
Sample data	
Current sample data	Sample data of the current determination, *context-sensitive only* from the main dialog.
Sample table	List of all determinations in the sample table with the respective sample data, as entered in the sample table.
Result table	
Result table	List of all determinations in the result table with results and with the determination data, as saved in the result table.
More reports ▸ Method reports	
Method sequence	Method properties and the list of all method commands.

Report	Contents
Parameters full	Method properties and options, all method commands with all parameters. All parameters which no longer have their default settings will be printed in **bold**. All parameters which have been modified in comparison to the stored version of the method are indicated by an *.
Titration & measuring param.	Method properties; titration, measuring and calibration commands with all parameters. All parameters which no longer have their default settings will be printed in **bold**. All parameters which have been modified in comparison to the stored version of the method are indicated by an *.
Modified parameters	Method properties, all method parameters which have been modified in comparison to the stored version of the method.
Non default parameters	Method properties, all method parameters which no longer have any default settings.
More reports ▸ System reports	
System settings	
System settings	Settings for acoustic signals and accuracy of the measured value display.
Dialog options	Settings for routine dialog and expert dialog.
User list	List with all of the users configured in the system, together with their data, *context-sensitive only* from the user list.
Login options	Login options, *context-sensitive only* from the respective dialog.
Titrants	
Titrant list	List of all the titrants configured in the system.
All titrant data short	The most important titrant data of all titrants (name, concentration, titer, last titer determination).
All titrant data full	All of the titrant data of all of the titrants (working life, titer options, data concerning the exchange unit/dosing unit).
Titrant data short	The most important titrant data of the selected titrant, *context-sensitive only* from the editing dialog.
Titrant data full	All titrant data of the selected titrant, *context-sensitive only* from the editing dialog.
Sensors	
Sensor list	List of all the sensors configured in the system.
All sensor data short	The most important sensor data for all sensors (name, calibration data).
All sensor data full	All of the sensor data for all of the sensors (working life, complete calibration data, calibration interval).

Report	Contents
Sensor data short	The most important sensor data of the selected sensor, *context-sensitive only* from the editing dialog.
Sensor data full	All of the sensor data of the selected sensor, *context-sensitive only* from the editing dialog.
Device manager	
Device list	List of all devices configured in the system.
All device properties	Properties of all the devices configured in the system.
Device properties	Properties of the selected device, *context-sensitive only* from the editing dialog.
GLP manager	
GLP data	All data stored in the GLP manager.
Common variables	
Common variable list	List of all the common variables defined in the system, together with their most important data (name, value, status).
All common variable properties	Properties of all common variables (name, value, validity, status).
Common variable properties	Properties of the selected common variable (name, value, validity, status), *context-sensitive only* from the editing dialog.
Local Common variable list	List with the common variables available at the time of the determination, together with their most important data (name, value, status), *context-sensitive only* from the dialog "More determination data / Local common variables".
Local common var. properties	Properties of the selected common variable (name, value, validity, status), *context-sensitive only* from the dialog "More determination data / Local common variables".
Templates	
Templates sample data	Sample identification list and sample assignment table.
Result template list	List with all of the user-generated result templates.
All result templates details	Details of the all of the user-generated result templates (calculation formula, result options, note).
Result template details	Details of the selected result template, *context-sensitive only* from the editing dialog.
Input/Output lines	List with all of the defined input and output lines at the remote interface (name, bit pattern).
Custom calibration buffers	Temperature tables for all defined custom calibration buffers.
Rack tables	
Sample rack list	List with all of the sample racks configured in the system, together with designation, number of positions and rack code.

27 Manual control



The following functions are available in the manual control:

[Measure]

Carrying out manual measurements *(see Chapter 27.2, page 251)*.

Measuring modes:

- **pH** (potentiometric pH measurement)
- **U** (potentiometric voltage measurement)
- **Ipol** (voltametric measurement with selectable polarization current)
- **Upol** (amperometric measurement with selectable polarization voltage)
- **T** (temperature measurement)

[Dosing]

Dosing manually *(see Chapter 27.3, page 253)*.

The following dosing functions are available:

- Preparing the exchange or dosing unit
- Emptying the dosing unit
- Filling the dosing cylinder of the exchange / dosing unit
- Dosing a specified volume
- Dosing continuously

[Stir]

Controlling the stirrer manually *(see Chapter 27.4, page 262)*.

[Remote]

Scanning the input lines on the remote interface and setting the output lines *(see Chapter 27.5, page 264)*.

[Sample Processor]

Controlling the USB Sample Processor manually *(see Chapter 27.6, page 265)*.

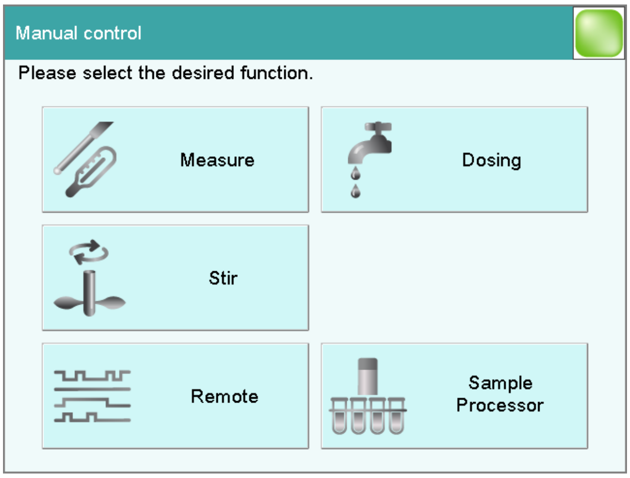
27.1 Opening and closing the manual control

Opening the manual control

1 Open the dialog window

- Tap on the fixed key **[ ]**.

Manual control opens:



2 Select the function

- Tap on the button for the desired function.

If the function can be carried out by several devices, a dialog to select the device will appear first; otherwise the dialog for the selected function will appear immediately.

Closing the manual control

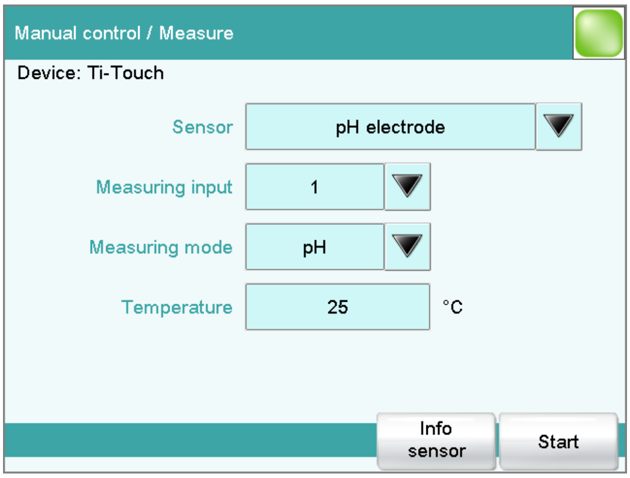
1
- Tap on the fixed key **[ ]**.

NOTE

Manual control can also be exited when a manual sequence has been started but has not yet ended. The fact that a sequence has been started in manual control can be recognized by the corresponding symbol in the title line *(see Chapter 6.2.3, page 32)*.

27.2 Measuring

Manual control ▸ Measure



Manual measurements can be carried out with the function **[Measure]**.

Proceed as follows:

1 Select a sensor

- Select the desired sensor from the sensor list.
  All of the sensors available in the sensor list are displayed. Sensors are defined under **System ▸ Sensors**.
- Select the measuring input at which the sensor is connected.

2 Select a measuring mode

- Select the desired measuring mode.
  Only those measuring modes are displayed which are advisable for the selected sensor.

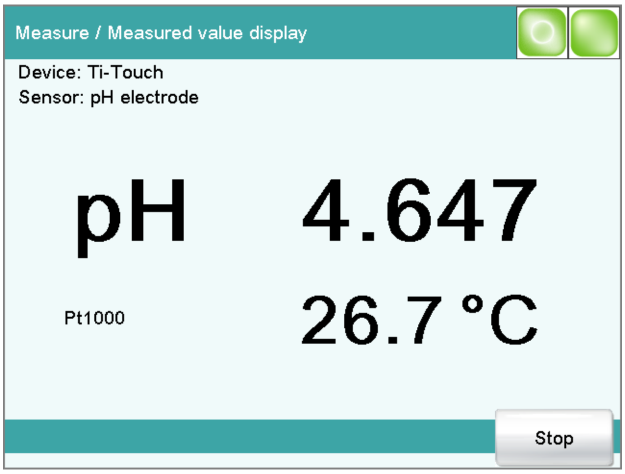
3 **Enter a measuring temperature**

- Enter the measuring temperature if no temperature sensor is connected. If a temperature sensor is connected, then the temperature will be measured automatically.
  This temperature is used for automatic temperature compensation with pH measurements.

4 **Start the measurement**

- Tap on **[Start]**.

The measured value display is opened:



The ongoing measurement is canceled with **[Stop]**. The label switches once again to **[Start]**.

27.2.1 Parameter description

Dialog "Manual control / Measure"

Sensor

Selection of the sensor from the sensor list. Sensors are defined under **System ▸ Sensors**.

Selection	**Selection of configured sensors**

Measuring input

Selection of the measuring input the sensor is connected to. The selection depends on whether the control device has one or two measuring interfaces.

Selection	**1 | 2**
Default value	**1**

Measuring mode

Selection of the measuring mode. Only those measuring modes are displayed which are advisable for the selected sensor.

Selection	**pH | U | Ipol | Upol | T**

pH
potentiometric pH measurement

U
potentiometric voltage measurement

Ipol
voltametric measurement with selectable polarization current

Upol
amperometric measurement with selectable polarization voltage

T
Temperature measurement

Temperature

Temperature entered manually. If a temperature sensor is connected then the temperature will be measured continuously. This value is used for temperature correction in pH measurements.

Input range	**–20.0 - 150.0 °C**
Default value	**25.0 °C**

[Info sensor]

Display information on the sensor.

27.3 Dosing

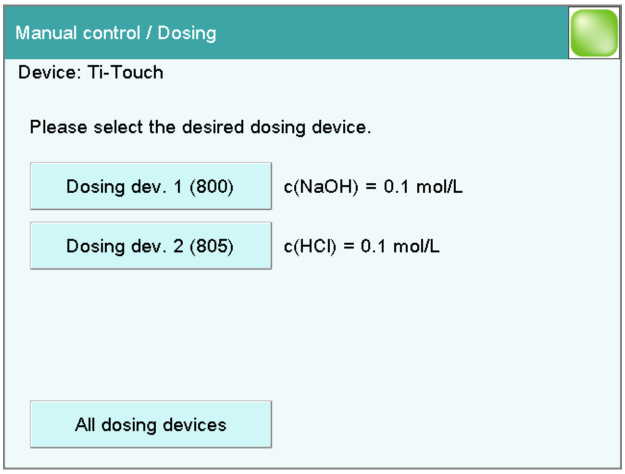
Manual control ▸ Dosing

The following dosing functions are available:

- Preparing the exchange or dosing unit *(see Chapter 27.3.3, page 260)*
- Emptying the dosing unit *(see Chapter 27.3.4, page 261)*
- Filling the dosing cylinder of the exchange unit/dosing unit *(see Chapter 27.3.5, page 261)*
- Dosing a specified volume *(see Chapter 27.3.2, page 257)*
- Dosing continuously *(see Chapter 27.3.1, page 256)*

Selecting the dosing device

If several dosing devices are connected to a control device, then the dialog for selecting a dosing device will be opened.



[Dosing device 1…4]

Selection of the dosing device. The MSB connector and the type of the connected dosing device are displayed.

Next to the button various information is shown:

- Titrants
  For dosing devices of the type 8XX with an intelligent exchange unit or dosing unit the titrant name is read off the data chip.
- Cylinder volume
  For dosing devices of the type 8XX with an exchange unit without data chip the cylinder volume is displayed only.
- ---
  For exchange or dosing units which are not or not correctly attached.
- Manual busy
  When a dosing function is being carried out.

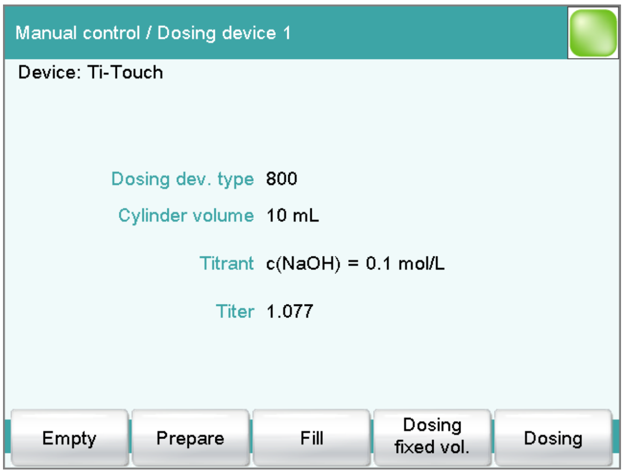
[All dosing devices]

Carrying out the functions **[Prepare]**, **[Empty]** and **[Fill]** at the same time with several dosing devices of the control device.

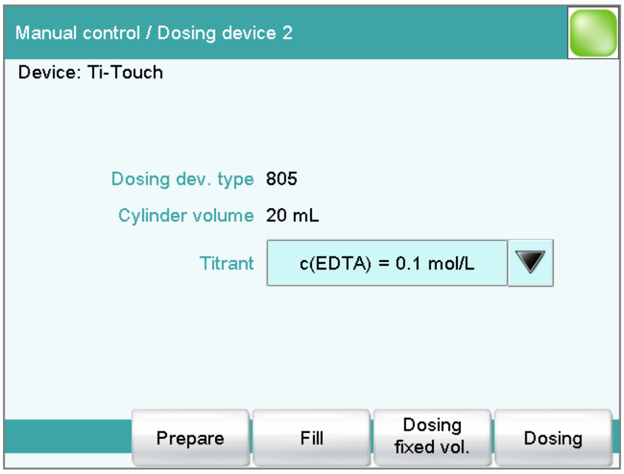
Selecting the dosing function

If only one dosing device is connected, then the properties of this dosing device will be shown directly. This information varies according to the type of dosing device:

- Type 8XX with integrated data chip:
  If an exchange or dosing unit with integrated data chip is attached, the data stored on the data chip is displayed.



- Type 8XX without integrated data chip:
  If an exchange unit without integrated data chip is attached, then the titrant can be selected from the titrant list. We recommend always selecting the titrant. This ensures that the parameters defined for the titrant for the preparing are used. Titrants are defined under **System ▸ Titrants**.



[Empty]

Empty the cylinder and the tubings of the dosing unit *(see Chapter 27.3.4, page 261)*.

[Prepare]

Rinse the cylinder and the tubings of the exchange / dosing unit *(see Chapter 27.3.3, page 260)*.

[Fill]

Fill the cylinder of the exchange / dosing unit *(see Chapter 27.3.5, page 261)*.

[Dosing fixed vol.]

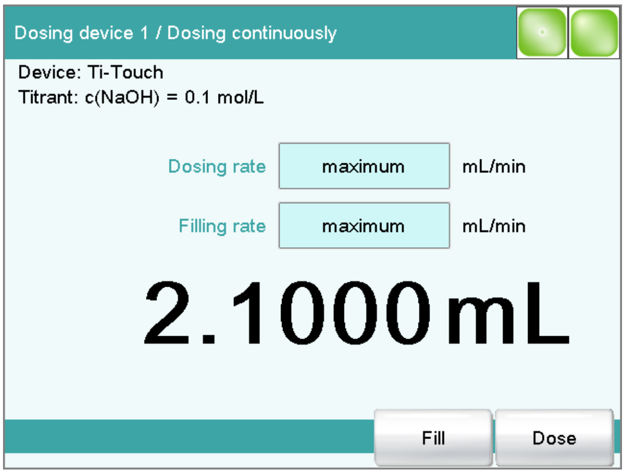
Dose a specified volume *(see Chapter 27.3.2, page 257)*.

[Dosing]

Dose continuously *(see Chapter 27.3.1, page 256)*.

27.3.1 Continuous dosing

Manual control: **Dosing** ▸ **Dosing**



With the function **[Dosing]**, dosing is continuous for as long as you hold the button **[Dose]** pressed down.

Proceed as follows:

1 Configure the dosing function

NOTE

- The dosing and filling rates should be decreased for viscous liquids.
- The maximum dosing and filling rates depend on the cylinder volume *(see Chapter 31, page 405)*.

- Enter the dosing rate.
- Enter the filling rate.

2 Start dosing

- Tap on **[Dose]**.

The volume dosed is displayed. When the volume of one cylinder has been dosed, the dosing cylinder will be refilled automatically.

3 Fill the cylinder

- Tap on **[Fill]**.

The dosing cylinder is filled. The displayed volume value will be reset to 0.0000 mL.

> **NOTE**
>
> If you exit the dialog with the fixed key **[⇦]**, the dosing cylinder will be filled automatically.

Parameter description

Dosing rate

Rate at which it is dosed.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum** | **dynamic**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

dynamic
This setting can only be selected when the dosing cylinder is filled. The dosing is being carried out faster and faster until the maximum dosing rate is reached (starting with 1 mL/min and then doubling the dosing rate every 1.5 s).

Filling rate

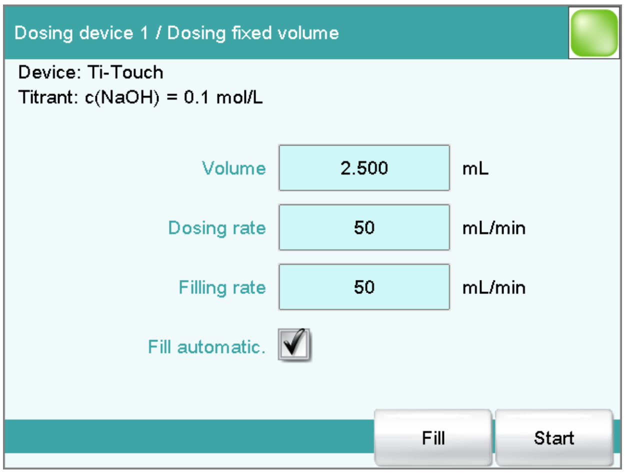
Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

27.3.2 Dosing fixed volumes

Manual control: **Dosing ▸ Dosing fixed vol.**



You can dose a particular volume with the **[Dosing fixed vol.]** function.

Proceed as follows:

1 Configure the dosing function

NOTE

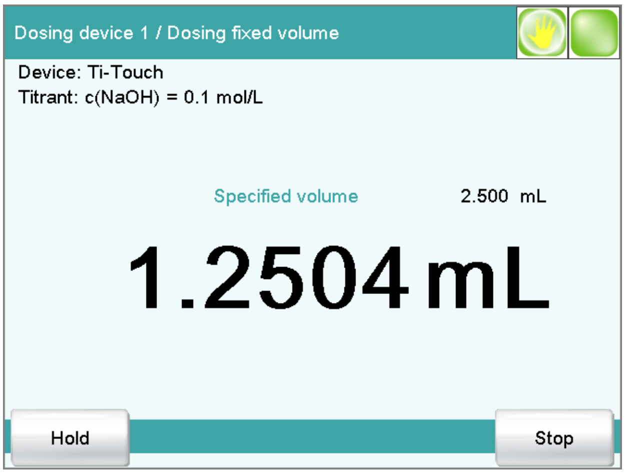
- The dosing and filling rates should be decreased for viscous liquids.
- The maximum dosing and filling rates depend on the cylinder volume *(see Chapter 31, page 405)*.

- Enter the desired volume.
- Enter the dosing rate.
- Enter the filling rate.

2 Start dosing

- Tap on **[Start]**.

The volume display is shown. When the volume of one cylinder has been dosed, the dosing cylinder will be refilled automatically.



Continuous dosing is paused with **[Hold]**. The label changes to **[Continue]**. This can be used to continue the run.

3 **Fill the cylinder**

With the default settings *(see "Fill automatic.", page 260)* the dosing cylinder is filled automatically.

Otherwise:

- Tap on **[Fill]**.

The dosing cylinder is filled. The displayed volume value will be reset to 0.0000 mL.

Parameter description

Volume

Volume which is dosed.

Input range	**0.00000 - 99999.9 mL**
Default value	**0.10000 mL**

Dosing rate

Rate at which it is dosed.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Fill automatic.

on | off (Default value: **on**)

If this parameter is activated, then the dosing cylinder is being automatically filled at the end of the dosing.

27.3.3 Preparing

Manual control: **Dosing ▶ Prepare**

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

If the titrant is selected *(see "Selecting the dosing function", page 254)*, the parameters defined for the titrant for preparing/emptying and the tubing parameters will be used (dosing unit only). If the titrant is not selected, default parameters will be used *(see Chapter 31.1.2, page 405* and *Chapter 31.2.2, page 406)*.

The following two figures show the live display of an exchange unit and a dosing unit:

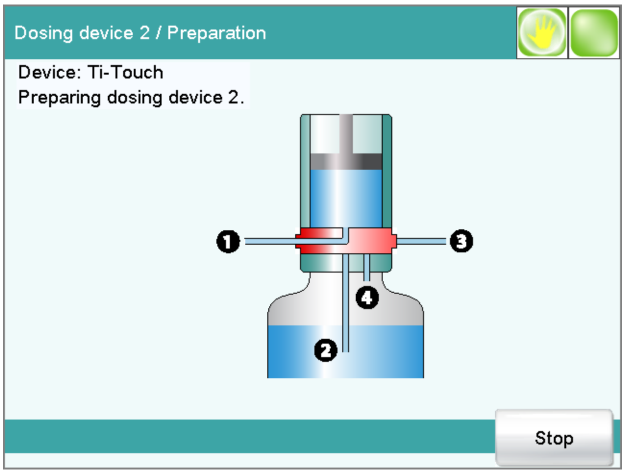


Figure 19 Live display "Preparing the dosing unit"

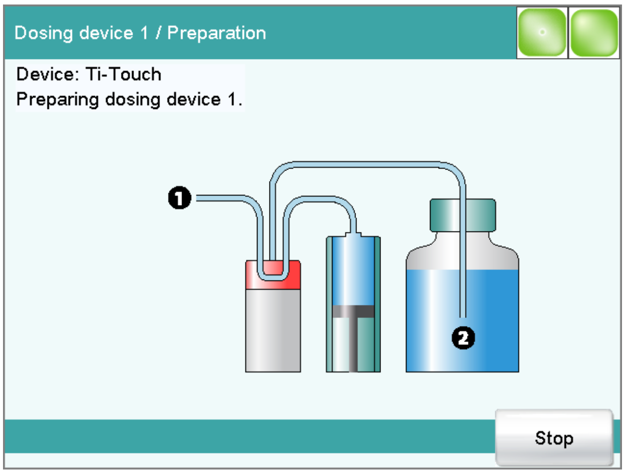


Figure 20 Live display "Preparing the exchange unit"

27.3.4 Emptying

Manual control: **Dosing** ▸ **Empty**

NOTE

The function **Empty** is possible only with dosing units.

The cylinders and the tubings of the dosing unit are emptied with this function.

If the titrant is selected *(see "Selecting the dosing function", page 254)*, the parameters defined for the titrant for preparing/emptying and the tubing parameters will be used. If the titrant is not selected, default parameters will be used (see *Chapter 31.2.2, page 406* and *Chapter 31.1.2, page 405*).

27.3.5 Filling

Manual control: **Dosing** ▸ **Fill**

You can use the function **[Fill]** to fill the dosing cylinder of the exchange unit/dosing unit manually. The filling rate cannot be configured; the maximum filling rate will be used.

27.3.6 Replacing reagent

NOTE

You can easily change the reagent in a dosing unit without no contact with the chemicals using the functions **Prepare** and **Empty**.

Proceed as follows:

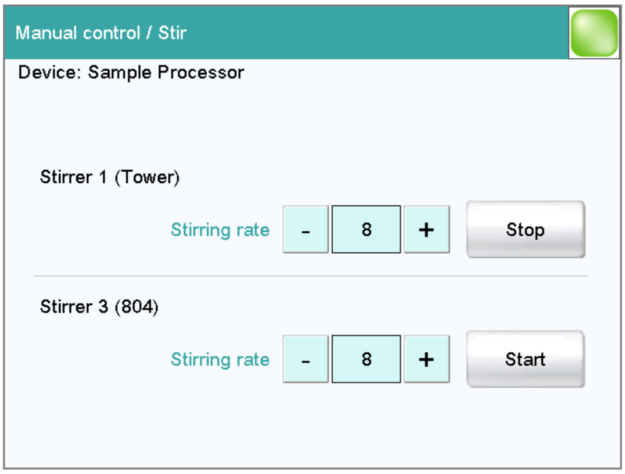
1. Execute the function **[Empty]**.
2. Attach the dosing unit to the bottle with a suitable solvent.
3. Execute the function **[Prepare]**.

   The last traces of the reagent in the cylinder and tubings are removed with the solvent.
4. Execute the function **[Empty]** again.
5. Attach the dosing unit to the bottle with the new reagent.
6. Execute the function **[Prepare]**.

   The dosing unit can now be used.

27.4 Stirring

Manual control ▸ Stir



The MSB connector and type of stirrer is indicated for each connected stirrer.

You can control a connected stirrer manually with the function **[Stir]**.

Proceed as follows:

1 Set the stirring rate

- Tap on the button **[–]** or **[+]**.
  Each time one of the buttons is tapped, the stirring rate is reduced or increased by one level.

2 Switch on the stirrer

- Tap on **[Start]**.

The stirrer is started.

3 Switch off the stirrer

- Tap on **[Stop]**.

The stirrer is stopped.

Parameter description

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "–": clockwise rotation

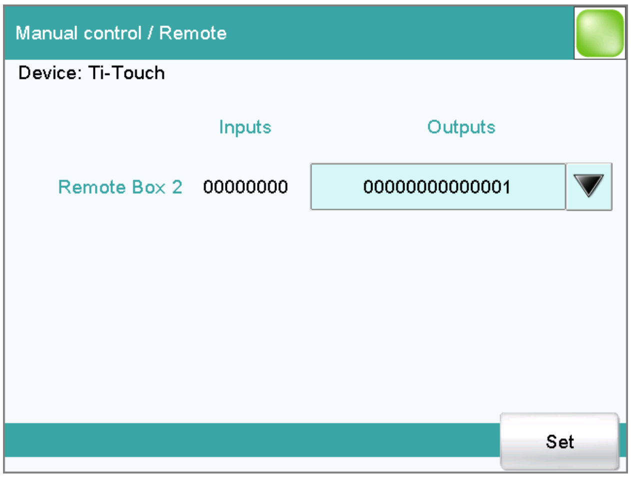
Input range	**–15 - 15**
Default value	**8**

NOTE

If a stirrer is used in the determination run, it can nevertheless be controlled manually at the same time. For example, you can use the manual control to reduce the stirring rate of a stirrer which has been started in the determination run.

27.5 Remote

Manual control ▶ Remote



With the function **[Remote]**, you can define manual output signals to the remote interface of a connected Remote Box. It is not possible to define input signals; the current status of the input lines is, however, displayed.

Inputs

Current status of the input lines.

Outputs

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System ▶ Templates ▶ Output lines**.

Entering the bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal **00000000000001** line 0 is set. With a pulse, the length is set to 200 ms. If you wish to set pulses with other lengths, you have to define a corresponding template.

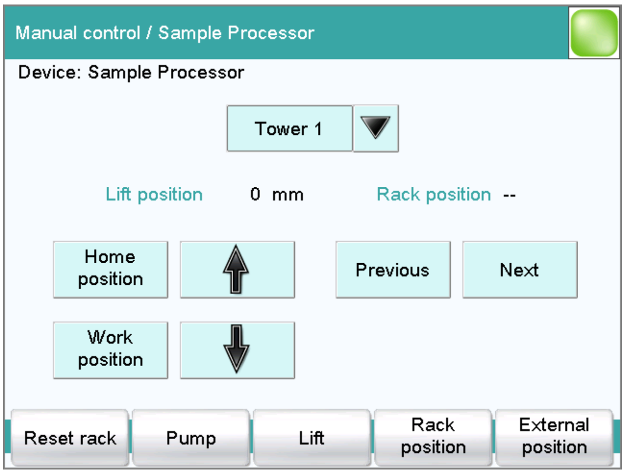
Entry	**Bit pattern containing exactly 14 characters or a max. of 24 characters for the name of the template**
Default value	**00000000000001**
Selection	**Selection of the templates defined**

[Set]

Set a defined output signal.

27.6 USB Sample Processor

Manual control ▸ Sample Processor



With the function **[Sample Processor]**, you can control a connected Sample Processor manually. The following functions are available:

- Moving a sample rack
- Moving the lift
- Defining specific lift positions (work position, rinse position, etc.)
- Switching pumps on and off
- Initializing the rack
- Defining external positions outside of the sample rack (only with Swing Head)

Tower for the manual control.

Selection	**Tower 1 | Tower 2**

Tower 1
View from the front, the right tower.

Tower 2
View from the front, the left tower. This selection is only available for Sample Processors with two towers.

Lift position

Current lift position.

Rack position

Current rack position. If the rack is not set to a valid position, e.g. after a rack reset, **--** is displayed to indicate this.

NOTE

Note that the rack has to be set to a valid position for all lift movements! Otherwise a corresponding error message will be displayed.

Move to a valid rack position with **[Previous]** or **[Next]**. Alternatively, you can carry out a MOVE command.

[Home position]

Move the lift to the home position (corresponds to lift position 0 mm).

[Work position]

Move the lift to the work position of the current rack position or the external position.

The work position can directly be defined here *(see "Assigning lift positions", page 268)* or in the device manager *(see "Lift positions Tower 1/2", page 109)*.

[⇧]

Continuously move the lift upwards as long as the button is pressed down. The lift rate used is defined in the dialog **Sample Processor / Lift**.

[⇩]

Continuously move the lift downwards as long as the button is pressed down. The lift rate used is defined in the dialog **Sample Processor / Lift**.

[Previous]

Move to the previous rack position.

[Next]

Move to the next rack position.

[Reset rack]

Initialize the rack. This function is identical with the command **RACK**. The following actions are carried out:

- The lift is moved upwards.
- The sample rack is rotated to the starting position.
- The rack code of the rack attached is being read out and the corresponding rack data is transferred to the Sample Processor.
- The sample variable is being reset to the value 1.

[Pump]

Switch on and off the pumps mounted or connected to the tower.

[Lift]

Move the lift to any or a specific lift position and assigning lift positions *(see Chapter 27.6.1, page 267)*.

[Rack position]

Move the rack to any sample position or to defined positions which are defined as special beakers *(see Chapter 27.6.2, page 269)*.

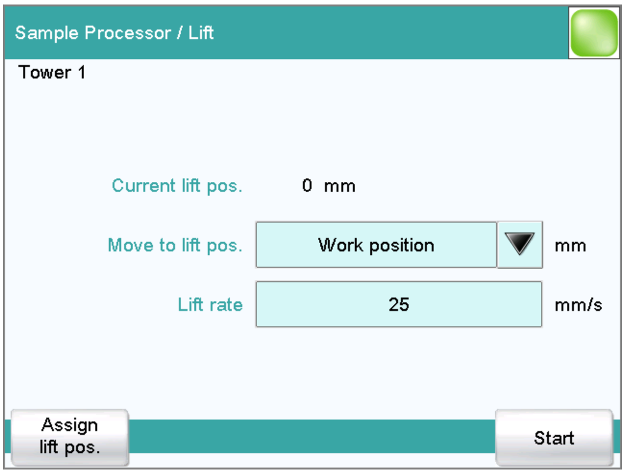
[External position]

This button is only enabled when a Swing Head is mounted to the Sample Processor.

Swing the robotic arm to an external position outside the sample rack and assign the swing angle and the lift position *(see Chapter 27.6.3, page 270)*.

27.6.1 Moving the lift

Manual control: **Sample Processor ▸ Lift**



In the dialog **Sample Processor / Lift**, you can move the lift to any lift position. You can also define frequently used positions (work position, rinse position, etc.) as specific lift positions and then to move to them with ease *(see "Assigning lift positions", page 268)*. This definition is possible in this dialog for the attached rack, and in the device manager for all of the racks in the list.

Current lift pos.

Current lift position.

Move to lift pos.

Selecting a predefined lift position or enter any lift position.

Input range	**0 - 'maximum stroke path' mm** A lift position of **0 mm** corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower *(see "Maximum stroke path", page 100)*. If a higher value is entered, an error message will be displayed.
Selection	**Work position** | **Shift position** | **Rinse position** | **Special position**
Default value	**Work position**

Lift rate

Rate at which the lift is moved in the manual control.

Input range	**5 - 25 mm/s**
Default value	**25 mm/s**

[Assign lift pos.]

Assign the current lift position to a preset lift position.

Assigning lift positions

Specific lift positions are stored separately for each sample rack used as well as for Tower 1 and Tower 2. The following specific lift positions are available:

- **General rack positions**
  A work position, a shift position, a rinse position and a special position can be defined for general rack positions.
- **Special beaker positions**
  An individual specific work position can be defined for each special beaker. The definitions of the general rack positions are used for the shift, rinse and special positions of the affected tower.
- **External positions** (only with robotic arm and mounted Swing Head, *see Chapter 27.6.3, page 270*)
  For each of the four possible external positions, a specific working position can be defined. Shift and rinse positions can only be defined for all four external positions together. A special position is not possible.

Proceed as follows to assign the current lift position to a specific lift position:

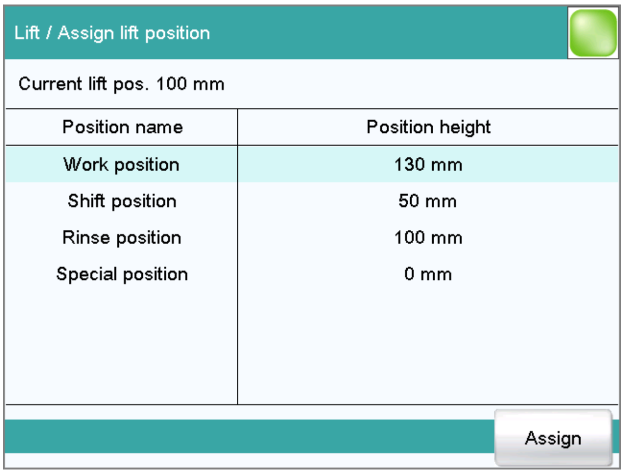
1 Move to lift position

- Enter the desired lift position in mm and tap on **[Start]**.

The lift moves to the desired lift position.

2 Assign the lift position

- Tap on **[Assign lift pos.]**.
  The dialog **Lift / Assign lift position** is displayed.

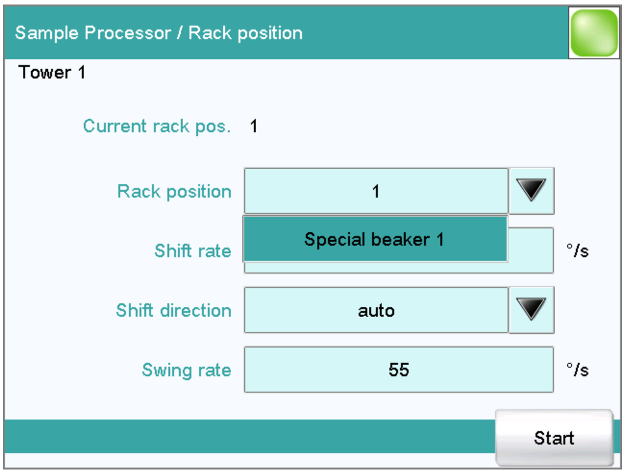


- Select the desired specific lift position and tap on **[Assign]**.

The current lift position is assigned to the specific lift position.

27.6.2 Moving to a rack position

Manual control: **Sample Processor ▸ Rack position**



In the dialog **Sample Processor / Rack position**, you can move to any position on the attached rack.

Current rack pos.

Current rack position. If the rack is not set to a valid position, e.g. after a rack reset, **--** is displayed to indicate this.

Rack position

Desired rack position.

Input range	**1 - Number of positions on the rack attached.**
Default value	**1**
Selection	**Special beaker 1…16**

Special beaker 1…16
The selection depends on how many rack positions are defined as special beakers *(see "Editing special beakers", page 111)*.

Shift rate

Rate at which the sample rack is moved.

Input range	**3 - 20 °/s**
Default value	**20 °/s**

Shift direction

Direction in which the rack is moved.

Selection	**auto** | **+** | **-**
Default value	**auto**

auto
A shift direction, with which the shorter way has to be passed, is automatically selected.

+
Counterclockwise rotation.

-
Clockwise rotation.

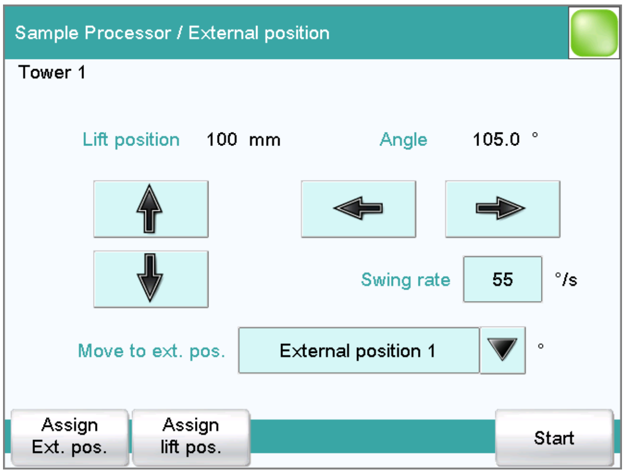
Swing rate

Rate at which the robotic arm is swung in the manual control.

Input range	**10 - 55 °/s**
Default value	**55 °/s**

27.6.3 External positions

Manual control: **Sample Processor ▸ External position**



NOTE

This dialog is accessible only if you have a Swing Head with robotic arm attached to the Sample Processor.

In the dialog **Sample Processor / External position**, you can swivel the robotic arm to an external position outside of the sample rack. As with the rack positions, here you can also define up to four frequently used external positions as specific positions. You can assign specific lift positions to these positions, analogous to the rack positions.

External positions are required if you have, for example, a measuring vessel or a titration cell mounted in addition to the rack.

Lift position

Current lift position.

Angle

Current angle position of the robotic arm.

[⇧]

Only enabled, when the robotic arm has been moved to a specific external position with **[Start]**.

Continuously move the lift upwards as long as the button is pressed down. The lift rate used is defined in the dialog **Sample Processor / Lift**.

[⇩]

Only enabled, when the robotic arm has been moved to a specific external position with **[Start]**.

Continuously move the lift downwards as long as the button is pressed down. The lift rate used is defined in the dialog **Sample Processor / Lift**.

[⇦]

Swing the robotic arm in clockwise direction as long as the button is pressed down.

[⇨]

Swing the robotic arm in counterclockwise direction as long as the button is pressed down.

Swing rate

Rate at which the robotic arm is swung in the manual control.

Input range	**10 - 55 °/s**
Default value	**55 °/s**

Move to ext. pos.

Selecting a predefined position or entering any swing angle.

Input range	**(Offset) - (Offset + max. swing range) °** The offset is made up of a design-dependent angle (approx. 8...9°) together with the robotic arm offset from the robotic arm properties. The maximum swing range is also defined under the robotic arm properties *(see "Properties – Robotic arm", page 103)*.
Selection	**External position 1…4**

[Assign Ext. pos.]

Assign the current angle position of the robotic arm to an external position as swing angle.

[Assign lift pos.]

Assign the current lift position to a preset lift position.

Assigning swing angles and lift positions

For each of the four possible external positions, a specific working position can be defined. Shift and rinse positions can only be defined for all four external positions together. A special position is not possible.

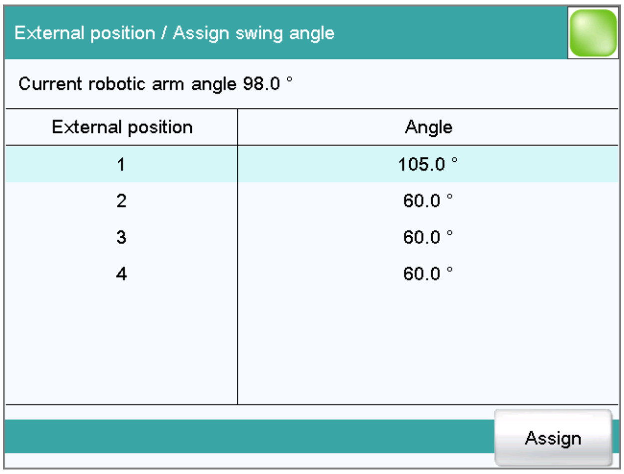
Proceed as follows to assign a swing angle to an external position and to assign the current lift position to a specific lift position:

1 Move to the external position

- Swing the robotic arm to the desired position with the arrow keys **[⇦]** or **[⇨]**.

2 Assign the external position

- Tap on **[Assign Ext. pos.]**.
  The dialog **External position / Assign swing angle** is displayed.



- Select the desired external position and tap on **[Assign]**.

The current angle position of the robotic arm is assigned to the external position.

3 Move to the external position

- Tap on **[⇦]**.
  The next higher-level dialog is displayed.
- Select **Move to ext. pos.** = **External position X** (X = 1…4) and tap on **[Start]**.

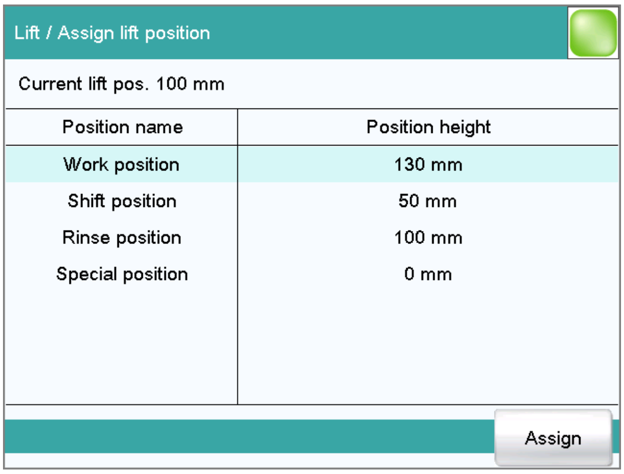
The robotic arm swings to the desired position.

4 Move to lift position

- Move the lift to the desired height with the arrow keys **[⇧]** or **[⇩]**.

5 Assign lift position

- Tap on **[Assign lift pos.]**.
  The dialog **Lift / Assign lift position** is displayed.



- Select the desired specific lift position.
- Tap on **[Assign]**.

The current lift position is assigned to the specific lift position.

28 Parameters

NOTE

For most of the numerical parameters, the result of a calculation can also be utilized in place of a number. A description of this can be found in the appendix *(see Chapter 31.6, page 411)*.

28.1 Dynamic equivalence point titrations (DET)

28.1.1 Start conditions

The parameters that are carried out before the start of titration are defined under **[Start conditions]**. The start conditions are processed in the following sequence:

1. Start volume
2. Start measured value
3. Start slope
4. Pause

Start volume

Volume that is dosed prior to the start of the titration.

Input range	**0.00000 - 9999.99 mL**
Default value	**0.00000 mL**

Dosing rate

Rate at which the start volume is dosed.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Pause

Waiting time, e.g. for the electrode to settle down after the start or a reaction time after the dosing of a start volume. The time entered here is only running when all start conditions have been fulfilled.

Input range	**0 - 999999 s**
Default value	**0 s**

More start conditions

Start meas. value

Before starting the titration, it will be dosed until this measured value is reached. If the start measured value is reached by the dosing of a start volume, then the titration starts directly.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measuring mode pH:

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Measuring mode U, Ipol:

Input range	**–2,000.0 - 2,000.0 mV**
Selection	**off**
Default value	**off**

Measuring mode Upol:

Input range	**–200.0 - 200.0 µA**
Selection	**off**
Default value	**off**

Start slope

Before starting the titration, it will be dosed until this slope (measured value per volume) is reached. If the start slope is reached by the dosing of a start volume, then the titration starts directly.

Measuring mode pH:

Input range	**00.000 - 9,999 pH/mL**
Selection	**off**
Default value	**off**

Measuring mode U, Ipol:

Input range	**0 - 999 mV/mL**
Selection	**off**
Default value	**off**

Measuring mode Upol:

Input range	**0 - 99 µA/mL**
Selection	**off**
Default value	**off**

Dosing rate

Rate to be dosed with until the start measured value or the start slope is reached.

Input range	**0.01 - 166.00 mL/min**
Default value	**5.00 mL/min**
Selection	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Initial measured value

The conditions for the entry of the first measured value in the measuring point list are defined under **[Initial meas. value]**.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

Measuring mode pH, U and Ipol:

Input range	**0.1 - 999.0 mV/min**
Selection	**off**
Default value	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Upol:

Input range	**0.01 - 99.90 µA/min**
Selection	**off**
Default value	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	**0 - 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	**0 - 999999 s**
Default value	**1 s**

28.1.2 Titration parameters

Under **[Titration parameters]**, the parameters influencing the sequence of the entire titration are defined.

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	**slow** | **optimal** | **fast** | **user**
Default value	**optimal**

slow
For titrations in which the finest details are also to be visible. This could however also lead to an increase in noise, which could result in unwanted equivalence points.

optimal
For all standard titrations. The parameters have been optimized for the most frequent applications.

fast
For fast and less critical titrations.

user
The individual titration parameters can be modified.

NOTE

Select **optimal** as titration rate when you are developing a new titration method. This parameter is suitable for virtually all titrations and only needs adaptation in special cases.

The settings of the individual titration rates are listed in *table 6, page 281*.

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement** = **automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	**–20.0 - 150.0 °C**
Default value	**25.0 °C**

User-defined parameters

These parameters are only accessible when **Titration rate** = **user**.

Meas. point density

A small value means small volume increments, i.e. a high measuring point density. The curve then shows all the finest details which also include noise; this could cause unwanted equivalence points to be found. A larger value, i.e. a smaller measuring point density, permits quicker titrations. If you are using a dosing device with a small cylinder volume then a smaller measuring point density value may be beneficial. However, you should also set a smaller signal drift and a higher EP criterion at the same time.

Input range	**0 - 9**
Default value	**4**

Min. increment

This smallest permitted volume increment is added at the start of the titration and with steep curves in the region of the equivalence point. Very small values should only be used if a low titrant consumption is expected; otherwise unwanted equivalence points could be evaluated.

Input range	**0.05 - 999.90 µL**
Default value	**10.00 µL**

Max. increment

A maximum volume increment should be selected in the following cases:

- when titration consumption is very low up until the equivalence point is reached.
- when a start volume is dosed up until shortly before the equivalence point is reached.
- when the change of direction in the jumping range is very abrupt, because otherwise it could easily happen that an excessively large volume will be dosed in the region of the equivalence point.

The value should not be less than 1/100 cylinder volume.

Input range	**0.1 - 9999.9 µL**
Selection	**off**
Default value	**off**

NOTE

It is not advisable to select similar volumes for the minimum and the maximum increment. Monotonic equivalence point titration (MET) is appropriate for these applications.

Dosing rate

Rate at which the volume increments are dosed.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. This type of titration is often referred to as equilibrium titration. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

NOTE

A constant measured value is often only reached after a certain time, as mixing and the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e. reaching a constant measured value takes longer and longer. Drift-controlled measured value acceptance is particularly advisable in such cases, as the measured values are only accepted when equilibrium has almost been reached.

Measuring mode pH, U and Ipol:

Input range	**0.1 - 999.0 mV/min**
Default value	**50.0 mV/min**
Selection	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed. This can be useful when the titration reaction proceeds slowly or the electrode is slow to respond.

Measuring mode Upol:

Input range	**0.01 - 99.90 µA/min**
Default value	**50.00 µA/min**
Selection	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed. This can be useful when the titration reaction proceeds slowly or the electrode is slow to respond.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	**0 - 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	**0 - 999999 s**
Default value	**26 s**

Table 6 Default values of the predefined titration rates for DET

	Titration rate		
	slow	**optimal**	**fast**
Meas. point density	2	4	6
Min. increment	10.00 µL	10.00 µL	30.00 µL
Max. increment	off	off	off
Dosing rate	maximum	maximum	maximum
Signal drift – pH, U and Ipol – Upol	 20.0 mV/min 20.0 µA/min	 50.0 mV/min 50.0 µA/min	 80.0 mV/min 80.0 µA/min
Min. waiting time	0 s	0 s	0 s
Max. waiting time	38 s	26 s	21 s

28.1.3 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**.

Stop volume

The titration is stopped when the specified volume has been dosed since the start of the titration. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	**0.00000 - 9999.99 mL**
Default value	**100,000 mL**
Selection	**off**

Stop meas. value

The titration is canceled when the specified measured value has been reached since the start of the titration.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measuring mode pH:

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Measuring mode U, Ipol:

Input range	**–2,000.0 - 2,000.0 mV**
Selection	**off**
Default value	**off**

Measuring mode Upol:

Input range	**–200.0 - 200.0 µA**
Selection	**off**
Default value	**off**

Stop EP

The titration is stopped when the specified number of equivalence points has been found.

Input range	**1 - 9**
Default value	**9**
Selection	**off**

Volume after EP

This volume will be added when the number of equivalence points defined under **Stop EP** has been found. The curve shape after the equivalence point can also be seen this way.

Input range	**0.01000 - 9999.99 mL**
Selection	**off**
Default value	**off**

Stop time

The titration is stopped when the specified time has elapsed since the start of the titration.

Input range	**0 - 999999 s**
Selection	**off**
Default value	**off**

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

28.1.4 Potentiometric evaluation

The parameters for the evaluation of the titration curve are defined under **[Potentiometr. evaluation]**.

EP criterion

The equivalence point criterion found (ERC = Equivalence point Recognition Criterion) is compared with this value. Equivalence points whose ERC is less than the value defined here will be ignored.

Input range	**0 - 200**
Default value	**5**

EP recognition

This parameter allows you to filter out only the equivalence points that are being sought.

Selection	**all** | **greatest** | **last** | **ascending** | **descending** | **off**
Default value	**all**

all
All equivalence points will be recognized.

greatest
Only the equivalence point with the greatest ERC value, i.e. the steepest jump, will be recognized.

last
Only the last equivalence point will be recognized.

ascending
Only equivalence points with a positive slope of the titration curve will be recognized.

descending
Only equivalence points with a negative slope of the titration curve will be recognized.

off
No evaluation takes place.

Set windows

This parameter allows to recognize equivalence points only in a particular range (so-called window) of the curve. Equivalence points outside this window will not be recognized. A maximum of 9 windows can be defined. Setting windows is advisable when interference and unnecessary equivalence points are to be suppressed.

Selection	**Measured value** | **Volume** | **off**
Default value	**off**

Measured value
The windows are defined on the measured value axis.

Volume
The windows are defined on the volume axis.

off
The entire titration curve is being evaluated.

Setting windows

The list of defined windows is opened with **[Set window]**.

When the list is opened for the first time, a window over the entire measured value range or volume range is already defined. The windows must not overlap, they only may lie next to one another. For each window, own criteria can be defined for the equivalence point recognition.

NOTE

When you define a result variable instead of a numerical value as limit value *(see Chapter 31.6, page 411)*, then just one window can be defined.

[New]

Define a new window. This is only possible when not the entire range is covered yet.

[Delete]

Delete the selected window.

[Edit]

Edit the settings of the selected window.

Lower limit

Measured value or volume for the lower limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measured value (measuring mode pH):

Input range	**–20.000 - 20.000**
Default value	**–20.000**

Measured value (measuring mode U, Ipol):

Input range	**–2,000.0 - 2,000.0 mV**
Default value	**–2,000.0 mV**

Measured value (measuring mode Upol):

Input range	**–200.00 - 200.00 µA**
Default value	**–200.00 µA**

Volume:

Input range	**0.00000 - 9,999.99 mL**
Default value	**0.00000 mL**

Upper limit

Measured value or volume for the upper limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measured value (measuring mode pH):

Input range	**–20.000 - 20.000**
Default value	**20.000**

Measured value (measuring mode U, Ipol):

Input range	**–2,000.0 - 2,000.0 mV**
Default value	**2,000.0 mV**

Measured value (measuring mode Upol):

Input range	**–200.00 - 200.00 µA**
Default value	**200.00 µA**

Volume:

Input range	**0.00000 - 9,999.99 mL**
Default value	**9,999.99 mL**

EP criterion

The equivalence point criterion found (ERC = Equivalence point Recognition Criterion) is compared with this value. Equivalence points whose ERC is less than the value defined here will be ignored.

Input range	**0 - 200**
Default value	**5**

EP recognition

This parameter allows you to filter out only the equivalence points that are being sought.

Selection	**first** | **greatest** | **last** | **ascending** | **descending**
Default value	**first**

first
Only the first equivalence point will be recognized.

greatest
Only the equivalence point with the greatest ERC value, i.e. the steepest jump, will be recognized.

last
Only the last equivalence point will be recognized.

ascending
Only equivalence points with a positive slope of the titration curve will be recognized.

descending
Only equivalence points with a negative slope of the titration curve will be recognized.

Only one equivalence point will be recognized in a window. The numbering of the equivalence points (EP) is defined by the numbering of the windows (e.g. EP2 in window 2), so that even if EPs are missing, the calculations will still be carried out with the correctly assigned EP volumes.

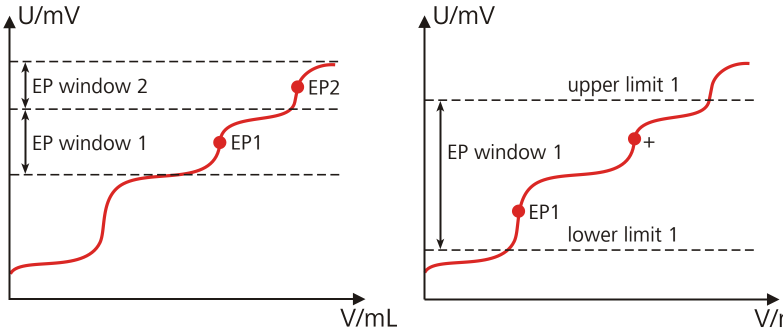


Figure 21 Equivalence point recognition and equivalence point numbering within windows

In the first example in the above figure, two equivalence points are recognized in two different windows (EP1 in window 1 and EP2 in window 2). In the second example, two equivalence points are found in one window, but only the first one is recognized. In order to ensure that the user recognizes that more than one equivalence point was found in the set window, EP1 is marked with a "+" in the result view. In addition, a corresponding message is entered in the message list.

Evaluation and equivalence point criterion with DET

The equivalence points (EP) are localized in a way similar to the Tubbs method [1][2]. The volume value of the equivalence point (V_E) is shifted from the inflection point (see arrow) towards the smaller circle of curvature for real asymmetric titration curves.

[1] C. F. Tubbs, *Anal. Chem.* **1954**, *26*, 1670–1671.

[2] E. Bartholomé, E. Biekert, H. Hellmann, H. Ley, M. Weigert, E. Weise, *Ullmanns Encyklopädie der technischen Chemie*, Vol. 5, Verlag Chemie, Weinheim, 1980, p. 659.

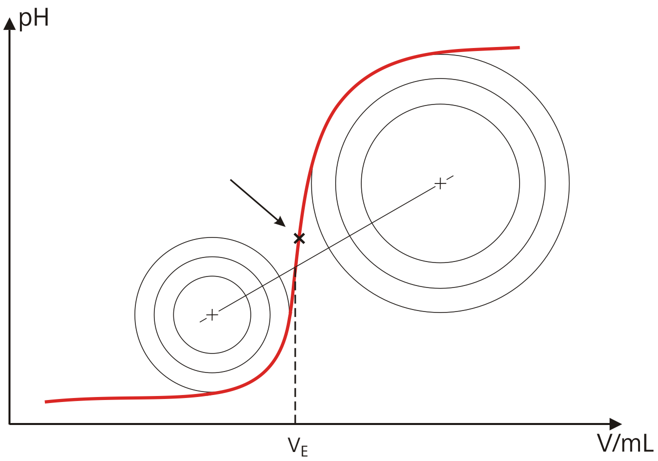


Figure 22 Tubbs method for determining the equivalence point

The figure shows that the evaluation also requires measured values from the measuring point list after the equivalence point as well.

For the recognition of the EPs found the set EP criterion is compared with the ERC (Equivalence point Recognition Criterion) found. The ERC is the first derivative of the titration curve combined with a mathematical function which is more sensitive for flat jumps than for steeper ones. EPs whose ERC is smaller than the defined EP criterion will not be recognized. The ERC is displayed in the results dialog for each discovered and recognized EP. If you adjust the EP criterion later in order to recognize more or fewer EPs, then you can reevaluate the determination (**[Recalculate]** function in the results dialog).

28.1.5 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System ▸ Device manager**.

NOTE

This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.1.6 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	**1 | 2**
Default value	**1**

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ▸ Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	**Selection of configured sensors**

I(pol)

The polarization current is the current that is applied to a polarizable electrode during the voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–125.0 - 125.0 µA** (Increment: **2.5**)
Default value	**5.0 µA**
Selection	**–1.0 µA** | **1.0 µA**

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–1,250 - 1,250 mV** (Increment: **25**)
Default value	**400 mV**

Electrode check

on | off (Default value: **off**)

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	**continuous** | **automatic** | **off**
Default value	**automatic**

continuous
A temperature sensor must be connected. The temperature is measured continuously.

automatic
If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off
The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

28.1.7 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4**
Default value	**1**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ▸ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

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

not defined
No check takes place.

28.1.8 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**1**

off
No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "–": clockwise rotation

Input range	**–15 - 15**
Default value	**8**

Switch off automatically

on | off (Default value: **on**)

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

28.2 Monotonic equivalence point titrations (MET)

28.2.1 Start conditions

The parameters that are carried out before the start of titration are defined under **[Start conditions]**. The start conditions are processed in the following sequence:

1. Start volume
2. Start measured value
3. Start slope
4. Pause

Start volume

Volume that is dosed prior to the start of the titration.

Input range	**0.00000 - 9999.99 mL**
Default value	**0.00000 mL**

Dosing rate

Rate at which the start volume is dosed.

Input range	**0.01 - 166.00 mL/min**

Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Pause

Waiting time, e.g. for the electrode to settle down after the start or a reaction time after the dosing of a start volume. The time entered here is only running when all start conditions have been fulfilled.

Input range	**0 - 999999 s**
Default value	**0 s**

More start conditions

Start meas. value

Before starting the titration, it will be dosed until this measured value is reached. If the start measured value is reached by the dosing of a start volume, then the titration starts directly.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measuring mode pH:

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Measuring mode U, Ipol:

Input range	**–2,000.0 - 2,000.0 mV**
Selection	**off**
Default value	**off**

Measuring mode Upol:

Input range	**–200.0 - 200.0 µA**
Selection	**off**
Default value	**off**

Start slope

Before starting the titration, it will be dosed until this slope (measured value per volume) is reached. If the start slope is reached by the dosing of a start volume, then the titration starts directly.

Measuring mode pH:

Input range	**00.000 - 9,999 pH/mL**

Selection	**off**
Default value	**off**

Measuring mode U, Ipol:

Input range	**0 - 999 mV/mL**
Selection	**off**
Default value	**off**

Measuring mode Upol:

Input range	**0 - 99 µA/mL**
Selection	**off**
Default value	**off**

Dosing rate

Rate to be dosed with until the start measured value or the start slope is reached.

Input range	**0.01 - 166.00 mL/min**
Default value	**5.00 mL/min**
Selection	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Initial measured value

The conditions for the entry of the first measured value in the measuring point list are defined under **[Initial meas. value]**.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

Measuring mode pH, U and Ipol:

Input range	**0.1 - 999.0 mV/min**
Selection	**off**
Default value	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Upol:

Input range	**0.01 - 99.90 µA/min**
Selection	**off**
Default value	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	**0 - 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	**0 - 999999 s**
Default value	**1 s**

28.2.2 Titration parameters

Under **[Titration parameters]**, the parameters influencing the sequence of the entire titration are defined.

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	**slow** | **optimal** | **fast** | **user**
Default value	**optimal**

slow
For titrations in which the finest details are also to be visible. This could however also lead to an increase in noise, which could result in unwanted equivalence points.

optimal
For all standard titrations. The parameters have been optimized for the most frequent applications.

fast
For fast and less critical titrations.

user
The individual titration parameters can be modified.

NOTE

Select **optimal** as titration rate when you are developing a new titration method. This parameter is suitable for virtually all titrations and only needs adaptation in special cases.

The settings of the individual titration rates are listed in *table 7, page 297*.

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement** = **automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	**–20.0 - 150.0 °C**
Default value	**25.0 °C**

User-defined parameters

These parameters are only accessible when **Titration rate** = **user**.

Volume increment

Volume that is dosed in each dosing step. The choice of the correct volume increment is a basic requirement for achieving high accuracy. A good guideline is 1/20 of the expected EP volume. For steep jumps the volume increment should tend toward 1/100 and for flat jumps toward 1/10 of the EP volume.

Small volume increments are used for determining blank values or with very asymmetrical curves.

NOTE

The accuracy of the evaluation cannot be increased by using smaller increments as the measured value modifications between two measuring points are then of the same order of magnitude as the noise.

Input range	**0.00005 - 999,900 mL**
Default value	**0.10000 mL**

Dosing rate

Rate at which the volume increments are dosed.

Input range	**0.01 - 166.00 mL/min**

Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. This type of titration is often referred to as equilibrium titration. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

NOTE

A constant measured value is often only reached after a certain time, as mixing and the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e. reaching a constant measured value takes longer and longer. Drift-controlled measured value acceptance is particularly advisable in such cases, as the measured values are only accepted when equilibrium has almost been reached.

Measuring mode pH, U and Ipol:

Input range	**0.1 - 999.0 mV/min**
Default value	**50.0 mV/min**
Selection	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed. This can be useful when the titration reaction proceeds slowly or the electrode is slow to respond.

Measuring mode Upol:

Input range	**0.01 - 99.90 µA/min**
Default value	**50.00 µA/min**
Selection	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed. This can be useful when the titration reaction proceeds slowly or the electrode is slow to respond.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	**0 - 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	**0 - 999999 s**
Default value	**26 s**

Table 7 Default values of the predefined titration rates for MET

	Titration rate		
	slow	**optimal**	**fast**
Volume increment	0.05000 mL	0.10000 mL	0.20000 mL
Dosing rate	maximum	maximum	maximum
Signal drift – pH, U and Ipol – Upol	 20.0 mV/min 20.0 µA/min	 50.0 mV/min 50.0 µA/min	 80.0 mV/min 80.0 µA/min
Min. waiting time	0 s	0 s	0 s
Max. waiting time	38 s	26 s	21 s

28.2.3 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**.

Stop volume

The titration is stopped when the specified volume has been dosed since the start of the titration. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	**0.00000 - 9999.99 mL**
Default value	**100,000 mL**
Selection	**off**

Stop meas. value

The titration is canceled when the specified measured value has been reached since the start of the titration.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measuring mode pH:

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Measuring mode U, Ipol:

Input range	**–2,000.0 - 2,000.0 mV**
Selection	**off**
Default value	**off**

Measuring mode Upol:

Input range	**–200.0 - 200.0 µA**
Selection	**off**
Default value	**off**

Stop EP

The titration is stopped when the specified number of equivalence points has been found.

Input range	**1 - 9**
Default value	**9**
Selection	**off**

Volume after EP

This volume will be added when the number of equivalence points defined under **Stop EP** has been found. The curve shape after the equivalence point can also be seen this way.

Input range	**0.01000 - 9999.99 mL**
Selection	**off**
Default value	**off**

Stop time

The titration is stopped when the specified time has elapsed since the start of the titration.

Input range	**0 - 999999 s**
Selection	**off**
Default value	**off**

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum

The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

28.2.4 Potentiometric evaluation

The parameters for the evaluation of the titration curve are defined under **[Potentiometr. evaluation]**.

EP criterion

The equivalence point criterion found (ERC = Equivalence point Recognition Criterion) is compared with this value. Equivalence points whose ERC is less than the value defined here will be ignored.

Measuring mode pH:

Input range	**0.10 - 9.99**
Default value	**0.50**

Measuring mode U, Ipol:

Input range	**1 - 999 mV**
Default value	**30 mV**

Measuring mode Upol:

Input range	**0.1 - 99.9 µA**
Default value	**2.0 µA**

EP recognition

This parameter allows you to filter out only the equivalence points that are being sought.

Selection	**all** | **greatest** | **last** | **ascending** | **descending** | **off**
Default value	**all**

all

All equivalence points will be recognized.

greatest

Only the equivalence point with the greatest ERC value, i.e. the steepest jump, will be recognized.

last

Only the last equivalence point will be recognized.

ascending

Only equivalence points with a positive slope of the titration curve will be recognized.

descending

Only equivalence points with a negative slope of the titration curve will be recognized.

off
No evaluation takes place.

Set windows

This parameter allows to recognize equivalence points only in a particular range (so-called window) of the curve. Equivalence points outside this window will not be recognized. A maximum of 9 windows can be defined. Setting windows is advisable when interference and unnecessary equivalence points are to be suppressed.

Selection	**Measured value** | **Volume** | **off**
Default value	**off**

Measured value
The windows are defined on the measured value axis.

Volume
The windows are defined on the volume axis.

off
The entire titration curve is being evaluated.

Setting windows

The list of defined windows is opened with **[Set window]**.

When the list is opened for the first time, a window over the entire measured value range or volume range is already defined. The windows must not overlap, they only may lie next to one another. For each window, own criteria can be defined for the equivalence point recognition.

NOTE

When you define a result variable instead of a numerical value as limit value *(see Chapter 31.6, page 411)*, then just one window can be defined.

[New]

Define a new window. This is only possible when not the entire range is covered yet.

[Delete]

Delete the selected window.

[Edit]

Edit the settings of the selected window.

Lower limit

Measured value or volume for the lower limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measured value (measuring mode pH):

Input range	**–20.000 - 20.000**
Default value	**–20.000**

Measured value (measuring mode U, Ipol):

Input range	**–2,000.0 - 2,000.0 mV**
Default value	**–2,000.0 mV**

Measured value (measuring mode Upol):

Input range	**–200.00 - 200.00 µA**
Default value	**–200.00 µA**

Volume:

Input range	**0.00000 - 9,999.99 mL**
Default value	**0.00000 mL**

Upper limit

Measured value or volume for the upper limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measured value (measuring mode pH):

Input range	**–20.000 - 20.000**
Default value	**20.000**

Measured value (measuring mode U, Ipol):

Input range	**–2,000.0 - 2,000.0 mV**
Default value	**2,000.0 mV**

Measured value (measuring mode Upol):

Input range	**–200.00 - 200.00 µA**
Default value	**200.00 µA**

Volume:

Input range	**0.00000 - 9,999.99 mL**
Default value	**9,999.99 mL**

EP criterion

The equivalence point criterion found (ERC = Equivalence point Recognition Criterion) is compared with this value. Equivalence points whose ERC is less than the value defined here will be ignored.

Measuring mode pH:

Input range	**0.10 - 9.99**
Default value	**0.50**

Measuring mode U, Ipol:

Input range	**1 - 999 mV**
Default value	**30 mV**

Measuring mode Upol:

Input range	**0.1 - 99.9 µA**
Default value	**2.0 µA**

EP recognition

This parameter allows you to filter out only the equivalence points that are being sought.

Selection	**first** | **greatest** | **last** | **ascending** | **descending**
Default value	**first**

first
Only the first equivalence point will be recognized.

greatest
Only the equivalence point with the greatest ERC value, i.e. the steepest jump, will be recognized.

last
Only the last equivalence point will be recognized.

ascending
Only equivalence points with a positive slope of the titration curve will be recognized.

descending
Only equivalence points with a negative slope of the titration curve will be recognized.

Only one equivalence point will be recognized in a window. The numbering of the equivalence points (EP) is defined by the numbering of the windows (e.g. EP2 in window 2), so that even if EPs are missing, the calculations will still be carried out with the correctly assigned EP volumes.

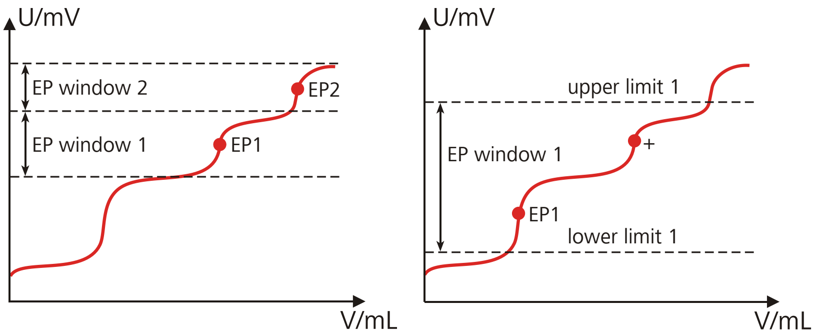


Figure 23 Equivalence point recognition and equivalence point numbering within windows

In the first example in the above figure, two equivalence points are recognized in two different windows (EP1 in window 1 and EP2 in window 2). In the second example, two equivalence points are found in one window, but only the first one is recognized. In order to ensure that the user recognizes that more than one equivalence point was found in the set window, EP1 is marked with a "+" in the result view. In addition, a corresponding message is entered in the message list.

Evaluation and equivalence point criterion with MET

The equivalence points (EPs) are localized by a method based on the Fortuin method which has been adapted by Metrohm for numerical methods. A search is made for the largest measured value modification (Δ_n). The exact EP is determined by using an interpolation factor ρ which depends on the Δ values before and after Δ_n.

$$V_{EP} = V_0 + \rho \cdot \Delta V$$

V_{EP}: EP volume

V_0: Dosed total volume before Δ_n

ΔV: Volume increment

ρ: Interpolation factor according to Fortuin

For the recognition of the EPs found the set EP criterion is compared with the ERC (Equivalence point Recognition Criterion) found. The ERC is the sum of the measured value modifications before and after the jump:

$$|\Delta_{n-2}| + |\Delta_{n-1}| + |\Delta_n| + |\Delta_{n+1}| + |\Delta_{n+2}|$$

In certain cases only three or only a single summand are taken into account.

EPs whose ERC is smaller than the defined EP criterion will not be recognized. The ERC is displayed in the results dialog for each discovered and recognized EP. If you adjust the EP criterion later in order to recognize more or fewer EPs, then you can reevaluate the determination (**[Recalculate]** function in the results dialog).

28.2.5 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System ▸ Device manager**.

NOTE

This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.2.6 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	**1** | **2**
Default value	**1**

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ▸ Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	**Selection of configured sensors**

I(pol)

The polarization current is the current that is applied to a polarizable electrode during the voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–125.0 - 125.0 µA** (Increment: **2.5**)
Default value	**5.0 µA**
Selection	**–1.0 µA** | **1.0 µA**

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–1,250 - 1,250 mV** (Increment: **25**)
Default value	**400 mV**

Electrode check

on | off (Default value: **off**)

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	**continuous** | **automatic** | **off**
Default value	**automatic**

continuous
A temperature sensor must be connected. The temperature is measured continuously.

automatic
If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off
The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

28.2.7 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4**
Default value	**1**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ▸ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

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

not defined
No check takes place.

28.2.8 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**1**

off
No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "–": clockwise rotation

Input range	**–15 - 15**
Default value	**8**

Switch off automatically

on | off (Default value: **on**)

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

28.3 Endpoint titrations (SET)

28.3.1 Start conditions

The parameters that are carried out before the start of titration are defined under **[Start conditions]**.

Pause 1

Waiting time, e.g. for the electrode to settle down before a start volume is added.

Input range	**0 - 999999 s**
Default value	**0 s**

Start volume

Volume that is dosed prior to the start of the titration.

Input range	**0.00000 - 9999.99 mL**
Default value	**0.00000 mL**

Dosing rate

Rate at which the start volume is dosed.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum

The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Pause 2

Waiting time, e.g. for the electrode to settle down after the start or a reaction time after the dosing of a start volume.

Input range	**0 - 999999 s**
Default value	**0 s**

Initial measured value

The conditions for the entry of the first measured value in the measuring point list are defined under **[Initial meas. value]**.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

Measuring mode pH, U and Ipol:

Input range	**0.1 - 999.0 mV/min**
Selection	**off**
Default value	**off**

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Upol:

Input range	**0.01 - 99.90 µA/min**
Selection	**off**
Default value	**off**

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	**0 - 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	**0 - 999999 s**
Default value	**1 s**

28.3.2 Control parameters

The control parameters for endpoint 1 and endpoint 2 are defined under **[Control parameters]**.

Endpoint 1 at

Measured value for the first endpoint.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measuring mode pH:

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Measuring mode U and Ipol:

Input range	**–2,000.0 - 2,000.0 mV**
Selection	**off**
Default value	**off**

Measuring mode Upol:

Input range	**–200.00 - 200.00 µA**
Selection	**off**
Default value	**off**

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	**slow** | **optimal** | **fast** | **user**
Default value	**optimal**

slow
For steep titration curves for which dosing must be carried out in small steps at the endpoint.

optimal
For all standard titrations. The parameters have been optimized for the most frequent applications.

fast
For flat titration curves for which the endpoint is reached only slowly.

user
The individual titration parameters can be modified.

The settings of the individual titration rates are listed in *table 8, page 311*.

User-defined parameters

These parameters are only accessible when **Titration rate** = **user**.

Dynamics

This parameter defines the control range before the specified endpoint. Individual volume steps are dosed in the control range, the dosing is finely controlled. The closer the endpoint, the slower the dosing until the dosing rate defined under **Min. rate** has been reached. The larger the control range, the slower the titration. Outside the control range, dosing is carried out continuously, and the dosing rate is defined under **Max. rate**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measuring mode pH:

Input range	**0.001 - 20.000**
Default value	**2.000**
Selection	**off**

Measuring mode U and Ipol:

Input range	**0.1 - 2,000.0 mV**
Default value	**100.0 mV**
Selection	**off**

Measuring mode Upol:

Input range	**0.01 - 200.00 µA**
Default value	**10.00 µA**
Selection	**off**

Max. rate

Rate at which dosing is carried out outside of the control range.

Input range	**0.01 - 166.00 mL/min**
Default value	**10.00 mL/min**
Selection	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Min. rate

Rate at which dosing is carried out at the very beginning of the titration and in the control range at the end of the titration. This parameter has a decisive influence on the titration rate and thus also on the accuracy. The smaller the selected minimum rate, the slower the titration.

Input range	**0.01 - 9999.00 µL/min**
Default value	**25.00 µL/min**

Table 8 Default values of the predefined titration rates for SET

	Titration rate		
	slow	**optimal**	**fast**
Dynamics – pH – U und Ipol – Upol	 5.000 300.0 mV 40.00 µA	 2.000 100.0 mV 10.00 µA	 0.500 30.0 mV 5.00 µA
Max. rate	1.00 mL/min	10.00 mL/min	maximum
Min. rate	5.00 µL/min	25.00 µL/min	50.00 µL/min

Stop criterion

Stop criterion

The titration is stopped when the endpoint has been reached and this stop criterion has been fulfilled. If no stop criterion has been selected then the titration will not be stopped. The stop conditions *(see Chapter 28.3.4, page 313)* always lead to a stop, even if the stop criterion has not been reached.

NOTE

In older instructions the delay time was usually defined as the stop criterion. The same delay time may however result in different stopping time points – because of different smallest possible volume increments (depending on the cylinder volume). In contrast, if the stop drift is used, the titration will always be stopped at the same curve slope dV/dt.

Selection	**drift | time | off**
Default value	**drift**

drift
The titration is stopped when the stop drift has been reached.

time
The titration is stopped when the endpoint has been exceeded during a certain period of time (**Delay time**).

off
The titration will not be stopped until the stop conditions have been fulfilled.

Stop drift

This parameter can only be edited with **Stop criterion** = **drift**.

The titration is stopped when the endpoint and the stop drift have been reached.

Input range	**1 - 999 µL/min**
Default value	**20 µL/min**

Delay time

This parameter can only be edited with **Stop criterion** = **time**.

When the endpoint has been reached, the specified time is allowed to elapse after the last dosing and the titration is then stopped.

Input range	**0 - 999 s**
Default value	**10 s**

Endpoint 2

The control parameters for the second endpoint are defined under **[Endpoint 2]**. The parameters and input ranges are identical with those for the first endpoint.

28.3.3 Titration parameters

Under **[Titration parameters]**, the parameters influencing the sequence of the entire titration are defined.

Titration direction

The titration direction is normally determined automatically from the start measured value and the set endpoint. It is recommended that, whenever possible, a positive or negative modification of the measured value is entered. If two endpoints have been set then the titration direction will be defined automatically. In this case the setting will be ignored.

Selection	**+ | - | auto**
Default value	**auto**

+
Positive measured value modification, i.e. in the direction of a higher pH value, greater voltage or greater current.

-
Negative measured value modification, i.e. in the direction of a lower pH value, lesser voltage or lesser current.

auto
The titration direction is determined automatically from the start measured value and the set endpoint.

Extraction time

Minimum duration of the titration. The titration will not be stopped during the extraction time, even if the endpoint has already been reached. The titration is however stopped if a stop condition is fulfilled during this time *(see Chapter 28.3.4, page 313)*. The entry of an extraction time may be advisable, e.g. for the titration of sparingly soluble samples.

Input range	**0 - 999999 s**
Default value	**0 s**

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement** = **automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	**–20.0 - 150.0 °C**
Default value	**25.0 °C**

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	**0.1 - 999999.0 s**
Default value	**2.0 s**

28.3.4 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**, if this does not occur automatically. This could be the case when the endpoint set is not reached or if the stop criterion *(see "Stop criterion", page 311)* is not fulfilled.

Stop volume

The titration is stopped when the specified volume has been dosed since the start of the titration. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	**0.00000 - 9999.99 mL**
Default value	**100,000 mL**

Selection	**off**

Stop time

The titration is stopped when the specified time has elapsed following the termination of the start conditions.

Input range	**1 - 999999 s**
Selection	**off**
Default value	**off**

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

28.3.5 Conditioning

The conditions required for conditioning are defined under **[Conditioning]**.

Conditioning

on | off (Default value: **off**)

If this parameter is activated, then the first time the titration is started the working medium will be titrated to the endpoint with the specified control parameters. The status is kept stable. The actual method run does not begin until **[▷]** has been pressed once more.

Start drift

Conditioning OK will be displayed as soon as this drift has been reached and the titration can be started.

Input range	**1 - 999 µL/min**
Default value	**20 µL/min**

Drift correction

The endpoint volume can be corrected by taking the drift value into account. For this, the drift is multiplied with the drift correction time and this value is then subtracted from the endpoint volume. The drift correction time is the time interval between the end of conditioning and the end of the determination.

Selection	**auto | manual | off**
Default value	**off**

auto
The value of the current drift is automatically applied at the start of the titration.

manual
If the drift is known throughout a longer period of time, this can be entered manually.

off
No drift correction takes place.

Drift value

This parameter can only be edited with **Drift correction** = **manual**.

Drift for manual drift correction.

Input range	**0.0 - 99.9 µL/min**
Default value	**0.0 µL/min**

Measured value display

on | off (Default value: **off**)

If this parameter is activated, the currently measured value is displayed during the conditioning.

Conditioning options [Cond. options]

Cond. stop volume

Maximum permissible volume that can be dosed during conditioning. Conditioning is stopped when the specified volume is dosed. If conditioning is continued by pressing **[▷]** once again, then the titrant volume that has already been dosed will not be taken into account; i.e. the dosing starts again at zero. The stop volume should be adjusted to the size of the titration cell in order to prevent any overflow.

Input range	**0.00000 - 9999.99 mL**
Default value	**20.0000 mL**
Selection	**off**

Cond. stop time

Maximum permissible time over which conditioning may take place. Conditioning is stopped when the specified time has elapsed.

Input range	**1 - 999999 s**
Selection	**off**
Default value	**off**

Delay reconditioning

on | off (Default value: **off**)

If this parameter is activated, the conditioning will not start before all the method commands have been processed. Otherwise, the conditioning will immediately start after the titration command.

NOTE

This parameter must be activated if commands follow which must not run simultaneously with the conditioning.

Example: Emptying the titration cell followed by adding new working medium.

28.3.6 Cell

The monitoring of the reagent used is activated or deactivated under **[Cell]**.

Reagent monitoring

Selection of the reagent from the list of reagents. The selection depends on the titration mode. Reagents are defined under **System** ▸ **Reagents**.

Selection	**Selection of configured reagents** | **off**
Default value	**off**

off
The reagent monitoring is not active.

28.3.7 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System** ▸ **Device manager**.

NOTE

This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.3.8 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	**1** | **2**
Default value	**1**

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ▸ Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	**Selection of configured sensors**

I(pol)

The polarization current is the current that is applied to a polarizable electrode during the voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–125.0 - 125.0 µA** (Increment: **2.5**)
Default value	**5.0 µA**
Selection	**–1.0 µA** | **1.0 µA**

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–1,250 - 1,250 mV** (Increment: **25**)
Default value	**400 mV**

Electrode check

on | off (Default value: **off**)

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	**continuous | automatic | off**
Default value	**automatic**

continuous
A temperature sensor must be connected. The temperature is measured continuously.

automatic
If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off
The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

28.3.9 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4**
Default value	**1**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ▸ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

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

not defined
No check takes place.

28.3.10 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**1**

off
No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of −15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "−": clockwise rotation

Input range	**−15 - 15**
Default value	**8**

Switch off automatically

on | off (Default value: **on**)

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

28.4 Manual titrations (MAT)

NOTE

Start of titration: Because of the technical implementation involved, a few microliters are already dosed at the start of a manual titration. The possibility of deviation from the actual endpoint volume is excluded, however, because the already dosed volume is taken into account.

End of titration: A manual titration must always be ended with the button **[Skip command]** (NOT with the fixed key **[☐]**). This is the only way to ensure that subsequent method commands will be carried out.

28.4.1 Dosing parameters

Under **[Dosing parameters]**, the parameters influencing the sequence of the manual titration are defined.

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 the defined dosing rate is to be reached.

Input range	**0 - 10 s**
Default value	**2 s**

Dosing rate

Rate at which it is dosed.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	**0.1 - 999999.0 s**
Default value	**5.0 s**

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement** = **automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	**–20.0 - 150.0 °C**
Default value	**25.0 °C**

28.4.2 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System ▸ Device manager**.

NOTE

This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.4.3 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	**1** | **2**
Default value	**1**

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ▸ Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	**Selection of configured sensors**

Temp. measurement

Type of temperature measurement.

Selection	**continuous** | **automatic** | **off**
Default value	**automatic**

continuous
A temperature sensor must be connected. The temperature is measured continuously.

automatic
If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off
The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

28.4.4 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1** | **2** | **3** | **4**
Default value	**1**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ▸ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

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

not defined
No check takes place.

Tandem dosing

A second dosing device can be defined under **[Tandem dosing]** in order to enable uninterrupted dosing. Dosing is carried out with a combination of two dosing devices so that the second dosing device is dosing while the first one is being filled and vice-versa.

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**off**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. Titrants are defined under **System ▶ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, only the time interval for the GLP test of the buret unit is checked at the start of the determination.

NOTE

The concentration, validity of the titer and the working life of the titrant are ignored.

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

not defined
No check takes place.

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

However, in order to ensure uninterrupted dosing, the following points must be taken into account:

- Use the highest possible filling rate in order to keep the filling times as short as possible. The filling rate should be decreased for viscous liquids.
- When you use two buret units with different dosing cylinders, the filling rate for the larger sized cylinder must be at the minimum:

$$v_{2,Fill} \geq v_{1,Fill} \cdot \frac{V_{Cyl.2}}{V_{Cyl.1}}$$

$v_{2,Fill}$ = filling rate in mL/min for the larger sized cylinder

$v_{1,Fill}$ = filling rate in mL/min for the smaller cylinder

$V_{Cyl.2}$ = cylinder volume in mL of the buret unit of the second dosing device

$V_{Cyl.1}$ = cylinder volume in mL of the buret unit of the first dosing device

Example:

Dosing device 1: volume = 20 mL, filling rate = 50 mL/min

Dosing device 2: volume = 50 mL

Filling rate 2 ≥ 50 mL/min · 50 mL / 20 mL ≥ 125 mL/min

- The dosing rate must not exceed 75 % of the filling rate of the smaller cylinder. These values are listed in the following table, valid at maximum filling rate:

Table 9 Maximum dosing rate for different dosing cylinders

Cylinder volume	maximum dosing rate	
	Exchange unit	**Dosing unit**
1 mL	2.25 mL/min	–
2 mL	–	5.00 mL/min
5 mL	11.25 mL/min	12.50 mL/min
10 mL	22.50 mL/min	25.00 mL/min
20 mL	45.00 mL/min	50.00 mL/min
50 mL	112.50 mL/min	124.50 mL/min

28.4.5 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**1**

off
No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of −15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "−": clockwise rotation

Input range	**−15 - 15**
Default value	**8**

Switch off automatically

on | off (Default value: **on**)

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

28.5 Measurements (MEAS)

28.5.1 Measuring parameters

Under **[Measuring parameters]**, the parameters influencing the sequence of the entire measurement are defined.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

NOTE

A constant measured value is often only reached after a certain time, as mixing and the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e. reaching a constant measured value takes longer and longer. Drift-controlled measured value acceptance is particularly advisable in such cases, as the measured values are only accepted when equilibrium has almost been reached.

Measuring mode pH, U and Ipol:

Input range	**0.1 - 999.0 mV/min**
Default value	**10.0 mV/min**
Selection	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Upol:

Input range	**0.01 - 99.90 µA/min**
Default value	**10.00 µA/min**
Selection	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode T:

Input range	**0.1 - 999.0 °C/min**
Default value	**0.5 °C/min**
Selection	**off**

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	**0 - 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	**0 - 999999 s** The default value depends on the measuring mode.
Selection	**off**

off

The measurement is continued endlessly.

Stop meas. value

The measurement is canceled when the specified measured value has been reached since the start of the measurement.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measuring mode pH:

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Measuring mode U, Ipol:

Input range	**–2,000.0 - 2,000.0 mV**
Selection	**off**
Default value	**off**

Measuring mode Upol:

Input range	**–200.00 - 200.00 µA**
Selection	**off**
Default value	**off**

Measuring mode T:

Input range	**–20.0 - 150.0 °C**
Selection	**off**
Default value	**off**

Temperature

This parameter is not available with the command **MEAS T** (temperature measurement).

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement** = **automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	**–20.0 - 150.0 °C**
Default value	**25.0 °C**

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	**0.1 - 999999.0 s**
Default value	**2.0 s**

28.5.2 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System ▶ Device manager**.

NOTE

This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.5.3 Sensor

The parameters for the sensor are edited under **[Sensor]**.

The parameters are valid for all measuring modes except for **Temp. measurement**. This parameter is not available with the **MEAS T** command (temperature measurement).

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	**1** | **2**
Default value	**1**

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ▸ Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	**Selection of configured sensors**

I(pol)

The polarization current is the current that is applied to a polarizable electrode during the voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–125.0 - 125.0 µA** (Increment: **2.5**)
Default value	**5.0 µA**
Selection	**–1.0 µA** | **1.0 µA**

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–1,250 - 1,250 mV** (Increment: **25**)
Default value	**400 mV**

Electrode check

on | off (Default value: **off**)

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	**continuous | automatic | off**
Default value	**automatic**

continuous
A temperature sensor must be connected. The temperature is measured continuously.

automatic
If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off
The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

28.5.4 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**1**

off
No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "–": clockwise rotation

Input range	**–15 - 15**
Default value	**8**

Switch off automatically

on | off (Default value: **on**)

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

28.6 Calibration of sensors (CAL)

28.6.1 Calibration parameters (CAL pH)

Under **[Calibration parameters]**, the parameters influencing the sequence of the entire calibration are defined.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

Input range	**0.1 - 999.0 mV/min**
Default value	**2.0 mV/min**
Selection	**off**

off
Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	**0 - 999999 s**
Default value	**10 s**

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	**0 - 999999 s**
Default value	**110 s**
Selection	**off**

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement** = **automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	**–20.0 - 150.0 °C**
Default value	**25.0 °C**

Sample Processor

If the calibration is carried out with a Sample Processor, the buffers or standards are automatically changed. This is why no request for the calibration temperature appears when starting the calibration. The value entered above is used.

Selection	**off** | **Remote** | **USB**
Default value	**off**

off
For calibrations without Sample Processor. During the calibration, a request for changing the buffer/standard is displayed.

Remote
For automatic calibrations with Sample Processors, which are connected via the Remote Box.

USB
For automatic calibrations with a USB Sample Processor *(see Chapter 31.7, page 412)*.

Buffers

The buffer type and the number of buffers is defined under **[Buffers]**.

Buffer type

Selection of a predefined buffer series or definition of special buffers. In the case of predefined buffer series, the instrument automatically recognizes which buffer is involved.

Selection	**Metrohm** | **NIST** | **DIN** | **Fisher** | **Fluka Basel** | **Mettler** | **Merck Tit.** | **Beckman** | **Radiometer** | **Custom** | **Special** | **Merck Cer.** | **Baker** | **Hamilton** | **Precisa**
Default value	**Metrohm**

Custom
Definition of a custom buffer series. The buffer series is defined under **System ▸ Templates ▸ Custom calib. buffers**.

Special
Up to five calibration buffers can be defined in the method. The automatic buffer detection is not activated in this case. The buffers must be measured precisely in the specified sequence.

Merck Cer.
Reference temperature = 25 °C. When using Merck CertiPUR buffers (20 °C) the buffer type **Merck Tit.** must be selected.

Number of buffers

This parameter is not visible when **Buffer type** = **Special** is defined.

Number of buffers that are used for calibration. If calibration is accomplished with more than two buffers, then they can be used repeatedly in order to give them more statistical weight. The first two buffers must however always be different from one another.

Selection	**1 | 2 | 3 | 4 | 5**
Default value	**2**

Buffer 1 pH

This parameter is visible only when **Buffer type** = **Special**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–20.000 - 20.000**
Default value	**7.000**

Buffer 2 pH

This parameter is visible only when **Buffer type** = **Special**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–20.000 - 20.000**
Default value	**4.000**
Selection	**off**

Buffer 3 pH

This parameter is visible only when **Buffer type** = **Special**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Buffer 4 pH

See **Buffer 3 pH**.

Buffer 5 pH

See **Buffer 3 pH**.

Stirrer control

The parameters for the stirrer control during the calibration are edited under **[Stirrer control]**. Ensure that a stirrer has been selected in the **Edit command / Stirrer** dialog.

NOTE

Deactivate the **Stir solution during measurement** parameter when you carry out the calibration with an 814/815 USB Sample Processor. The stirrer control for the tower stirrer is ineffective with these instruments.

Stir solution during measurement

on | off (Default value: **on**)

If this parameter is activated, the stirrer will be switched on and off automatically at the start or end of the measurement.

Stir before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If the stirrer is switched off during the measurement, it will be stirred for the time entered before measuring.

Input range	**0 - 999999 s**
Default value	**0 s**

Pause before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If it is stirred before the measurement, a waiting time can be defined here before starting the measurement. No stirring or measuring occurs during this time.

Input range	**0 - 999999 s**
Default value	**0 s**

28.6.2 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System ▶ Device manager**.

NOTE

This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.6.3 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	**1 | 2**
Default value	**1**

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ▶ Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	**Selection of configured sensors**

Electrode check

on | off (Default value: **off**)

For pH electrodes, an electrode check can be carried out. A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started.

Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	**continuous | automatic | off**
Default value	**automatic**

continuous
A temperature sensor must be connected. The temperature is measured continuously.

automatic
If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the calibration temperature entered manually will be used.

off
The temperature will not be measured. The calibration temperature entered manually is used. The temperature is requested after the start, except the determination is carried out with a Sample Processor.

28.6.4 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**1**

off
No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "–": clockwise rotation

Input range	**–15 - 15**
Default value	**8**

28.7 Electrode test for pH electrodes (ELT)

An automatic electrode test can be carried out for pH electrodes which will permit a qualification of the electrode used. Differentiated specifications regarding characteristic measurement properties of your pH electrode (slope, response time, etc.) will be obtained as the result. The concluding evaluation of the electrode is carried out by testing these results against the specified limit values. Once the electrode test has been successfully completed, the calibration data is stored with the sensor data of the sensor used.

These limit values are saved in the software for the following types of pH electrodes:

- Standard electrodes
- Gel electrodes
- Electrodes with a non-aqueous reference electrolyte

You can however also define limits of your own choosing *(see Chapter 15.7, page 167)*. The precise classification of the measuring chain is determined by the reference system used. You will find an overview of these electrode types and the corresponding limit values in *table 10, page 341*.

Faulty electrodes often exhibit certain combinations of measurement results of the electrode test which fall outside the intended limits. This makes it possible to have more precise data concerning possible causes of errors and recommended remedial measures.

Buffers

You will require flawless buffers in the pH values 4, 7 and 9 for carrying out the electrode test. We recommend for this purpose the appropriate Metrohm buffers. The electrode test can however in principle also be carried out with any of the buffer sets contained in the memory.

The buffers must be measured in the following sequence:

1. pH 9
2. pH 4
3. pH 7

NOTE

Ensure in particular the flawlessness of the pH 9 buffer. It can readily deviate from its specified pH value as the result of absorption of CO_2 from the ambient atmosphere, thus leading to incorrect test results.

Stirrer

A stirrer has to be connected for the electrode test.

Temperature

Take care to ensure that the entire electrode test is carried out at a consistently uniform temperature. Work should be accomplished at room temperature wherever possible, in light of the fact that temperature exercises a great influence on response time. The preset limit values are calibrated to 25 °C.

28.7.1 Electrode test parameters

Under **[Electrode test param.]**, the parameters influencing the sequence of the electrode test are defined.

Buffer type

Selecting a predefined buffer series.

Selection	**Metrohm** | **NIST** | **DIN** | **Fluka Basel** | **Mettler** | **Merck Tit.** | **Radiometer** | **Merck Cer.** | **Baker** | **Hamilton** | **Precisa**
Default value	**Metrohm**

Merck Cer.
Reference temperature = 25 °C. When using Merck CertiPUR buffers (20 °C) the buffer type **Merck Tit.** must be selected.

Sample Processor

If the calibration is carried out with a Sample Processor, the buffers or standards are automatically changed. This is why no request for the calibration temperature appears when starting the calibration. The value entered above is used.

Selection	**off** | **Remote** | **USB**
Default value	**off**

off
For calibrations without Sample Processor. During the calibration, a request for changing the buffer/standard is displayed.

Remote
For automatic calibrations with Sample Processors, which are connected via the Remote Box.

USB
For automatic calibrations with a USB Sample Processor *(see Chapter 31.7, page 412)*.

Electrode type

Selection of the electrode type.

Selection	**Standard | Gel | Non-aqueous | Custom**
Default value	**Standard**

Standard
Electrodes which contain e.g. KCl solution as reference electrolyte.

Gel
Electrodes which contain Idrolyte as reference electrolyte.

Non-aqueous
Electrodes, which contain a non-aqueous reference electrolyte, e.g. TEABr in ethylene glycol or LiCl in ethanol.

Custom
Under **System ▸ Templates** a custom electrode type can be defined.

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement** = **automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	**–20.0 - 150.0 °C**
Default value	**25.0 °C**

28.7.2 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System ▸ Device manager**.

NOTE

This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.7.3 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	**1 | 2**
Default value	**1**

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ▸ Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	**Selection of configured sensors**

Temp. measurement

Type of temperature measurement.

Selection	**continuous | automatic | off**
Default value	**automatic**

continuous
A temperature sensor must be connected. The temperature is measured continuously.

automatic
If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the calibration temperature entered manually will be used.

off
The temperature will not be measured. The calibration temperature entered manually is used. The temperature is requested after the start, except the determination is carried out with a Sample Processor.

28.7.4 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4**
Default value	**1**

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "−": clockwise rotation

Input range	**−15 - 15**
Default value	**8**

28.7.5 Further information

Table 10 Limit values of the three electrode types

	Rating		
	Excellent electrode	**Good electrode**	**Usable electrode**
Electrode type "Standard"			
Streaming potential	2.5 mV	3.0 mV	4.0 mV
Drift	2.0 mV/s	2.5 mV/s	3.0 mV/s
Min. slope	96.5 %	96.0 %	95.0 %
Max. slope	101.0 %	102.0 %	103.0 %
Response time	45 s	50 s	60 s
Lower limit Uoff	−15 mV		
Upper limit Uoff	15 mV		
Electrode type "Gel"			
Streaming potential	3.0 mV	3.5 mV	4.5 mV
Drift	2.5 mV/s	3.0 mV/s	4.0 mV/s
Min. slope	96.5 %	96.0 %	95.0 %
Max. slope	101.0 %	102.0 %	103.0 %
Response time	60 s	75 s	90 s
Lower limit Uoff	−20 mV		
Upper limit Uoff	20 mV		
Electrode type "Non-aqueous"			
Streaming potential	3.0 mV	4.5 mV	6.0 mV
Drift	5.0 mV/s	7.0 mV/s	9.0 mV/s
Min. slope	88.0 %	80.0 %	70.0 %
Max. slope	120.0 %	130.0 %	140.0 %
Response time	60 s	75 s	90 s
Lower limit Uoff	−50 mV		
Upper limit Uoff	100 mV		

Table 11 Possible errors during the electrode test

Test criterion	Message	Remedy
Buffer pH 9: The drift in stirred solution is > 1 mV.	**General problem**	▪ Connect an electrode. ▪ Replace the defective electrode cable. ▪ Clean the diaphragm (see leaflet for the electrode). ▪ Replace the electrode.
Buffer pH 9: –10 mV < U(not stirred) < 10 mV and The sum of the drift values after 1, 2, 3 and 4 min is < 12 mV/min.	**Short circuit**	Replace the electrode.
A response time does not fulfill the limit value for the rating **Usable electrode**.	**Glass membrane / Diaphragm**	Clean the diaphragm (see leaflet for the electrode).
The pH values are not defined for all the buffers at the temperature measured.	**No buffer data**	Repeat the electrode test at a temperature at which the pH values of all the buffers are defined.
All the slopes fulfill the limit values for the rating **Usable electrode**. and Uoff is outside the preset limits.	**Unsuitable reference electrode**	▪ Repeat the electrode test with a suitable reference system. ▪ Replace the contaminated reference electrolyte. ▪ Select **Electrode type** = **Custom** and adjust the limits for Uoff.
The streaming potential is too high.	**Contaminated diaphragm**	Clean the diaphragm (see leaflet for the electrode).
Two slopes do not fulfill the limit values for the rating **Usable electrode**.	**Wrong buffer**	Repeat the electrode test with buffers pH 4, 7 and 9.
All the slopes do not fulfill the limit values for the rating **Usable electrode**.	**Partial short circuit**	▪ Check the temperature sensor. ▪ Enter the correct calibration temperature.

28.8 Evaluations (EVAL)

Various **additional evaluations** (EVAL commands) can be carried out for titrations and measurements. The evaluation always refers to the last titration or measurement prior to the EVAL command. Only those evaluation commands which are available for the last titration or measurement prior to the EVAL command can be inserted in the list of commands. If a titration or measuring command is deleted before the EVAL command, then it will be shown in red in the list of commands, as the reference is missing.

EVAL commands can also be inserted in the method run at a later time and the determination can be reevaluated (**[Recalculate]** function in the results dialog).

Additional evaluations for DET titrations

The following additional evaluations are possible:

- **EVAL FIX-EP** (fixed endpoints)
  Measured quantities:
  - Measured value
  - Time
  - Volume
- **EVAL pK/HNP** (pK value / half neutralization potential HNP)
  This evaluation is only possible for the measuring modes **pH** and **U**.
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL BREAK** (break points)

Additional evaluations for MET titrations

The following additional evaluations are possible:

- **EVAL FIX-EP** (fixed endpoints)
  Measured quantities:
  - Measured value
  - Time
  - Volume
- **EVAL pK/HNP** (pK value / half neutralization potential HNP)
  This evaluation is only possible for the measuring modes **pH** and **U**.
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL BREAK** (break points)

Additional evaluations for SET titrations

The following additional evaluations are possible:

- **EVAL FIX-EP** (fixed endpoints)
  Measured quantities:
  - Measured value
  - Time
  - Volume
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL RATE** (average dosing rate)

Additional evaluations for measurements

The following additional evaluations are possible:

- **EVAL FIX-EP** (fixed endpoints)
  Measured quantities:
  - Measured value
  - Time
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL BREAK** (break points)

28.8.1 Fixed endpoint evaluation (EVAL FIX-EP)

For the fixed endpoint evaluation, the associated values are interpolated from the measuring point list for one quantity (measured value, volume, etc.). Up to nine fixed endpoints can be evaluated with one command.

Fixed quantity

Selection of the quantity to which the associated value is interpolated from the measuring point list.

Selection	**Measured value** | **Time** | **Volume**
Default value	**Measured value**

Fixed EP1 at

The fixed endpoint must lie between the first and the final entry in the measuring point list.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measured value (measuring mode pH):

Input range	**–20.000 - 20.000**
Selection	**off**
Default value	**off**

Measured value (measuring mode U, Ipol):

Input range	**–2,000.0 - 2,000.0 mV**
Selection	**off**
Default value	**off**

Measured value (measuring mode Upol):

Input range	**–200.00 - 200.00 µA**
Selection	**off**
Default value	**off**

Measured value (measuring mode T):

Input range	**–20.0 - 150.0 °C**
Selection	**off**
Default value	**off**

Time:

Input range	**0.0 - 999,999.9 s**
Selection	**off**
Default value	**off**

Volume:

Input range	**0.00000 - 9,999.99 mL**
Selection	**off**
Default value	**off**

Fixed EP2 at…Fixed EP9 at

See **Fixed EP1 at**.

28.8.2 pK value and half neutralization potential evaluation (EVAL pK/HNP)

The pK value (pH measuring mode) or the half neutralization potential (U measuring mode) can be determined for DET and MET titrations.

The activities of conjugated acid-base pairs are linked by the so-called Henderson-Hasselbalch equation:

$pH = pK_a + \log (a_B/a_A)$

If the activities of the acid and the conjugated base are equal ($a_A = a_B$), then $pH=pK_a$. This is the value at the half neutralization point and can be extrapolated from the titration curve. A careful pH calibration is necessary for pK evaluations. Nonetheless, the determined pK value is only an approximation, as the ionic strength is not taken into account. In order to obtain more accurate values, titrations must be carried out with decreasing ionic strength and the results extrapolated to the ionic strength zero. pK evaluation in aqueous solution is limited to the range $3.5 < pK < 10.5$ because of the leveling effect of strong acids and the lack of jumps with very weak acids. pK values of mixtures of acids and polyvalent acids can also be determined.

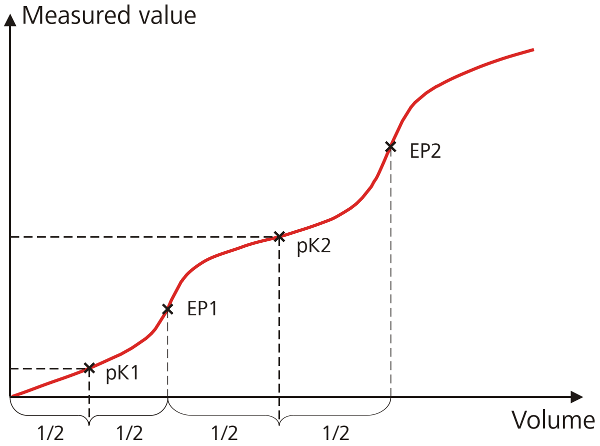


Figure 24 Evaluation of pK value / half neutralization potential

In non-aqueous solutions the half neutralization potential (HNP) is frequently used instead of the pK value. The HNP is evaluated in the same way as the pK value.

No parameters can be edited for the command **EVAL pK/HNP**.

NOTE

If a start volume is to be added then it must be smaller than the half endpoint volume.

28.8.3 Minimum and maximum evaluation (EVAL MIN/MAX)

For the minimum or maximum measured value the associated volume, time and temperature are interpolated from the measuring point list. The evaluation begins as soon as the slope of the curve exceeds a particular threshold value.

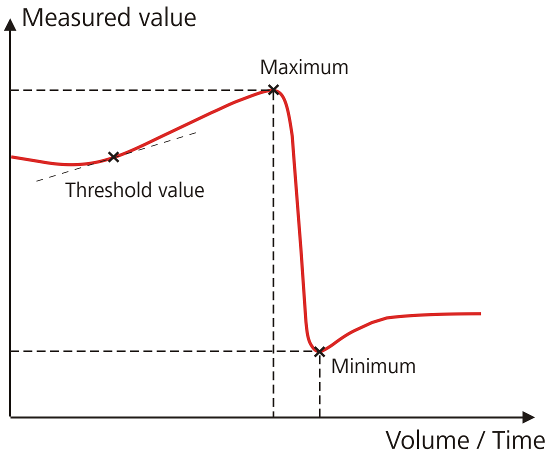


Figure 25 Evaluation of minimum and maximum

Evaluation

Selection whether the minimum or the maximum of the titration curve is being evaluated. With a command either the minimum or the maximum can be evaluated. If both values are needed, a second command has to be defined in the method.

Selection	**Minimum | Maximum**
Default value	**Maximum**

Threshold value

The evaluation of the minimum or maximum begins as soon as the slope of the curve exceeds the set threshold value. Use a lower threshold value if the minimum or maximum is not found.

Measuring mode pH:

Input range	**0.1 - 20**
Default value	**1.0** With titrations, the unit is pH/mL, with measurements pH/s.

Measuring mode U, Ipol:

Input range	**1.0 - 2000.0**
Default value	**25.0** With titrations the unit is mV/mL, with measurements mV/s.

Measuring mode Upol:

Input range	**0.5 - 10.0**
Default value	**5.0** With titrations the unit is µA/mL, with measurements µA/s.

Measuring mode T:

Input range	**0.1 - 20.0 °C/s**
Default value	**1.0 °C/s**

28.8.4 Break point evaluation (EVAL BREAK)

A break point evaluation is used to determine sharp changes of direction in the titration curve. This evaluation is primarily used for photometric and conductivity titrations. The method is based on the search for extremes in the second derivative of the curve.

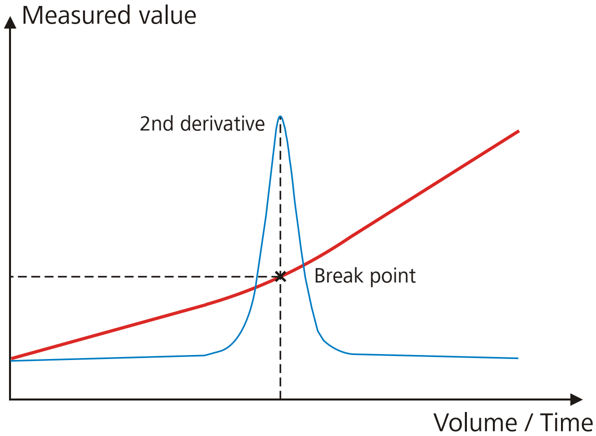


Figure 26 Evaluation of a break point

EP criterion

Measure of the minimum sharpness of the break point. The smaller the EP criterion set, the more break points will be found. As this is a relative value related to the total measured value modification, even small changes in the measured value can be evaluated as a break point for a small measured value range.

Input range	**0.0 - 1.0**
Default value	**0.3**

Slope

Minimum difference between the slope before and after the break point. The smaller the difference, the more break points will be found.

Input range	**0.0 - 10.0**
Default value	**0.9**

Smoothing factor

The higher the smoothing factor, the fewer break points will be found.

Input range	**2 - 20**
Default value	**5**

Set windows

This parameter allows to evaluate break points only in a certain range (so-called window) of the curve. Break points outside this window will not be evaluated. Only one window can be defined. Within this window however, all break points are evaluated.

Selection	**off** | **Measured value** | **Time** | **Volume**
Default value	**off**

off
The entire titration curve is being evaluated.

Measured value
The window is defined on the measured value axis.

Time
The window is defined on the time axis.

Volume
The window is defined on the volume axis.

Setting windows

The lower and upper limit of the window is defined under **[Set window]**.

Lower limit

Measured value, time or volume for the lower limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measured value (measuring mode pH):

Input range	**–20.000 - 20.000**
Default value	**–20.000**

Measured value (measuring mode U, Ipol):

Input range	**–2,000.0 - 2,000.0 mV**
Default value	**–2,000.0 mV**

Measured value (measuring mode Upol):

Input range	**–200.00 - 200.00 µA**
Default value	**–200.00 µA**

Measured value (measuring mode T):

Input range	**–20.0 - 150.0 °C**
Default value	**–20.0 °C**

Time:

Input range	**0.0 - 999,999.9 s**
Default value	**0.0 s**

Volume:

Input range	**0.00000 - 9,999.99 mL**
Default value	**0.00000 mL**

Upper limit

Measured value, time or volume for the upper limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the *32 Technical specifications chapter, page 428*.

Measured value (measuring mode pH):

Input range	**–20.000 - 20.000**
Default value	**20.000**

Measured value (measuring mode U, Ipol):

Input range	**–2,000.0 - 2,000.0 mV**
Default value	**2,000.0 mV**

Measured value (measuring mode Upol):

Input range	**–200.00 - 200.00 µA**
Default value	**200.00 µA**

Measured value (measuring mode T):

Input range	**–20.0 - 150.0 °C**
Default value	**150.0 °C**

Time:

Input range	**0.0 - 999,999.9 s**
Default value	**999,999.9 s**

Volume:

Input range	**0.00000 - 9,999.99 mL**
Default value	**9,999.99 mL**

28.8.5 Rate evaluation (EVAL RATE)

The rate evaluation provides the median dosing rate in a defined range (so-called window). The median dosing rate is determined by means of linear regression through a minimum of three measuring points. If the dosing is carried out with only one dosing device and if more than one cylinder volume is dosed, then the median dosing rate will be reduced as a result of the filling time.

When the command is opened for the first time, a window over the entire time range is already defined. In contrary to the potentiometric evaluation of a DET/MET titration the individual windows may overlap. A maximum of 9 windows can be defined.

[New]

Define a new window.

[Delete]

Delete the selected window.

[Edit]

Edit the settings of the selected window.

Lower limit

Time for the lower limit.

Input range	**0 - 999999 s**
Default value	**0 s**

Upper limit

Time for the upper limit.

Input range	**0 - 999999 s**
Default value	**999999 s**

28.9 Calculations

The following calculation commands are available:

CALC Defining calculations of a determination.

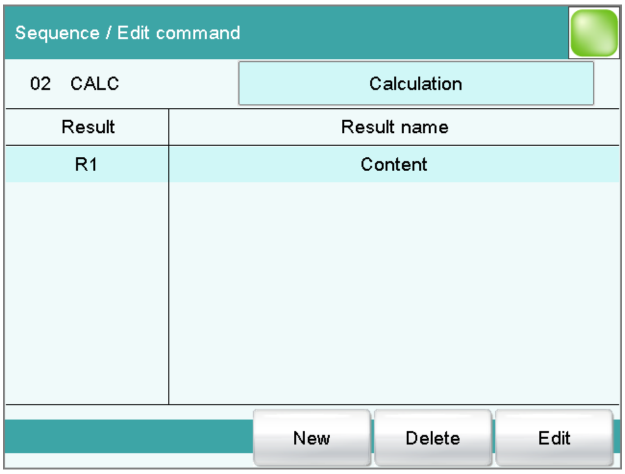
CALC LIVE Defining the calculation whose result will be displayed in the live display (so-called live result) during a titration or measurement.

28.9.1 Calculations (CALC)

Calculations are defined with the command **CALC**. A method may contain a maximum of nine calculation commands. A maximum of nine calculations can be defined per command. A series of variables (raw data from the determination, previously calculated results, etc.) is available for the calculations.

The command contains the following options, among others:

- Save result as titer
- Save result as common variable
- Save result in result table
- Define result limits



The result name is specified in the list for each calculation.

[New]

Define a new calculation or load an existing template, see following chapter.

[Delete]

Delete the selected calculation from the list.

[Edit]

Edit the data of the selected calculation *(see Chapter 28.9.1.2, page 355)*.

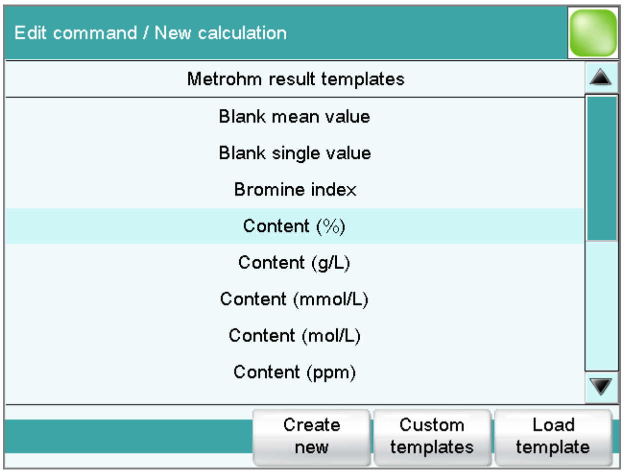
28.9.1.1 Loading a result template

The most common calculations are already available, the so-called result templates, in order to facilitate the definition of a new calculation. You also have the option, however, of defining templates of your own (see dialog **System / Templates**).

Proceed as follows to load an existing template:

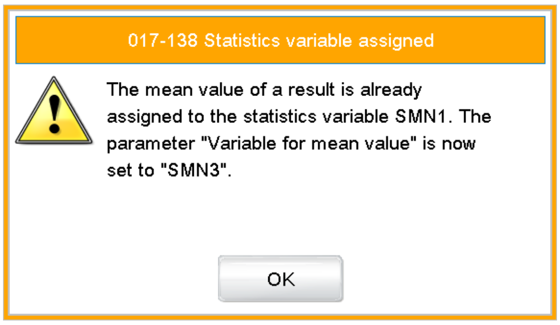
1 Select a result template

- In the dialog **Sequence / Edit command**, tap on the button **[New]**.
  The list of Metrohm result templates is displayed:



- Select the desired Metrohm result template and tap on **[Load template]**.
  or
  Tap on **[Custom templates]** and select a template you generated yourself.

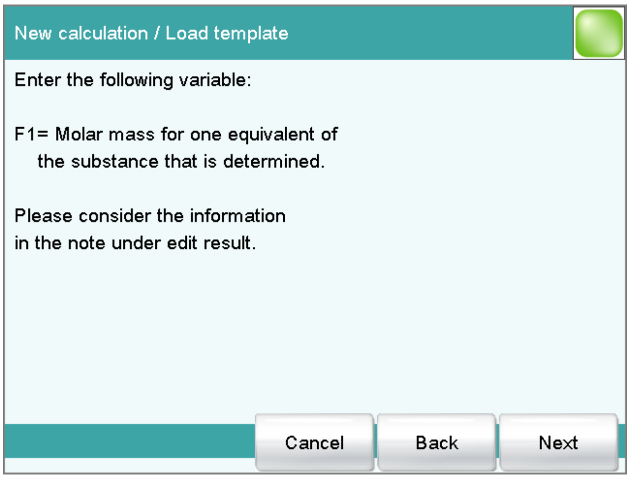
If a statistic variable SMN# (# = 1…9) is defined in the template which is already used in another calculation, then the following message will be displayed:



2 **Confirm the message**

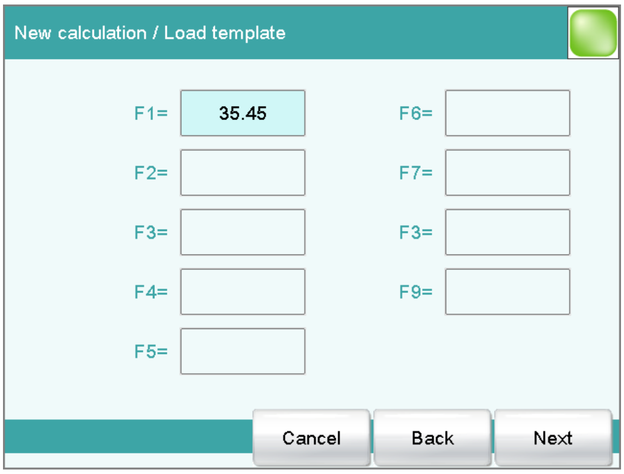
- Tap on **[OK]**.

The Note dialog is displayed. This note is defined in the dialog **Edit result template / Note for wizard**.



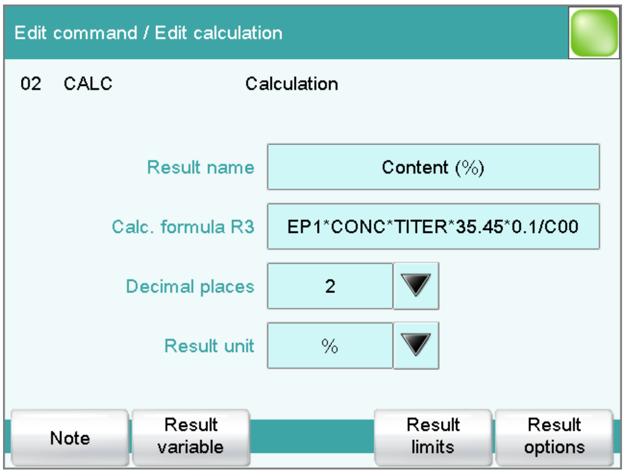
3 **Enter the numerical values of the wildcards**

- Tap on **[Next]**.
  The list of wildcards is displayed:



- Enter the numerical values of the wildcards.
- Tap on **[Next]**.

The editing dialog of the new calculation is displayed:



The calculation can now be edited further, e.g. define result limits, see following chapter.

28.9.1.2 Editing a calculation

Result name

The result name is the text which will be shown in the result display and in the report. The default name corresponds to the result variable.

Entry	**max. 24 characters**
Default value	**R1…R9**

Calc. formula R1...R9

Shows the calculation formula. A special editor is opened for the definition *(see Chapter 28.9.3, page 361)*. The designation **R1…R9** corresponds to the result variable. Under **[Result variable]** this can later be modified.

Entry	**max. 100 characters**
Default value	**empty**

Decimal places

Number of decimal places used to display the result.

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

Result unit

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

Entry	**max. 10 characters**
Selection	**% | mol/L | mmol/L | g/L | mg/L | mg/mL | mg/100 g | ppm | g | mg | µg | mL | µL | mg/piece | °C | µg/min | mL/min | µL/min**
Default value	**%**

[Note]

Entering a note on the calculation.

[Result variable]

Modifying the result variable.

[Result limits]

Defining the limits for the monitoring of the result.

[Result options]

Defining additional settings for the calculation.

Dialog "Edit calculation / Note"

In this dialog you can enter a short text, e.g. to describe the variables used.

Dialog "Edit calculation / Result variable"

When a new calculation is created, the result variable will be automatically issued. In this dialog however, it can be modified at any time.

Result variable

To each calculation belongs an unambiguous result variable. With this result variable you can use this result in additional calculations.

Selection	**R1** | **R2** | **R3** | **R4** | **R5** | **R6** | **R7** | **R8** | **R9** The selection contains only those result variables which are not issued in this calculation command yet.

Dialog "Edit calculation / Result limits"

For each result, limit values can be defined. These result limits are monitored when the calculation is carried out. If monitoring is activated, the results are shown as follows in the result display:

- Green, if the result falls within the limit values
- Red, if the result lies outside the limit values

Monitoring result limits

on | off (Default value: **off**)

Enabling and disabling the monitoring function.

Lower limit

When the monitored quantity falls below this value, the action defined in the following is triggered.

Input range	**0 - 9999999999**
Default value	**0**

Upper limit

When this value is exceeded, the action defined in the following is triggered.

Input range	**0 - 9999999999**
Default value	**9999999999**

Action

Selection of the action, which is carried out when the result limits are exceeded.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message**

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the result limits have been exceeded.

Cancel determination
The determination is stopped.

Dialog "Edit calculation / Result options"

In the dialog **Edit calculation / Result options**, settings for how to process the calculated result are defined.

Variable for mean value

If the statistic calculations have been activated (see method options), the mean value of the single results will be saved as variable SMN1 to SMN9. As default value, always the first free variable is being displayed.

Selection	**SMN1 … SMN9** | **off**

off
For the result not statistic calculations are carried out.

Save as titer

The result can be saved as titer for the selected titrant.

NOTE

The titer is assigned to the titrant defined in the last titration command before the calculation. Please note that the CALC command containing the titer assignment is inserted after the titration command with which the titer is determined.

Selection	**Single value** | **Mean value** | **off**
Default value	**off**

Single value
The result of the current determination is saved as titer.

Mean value
If statistic calculations are carried out for the result, the current mean value of the determination series is saved.

off
The result is not saved as titer.

Save as common variable

on | off (Default value: **off**)

The calculated result can be saved as a method-independent variable, a so-called common variable. The result is then also available in other methods for calculations. In all cases, only the single value will be saved, even if the statistics function is enabled.

Variable

Selection of the common variable to which the result is being assigned.

Selection	**CV01 ... CV25**

Display result

on | off (Default value: **on**)

If you deactivate this parameter, the result is neither displayed in the result dialog nor printed in the result report. This can be advisable for intermediate results.

Save result in result table

on | off (Default value: **off**)

The calculated result can be saved in the result table. This may be advisable if e.g. the results of all determinations carried out on a particular day are to be displayed clearly. A maximum of nine results from a determination can be saved in the result table.

Precision

Setting, with which accuracy the result is used in additional calculations.

Selection	**Round** | **Truncate** | **Full precision**
Default value	**Round**

Round
The result is rounded to the defined number of decimal places (commercial rounding, in accordance with the US Pharmacopeia USP). If the digit at the first dropped decimal place is **1, 2, 3 or 4**, then it will be rounded off; if this digit is **5, 6, 7, 8 or 9**, then it will be rounded up. Negative digits will be rounded in accordance with their amount, i.e. away from zero.

Truncate
The result is cut to the number of decimal places defined.

Full precision
The result is used with full accuracy (floating point number either in "single precision" (32 bit) or in "double precision" (64 bit), according to the standard IEEE 754).

28.9.2 Calculations (CALC LIVE)

The command **CALC LIVE** can be used to define a calculation, the result of which will be shown in the live display during a titration or measurement. The current volume or measured value, respectively, is used for this purpose. This is helpful, e.g. for Karl Fischer titrations, in order to be able to track the water content directly during the titration.

CAUTION

The command must be inserted directly before the corresponding titration or measuring command.

This command is identical with the **CALC** command except for the following differences:

- The number of variables is limited.
- There are no result options.
- The result cannot be monitored.
- The result variable cannot be modified.
- The result will only be displayed in the live display. It appears neither in the results dialog nor in a report.

Result name

With live calculations no custom result name can be defined, the designation **LR** cannot be modified.

Calculation formula

Shows the calculation formula. A special editor is opened for the definition *(see Chapter 28.9.3, page 361)*.

Entry	**max. 100 characters**
Default value	**empty**

Decimal places

Number of decimal places used to display the result.

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

Result unit

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

Entry	**max. 10 characters**
Selection	**% | mol/L | mmol/L | g/L | mg/L | mg/mL | mg/100 g | ppm | g | mg | µg | mL | µL | mg/piece | °C | µg/min | mL/min | µL/min**
Default value	**%**

[Note]

Entering a note on the calculation.

Dialog "Edit calculation / Note"

In this dialog you can enter a short text, e.g. to describe the variables used.

Displaying the live result

Proceed as follows to display the live result in the live display:

1 Start the determination

- Tap on **[▷]**.

The determination starts and the live display is shown:

2 Define the display options

- Tap on the button **[View]**.
- Tap on the button **[Meas. value options]**.
  A maximum of three measured values can be shown in the live display.
- Select the option **Live result** at one of the three parameters.

3 Display the live display

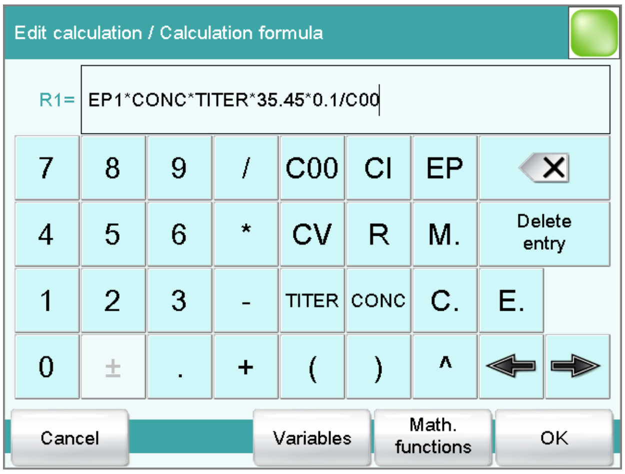
- Tap twice on **[⇦]**.

The current result is displayed,

28.9.3 Formula editor

The formulas for the calculations are entered with the formula editor. The maximum formula length is 100 characters.

The formula editor contains buttons for entering numbers, mathematical operators and variables. The variables can be selected from lists. This is advisable in order to avoid spelling mistakes. The formula editor is equipped with an automatic syntax check, which is activated when applying the formula. The standard rules of priority apply for the calculation operations.



Key	Description
C00	Sample size
CI	Sample identification CI# (# = 1…2)
EP	Volume of endpoint EP# (# = 1…9)
CV	Common Variable CV# (# = 1…25)
R	Result R# (# = 1…9)
TITER	Titer of the titrant selected in the previous command
CONC	Concentration of the titrant selected in the previous command
⌫	The character in front of the cursor is deleted.
Delete entry	The content of the input field is deleted completely.

Key	Description
⇦	The cursor within the input field is shifted to the left by one character.
⇨	The cursor within the input field is shifted to the right by one character.

If the method contains more than one data-generating command (titration, measurement etc.) before the calculation command, then you will have to indicate the command identification in front of the variable:

Variable	Description
#M.	Titration or measuring command
#C.	Calculation command
#E.	Evaluation command

"#" stands for a sequential number that you must enter manually. The number for each command identification will be counted separately and does not necessarily correspond to the number of the command line.

Example: The variable **1M.TITER** corresponds to the titer of the titrant selected in the first titration command.

CAUTION

The command identifications are not adjusted automatically when additional commands are subsequently inserted into the method. Check the formula for correctness in such cases.

[Variables]

Opening the list of additional variables *(see Chapter 28.9.3.1, page 362)*.

[Math. functions]

Opening the list with mathematical functions *(see Chapter 28.9.3.2, page 363)*.

28.9.3.1 Variables

All of the variables which can be used for calculations are divided up according to subject in the dialog **Calculation formula / Variables**.

- **System variables**
  List of the system-specific variables. These variables describe the current status of the system.
- **Result and statistics variables**
  List of the variables which are required for calculating results and statistics for the current determination.

- **Common variables**
  List of common variables. All of the common variables are listed, no matter whether they possess a value or not.

You will find a detailed description of all of the variables in *chapter 28.9.3.3, page 364*.

28.9.3.2 Mathematical functions

The following mathematical functions can be utilized in a calculation formula:

Function	Description
y^z	Power function Example: 4^2 = 16
SQRT(X)	square root of X Example: √(EP1)
ABS(X)	absolute value of X Example: ABS(C00); in order, e.g. with reweighings, to convert the negative sample size to a positive value for later calculations
LN(X)	natural logarithm of X
LOG(X)	decimal logarithm of X
FRAC(X)	Fraction of X Example: FRAC(2.5971) = 0.5971
INT(X)	integer part of X Example: INT(2.5971) = 2
TST(X,Y)	Test function If invalid variables (e.g. missing endpoints) occur in a calculation, then these can be replaced with a valid value by using this function. In this way invalid results can be avoided. ▪ Syntax: – X = variable to be tested – Y = replacement value

28.9.3.3 Variable list

The following table contains all of the variables which can be used for calculations. For variables having an index (e.g. **'EP1'**), the index must be entered manually. In the following table, this index is characterized with the character "#".

Variable	Description
C00	Sample size
CI1, CI2	Sample identifications The sample identifications can be used in calculations only if numerical values are entered.
DD	Duration of the entire determination
Titrants	
TITER	Titer of the titrant selected in the titration command
CONC	Concentration of the titrant selected in the titration command
Titrations, measurements, calibrations	
EP#	Volume/quantity of endpoint EP# (# = 1…9)
EC#	Charge at endpoint EP# (# = 1…9)
EM#	Measured value of endpoint EP# (# = 1…9)
EF#	ERC of endpoint EP# (# = 1…9)
ET#	Temperature at endpoint EP# (# = 1…9)
ED#	Time at endpoint EP# (# = 1…9)
ESI#	Recognition of endpoint EP# (# = 1…9) Endpoint found = 1, no endpoint = 0
MIM	Initial measured value, i.e. measured value prior to the processing of the start conditions
MIT	Initial temperature, i.e. temperature prior to the processing of the start conditions
MSA	Volume for start volume
MSP	Volume for start measured value
MSS	Volume for start slope
MSV	Volume for all the start conditions
MSD	Duration of start conditions
MSM	Start measured value, i.e. measured value after the processing of the start conditions
MST	Start temperature, i.e. temperature after the processing of the start conditions
MCD	Total duration of the titration, measurement or calibration
MTM	Type of temperature measurement (Pt1000, NTC or manually) Format = Text
MDD	Duration of effective dosing, i.e. without filling times, pauses.

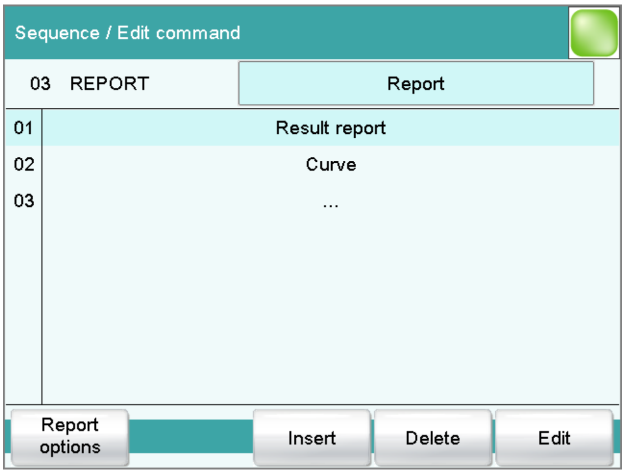
Variable	Description
MDC	Drift for drift correction
DDC	Time for drift correction
MCV	End volume, i.e. total dosed volume at the end of the titration
MCQ	End quantity, i.e. total amount of removed water or of generated bromine, respectively, at the end of the titration (in µg)
MCC	Final charge, i.e. total charge in mAs at the end of the titration
MCM	End measured value
MCT	End temperature
MMP	Number of measuring points in measuring point list
MTS	Stop type Format = Text
LV	Currently dosed volume of the ongoing determination
LM	Current measured value of the ongoing determination
LD	Current duration of the ongoing titration or measuring command
LT	Current temperature of the ongoing determination
Sensor	
MEN	Electrode zero point pH(0) or E(0)
MSL	Electrode slope
MVA	Electrode variance (mathematically only defined for three standards or more); CAL Conc: calculated only if calibration is carried out with a minimum of four standards
MCL	Cell constant of conductivity measuring cell
Evaluations	
FP#	Volume of fixed endpoint FP# (# = 1…9)
FM#	Measured value of fixed endpoint FP# (# = 1…9)
FT#	Temperature at fixed endpoint FP# (# = 1…9)
FD#	Time at fixed endpoint FP# (# = 1…9)
HP#	Volume of pK value / half neutralization potential HP#
HM#	Measured value of pK value / half neutralization potential HP#
HT#	Temperature at pK value / half neutralization potential HP#
HD#	Time at pK value / half neutralization potential HP#
XIP	Volume/quantity of minimum measured value
XIM	Minimum measured value
XIT	Temperature at minimum measured value
XID	Time at minimum measured value

Variable	Description
XAP	Volume/quantity of maximum measured value
XAM	Maximum measured value
XAT	Temperature at maximum measured value
XAD	Time at maximum measured value
BP#	Volume of break point BP# (# = 1…9)
BM#	Measured value of break point BP# (# = 1…9)
BT#	Temperature at break point BP# (# = 1…9)
BD#	Time at break point BP# (# = 1…9)
RD#	Mean rate in time slot # (# = 1…9)
RDS#	Standard deviation for RD# (# = 1…9)
RDC#	Correlation coefficient for RD# (# = 1…9)
RM	Mean rate for whole range
RMS	Standard deviation for RM
RMC	Correlation coefficient for RM
Results, statistics	
R#	Result (# = 1…9)
SMN#	Mean value of result R# (# = 1…9)
SSA#	Absolute standard deviation of SMN# (# = 1…9)
SSR#	Relative standard deviation of SMN# in % (# = 1…9)
SNR#	Number of results from which the mean value SMN# was calculated (# = 1…9)
SSD	Number of determinations that are carried out for the statistics calculations
SNT	Statistics status (statistics activated = 1, statistics deactivated = 0)
Common variables	
CV#	Common variable (# = 1…25)
System variables	
%RN	Sample number, i.e. number that is increased by one at each start of a determination
%SC	Start counter, see dialog More determination data / Properties
%AS	Autostart status (autostart activated = 1, autostart deactivated = 0)
%AC	Autostart counter, i.e. number of autostarts already carried out
%AD	Autostart setpoint counter, i.e. number of autostarts to be carried out
%SS	Status of the sample table (sample table activated = 1, sample table deactivated = 0)
%SL	Number of the current sample table line
%SE	Last sample in the sample table processed (yes = 1, no = 0)

28.10 Reports (REPORT)

The reports to be printed out are defined with the command **REPORT**. A maximum of ten reports can be defined for each command. The following reports can be inserted, among others:

- Result report
- Calculation report
- Parameter report
- System reports (system settings, sensor list, GLP data etc.)
- Method reports (method run, method parameters etc.)



[Report options]

Defining the general settings for the report output.

[Insert]

Add a new report to the list.

[Delete]

Delete the selected report from the list.

[Edit]

Edit the settings of the selected report.

28.10.1 General report options

The settings for the report printout can be adjusted in the dialog **Edit command / Report options** to indicate, for example, whether a report header, a signature line or a frame is to be printed.

Report header

Defining the output of the report header. The report header contains general information such as device type, serial number, program version and the printing date.

NOTE

You can also define your own report header, which is printed in addition to this report header (**System ▸ Templates ▸ Report header**).

Selection	**off | once | on each page**
Default value	**on each page**

off
The report header will not be printed.

once
The report header will only be printed on the first page.

on each page
The report header will be printed on every page.

Signature line

Output of a special line for date and signature. This line will be printed at the very bottom of every page.

Selection	**off | once | on each page**
Default value	**off**

off
No signature line will be printed.

once
The signature line will only be printed on the last page.

on each page
The signature line will be printed on every page.

Frame

on | off (Default value: **on**)

If this parameter is activated, a frame is printed as lateral marking.

28.10.2 Settings of the individual reports

Fixed key **[ ]**: **More reports ▸ Report ▸ Edit**

Command REPORT: **Report ▸ Edit**

Settings can be edited for the following reports (for details, see online help):

- **Result report**
- **Curve**
  Definition of the curve size, display of the individual measuring points and grid lines, etc.

- **Measuring point list**
  Definition of the method command to which the measuring point list is to be printed.
- **Calculations**
  Definition of the accuracy with which the variables used as well as the results calculated are printed.
- **Statistics short**
  Definition of the time at which the report is to be printed (with each determination or only at the end of a sample series).
- **Statistics overview**
  Definition of the time at which the report is to be printed (with each determination or only at the end of a sample series).
- **Sample table**
- **Result table**
  Definition of the time at which the report is to be printed (with each determination, at the end of a sample series or at the end of the sample table).
- **Used devices**
- **Variables**
- **Monitoring**

28.10.3 List of reports

The following reports can be inserted in the command **REPORT**.

Report	Contents
Result report	Report with determination properties, sample data, calculated results, etc. If there are multiple determinations, the statistics will also be printed out.
Curve	Curve report.
Measuring point list	Measuring point list report.
Calculations	Details concerning the calculations carried out (parameter settings in accordance with the CALC command and the calculated results).
Used devices	The devices used for the determination, as displayed in the **More determination data / Properties** dialog.
Variables	All determination variables, as displayed in the results dialog.
Monitoring	Details for the monitored quantities (STAT, DOS only).
Statistics	
Statistics short	Summary of the statistics calculations. The number of determinations, the mean value, and the absolute and relative standard deviations are printed out for each result.
Statistics overview	Detailed statistical overview. The sample data and all individual results are printed out for each determination. The number of determinations, the mean value, and the absolute and relative standard deviations are printed out for each result.

Report	Contents
Sample data	
Sample table	List of all determinations in the sample table with the respective sample data, as entered in the sample table.
Result table	
Result table	List of all determinations in the result table with results and with the determination data, as saved in the result table.
More reports ▸ Method reports	
Method sequence	Method properties and the list of all method commands.
Parameters full	Method properties and options, all method commands with all parameters. All parameters which no longer have their default settings will be printed in **bold**. All parameters which have been modified in comparison to the stored version of the method are indicated by an *.
Titration & measuring param.	Method properties; titration, measurement and calibration commands with all parameters. All parameters which no longer have their default settings will be printed in **bold**. All parameters which have been modified in comparison to the stored version of the method are indicated by an *.
Modified parameters	Method properties, all method parameters which have been modified in comparison to the stored version of the method.
Non default parameters	Method properties, all method parameters which no longer have any default settings.
More reports ▸ System reports	
System settings	
System settings	Settings for acoustic signals and accuracy of the measured value display.
Dialog options	Settings for routine dialog and expert dialog.
Titrants	
Titrant list	List of all the titrants configured in the system.
All titrant data short	The most important titrant data of all titrants (name, concentration, titer, last titer determination).
All titrant data full	All of the titrant data of all of the titrants (working life, titer options, data concerning the exchange unit/dosing unit).
Sensors	
Sensor list	List of all the sensors configured in the system.
All sensor data short	The most important sensor data for all sensors (name, calibration data).

Report	Contents
All sensor data full	All of the sensor data for all of the sensors (working life, complete calibration data, calibration interval).
Device manager	
Device list	List of all devices configured in the system.
All device properties	Properties of all the devices configured in the system.
GLP manager	
GLP data	All data stored in the GLP manager.
Common variables	
Common variable list	List of all the common variables defined in the system, together with their most important data (name, value, status).
All common variable properties	Properties of all common variables (name, value, validity, status).
Templates	
Templates sample data	Sample identification list and sample assignment table.
Result template list	List with all of the user-generated result templates.
All result templates details	Details of the all of the user-generated result templates (calculation formula, result options, note).
Input/Output lines	List with all of the defined input and output lines at the remote interface (name, bit pattern).
Custom calibration buffers	Temperature tables for all defined custom calibration buffers.
Rack tables	
Sample rack list	List with all of the sample racks configured in the system, together with designation, number of positions and rack code.
Miscellaneous	
Form feed	If this entry is inserted between two reports, then these will each be printed out on a separate page.

28.11 Dosing and Liquid Handling

The following dosing commands are available:

Preparing the exchange unit or dosing unit (PREP)
Rinsing the cylinder and the tubings of the exchange unit / dosing unit.

Emptying the dosing unit (EMPTY)
Emptying the cylinder and the tubings of the dosing unit.

Dosing a fixed volume (ADD)
Dosing a specified volume.

Liquid Handling (LQH)	Carrying out complex dosing tasks with a Dosino.

28.11.1 Preparing an exchange or dosing unit (PREP)

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

Control device

This parameter will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device. Control devices are defined under **System** ▸ **Device manager**.

Selection of the control device from the list of devices.

Selection	**Selection of configured control devices**

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1** | **2** | **3** | **4**
Default value	**1**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the parameters defined for the titrant for the preparing as well as the tubing parameters (dosing unit only) are used. Titrants are defined under **System** ▸ **Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

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

not defined
No check takes place. The command is carried out with default parameters *(see Chapter 31.1.2, page 405* and *Chapter 31.2.2, page 406)*.

Cylinder volume to

This parameter can only be edited with **Titrant** = **not defined**.

Selection of the port via which the titrant is ejected. This setting is only relevant for dosing units, in case of preparing an exchange unit, this setting is ignored.

Selection	**Port 1 | Port 2 | Port 3 | Port 4**
Default value	**Port 1**

28.11.2 Emptying a dosing unit (EMPTY)

The **EMPTY** command is used to empty the cylinder and tubings of the dosing unit.

Control device

This parameter will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device. Control devices are defined under **System ▸ Device manager**.

Selection of the control device from the list of devices.

Selection	**Selection of configured control devices**

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4**
Default value	**1**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the parameters defined for the titrant for the preparing as well as the tubing parameters (dosing unit only) are used. Titrants are defined under **System ▸ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

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

not defined
No check takes place. The command is carried out with default parameters *(see Chapter 31.1.2, page 405* and *Chapter 31.2.2, page 406)*.

Air inlet

This parameter can only be edited with **Titrant** = **not defined**.

Selection of the port via which air is aspirated. This setting is only relevant for dosing units, in case of preparing an exchange unit, this setting is ignored.

Selection	**Port 1 | Port 2 | Port 3 | Port 4**
Default value	**Port 4**

28.11.3 Dosing a specified volume (ADD)

You can dose a specified volume with the command **ADD**.

28.11.3.1 Dosing parameters

The parameters for the dosing are defined under **[Dosing parameters]**.

Volume

Volume which is dosed.

Input range	**0.00000 - 99999.9 mL**
Default value	**10.0000 mL**

Dosing rate

Rate at which it is dosed.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing rate depends on the cylinder volume *(see Chapter 31, page 405)*.

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

28.11.3.2 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System ▸ Device manager**.

NOTE

This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.11.3.3 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4**
Default value	**1**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ▸ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

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

not defined
No check takes place.

Tandem dosing

A second dosing device can be defined under **[Tandem dosing]** in order to enable uninterrupted dosing. Dosing is carried out with a combination of two dosing devices so that the second dosing device is dosing while the first one is being filled and vice-versa.

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**off**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. Titrants are defined under **System ▶ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, only the time interval for the GLP test of the buret unit is checked at the start of the determination.

NOTE

The concentration, validity of the titer and the working life of the titrant are ignored.

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

not defined
No check takes place.

Filling rate

Rate at which the dosing cylinder is filled.

Input range	**0.01 - 166.00 mL/min**

Selection	**maximum**
Default value	**maximum**

maximum
The maximum filling rate depends on the cylinder volume *(see Chapter 31, page 405)*.

However, in order to ensure uninterrupted dosing, the following points must be taken into account:

- Use the highest possible filling rate in order to keep the filling times as short as possible. The filling rate should be decreased for viscous liquids.
- When you use two buret units with different dosing cylinders, the filling rate for the larger sized cylinder must be at the minimum:

$$v_{2,Fill} \geq v_{1,Fill} \cdot \frac{V_{Cyl.2}}{V_{Cyl.1}}$$

$v_{2,Fill}$ = filling rate in mL/min for the larger sized cylinder

$v_{1,Fill}$ = filling rate in mL/min for the smaller cylinder

$V_{Cyl.2}$ = cylinder volume in mL of the buret unit of the second dosing device

$V_{Cyl.1}$ = cylinder volume in mL of the buret unit of the first dosing device

Example:

Dosing device 1: volume = 20 mL, filling rate = 50 mL/min

Dosing device 2: volume = 50 mL

Filling rate 2 ≥ 50 mL/min · 50 mL / 20 mL ≥ 125 mL/min

- The dosing rate must not exceed 75 % of the filling rate of the smaller cylinder. These values are listed in the following table, valid at maximum filling rate:

Table 12 Maximum dosing rate for different dosing cylinders

Cylinder volume	maximum dosing rate	
	Exchange unit	Dosing unit
1 mL	2.25 mL/min	–
2 mL	–	5.00 mL/min
5 mL	11.25 mL/min	12.50 mL/min
10 mL	22.50 mL/min	25.00 mL/min

Cylinder volume	maximum dosing rate	
	Exchange unit	Dosing unit
20 mL	45.00 mL/min	50.00 mL/min
50 mL	112.50 mL/min	124.50 mL/min

28.11.3.4 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4 | off**
Default value	**1**

off
No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "–": clockwise rotation

Input range	**–15 - 15**
Default value	**8**

Switch off automatically

on | off (Default value: **on**)

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

28.11.4 Liquid Handling (LQH)

The command **LQH** can be used to carry out Liquid Handling tasks with a dosing device of the type **Dosino 800**. The manifold options of the Dosino can be exploited in full in combination with a USB Sample Processor. The four ports of the dosing units can be used at will as output or input ports. This means that not only simple dosing and filling procedures are possible. Complex Liquid Handling tasks such as pipetting or sample transfers can be carried out without difficulty. Several LQH and automation commands are required for this purpose which are best combined into subsequences.

28.11.4.1 Liquid Handling parameters

The parameters for the Liquid Handling function are defined under **[Liquid Handling param.]**.

Function

Type of Liquid Handling function.

Selection	**Dose** | **Fill** | **Aspirate** | **Eject** | **Exchange position** | **Change port** | **Compensate** | **End volume**

Dose
The given volume is dosed. The dosing cylinder neither is automatically filled before nor afterwards.

Fill
The dosing cylinder is filled. The valve disc then remains at the selected port.

Aspirate
Liquid is aspirated. The dosing cylinder neither is automatically filled before nor afterwards. The aspirating volume has to be aspirated with a single piston stroke.

Eject
The whole cylinder content is ejected. The piston is, in contrast to the function **End volume**, lowered to the stop point, i.e. past the maximum volume mark. This function should only be carried out for preparing a dosing unit before the pipetting procedure.

Exchange position
The dosing cylinder is filled. This means that, for example, air can be aspirated via Port 4. The valve disc is then rotated to Port 2 and the dosing drive can be removed from the dosing unit.

Change port
The stopcock is moved to the given port, but no piston movement takes place.

Compensate
Because of the fact that the dosing units are interchangeable, the coupling of the Dosino piston rod (spindle) exhibits a low mechanical tolerance that can be noticed when the piston changes its direction of movement. This tolerance can be compensated with this function. A short piston movement is first made in the same direction as the previous movement, which is then followed by a piston movement in the reverse direction.

End volume
The whole cylinder content is ejected. The piston is lowered to the maximum volume mark i.e. until 10'000 pulses have been dosed. This command should be used for pipetting functions for emptying the cylinder.

In-/Outlet

Selection of the port via which the Liquid Handling command is carried out.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**

Port 1
Default value, when **Function** = **Dose**, **Aspirate** and **End volume**.

Port 2
Default value, when **Function** = **Fill**, **Exchange position** and **Change port**.

Port 4
Default value, when **Function** = **Eject** and **Compensate**.

Volume

This parameter can only be edited with **Function** = **Dose** and **Aspirate**.

Volume which is dosed or aspirated.

Function = Dose:

Input range	**0.00000 - 99999.9 mL**
Default value	**1.00000 mL**

Function = Aspirate:

Input range	**0.00000 - 50.0000 mL**
Default value	**1.00000 mL**

Flow rate

This parameter can only be edited with **Function** = **Dose**, **Fill**, **Aspirate**, **Eject**, **Exchange position** and **End volume**.

Rate at which it is dosed or filled.

Input range	**0.01 - 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

maximum
The maximum dosing and filling rates depend on the cylinder volume *(see Chapter 31, page 405)*.

28.11.4.2 Control device

The control device the determination is carried out with is selected under **[Control device]**. Control devices are defined under **System ▸ Device manager**.

> **NOTE**
>
> This button will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device.

Control device

Selection of the control device from the list of devices. Only those devices are displayed which are able to carry out the command.

Selection	**Selection of configured control devices**

28.11.4.3 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector the dosing device is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4**
Default value	**1**

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ▸ Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

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

not defined
No check takes place.

28.12 Communication

The following communications commands are available:

Scanning remote lines (SCAN)	Defining remote signals which are awaited before the next method command is started.
Setting remote lines (CTRL)	Defining remote signals.
Receiving RS-232 commands (SCAN RS)	Defining RS-232 commands which are awaited before the next method command is started.
Sending RS-232 commands (CTRL RS)	Defining the RS-232 commands which are sent.

28.12.1 Scanning remote lines (SCAN)

The command **SCAN** can be used to define input signals at the remote interface which are awaited before the next method command is started.

Control device

This parameter will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device. Control devices are defined under **System** ▶ **Device manager**.

Selection of the control device from the list of devices.

Selection	**Selection of configured control devices**

Remote Box

Selection of the MSB connector the Remote Box is connected to. The selection does not depend on the number of MSB connectors of the control device. The remote signal defined is requested on this Remote Box.

Selection	**1** | **2** | **3** | **4**
Default value	**1**

Input signal

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System** ▶ **Templates** ▶ **Input lines**.

Entering a bit pattern:

- 0 = line inactive

- 1 = line active
- * = retain line status

The input lines are always numbered from right to left, i.e. with the signal *********1** line 0 is expected to be active.

NOTE

We recommend masking lines that are of no interest or for which no defined condition can be predicted with an asterisk (*****).

Entry	**Bit patterns containing exactly 8 characters or a max. of 24 characters for the name of the template**
Default value	********
Selection	**Selection of the templates defined**

Timeout

When this time interval has expired without recognizing the remote signal, the action defined in the following is triggered.

Input range	**0 - 999 s**
Default value	**0 s**

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message** | **Document message** | **Cancel determination**
Default value	**Display message** For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

28.12.2 Setting remote lines (CTRL)

The command **CTRL** can be used to define output signals at the remote interface.

Control device

This parameter will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device. Control devices are defined under **System** ▶ **Device manager**.

Selection of the control device from the list of devices.

Selection	**Selection of configured control devices**

Remote Box

Selection of the MSB connector the Remote Box is connected to. The selection does not depend on the number of MSB connectors of the control device. The remote signal defined is sent via this Remote Box.

Selection	**1** | **2** | **3** | **4**
Default value	**1**

Output signal

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System** ▶ **Templates** ▶ **Output lines**.

NOTE

A line set active is not being reset automatically, not even at the end of the determination.

Entering a bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal **************1** line 0 is set. With a pulse, the length is set to 200 ms. If it is required to set pulses with other lengths, you have to define a corresponding template.

NOTE

We recommend masking lines that are of no interest or for which no defined condition can be predicted with an asterisk (*).

Entry	**Bit patterns containing exactly 14 characters or a max. of 24 characters for the name of the template**
Default value	**************
Selection	**Selection of the templates defined**

28.12.3 Scanning the RS-232 interface (SCAN RS)

The command **SCAN RS** can be used to define RS-232 commands which are awaited before the next method command is started.

Serial port

Selection of the serial interface the peripheral device is connected to. The RS-232 command defined is requested on this interface.

Selection	**COM1** | **COM2** | **COM3** | **COM4** | **COM5** | **COM6** | **COM7** | **COM8**
Default value	**COM1**

Character string

Input of the RS-232 command as character string. All characters of the ASCII code page can be used. Control characters (Esc, FF etc.) have to be entered as a three-place, decimal ASCII code, starting with a slash. Each command is automatically terminated with the ASCII characters **CR** and **LF**. The * can be used for one or more characters.

Entry	**ASCII string with a max. of 24 characters**
Default value	**!*.R**

Timeout

When this time interval has expired without recognizing the RS-232 command, the action defined in the following is triggered.

Input range	**0 - 999 s**
Default value	**0 s**

Action

Selection of the action which is carried out when the time interval has expired.

Selection	**Display message | Document message | Cancel determination**
Default value	**Display message**
	For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Document message
In the determination data it will be documented, that the time interval has been expired.

Cancel determination
The determination is stopped.

28.12.4 Defining RS-232 commands (CONTROL RS)

The command **CONTROL RS** can be used to define the RS-232 commands which are sent.

Serial port

Selection of the serial interface the peripheral device is connected to. The RS-232 command defined is sent via this interface.

Selection	**COM1 | COM2 | COM3 | COM4 | COM5 | COM6 | COM7 | COM8**
Default value	**COM1**

Character string

Input of the RS-232 command as character string. All characters of the ASCII code page can be used. Control characters (Esc, FF etc.) have to be entered as a three-place, decimal ASCII code, starting with a slash. Each command is automatically terminated with the ASCII characters **CR** and **LF**.

Entry	**ASCII string with a max. of 24 characters**
Default value	**&M;$G**

28.13 Automation

28.13.1 Rotating sample rack (MOVE)

The command **MOVE** is used to move to a rack position or an external position.

Tower

Selection of the tower, with which the command is carried out. Both Tower 1 and Tower 2 can always be selected, even if your Sample Processor has only one tower.

Selection	**1 | 2**
Default value	**1**

1
View from the front, the right tower.

2
View from the front, the left tower.

Destination

Selection of the required target position.

Selection	**Sample | Ext. position | Special beaker | Rack position | Current sample + | Current sample - | Next position | Prev. position | Calibration pos. | rotate + | rotate - | swing + | swing -**
Default value	**Sample**

Sample
Rack position, which is defined by the sample variable. The sample variable is automatically increased by 1 after every method run or it can selectively be modified with the command **SAMPLE**.

Ext. position
One of the four external positions which can be moved to with the Swing Head. Enter the number of the external position (**1…4**) in the field to the right.

Special beaker
Special beakers, which are defined in the rack table, can be directly moved to. Enter the number of the special beaker (**1…16**) in field to the right.

Rack position
Any rack position. Enter the number of the rack position (**1…999**) in the field to the right.

Current sample +
Starting from the current sample (defined by the sample variable) the rack is moved forward by the number of rack positions (**1…999**) entered in the field to the right.

Current sample -
Starting from the current sample (defined by the sample variable) the rack is moved backward by the number of rack positions (**1…999**) entered in the field to the right.

Next position
Starting from the current rack position, the rack is moved forward by one position.

Prev. position
Starting from the current rack position, the rack is moved backward by one position.

Calibration pos.
For automatic calibrations with a USB Sample Processor *(see Chapter 31.7, page 412)*.

rotate +
Moving the rack forward by a certain increment. The rotation increment is defined in the properties of the tower.

rotate -
Moving the rack backward by a certain increment. The rotation increment is defined in the properties of the tower.

swing +
Swinging the robotic arm outward by a certain increment (towards higher angular degrees). The swing increment is defined in the properties of the Swing Head.

swing -
Swinging the robotic arm towards the center of the rack by a certain increment (towards lower angular degrees). The swing increment is defined in the properties of the Swing Head.

Beaker test action

This parameter can only be edited with **Destination** = **Sample**, **Next position** or **Prev. position**.

Selection of the action which is carried out, when the beaker sensor does not detect any vessel at the sample position moved to. Additionally, enable the beaker sensor in the rack table.

Selection	**Rotate rack | Display message**
Default value	**Display message**

Rotate rack
The rack is moved to the next vessel on a sample position. **Exception:** If the sample variable is newly defined in the method before this command (command **SAMPLE**), then the option **Display message** is automatically valid.

Display message
A message is displayed. You can select whether you want to continue with the determination or cancel the run.

Options

Shift rate

Rate at which the sample rack is moved.

Input range	**3 - 20 °/s**
Default value	**20 °/s**

Shift direction

Direction in which the rack is moved.

Selection	**auto** | **+** | **-**
Default value	**auto**

auto
A shift direction, with which the shorter way has to be passed, is automatically selected.

+
Counterclockwise rotation.

-
Clockwise rotation.

Swing rate

Rate at which the robotic arm is swung.

Input range	**10 - 55 °/s**
Default value	**55 °/s**

28.13.2 Moving the lift (LIFT)

The lift of a Sample Processor is moved with the command **LIFT**. The movement can however only be carried out if the Sample Processor is located at a valid rack position. This will not be the case, for example, after a Rack Reset.

Tower

Selection of the tower, with which the command is carried out. Both Tower 1 and Tower 2 can always be selected, even if your Sample Processor has only one tower.

Selection	**1** | **2**
Default value	**1**

1
View from the front, the right tower.

2
View from the front, the left tower.

Lift position

Selecting a predefined lift position or enter any lift position. The predefined lift positions are defined in the device properties of the Sample Processor. They can however also be assigned in the manual control.

Input range	**0 - 235 mm**
Selection	**Work position** | **Shift position** | **Rinse position** | **Special position** | **Home position**
Default value	**Work position**

Home position
The lift is being located at the upper stop position, i.e. at the position 0 mm.

Lift rate

Rate at which the lift is moved.

Input range	**5 - 25 mm/s**
Default value	**20 mm/s**

28.13.3 Controlling pumps (PUMP)

The **PUMP** command is used to control the pumps mounted on or connected to the tower of the sample changer.

Tower

Selection of the tower, with which the command is carried out. Both Tower 1 and Tower 2 can always be selected, even if your Sample Processor has only one tower.

Selection	**1** | **2**
Default value	**1**

1
View from the front, the right tower.

2
View from the front, the left tower.

Pump

Selection of the pump.

Selection	**1 | 2 | 1 + 2**
Default value	**1**

1
Pump 1 of the selected tower is switched.

2
Pump 2 of the selected tower is switched.

1 + 2
Both pumps of the selected tower are switched at the same time.

Status/Duration

Switching the pump(s) on and off.

Input range	**0 - 999 s** (Increment: **1**) The pump is running during this time.
Selection	**on | off**
Default value	**on**

on
The pump is switched on. The pump is running until it is explicitly switched off. If the determination is canceled with the key **[□]**, the pump is also switched off.

off
The pump is switched off.

28.13.4 Resetting the rack (RACK)

The following actions are carried out with the command **RACK**:

- Rack, lift and robotic arm are being reset.
- The rack code of the rack attached is being read out and the corresponding rack data is transferred to the Sample Processor.
- The sample variable is being reset to the value 1.

Check rack

on | off (Default value: **off**)

Activate this parameter when the rack attached is to be checked. For this you however have to additionally select the rack in the dialog **Method options / Start options** at the option **Check rack**.

28.13.5 Defining the sample variable (SAMPLE)

The sample variable describes the current position of the sample on the rack of the Sample Processor. It is automatically increased by 1 after the end of a method run. In the following cases, the sample variable is automatically reset to the value 1:

- if the autostart counter is reset.
- if the sample rack is reset.

The sample variable can be altered specifically with the command **SAMPLE**.

Sample variable

Modifying the sample variable.

Selection	**= | + | -**
Default value	**+**

=
The sample variable corresponds to the number entered in the field **Value**.

+
The sample variable corresponds to the current value plus the number entered in the field **Value**.

-
The sample variable corresponds to the current value minus the number entered in the field **Value**.

Value

Value by which the current sample variable is to be modified.

NOTE

The sample variable can only be set on rack positions which are not defined as special beakers.

Input range	**1 - 999**
Default value	**1**

28.13.6 Creating a subsequence (SUBSEQ)

It is useful, particularly with more complex tasks, e.g. rinsing sequences or Liquid Handling, to combine individual command sequences into a single subsequence. Subsequences are managed the same as method commands. A maximum of 99 commands can be combined to form a single subsequence. There is no limit to the number of subsequences within one method.

[Load/ Save]

Loading a saved subsequence or saving the current subsequence.

[Subseq. options]

Defining various settings which correspond to the entire subsequence.

[Insert command]

Insert a new method command. It is inserted before the selected command.

NOTE

Not all commands are available for subsequences. Commands which cannot be inserted into subsequences are disabled.

[Delete command]

Delete the selected method command.

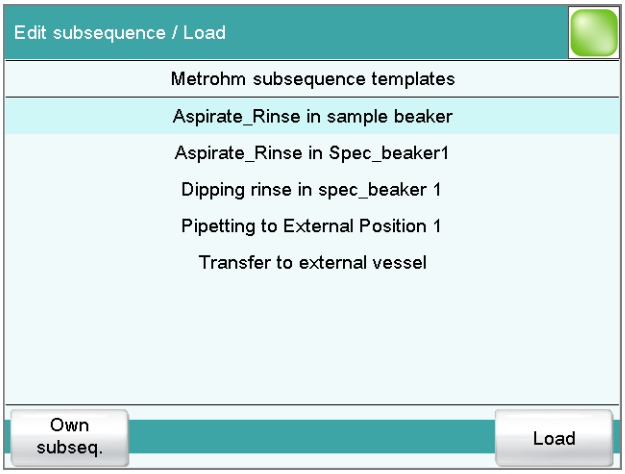
[Edit command]

Edit the selected method command.

28.13.6.1 Loading / saving a subsequence

[Load/ Save] is used to load stored subsequences or to save new subsequences. This means that they are available for all methods and only have to be created once.

Loading a subsequence



[Own subseq.]

Opening the list of own subsequences.

[Load]

Loading the selected subsequence.

Saving a subsequence

Custom-made subsequences are saved in the internal memory.

> **NOTE**
>
> In order to be able to use the subsequences also for other titration systems, you have to create a backup. You can only restore the subsequences from this backup on another system.

File name

File name of the subsequence.

Entry	**max. 32 characters**

[Save]

Saving the subsequence to the internal memory.

28.13.6.2 Subsequence options

In this dialog, the settings can be defined which correspond to the entire subsequence.

Subsequence type

Selection	**Sample sequence** | **Start sequence** | **End sequence** | **Stop sequence** | **Cond. sequence**
Default value	**Sample sequence**

Sample sequence
The subsequence is carried out with every determination.

Start sequence
This subsequence is only carried out at the start of a sample series when the autostart counter = 1.

End sequence
This subsequence is only carried out at the last sample of a series when the autostart counter has reached the setpoint value (number of autostarts).

Stop sequence
The stop sequence is only carried out when canceling a method because of one of the following cases: Manual stop with **[□]**, stop because of an error, stop via remote signal.

Cond. sequence
This subsequence is carried out directly before the conditioning. This gives you the possibility to start e.g. a connected Polytron® high-frequency homogenizer before the conditioning as well as to set its stirring rate. Use the command **CONTROL RS** for this.

Cycles

Number of directly consecutive repetitions of the subsequence.

Input range	**0 - 999**
Default value	**1**
Selection	**Calibration**

Calibration
For automatic calibrations with a USB Sample Processor *(see Chapter 31.7, page 412)*.

[Note]

Entering a note on the subsequence.

Dialog "Subsequence options / Note"

A short text can be entered in this dialog, e.g. for the description of the subsequence commands or for the application purpose.

[Display options]

Definition when the note is being displayed.

Automatically after loading the subsequence

on | off (Default value: **off**)

If this parameter is activated, the note is displayed when loading the subsequence. It can otherwise only be read in this dialog.

28.14 Miscellaneous commands

28.14.1 Controlling a stirrer (STIR)

A stirrer is controlled with the command **STIR**.

Control device

This parameter will only be shown when, in addition to the Ti-Touch, a Sample Processor has been configured as control device. Control devices are defined under **System ▶ Device manager**.

Selection of the control device from the list of devices.

Selection	**Selection of configured control devices**

Stirrer

Selection of the MSB connector the stirrer is connected to. The selection does not depend on the number of MSB connectors of the control device.

Selection	**1 | 2 | 3 | 4**
Default value	**1**

Status/Duration

Switching the stirrer on or off.

Input range	**0 - 999 s** (Increment: **1**) During this time the stirrer is running.
Selection	**on | off**
Default value	**on**

on
The stirrer is switched on. The stirrer runs until it is explicitly switched off. If the determination is canceled with the key **[☐]**, the stirrer is also switched off.

off
The stirrer is switched off.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 31.3, page 406*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "–": clockwise rotation

Input range	**–15 - 15**
Default value	**8**

28.14.2 Pausing the method run (WAIT)

The method run can be paused with the command **WAIT**.

Hold sequence

on | off (Default value: **off**)

If this parameter is activated, then the method run is paused until it is continued manually.

Waiting time

This parameter can only be edited when **Hold sequence** is deactivated.

The method run is automatically continued after this waiting time.

Input range	**0 - 99999 s**
Default value	**30 s**

Message

on | off (Default value: **off**)

If this parameter is activated, the text message defined in the following is displayed during the waiting time.

Message text

This parameter can only be edited when **Message** is activated.

Text which is displayed during the waiting time.

Entry	**max. 28 characters**
Default value	**empty**

28.14.3 Scan data (REQUEST)

The following data can be scanned in the method run with the command **REQUEST**:

- Sample data
  - Sample identification 1
  - Sample identification 2
  - Sample size (value and unit)
- Common variable

You can select thereby whether the sequence should be paused or resumed in the background.

Sample ident.

Selection of the sample identification that is queried in the method run.

Selection	**off | Identification 1 | Identification 2 | ID1 & ID2**
Default value	**off**

Sample size

on | off (Default value: **on**)

If this parameter is activated, then the value for the sample size will be requested.

Sample size unit

on | off (Default value: **off**)

If this parameter is activated, then the unit for the sample size will be requested.

Common variable

Selection of the common variable which is queried in the method run.

Selection	**CV01…CV25 | off**
Default value	**off**

Hold sequence

on | off (Default value: **on**)

If this parameter is activated, then the run will be paused during the request. If this parameter is deactivated, then the method continues in the background until the following measurement or titration has been completed.

28.14.4 Defining an acoustic signal (BEEP)

The **BEEP** command can be used to produce an acoustic signal.

Duration

Approximate playing time in seconds of the permanently stored melody.

Input range	**1 - 9**
Default value	**1**

28.14.5 Canceling the method run (END)

The method run will cancel as soon as the command **END** is reached. This is a good idea if you wish to test only the first part of a method. No parameters can be edited for this command.

29 Operation and maintenance

29.1 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.

Proceed as follows for system initialization:

1 Switch off the instrument

- Press the mains switch at the rear.

2 Switch on the instrument

- Press the mains switch at the rear.
  An image with a frog will be displayed after a couple of seconds.
- While the image is being displayed, press the mains switch again and hold it down.
- Do not release the mains switch until an acoustic signal sounds.

A system message is displayed.

3 Confirm system initialization

- Confirm the message with **[Yes]**.
  A second safety prompt is displayed.
- Confirm this message with **[Yes]** as well.

Initialization is started. After the initialization has been completed, the 916 Ti-Touch is started automatically.

29.2 Quality Management and qualification with Metrohm

Quality management

Metrohm offers you comprehensive support in implementing quality management measures for instruments and software. Further information on this can be found in the brochure **"Metrohm Quality Management"** available from your local Metrohm representative.

Qualification

Please contact your local Metrohm representative for support in qualification of instruments and software. The **Installation Qualification** (IQ) and **Operational Qualification** (OQ) are offered by Metrohm representatives as a service. They are carried out by trained employees using standardized qualification documents and in accordance with the currently applicable requirements of the regulated industry. Further information on this can be found in the brochure **"Analytical Instrument Qualification – Confidence in quality with IQ/OQ"**.

Maintenance

The electronic and mechanical functional groups of Metrohm instruments can and should be checked by specialist personnel from Metrohm as part of a regular preventive maintenance schedule. Please ask your local Metrohm representative regarding the precise terms and conditions involved in concluding a corresponding maintenance agreement. Further information on this can be found in the brochure **"Metrohm Care Contracts – Protect your investment the smart way"** available from your local Metrohm representative.

30 Troubleshooting

30.1 Editing methods

Problem	Cause	Remedy
The method command cannot be inserted.	*The method command is disabled.*	In the dialog **Dialog options / Command list**, activate the desired command *(see "Blocking unneeded commands and fixed keys", page 39)*.
	No control device which supports the method command is configured in the device manager.	Add a control device which supports the desired method command to the list of devices *(see Chapter 11, page 86)*.
The additional evaluations (EVAL commands) cannot be inserted.	*A titration or measuring command to which the evaluation can be applied is missing.*	1. Insert a titration or measuring command. 2. Insert the EVAL command directly after it.
An EVAL command is depicted in red in the command list.	*The associated titration or measuring command has been deleted or replaced by a different one, e.g. DET pH by DET U.*	1. Delete the EVAL command. 2. Insert a titration or measuring command. 3. Insert the EVAL command directly after it.

30.2 Sample table

Problem	Cause	Remedy
The method cannot be entered in the sample table.	*The option **Use sample assignment table** is activated. The method assigned to the sample identification will be loaded automatically at the start of the determination.*	Deactivate the option *(see Chapter 15.1, page 151)*.

30.3 Results/Statistics

Problem	Cause	Remedy
No statistics are carried out for a result.	*Statistics is not activated.*	In the method options, activate the option **Statistics** *(see Chapter 16.5, page 176)*.

Problem	Cause	Remedy
	No statistics variable has been assigned to the calculation.	In the result options (command **CALC**), define a variable for the mean value *(see "Variable for mean value", page 157)*.
	Statistics is not activated.	In the control dialog, activate the option **Statistics** *(see Chapter 17, page 187)*.
A result has been removed from the statistics, the mean value has not been reassigned to the common variable or to the TITER variable.	*Assignment is not carried out automatically with retroactive modifications.*	Recalculate the determination manually *(see Chapter 23, page 215)*.
The result is not displayed in the result table.	*The column display in the result table is incorrectly configured.*	Modify the settings for the display accordingly *(see Chapter 25.1, page 237)*.
	The parameter ***Save result in result table*** *is not activated.*	In the result options (command **CALC**), activate the parameter *(see "Save result in result table", page 158)*.

30.4 Printing

Problem	Cause	Remedy
Tapping on the fixed key [ ] has no effect.	*The fixed key is disabled.*	In the dialog **Dialog options / Fixed keys**, activate the option **Print** *(see "Blocking unneeded commands and fixed keys", page 39)*.
	A determination is running.	Wait until the determination is finished.

30.5 Manual control

Problem	Cause	Remedy
Tapping on the fixed key [ ] has no effect.	*The fixed key is disabled.*	In the dialog **Dialog options / Fixed keys**, activate the option **Manual control** *(see "Blocking unneeded commands and fixed keys", page 39)*.

Problem	Cause	Remedy
A button in the manual control is disabled.	*The required hardware is either not connected or incorrectly connected.*	1. Switch off the 916 Ti-Touch. 2. Connect the hardware correctly. 3. Switch the 916 Ti-Touch back on.
	The required hardware is being used in the ongoing determination.	Wait until the determination is finished.

30.6 SET titration

Problem	Cause	Remedy
The titration will not be finished.	*The minimum dosing rate is too low.*	Define **Titration rate** = **user** and increase the minimum rate (**Min. rate**) *(see Chapter 28.3.2, page 309)*.
	The stop criterion is unsuitable.	Adjust the control parameters *(see Chapter 28.3.2, page 309)*: ▪ Increase the stop drift. ▪ Select a short delay time.
The sample is over-titrated.	*The control parameters are unsuitable.*	Adjust the control parameters *(see Chapter 28.3.2, page 309)*: ▪ Select **Titration rate** = **slow**. ▪ Define **Titration rate** = **user** and increase the control range. ▪ Define **Titration rate** = **user** and reduce the maximum rate (**Max. rate**). ▪ Define **Titration rate** = **user** and reduce the minimum rate (**Min. rate**). ▪ Stir faster. ▪ Arrange the electrode and buret tip to an optimum .
	The electrode responds too slowly.	Replace the electrode.
The titration time is too long.	*The control parameters are unsuitable.*	Adjust the control parameters *(see Chapter 28.3.2, page 309)*: ▪ Select **Titration rate** = **optimal** or **fast**. ▪ Define **Titration rate** = **user** and reduce the control range. ▪ Define **Titration rate** = **user** and increase the maximum rate (**Max. rate**).

Problem	Cause	Remedy
		▪ Define **Titration rate** = **user** and increase the minimum rate (**Min. rate**).
The results are spread widely.	*The minimum dosing rate is too high.*	Define **Titration rate** = **user** and reduce the minimum rate (**Min. rate**) *(see Chapter 28.3.2, page 309)*.
	The control range is too small.	Define **Titration rate** = **user** and increase the control range.
	The electrode responds too slowly.	Replace the electrode.

31 Appendix

31.1 Dosing unit

31.1.1 Maximum dosing and filling rate

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

Cylinder volume	Maximum rate
2 mL	6.67 mL/min
5 mL	16.67 mL/min
10 mL	33.33 mL/min
20 mL	66.67 mL/min
50 mL	166.00 mL/min

Independent of the cylinder volume, values ranging from 0.01 to 166.00 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.

31.1.2 Default parameters for preparing (PREP) and emptying (EMPTY)

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

The command **EMPTY** is used to empty the cylinders and the tubings of the dosing unit.

If no titrant is selected in the command, preparing and emptying will be carried out with the following default parameters:

- The entire cylinder volume is dosed at the maximum dosing rate through Port 1.
- The cylinder is filled at the maximum filling rate through Port 2.
- The following dimensions apply for the tubings:
  - Tubing at Port 1: length = 40.0 cm, diameter = 2 mm
  - Tubing at Port 2: length = 25.0 cm, diameter = 2 mm

31.2 Exchange unit

31.2.1 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 166.00 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.

31.2.2 Default parameters for preparing (PREP)

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

If no titrant is selected in the command, preparing will be carried out with the following default parameters:

- The entire cylinder volume is dosed twice at the maximum dosing rate.
- The cylinder is filled at the maximum filling rate.

31.3 Stirring rate

The stirring rate can be adjusted in steps of −15 to +15.

The approximate rotational speed can be calculated with the following formula:

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

Example:

Stirring rate set: 8

Rotational speed in rpm = 125 · 8 = 1000

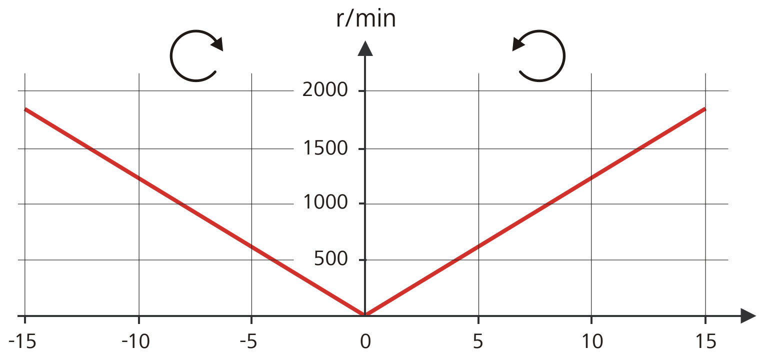


Figure 27 Rotational speed depending on stirring rate

31.4 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**

31.5 Remote interface

The 6.2148.010 Remote Box allows devices to be controlled which cannot be connected directly to the MSB interface of the Ti-Touch.

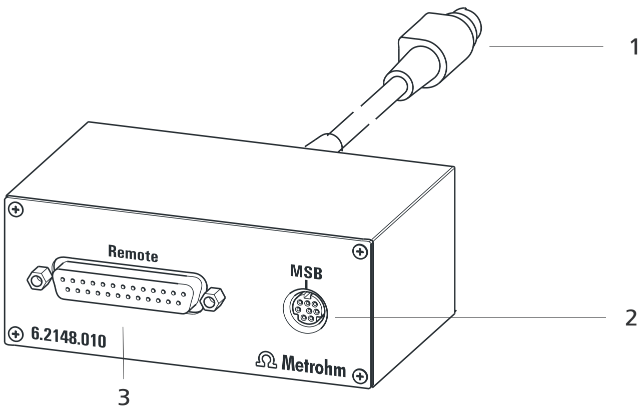


Figure 28 Connectors of the Remote Box

1 Cable For connecting to the Ti-Touch.	**2 MSB connector** Metrohm Serial Bus. For connecting external dosing devices or stirrers.
3 Remote connector For connecting instruments with a remote interface.	

31.5.1 Pin assignment of the remote interface

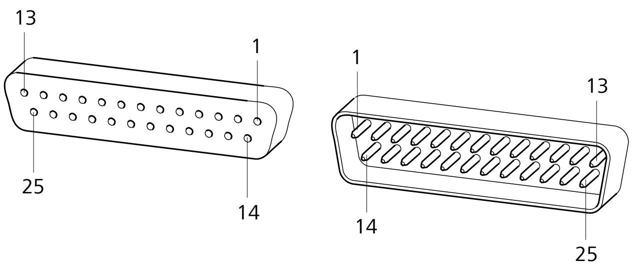
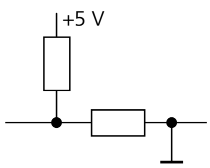


Figure 29 Pin assignment of remote socket and plug

The above figure of the pin assignment of a Metrohm remote interface applies not only for the Remote Box, but also for all Metrohm devices with 25-pin D-Sub remote connector.

Inputs

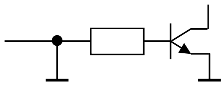


approx. 50 kΩ Pull-up

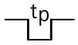
t_p $t_p > 20$ ms

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

The following tables offer information concerning the assignment of the individual pins and their function.

Table 13 Inputs and outputs of the remote interface

Assignment	Pin No.	Function
Input 0	21	**Start**
Input 1	9	**Stop**
Input 2	22	
Input 3	10	**Quit**
Input 4	23	**-**
Input 5	11	
Input 6	24	
Input 7	12	
Output 0	5	**Ready**
Output 1	18	**Conditioning OK**
Output 2	4	**Determination**
Output 3	17	**EOD**
Output 4	3	
Output 5	16	**Error**
Output 6	1	
Output 7	2	**Warning**
Output 8	6	
Output 9	7	
Output 10	8	
Output 11	13	
Output 12	19	

Assignment	Pin No.	Function
Output 13	20	
0 volts / GND	14	
+5 volts	15	
0 volts / GND	25	

Table 14 Explanation of the individual functions

Function	Explanation
Start	The current method is started at the time of activation. t_{pulse} > 100 ms
Stop	The current method is canceled (Stop) at the time of activation. t_{pulse} > 100 ms
Quit	The current command in the determination run will be canceled at the time of activation. t_{pulse} > 100 ms
Ready	The instrument is ready to receive a start signal.
Conditioning OK	The line is set when Conditioning with SET titration is at OK. The line remains set until the determination is started with **[START]**.
Determination	The instrument performs a data-generating determination.
EOD	**E**nd **o**f **D**etermination. Pulse (t_{pulse} = 200 ms) after a determination or after a buffer during calibration using a Sample Processor.
Error	The line is set for error message display.
Warning	The line is set for warning message display.

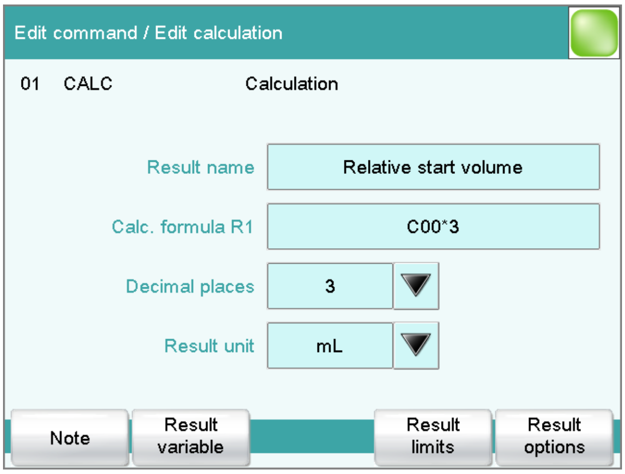
31.6 Result variables as parameter setting

For most of the numerical parameters, the result of a calculation can also be utilized in place of a number. This result must be calculated in a preceding calculation command (command **CALC**). A typical application is the use of a relative start volume.

The following example is used to explain how this method is used to define a sample size-dependent start volume for a titration. Proceed as follows:

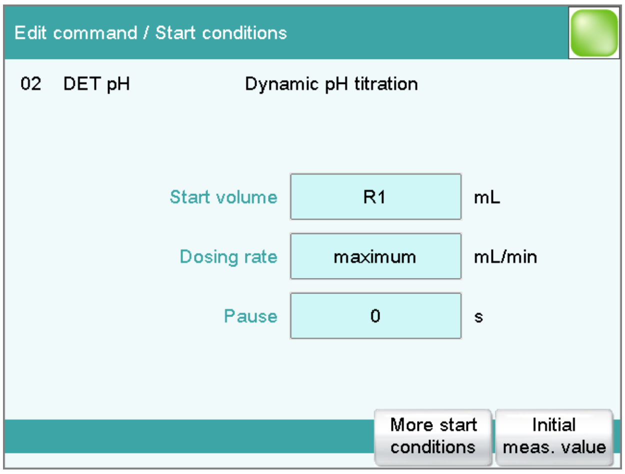
1 Create a new calculation

- Insert the calculation command **CALC** in front of the titration command.
- Enter the calculation formula, e.g. R1 = C00*3.



2 Define a result variable as parameter setting

- In the titration command, enter the variable **R1** as the start volume.



The selection of the result variables is displayed in the number editor.

NOTE

If the method before the command with the result variables applied contains more than one calculation commands (possibly with result variables bearing the same name), then the result variable of the preceding calculation command will always be used.

Please note that the result must be within the input range of the parameter, as otherwise the determination run will be stopped when the parameter is accessed.

31.7 Electrode calibration with USB Sample Processors

Basic framework for a method for automatic calibrations

If the calibration of electrodes is carried out with a USB Sample Processor, then the basic framework of the method will appear as follows:

1. Subsequence with the commands required for the calibration (command **SUBSEQ**)
   a. Command for change of buffer (command **MOVE**)
   b. Command for moving the lift (command **LIFT**)
   c. Calibration command (command **CAL pH**)
   d. …
2. …

In the interest of general comprehensibility, other commands which are required are not listed here. A method template is available for an automatic pH calibration with subsequent measurement.

Command parameterization

The following special settings are required with the individual commands:

- Command **SUBSEQ**:
  The setting **Cycles** = **Calibration** must be adjusted in the Subsequence options dialog.
- Command **MOVE** for changing the buffer:
  The only definition made in this command is that a calibration position is to be moved to. The setting **Destination** = **Calibration pos.** must be adjusted for this purpose. The question of which rack positions are used as calibration positions must be defined in the rack table (see below).
- Command **CAL pH**:
  The setting **Sample Processor** = **USB** must be adjusted in the Calibration parameters dialog.

Definition of the calibration positions

The positions of the individual buffers on the rack are defined in the rack table of the rack used. The following options are available:

- **Utilization of sample positions**
  The desired rack position for the first buffer must be entered in the dialog **Sample rack / Edit rack data** for the parameter **1. Calibration pos.**. In this case, it is imperative that the remaining buffers be placed on the rack positions directly following.
- **Utilization of special beakers**
  Any rack position can be defined as a special beaker. It is, however, preferable to set them at high rack positions in order to be able to begin sample series at rack position 1. The special beakers are moved to in ascending order.
  The list of special beakers is displayed in the dialog **Sample rack / Edit rack data** by pressing **[Special beakers]**. The number of buffers used for calibration will determine the number of special beakers to be defined. We recommend defining special beakers 1…n. Afterwards, in the dialog **Sample rack / Edit rack data**, for the parameter **1. Calibration pos.**, the option **Special beaker 1** must be selected for the first buffer.

31.8 Stored buffer series for pH calibration

The temperature-dependent pH values of several common pH buffers are stored in the system for automatic buffer recognition during pH calibration. Apart from the Metrohm buffer solutions other reference and technical buffers are also included in the tables.

The following tables provide an overview of the stored pH(T) series.

pH values printed in **bold** are the values for the reference temperature of the respective buffer set.

pH values printed in ***italics*** are interpolated or extrapolated values, all the others correspond to the manufacturer's specifications.

Temp. (°C)	Metrohm			NIST (DIN 19266, 2000)				
	Met4 pH 4.00	Met7 pH 7.00	Met9 pH 9.00	NIST1 pH 1	NIST4 pH 4	NIST7 pH 7	NIST9 pH 9	NIST13 pH 13
0	3.99	7.11	9.27	-	4.010	6.984	9.464	13.423
5	3.99	7.08	9.18	1.668	4.004	6.950	9.392	13.207
10	3.99	7.06	9.13	1.670	4.001	6.922	9.331	13.003
15	3.99	7.04	9.08	1.672	4.001	6.900	9.277	12.810
20	3.99	7.02	9.04	1.676	4.003	6.880	9.228	12.627
25	**4.00**	**7.00**	**9.00**	**1.680**	**4.008**	**6.865**	**9.184**	**12.454**
30	4.00	6.99	8.96	1.685	4.015	6.853	9.144	12.289
35	4.01	6.98	8.93	1.691	4.025	6.843	9.107	12.133
40	4.02	6.98	8.90	1.697	4.036	6.837	9.076	11.984
45	4.03	6.97	8.87	1.704	4.049	6.834	9.046	11.841
50	4.04	6.97	8.84	1.712	4.064	6.833	9.018	11.705
55	4.06	6.97	8.81	1.715	4.075	6.834	8.985	11.574
60	4.07	6.97	8.79	1.723	4.091	6.836	8.962	11.449
65	4.09	6.98	8.76	***1.732***	***4.108***	***6.840***	***8.941***	-
70	4.11	6.98	8.74	1.743	4.126	6.845	8.921	-
75	4.13	6.99	8.73	***1.754***	***4.145***	***6.852***	***8.902***	-
80	4.15	7.00	8.71	1.766	4.164	6.859	8.885	-
85	4.18	7.00	8.70	***1.778***	***4.185***	***6.867***	***8.867***	-
90	4.20	7.01	8.68	1.792	4.205	6.877	8.850	-
95	4.23	7.02	8.67	1.806	4.227	6.886	8.833	-

Temp. (°C)	DIN (DIN 19267, 1978)					
	DIN1 pH 1	**DIN3 pH 3**	**DIN4 pH 4**	**DIN7 pH 7**	**DIN9 pH 9**	**DIN12 pH 12**
0	1.08	-	4.67	6.89	9.48	-
5	***1.08***	-	***4.66***	***6.86***	***9.43***	-
10	1.09	3.10	4.66	6.84	9.37	13.37
15	***1.09***	***3.08***	***4.65***	***6.82***	***9.32***	***13.15***
20	1.09	3.07	4.65	6.80	9.27	12.96
25	**1.09**	**3.06**	**4.65**	**6.79**	**9.23**	**12.75**
30	1.10	3.05	4.65	6.78	9.18	12.61
35	***1.10***	***3.05***	***4.66***	***6.77***	***9.13***	***12.44***
40	1.10	3.04	4.66	6.76	9.09	12.29
45	***1.10***	***3.04***	***4.67***	***6.76***	***9.04***	***12.13***
50	1.11	3.04	4.68	6.76	9.00	11.98
55	***1.11***	***3.04***	***4.69***	***6.76***	***8.97***	***11.84***
60	1.11	3.04	4.70	6.76	8.92	11.69
65	***1.11***	***3.04***	***4.71***	***6.76***	***8.90***	***11.56***
70	1.11	3.04	4.72	6.76	8.88	11.43
75	***1.12***	***3.04***	***4.74***	***6.77***	***8.86***	***11.30***
80	1.12	3.05	4.75	6.78	8.85	11.19
85	***1.12***	***3.06***	***4.77***	***6.79***	***8.83***	***11.08***
90	1.13	3.07	4.79	6.80	8.82	10.99
95	-	-	-	-	-	-

Temp. (°C)	Fisher				Fluka Basel		
	Fis2 pH 2	**Fis4 pH 4**	**Fis7 pH 7**	**Fis10 pH 10**	**FBS4 pH 4**	**FBS7 pH 7**	**FBS9 pH 9**
0	-	4.01	7.13	10.34	4.01	7.11	9.20
5	1.98	3.99	7.10	10.26	4.00	7.08	9.15
10	1.98	4.00	7.07	10.19	4.00	7.05	9.10
15	2.02	3.99	7.05	10.12	4.00	7.02	9.05
20	2.00	4.00	7.02	10.06	**4.00**	**7.00**	**9.00**
25	**2.00**	**4.00**	**7.00**	**10.00**	4.01	6.98	8.96
30	2.00	4.01	6.99	9.94	4.01	6.97	8.91
35	2.02	4.02	6.98	9.90	4.02	6.96	8.88
40	2.01	4.03	6.97	9.85	4.03	6.95	8.84
45	2.01	***4.04***	***6.97***	***9.81***	4.04	6.94	8.80
50	2.01	4.06	6.97	9.78	4.06	6.94	8.77
55	-	***4.07***	***6.97***	***9.74***	4.07	6.93	8.74
60	-	4.09	6.98	9.70	4.09	6.93	8.71
65	-	***4.11***	***6.99***	***9.68***	***4.11***	***6.93***	***8.69***
70	-	***4.13***	***7.00***	***9.65***	4.13	6.94	8.67
75	-	***4.14***	***7.02***	***9.63***	***4.14***	***6.94***	***8.65***
80	-	***4.16***	***7.03***	***9.62***	4.16	6.95	8.63
85	-	***4.18***	***7.06***	***9.61***	***4.18***	***6.96***	***8.61***
90	-	***4.21***	***7.08***	***9.60***	4.21	6.97	8.60
95	-	***4.23***	***7.11***	***9.60***	***4.23***	***6.98***	***8.59***

Temp. (°C)	Mettler Toledo					Beckmann		
	MT2 pH 2	MT4 pH 4	MT7 pH 7	MT9 pH 9	MT11 pH 11	Bec4 pH 4	Bec7 pH 7	Bec10 pH 10
0	***2.03***	***4.01***	***7.12***	***9.52***	***11.90***	4.00	7.12	10.32
5	2.02	4.01	7.09	9.45	11.72	4.00	7.09	10.25
10	2.01	4.00	7.06	9.38	11.54	4.00	7.06	10.18
15	2.00	4.00	7.04	9.32	11.36	4.00	7.04	10.12
20	2.00	4.00	7.02	9.26	11.18	4.00	7.02	10.06
25	**2.00**	**4.01**	**7.00**	**9.21**	**11.00**	**4.00**	**7.00**	**10.01**
30	1.99	4.01	6.99	9.16	10.82	4.01	6.99	9.97
35	1.99	4.02	6.98	9.11	10.64	4.02	6.99	9.93
40	1.98	4.03	6.97	9.06	10.46	4.03	6.98	9.89
45	1.98	4.04	6.97	9.03	10.28	4.05	6.98	9.86
50	1.98	4.06	6.97	8.99	10.10	4.06	6.97	9.83
55	***1.98***	***4.08***	***6.98***	***8.96***	-	4.08	6.98	-
60	***1.98***	***4.10***	***6.98***	***8.93***	-	4.09	6.98	-
65	***1.98***	***4.13***	***6.99***	***8.90***	-	4.11	6.99	-
70	***1.99***	***4.16***	***7.00***	***8.88***	-	4.12	6.99	-
75	***1.99***	***4.19***	***7.02***	***8.85***	-	4.14	7.00	-
80	***2.00***	***4.22***	***7.04***	***8.83***	-	4.16	7.00	-
85	***2.00***	***4.26***	***7.06***	***8.81***	-	4.18	7.01	-
90	***2.00***	***4.30***	***7.09***	***8.79***	-	4.19	7.02	-
95	-	***4.35***	***7.12***	***8.77***	-	4.21	7.03	-

Temp. (°C)	Radiometer			Baker			
	Rad4.01 pH 4.01	Rad7.00 pH 7	Rad9.18 pH 9.18	Bak4 pH 4.00	Bak7 pH 7.00	Bak9 pH 9.00	Bak10 pH 10.00
0	4.000	7.118	9.464	4.00	7.13	9.23	10.30
5	3.998	7.087	9.395	***4.00***	***7.09***	***9.17***	***10.24***
10	3.997	7.059	9.332	4.00	7.05	9.10	10.17
15	3.998	7.036	9.276	***4.00***	***7.03***	***9.05***	***10.11***
20	4.001	7.016	9.225	**4.00**	**7.00**	**9.00**	10.05
25	**4.005**	**7.000**	**9.180**	***4.00***	***6.98***	***8.96***	**10.00**
30	4.011	6.987	9.139	4.01	6.98	8.91	9.96
35	4.018	6.977	9.102	***4.02***	***6.98***	***8.88***	***9.93***
40	4.027	6.970	9.068	4.03	6.97	8.84	9.89
45	4.038	6.965	9.038	***4.04***	***6.97***	***8.81***	***9.86***
50	4.050	6.964	9.011	4.05	6.96	8.78	9.82
55	4.064	6.965	8.985	***4.07***	***6.96***	***8.76***	***9.79***
60	4.080	6.968	8.962	4.08	6.96	8.73	9.76
65	4.097	6.974	8.941	***4.10***	***6.97***	***8.71***	***9.74***
70	4.116	6.982	8.921	4.12	6.97	8.69	9.72
75	4.137	6.992	8.900	***4.14***	***6.98***	***8.68***	***9.70***
80	4.159	7.004	8.885	4.16	6.98	8.66	9.68
85	4.183	7.018	8.867	***4.19***	***6.99***	***8.64***	***9.66***
90	4.210	7.034	8.850	4.21	7.00	8.62	9.64
95	4.240	-	-	-	-	-	-

Temp. (°C)	Hamilton DURACAL				Precisa		
	Ham4.01 pH 4.01	Ham7.00 pH 7.00	Ham9.21 pH 9.21	Ham10.01 pH 10.01	Pre4 pH 4.00	Pre7 pH 7.00	Pre9 pH 9.00
0	-	-	-	-	3.99	7.11	9.27
5	4.01	7.09	9.45	10.19	3.99	7.08	9.18
10	4.00	7.06	9.38	10.15	3.99	7.06	9.13
15	4.00	7.04	9.32	10.11	3.99	7.04	9.08
20	4.00	7.02	9.26	10.06	3.99	7.02	9.04
25	**4.01**	**7.00**	**9.21**	**10.01**	**4.00**	**7.00**	**9.00**
30	4.01	6.99	9.16	9.97	4.00	6.99	8.96
35	4.02	6.98	9.11	9.92	4.01	6.98	8.93
40	4.03	6.97	9.06	9.86	4.02	6.98	8.90
45	4.04	6.97	9.03	9.83	4.03	6.97	8.87
50	4.06	6.97	8.99	9.79	4.04	6.97	8.84
55	-	-	-	-	4.06	6.97	8.81
60	-	-	-	-	4.07	6.97	8.79
65	-	-	-	-	4.09	6.98	8.76
70	-	-	-	-	4.11	6.98	8.74
75	-	-	-	-	4.13	6.99	8.73
80	-	-	-	-	4.15	7.00	8.71
85	-	-	-	-	4.18	7.00	8.70
90	-	-	-	-	4.20	7.01	8.68
95	-	-	-	-	4.23	7.02	8.67

Temp. (°C)	Merck Titrisol				
	Mer2 pH 2	Mer4 pH 4	Mer7 pH 7	Mer9 pH 9	Mer12 pH 12
0	2.01	4.05	7.13	9.24	12.58
5	2.01	4.04	7.07	9.16	12.41
10	2.01	4.02	7.05	9.11	12.26
15	2.00	4.01	7.02	9.05	12.10
20	**2.00**	**4.00**	**7.00**	**9.00**	**12.00**
25	2.00	4.01	6.98	8.95	11.88
30	2.00	4.01	6.98	8.91	11.72
35	2.00	4.01	6.96	8.88	11.67
40	2.00	4.01	6.95	8.85	11.54
45	***2.00***	***4.00***	***6.95***	***8.82***	***11.44***
50	2.00	4.00	6.95	8.79	11.33
55	***2.00***	***4.00***	***6.95***	***8.76***	***11.19***
60	2.00	4.00	6.96	8.73	11.04
65	***2.00***	***4.00***	***6.96***	***8.715***	***10.97***
70	2.01	4.00	6.96	8.70	10.90
75	***2.01***	***4.00***	***6.96***	***8.68***	***10.80***
80	2.01	4.00	6.97	8.66	10.70
85	***2.01***	***4.00***	***6.98***	***8.65***	***10.59***
90	2.01	4.00	7.00	8.64	10.48
95	-	***4.00***	***7.02***	-	-

Temp. (°C)	MerckCertiPUR (25 °C)			
	MerC4.01 pH 4.01	MerC7.00 pH 7.00	MerC9.00 pH 9.00	MerC10.00 pH 10.00
0	-	-	-	-
5	4.00	7.09	9.22	10.22
10	4.00	7.06	9.16	10.16
15	4.00	7.04	9.10	10.10
20	4.00	7.02	9.05	10.05
25	**4.01**	**7.00**	**9.00**	**10.00**
30	4.01	6.98	8.96	9.94
35	4.03	6.98	8.93	9.90
40	4.03	6.97	8.89	9.86
45	4.05	6.97	8.87	9.80
50	4.06	6.97	8.84	9.73
55	-	-	-	-
60	-	-	-	-
65	-	-	-	-
70	-	-	-	-
75	-	-	-	-
80	-	-	-	-
85	-	-	-	-
90	-	-	-	-
95	-	-	-	-

31.9 Diagnosis

System ▸ Diagnosis

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

The following functions are available:

- **LCD test**
  Check the display for faulty pixels *(see Chapter 31.9.1, page 419)*.
- **Format storage medium**
  Format the external storage medium *(see Chapter 31.9.2, page 419)*.
- **Remove storage medium**
  Remove the external storage medium safely *(see Chapter 31.9.3, page 420)*.
- **Touch adjustment**
  Adjust the touch-sensitive screen *(see Chapter 31.9.4, page 420)*.
- **Touch screen test**
  Test the function of the touch-sensitive screen *(see Chapter 31.9.5, page 421)*.

- **Software update**
  Update the software of Ti-Touch and of the control devices *(see Chapter 31.9.6, page 422)*.
- **Service**
  Special functions for the service technician *(see Chapter 31.9.7, page 425)*.

31.9.1 LCD test

System ▸ Diagnosis ▸ LCD test

You can use the LCD test to check the display for faulty pixels. To do this, various test images are displayed one after the other.

> **NOTE**
>
> The **[⇦]** fixed key is used to display the preceding test picture; the test can be stopped at any time with the **[⌂]** fixed key.

Proceed as follows:

1
- Tap on **[LCD test]**.

The entire display turns white.

2
- Check the display for pixel errors and other irregularities.
- Continue the test with **[▷]**.

Other colors and patterns will be displayed one after the other.

3
- Repeat step 2 until the **System / Diagnosis** dialog is displayed again.

4
- Contact your Metrohm representative in the event of faults or irregularities.

31.9.2 Formatting an external storage medium

System ▸ Diagnosis ▸ Format storage medium

With this function, you have the option of formatting an external storage medium directly on the 916 Ti-Touch (quick formatting).

The following file systems can be selected:

- **FAT**
- **FAT32**
- **ExFAT**

CAUTION

If you format the storage medium with the **ExFAT** file system, it is possible that it will no longer be recognized by a PC. Read the pertinent information from Microsoft Support at *http://support.microsoft.com*.

Do not use this file system unless you need to be able to save more than 999 files in a single group.

31.9.3 Removing an external storage medium

System ▸ Diagnosis ▸ Remove storage medium

As long as the stored data is not being accessed (reading/saving data), you can plug in and disconnect the storage medium without difficulty at any time. The **[Remove storage medium]** function offers additional protection. This ensures that the storage medium cannot be removed while any data is being transferred.

31.9.4 Adjusting the touch screen

System ▸ Diagnosis ▸ Touch adjustment

With time the touch-sensitive screen may not register touches at their precise position. You can readjust the screen in this dialog.

Proceed as follows:

1. In the main dialog, tap on **[System]**.
2. Tap on **[Diagnosis]**.
3. Tap on **[Touch adjustment]**.

   A message in English and a cross hair will appear in the center of the screen.
4. Touch a stylus (a special pen-shaped instrument for operating devices with touch screens) to the center of the cross hair and maintain this position until the cross hair moves to a new position on the screen.
5. Repeat this process as long as the cross hair continues to be repositioned on the screen.

   A message in English will appear.
6. Tap at any location on the screen to confirm the adjustment.

7 Press **[⌂]** to finish the adjustment.

31.9.5 Testing the touch screen

System ▸ Diagnosis ▸ Touch screen test

You can use this test to check the function of the touch-sensitive monitor screen.

A calibration is not possible with this test. If the Touch screen does not work correctly anymore, it will need to be replaced. For that please contact your Metrohm representative.

NOTE

You can use the **[⌂]** fixed key to stop the test at any time.

Proceed as follows:

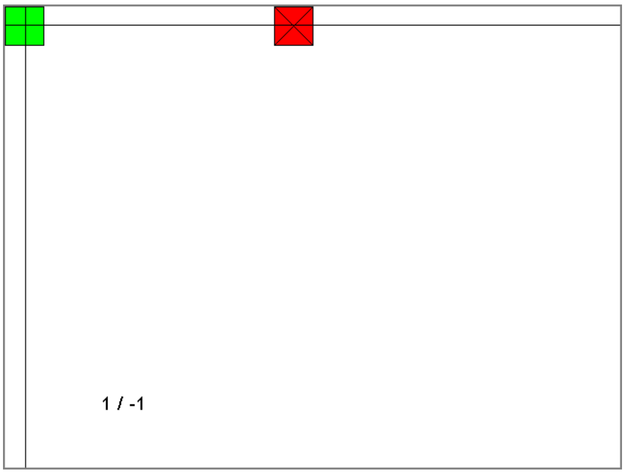
1 Tap on **[Touch screen test]**.

A red square is displayed at the upper left.

2 Tap on the square as close to the center as possible.

The actual detected point of contact will be displayed by a cross hair, and the deviation from the center will also be displayed on the lower edge of the image.

The next red square will also be displayed.



3 Repeat step 2 until all of the areas in the display have been tested.

A list with fixed keys will appear.

4 Tap on all of the fixed keys one after the other in any sequence.

The result is displayed in each case with a short information text, e.g. **[Print] key OK**.

5 Finish Touch screen test with **[ ]**.

31.9.6 Software update (loading program versions and language files)

System ▸ Diagnosis ▸ Software update

New program versions or language files can be loaded from an external storage medium (e.g. USB flash drive). The corresponding files must be stored on the storage medium in the **916/SwUpdates** directory *(see "Directory structure", page 130)*.

NOTE

If you wish to update a connected Sample Processor together with the Ti-Touch, then do not fail to update the control software of the Ti-Touch first and then afterwards the device program (firmware) of the Sample Processor.

NOTE

Before carrying out the software update, make a backup in order to save your data and the system settings *(see Chapter 12.3, page 131)*.

Program files

The files are instrument-specific. The file names are structured as follows:

- Control software for 916 Ti-Touch:
  5XXXyyyy.BIN
  5XXXyyyy.MBIN
  - XXX = instrument type (i.e. "916" for the 916 Ti-Touch)
  - yyyy = program version
- Firmware of the control device:
  5XXXyyyy.BIN
  - XXX = instrument type (e.g. 814 for the 814 USB Sample Processor)
  - yyyy = program version

Language files

Language files may have the following content:

- one or more additional dialog languages

- the online help for one or more additional dialog languages
- supplements for existing dialog languages/online help documents

They can be recognized by means of the two-digit language code in the file name. The file name has the following structure:

- **5XXXyZZZML.BIN**
  5XXXyZZZML.MBIN
  - XXX = instrument type (i.e. "916" for the 916 Ti-Touch)
  - y = version number of the language package
  - ZZZ = program version

31.9.6.1 Carrying out a software update

CAUTION

Make sure that the power supply is guaranteed during the entire update process. Otherwise there is the chance that the instrument will no longer be able to be switched on and that it will need to be sent in for repair.

Proceed as follows:

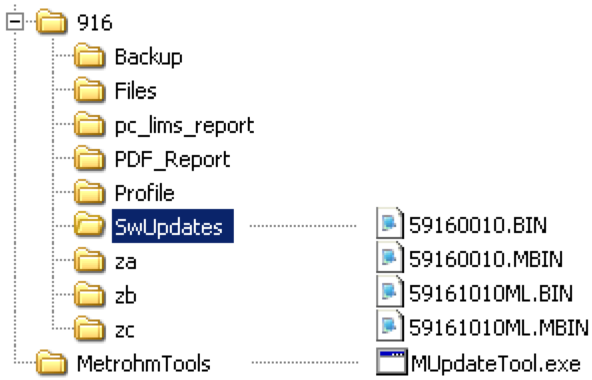
1 Copying files to an external storage medium

NOTE

In the case of the program versions and language files for the Ti-Touch, it is imperative that both the BIN file and the associated MBIN file be copied.

- Copy the files to the "SwUpdates" directory.

- Copy also the "MetrohmTools" folder with the "MUpdate-Tool.exe" file to the external storage medium.
  Make sure that the file is stored at the top level of the external storage medium. This also applies to the "916" folder.



  If this structure is not maintained, then the files will not be found, because the directories are accessed directly during the update process.
- Plug in the external storage medium at the Ti-Touch.

2 Opening the update dialog

- Under **System ▸ Diagnosis**, tap on the button **Software update**.

3 Selecting the instrument

- Tap on the **Control device** list box and select the instrument to be updated.

4 Selecting the file

- Tap on the **Binary file** list box.
  The selection list with the BIN files saved in the "SwUpdates" directory is opened.
- Select the required file.
- Tap on **[Select]**.
- Update of the Ti-Touch: Continue with Step 5.
  Update of the Sample Processor: Continue with Step 6.

5 Starting the update (916 Ti-Touch)

- Tap on the **[Start]** button (NOT on the **[▷]** fixed key).
- The message **023-102 Program update** is displayed.
- Confirm the message with **[Yes]**.

The update process is started, it runs automatically. The device is automatically switched off and back on during this process, possibly several times. No user intervention is required.

6 Starting the update (control devices)

- Tap on the **[Start]** button (NOT on the **[▷]** fixed key).
  If **Result** = **No errors** is displayed, then the update has been successful.
- Switch the 916 Ti-Touch off and then back on again.

31.9.7 Service

System ▸ Diagnosis ▸ Service

Access to the service functions is password-protected and only accessible to Metrohm service technicians. We recommend that you have maintenance performed on the system regularly by the Metrohm Service Department. You can automatically monitor the time interval after which the next service visit is due *(see Chapter 13.5.1, page 143)*.

31.10 Arithmetic algorithms in the Ti-Touch

Some of the algorithms and numerical formats used in the device software are explained in this chapter.

Numerical format

All floating point calculations use the IEEE 754 (1985) numerical format, either in "single precision" (32 Bit) or "double precision" (64 Bit).

Rounding off process

Measured values and results are rounded to the defined number of decimal places (commercial rounding, in accordance with the US Pharmacopeia USP). If the digit at the first dropped decimal place is **1, 2, 3 or 4**, then it will be rounded off; if this digit is **5, 6, 7, 8 or 9**, then it will be rounded up. Negative digits will be rounded in accordance with their amount, i.e. away from zero.

Examples:

2.33 yields **2.3**

2.35 yields **2.4**

2.47 yields **2.5**

–2.38 yields **–2.4**

–2.45 yields **–2.5**

Statistics

The arithmetic mean value and the absolute and relative standard deviations of results R, endpoints EP and variable C are calculated:

You can statistically evaluate a maximum of nine results (1 ≤ k ≤ 9) calculated in a determination. A statistical series can contain a maximum of 20 determinations (1 ≤ n ≤ 20).

The following convention applies to the subsequent formulas:

1 ≤ n ≤ 20 and 1 ≤ k ≤ 9.

Mean value:

$$\bar{x}_k = \frac{1}{n} \cdot \sum_{i=1}^{n} R_{k,i}$$

Absolute standard deviation:

$$S\,abs_k = +\sqrt{\frac{\sum_{i=1}^{n} \left(R_{k,i} - \bar{x}_k\right)^2}{n-1}}$$

Relative standard deviation (in %):

$$S\,rel_k = 100 \cdot \frac{S\,abs_k}{\bar{x}_k}$$

Explanations

The individual values are incorporated in the statistics in the selected Precision (Round, Truncate or Full precision).

7 significant places are yielded when the 32 bit numerical format is applied for the floating point number in decimal presentation. For the 64 bit numerical format, there are 15 significant places.

The accuracy can be controlled by the selection of the prefix of the unit (milli, micro) and the number of decimal places.

Example (64-bit numerical format):

The result displayed, **1234.56789158763 mg/L**, has 15 significant places. It should be rounded off to three decimal places according to the above rounding-off process:

- **1234.568 mg/L**.

If the same result is expressed in "**g/L**" (**1.23456789158763 g/L**), and is also rounded off to three decimal place, this yields

- **1.235 g/L**.

I.e. you obtain the lowest losses in accuracy with rounding when you select the application and the numerical format in such a way that the numbers displayed have as many places before the decimal point as possible.

A complete recalculation of the statistics using a pocket calculator or PC calculation programs may exhibit deviations. This can be explained by the different binary numerical formats used by these computers.

NOTE

The above losses of accuracy by rounding off in the range of significant places are only relevant theoretically. Most of the time they are lower by several orders of magnitude than – as an example – the uncertainties resulting from weighing out the sample.

32 Technical specifications

32.1 Touch screen

Display	VGA color display (640 pixels x 320 pixels), diagonal ca. 5.7"
Touch panel	resistive
Resistance to chemicals	Resistant to the following chemicals (no visible changes after 24 h of duration of action):

- without protective foil:
  - Methanol
  - Toluene
  - Ethyl acetate
  - Acetone
  - Dichloromethane
  - Hydrochloric acid c(HCl) = 2 mol/L
- with protective foil (order number 6.2723.300):
  - Methanol
  - Propanol
  - Toluene
  - Xylene
  - Acetone
  - Chloroform
  - Formamide
  - Sulfuric acid c(H_2SO_4) = 2 mol/L
  - Hydrochloric acid c(HCl) = 2 mol/L
  - Caustic soda c(NaOH) = 2 mol/L
  - Composite 5
  - 1-butanol
  - 1-hexanol
  - Decanol

32.2 Measuring inputs

The measuring cycle is 100 ms for all measuring modes.

32.2.1 Potentiometry

A high-ohm measuring input (**Ind.**) for pH, metal or ion-selective electrodes and a measuring input for separate reference electrodes (**Ref.**).

Input resistance	$> 1 \cdot 10^{12}$ Ω (under reference conditions)
Offset current	$< 1 \cdot 10^{-12}$ A (under reference conditions)
Measuring mode pH	
Measuring range	–13 - +20 pH
Resolution	0.001 pH
Measuring accuracy	±0.003 pH (±1 digit, without sensor error, under reference conditions)
Measuring mode U	
Measuring range	–1,200 - +1,200 mV
Resolution	0.1 mV
Measuring accuracy	±0.2 mV (±1 digit, without sensor error, under reference conditions)

32.2.2 Polarizer

A measuring input (**Pol.**) for polarizable electrodes.

Measuring mode Ipol	Determination with adjustable polarization current.
Polarization current	–120 - +120 µA (increment: 1 µA) –125 - –121 µA / +121 - +125 µA: non-guaranteed values, dependent on reference voltage +2.5 V
Measuring range	–1,200 - +1,200 mV
Resolution	0.1 mV
Measuring accuracy	±0.2 mV (±1 digit, without sensor error, under reference conditions)

Measuring mode Upol	Determination with adjustable polarization voltage.
Polarization voltage	–1,200 - +1,200 mV (increment: 10 mV) –1,250 - –1,210 mV / +1,210 - +1,250 mV: non-guaranteed values, dependent on reference voltage +2.5 V
Measuring range	–120 - +120 µA
Resolution	0.01 µA
Measuring accuracy	–

32.2.3 Temperature

A measuring input (**Temp.**) for temperature sensors of the Pt1000 or NTC type with automatic temperature compensation.

R (25 °C) and B value can be configured for NTC sensors.

Measuring range	
Pt1000	–150 - +250 °C
NTC	–5 - +250 °C (For an NTC sensor with R (25 °C) = 30,000 Ω and B (25/50) = 4,100 K)
Resolution	
Pt1000	0.1 °C
NTC	0.1 °C
Measuring accuracy	
Pt1000	±0.2 °C (applies for measuring range –20 - +150 °C)
NTC	±0.6 °C (applies for measuring range +10 - +40 °C)

32.3 Interfaces

USB connector	Type A, for connecting USB devices.
MSB connector	For connecting dosing devices, stirrers or a Remote Box.
iConnect connector	For connecting an 854 iConnect with iTrode.
Stirrer connector	For connecting an 802 Stirrer.
Ethernet connector	For connection to a data network (LAN).

32.4 Power supply

External power supply unit	24 V, 65 W
Input voltage range	110 - 230 V (± 10%), 50 - 60 Hz
Power consumption	10 W (with stirrer **On**, without other external power consumers)

32.5 Safety specifications

This instrument fulfills the following electrical safety requirements:

CE marking in accordance with the EU directives:

- 2006/95/EC (Low Voltage Directive, LVD)
- 2004/108/EC (EMC Directive, EMC)

Design and testing	According to EN/IEC/UL 61010-1, CSA-C22.2 No. 61010-1, protection class III (external power supply unit).
Safety instructions	This document contains safety instructions which have to be followed by the user in order to ensure safe operation of the instrument.

32.6 Electromagnetic compatibility (EMC)

Emission	Standards fulfilled: ▪ EN/IEC 61326-1 ▪ EN/IEC 61000-6-3 ▪ EN 55011
Immunity	Standards fulfilled: ▪ EN/IEC 61326-1 ▪ EN/IEC 61000-6-2 ▪ EN/IEC 61000-4-2 ▪ EN/IEC 61000-4-3 ▪ EN/IEC 61000-4-4 ▪ EN/IEC 61000-4-5 ▪ EN/IEC 61000-4-6

32.7 Ambient temperature

Nominal function range	+5 - +45 °C (at a maximum of 85% humidity)
Storage	–20 - +60 °C
Transport	–40 - +60 °C

32.8 Reference conditions

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

32.9 Dimensions

Width	193 mm
Height	
without support rod	135 mm
with support rod	430 mm
Depth	412 mm
Weight (including power supply unit)	4,900 g
Material (Housing)	Polybutylene terephthalate (PBT)

33 Warranty (Guarantee)

Metrohm guarantees that the deliveries and services it provides are free of errors in materials, design or manufacturing.

The general warranty period is 36 months (exclusions below) from the date of delivery or 18 months in the event of continuous operation. The warranty remains valid on the condition that the servicing is provided by a Service Organization authorized by Metrohm at defined intervals and with a defined scope.

The warranty period for anion suppressors is 120 months from the date of delivery or 60 months in the event of continuous operation.

The warranty period for IC separation columns is 90 days after start-up.

For third-party components that are recognizable as such, the manufacturer's warranty regulations apply.

Consumables and materials with limited storage life and glass breakage in the case of electrodes or other glass parts are excluded from the warranty.

Warranty claims cannot be asserted if the customer has failed to meet his payment obligations according to schedule.

During the warranty period, Metrohm undertakes either to replace free of charge or to credit the purchaser for any assemblies or components that can be shown to be faulty. Any transport or customs fees that may apply are the ordering party’s responsibility.

The precondition for this is that the ordering party must use the Return Material Authorization (RMA) to report the faulty part, along with specification of the article number, the article designation, an adequate error description, the delivery date and (if applicable) the serial number or the chip data, respectively. In addition, the ordering party undertakes to store the faulty part for at least 24 months in accordance with current storage directives (in compliance with ESD guidelines) and to hold it in readiness for onsite inspection or for return shipment to Metrohm. Metrohm reserves the right to invoice the ordering party for these articles, including retroactively, in the event of noncompliance with these pre-conditions.

The original warranty periods for the original part apply to parts that are replaced or repaired under the above-referenced warranties (no extension of the warranty period).

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.

Metrohm also offers a 120-month spare parts availability guarantee and a 60-month PC software support warranty, calculated from the date on which the product is withdrawn from the market. The content of this warranty is the ability of the customer to obtain functioning spare parts or appropriate software support at market prices during the time of the warranty period.

If Metrohm AG is unable to meet this obligation due to circumstances beyond the control of Metrohm AG, then the ordering party shall be offered alternative solutions at preferential conditions.

34 Accessories

NOTE

Subject to change without notice.

34.1 Scope of delivery

2.916.2010 Salt Ti-Touch

Qty.	Order no.	Description
1	1.800.0020	**800 Dosino (cable 0.65 m)**
1	1.802.0020	**802 Stirrer (cable 0.7 m)**
1	1.854.0010	**854 iConnect**
1	1.916.0010	**916 Ti-Touch**
1	6.0470.300	**iAg Titrode**

For precipitation titrations without alteration of the pH value, with memory chip for sensor data such as article and serial number, calibration data and calibration history.

Shaft material:	Glass
Measuring range:	-2000…2000
Measuring unit:	mV
Temp. continuous (°C):	0…80
Temp. short-term. (°C):	0…80
Diaphragm: resistance:	200…500
Shaft diameter top (mm):	12
Shaft diameter bottom (mm):	12
Shaft length to head (mm):	125
Length from standard ground joint (mm):	flexible SGJ sleeve
Minimum immersion depth (mm):	20
Indicator electrode shape:	Ring/hemisphere
Membrane glass type:	T

Qty.	Order no.	Description
1	6.1546.030	**Piston tongs**

For the PTFE pistons of the dosing unit.

Qty.	Order no.	Description
1	6.1608.023	**Amber glass bottle / 1000 mL / GL 45**

For exchange units. Bottle for auxiliary solutions.

Material:	Amber glass
Width (mm):	96
Height (mm):	223
Volume (mL):	1000

Qty.	Order no.	Description
1	6.1909.010	**Stirring propeller / 96 mm**

Stirring propeller, fitting length from lower edge of the ground joint: 96 mm. For usage in beakers with 722, 802 propeller stirrer.

Material:	PP

Qty.	Order no.	Description
1	6.2013.010	**Clamping ring**

For support rods with a diameter of 10 mm.

Material:	Metal
Width (mm):	20
Height (mm):	16

Qty.	Order no.	Description
1	**6.2016.050**	**Support rod / 300 mm** Material: Steel, stainless 18/8 Outer diameter (mm): 10 Length (mm): 300 
1	**6.2021.020**	**Electrode holder** Electrode holder for 4 electrodes and 2 buret tips. Material: Plastic 
2	**6.2043.005**	**Holding clamp for bottles** Holding spring for reagent bottles in exchange units. 
1	**6.2164.010**	**Power supply unit 100 - 240 V/24 V DC** Power supply unit for 915 KF Ti-Touch and 916 Ti-Touch.
1	**6.2621.070**	**Hexagon key 5 mm** Length (mm): 80 

Qty.	Order no.	Description
1	6.2709.070	**Guiding sleeve** For the fixation of buret and dosing tips in titration heads and electrode holders. Material: ETFE Length (mm): 16.5 
1	6.3032.220	**Dosing unit 20 mL** Dosing unit with integrated data chip with 20 mL glass cylinder and light protection, mountable to a reagent bottle with ISO/DIN GL45 glass thread. FEP tubing connection, antidiffusion buret tip. Volume (mL): 20 
1	6.6063.900	**tiBase 1.0 Demo CD** Demo CD for tiBase. Test version for 30 days.
1	6.6066.000	**USB flash drive for Ti-Touch** USB flash drive for 915 KF Ti-Touch and 916 Ti-Touch.
1	A.702.0006	**Metrodoc software CD-ROM Release 6**
1	6.2122.0x0	**Mains cable with C13 line socket IEC-60320-C13** Cable plug according to customer requirements. Switzerland: Type SEV 12 6.2122.020 Germany, …: Type CEE(7), VII 6.2122.040 USA, …: Type NEMA/ASA 6.2122.070
1	8.916.8005EN	**Manual 916 Ti-Touch** As PDF file on USB flash drive for Ti-Touch (6.6066.000).
1	8.916.8004EN	**Manual - Short Instructions 916 Ti-Touch**
1	8.916.8002EN	**Tutorial 916 Ti-Touch**

2.916.3010 Oil Ti-Touch

Qty.	Order no.	Description
1	1.800.0020	**800 Dosino (cable 0.65 m)**
1	1.802.0020	**802 Stirrer (cable 0.7 m)**
1	1.854.0010	**854 iConnect**
1	1.916.0010	**916 Ti-Touch**
1	6.0279.300	**iSolvotrode**

Combined pH glass electrode for titrations in non-aqueous media, with memory chip for sensor data such as article and serial number, calibration data and calibration history.

Shaft material:	Glass
Measuring range:	0…14
Measuring unit:	pH
Temp. continuous (°C):	0…70
Temp. short-term. (°C):	0…70
Diaphragm:	Ground-joint diaphragm
Diaphragm: flow rate:	0.4…5
Diaphragm: resistance:	< 150
Shaft diameter top (mm):	12
Shaft diameter bottom (mm):	12
Shaft length to head (mm):	125
Length from standard ground joint (mm):	flexible SGJ sleeve
Minimum immersion depth (mm):	30
Internal reference electrode type:	-
Indicator electrode shape:	Sphere
Bridge electrolyte type:	LiCl(sat) in ethanol
Temperature sensor:	none
Membrane glass type:	T
Membrane resistance:	40…150
Electrode zero point (mV):	10…60
Electrode slope:	> 0.90

Qty.	Order no.	Description
1	6.1546.030	**Piston tongs**

For the PTFE pistons of the dosing unit.

Qty.	Order no.	Description
1	6.1608.023	**Amber glass bottle / 1000 mL / GL 45**

For exchange units. Bottle for auxiliary solutions.

Material:	Amber glass
Width (mm):	96
Height (mm):	223
Volume (mL):	1000

Qty.	Order no.	Description
1	6.1909.010	**Stirring propeller / 96 mm**

Stirring propeller, fitting length from lower edge of the ground joint: 96 mm. For usage in beakers with 722, 802 propeller stirrer.

Material:	PP

Qty.	Order no.	Description
1	6.2013.010	**Clamping ring**

For support rods with a diameter of 10 mm.

Material:	Metal
Width (mm):	20
Height (mm):	16

Qty.	Order no.	Description
1	6.2016.050	**Support rod / 300 mm**

Material:	Steel, stainless 18/8
Outer diameter (mm):	10
Length (mm):	300

Qty.	Order no.	Description
1	6.2021.020	**Electrode holder**

Electrode holder for 4 electrodes and 2 buret tips.

Material:	Plastic

Qty.	Order no.	Description
2	6.2043.005	**Holding clamp for bottles**

Holding spring for reagent bottles in exchange units.

Qty.	Order no.	Description
1	6.2103.130	**Adapter red plug 2 mm / 4 mm socket**

For connecting plug B (4 mm) to socket 2 mm.

Qty.	Order no.	Description
1	6.2103.140	**Adapter black plug 2 mm / socket B 4 mm** For connecting plug B (4 mm) to socket 2 mm. 
1	6.2164.010	**Power supply unit 100 - 240 V/24 V DC** Power supply unit for 915 KF Ti-Touch and 916 Ti-Touch.
1	6.2320.000	**TEABr 0.4 mol/L in ethylene glycol (250 mL)** Electrolyte solution TEABr (tetraethylammonium bromide in ethylene glycol), c(TEABr) = 0.4 mol/L. Volume (mL): 250 
1	6.2621.070	**Hexagon key 5 mm** Length (mm): 80 

Qty.	Order no.	Description
1	6.2709.070	**Guiding sleeve** For the fixation of buret and dosing tips in titration heads and electrode holders. Material: ETFE Length (mm): 16.5
1	6.3032.220	**Dosing unit 20 mL** Dosing unit with integrated data chip with 20 mL glass cylinder and light protection, mountable to a reagent bottle with ISO/DIN GL45 glass thread. FEP tubing connection, antidiffusion buret tip. Volume (mL): 20
1	6.6063.900	**tiBase 1.0 Demo CD** Demo CD for tiBase. Test version for 30 days.
1	6.6066.000	**USB flash drive for Ti-Touch** USB flash drive for 915 KF Ti-Touch and 916 Ti-Touch.
1	A.702.0006	**Metrodoc software CD-ROM Release 6**
1	6.2122.0x0	**Mains cable with C13 line socket IEC-60320-C13** Cable plug according to customer requirements. Switzerland: Type SEV 12 6.2122.020 Germany, …: Type CEE(7), VII 6.2122.040 USA, …: Type NEMA/ASA 6.2122.070
1	8.916.8005EN	**Manual 916 Ti-Touch** As PDF file on USB flash drive for Ti-Touch (6.6066.000).
1	8.916.8004EN	**Manual - Short Instructions 916 Ti-Touch**
1	8.916.8002EN	**Tutorial 916 Ti-Touch**

2.916.4010 Food Ti-Touch

Qty.	Order no.	Description
1	1.800.0020	**800 Dosino (cable 0.65 m)**
1	1.802.0020	**802 Stirrer (cable 0.7 m)**
1	1.854.0010	**854 iConnect**
1	1.916.0010	**916 Ti-Touch**
1	6.0280.300	**iEcotrode Plus**

High durability in routine use at a fair price.

Shaft material:	Glass
Measuring range:	0…13
Measuring unit:	pH
Temp. continuous (°C):	0…80
Temp. short-term. (°C):	0…80
Diaphragm:	Fixed ground-joint
Diaphragm: resistance:	< 2 kOhm
Shaft diameter top (mm):	12
Shaft diameter bottom (mm):	12
Shaft length to head (mm):	125
Minimum immersion depth (mm):	15
Internal reference electrode type:	Ag/AgCl cartridge
Resistance (kOhm):	< 3 kOhm
Indicator electrode type:	pH glass electrode
Indicator electrode shape:	Hemisphere
Type of reference electrolyte:	c(KCl) = 3 mol/L
Bridge electrolyte type:	c(KCl) = 3 mol/L
Temperature sensor:	none
SGJ sleeve:	flexible SGJ sleeve
Plug for filling opening:	Orifice
Membrane glass type:	special
Membrane resistance:	50…300 MOhm
Electrode zero point (mV):	± 15 mV
Electrode slope:	< 0.97
Isothermal intersection point:	± 15 mV

Qty.	Order no.	Description
1	**6.1546.030**	**Piston tongs**

For the PTFE pistons of the dosing unit.

Qty.	Order no.	Description
1	**6.1608.023**	**Amber glass bottle / 1000 mL / GL 45**

For exchange units. Bottle for auxiliary solutions.

Material:	Amber glass
Width (mm):	96
Height (mm):	223
Volume (mL):	1000

Qty.	Order no.	Description
1	**6.1909.010**	**Stirring propeller / 96 mm**

Stirring propeller, fitting length from lower edge of the ground joint: 96 mm. For usage in beakers with 722, 802 propeller stirrer.

Material:	PP

Qty.	Order no.	Description
1	**6.2013.010**	**Clamping ring**

For support rods with a diameter of 10 mm.

Material:	Metal
Width (mm):	20
Height (mm):	16

Qty.	Order no.	Description
1	6.2016.050	**Support rod / 300 mm**

Material:	Steel, stainless 18/8
Outer diameter (mm):	10
Length (mm):	300

Qty.	Order no.	Description
1	6.2021.020	**Electrode holder**

Electrode holder for 4 electrodes and 2 buret tips.

Material:	Plastic

Qty.	Order no.	Description
2	6.2043.005	**Holding clamp for bottles**

Holding spring for reagent bottles in exchange units.

Qty.	Order no.	Description
1	6.2103.130	**Adapter red plug 2 mm / 4 mm socket**

For connecting plug B (4 mm) to socket 2 mm.

Qty.	Order no.	Description
1	6.2103.140	**Adapter black plug 2 mm / socket B 4 mm** For connecting plug B (4 mm) to socket 2 mm. 
1	6.2164.010	**Power supply unit 100 - 240 V/24 V DC** Power supply unit for 915 KF Ti-Touch and 916 Ti-Touch.
1	6.2307.230	**pH buffer solutions pH 4 / 7 / 9** Buffer set consisting respectively of 10 sachets (30 mL) of pH buffer solutions pH 4/7/9. 
1	6.2308.050	**Electrolyte 3 mol/L KCl (50 mL)** Electrolyte solution c(KCl) = 3 mol/L (for Ag/AgCl reference systems). 
1	6.2323.000	**Storage solution** Storage solution for all combined pH glass electrodes with reference electrolyte c(KCl) = 3 mol/L. Volume (mL): 250 

Qty.	Order no.	Description
1	6.2621.070	**Hexagon key 5 mm** Length (mm): 80 
1	6.2709.070	**Guiding sleeve** For the fixation of buret and dosing tips in titration heads and electrode holders. Material: ETFE Length (mm): 16.5 
1	6.3032.220	**Dosing unit 20 mL** Dosing unit with integrated data chip with 20 mL glass cylinder and light protection, mountable to a reagent bottle with ISO/DIN GL45 glass thread. FEP tubing connection, antidiffusion buret tip. Volume (mL): 20 
1	6.6063.900	**tiBase 1.0 Demo CD** Demo CD for tiBase. Test version for 30 days.
1	6.6066.000	**USB flash drive for Ti-Touch** USB flash drive for 915 KF Ti-Touch and 916 Ti-Touch.
1	A.702.0006	**Metrodoc software CD-ROM Release 6**
1	6.2122.0x0	**Mains cable with C13 line socket IEC-60320-C13** Cable plug according to customer requirements. Switzerland: Type SEV 12 6.2122.020 Germany, …: Type CEE(7), VII 6.2122.040 USA, …: Type NEMA/ASA

Qty.	Order no.	Description
		6.2122.070
1	8.916.8005EN	**Manual 916 Ti-Touch** As PDF file on USB flash drive for Ti-Touch (6.6066.000).
1	8.916.8004EN	**Manual - Short Instructions 916 Ti-Touch**
1	8.916.8002EN	**Tutorial 916 Ti-Touch**

34.2 Optional accessories

For 2.916.2010, 2.916.3010 and 2.916.4010

Order no.	Description
2.800.0010	**800 Dosino** Drive with write/read hardware for intelligent Dosing Units. With fixed cable (length 150 cm). 
2.805.0010	**805 Dosimat** Dosing device for the Titrando and Sample Processors with read/write hardware for intelligent Exchange Units. With permanently attached cable. Without Exchange Unit. 

Order no.	Description
6.3026.110	**Exchange Unit 1 mL**

Exchange Unit with integrated data chip with 1 mL glass cylinder and light protection. PCTFE/PTFE flat stopcock, FEP tubing connection, antidiffusion buret tip and standard amber glass reagent bottle.

Volume (mL): 1

Order no.	Description
6.3026.150	**Exchange Unit 5 mL**

Exchange Unit with integrated data chip with 5 mL glass cylinder and light protection. PCTFE/PTFE flat stopcock, FEP tubing connection, anti-diffusion buret tip and standard amber glass reagent bottle.

Volume (mL): 5

Order no.	Description
6.3026.210	**Exchange Unit 10 mL**

Exchange unit with integrated data chip with 10 mL glass cylinder and light protection. PCTFE/PTFE flat stopcock, FEP tubing connection, anti-diffusion buret tip and standard amber glass reagent bottle.

Volume (mL): 10

Order no.	Description

6.3026.220 **Exchange Unit 20 mL**

Exchange unit with integrated data chip with 20 mL glass cylinder and light protection. PCTFE/PTFE flat stopcock, FEP tubing connection, anti-diffusion buret tip and standard amber glass reagent bottle.

Volume (mL): 20

6.3026.250 **Exchange Unit 50 mL**

Exchange unit with integrated data chip with 50 mL glass cylinder and light protection. PCTFE/PTFE flat stopcock, FEP tubing connection, anti-diffusion buret tip and standard amber glass reagent bottle.

Volume (mL): 50

6.3032.120 **Dosing Unit 2 mL**

Dosing unit with integrated data chip with 2 mL glass cylinder and light protection, mountable on reagent bottle with ISO/DIN GL45 glass thread. FEP tubing connection, anti-diffusion buret tip.

Volume (mL): 2

6.3032.150 **Dosing Unit 5 mL**

Dosing unit with integrated data chip with 5 mL glass cylinder and light protection, mountable on reagent bottle with ISO/DIN GL45 thread. FEP tubing connection, anti-diffusion buret tip.

Volume (mL): 5

6.3032.210 **Dosing Unit 10 mL**

Dosing unit with integrated data chip with 10 mL glass cylinder and light protection, mountable on reagent bottle with ISO/DIN GL45 thread. FEP tubing connection, anti-diffusion buret tip.

Volume (mL): 10

Order no.	Description
6.3032.250	**Dosing Unit 50 mL**

Dosing unit with integrated data chip with 50 mL glass cylinder and light protection, mountable on reagent bottle with ISO/DIN GL45 thread. FEP tubing connection, anti-diffusion buret tip.

Volume (mL):	50

Order no.	Description
6.6063.102	**tiBase 1.0 Full (1 License)**

PC program for the administration of titration data. The following instruments are supported: 848 Titrino plus, 862 Compact Titrosampler, 870 Titrino plus, 877 Titrino plus, 840 Touch Control (Titrando), 900 Touch Control (Titrando), 915 KF Ti-Touch, 916 Ti-Touch.

Order no.	Description
6.6063.103	**tiBase 1.0 multi (3 Licenses)**

Client/Server program (database) for the administration of titration data. The following instruments are supported: 848 Titrino plus, 862 Compact Titrosampler, 870 Titrino plus, 877 Titrino plus, 840 Touch Control (Titrando), 900 Touch Control (Titrando), 915 KF Ti-Touch, 916 Ti-Touch.

Additionally for 2.916.4010

Order no.	Description
6.0430.100	**Ag Titrode**

For precipitation titrations without change of pH value.

Shaft material:	Glass
Measuring range:	–2000 … 2000
Measuring unit:	mV
Temperature range, long-term (°C):	0 … 80
Temperature range, short-term (°C):	0 … 80
Diaphragm:	-
Shaft diameter top (mm):	12
Shaft diameter bottom (mm):	12
Shaft length to head (mm):	125
Min. immersion depth (mm):	20
Electrode plug-in head:	Metrohm plug-in head G
Indicator electrode type :	Ag
Indicator electrode shape:	Ring/hemisphere
SGJ sleeve:	flexible SGJ sleeve
Plug for filling opening:	No
Membrane glass type:	T
Membrane resistance:	150 … 400

Order no.	Description
6.0470.300	**iAg Titrode**

For precipitation titrations without change of pH value, with memory chip for sensor data such as article and serial number, calibration data and calibration history.

Shaft material:	Glass
Measuring range:	-2000…2000
Measuring unit:	mV
Temperature range, long-term (°C):	0…80
Temperature range, short-term (°C):	0…80
Dia.: resistance:	200…500
Shaft diameter top (mm):	12
Shaft diameter bottom (mm):	12
Shaft length to head (mm):	125
Length from SGJ (mm):	flexible SGJ sleeve
Min. immersion depth (mm):	20
Indicator electrode shape:	Ring/hemisphere
Membrane glass type:	T

Order no.	Description
6.2104.020	**Electrode cable / 1 m / F**

For connecting electrodes with Metrohm plug-in head G to Metrohm instruments (socket F).

Length (m):	1

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