Operating Instructions

Volumetric KF Titrator

V10S/V20S/V30S

METTLER TOLEDO

Table of Contents

1 Introduction 7

2 Safety information 8
2.1 Definition of signal words and warning symbols 8
2.2 Product-specific safety notes 8

3 Design and Function 10
3.1 Instrument 10
3.1.1 Overview 10
3.1.2 Terminal 11
3.1.3 Titrator rear panel connections 11
3.2 User interface 12
3.2.1 Home screen 12
3.2.2 Footer buttons 12
3.2.3 Input field types 14
3.2.4 Keypads 14
3.2.5 Specific user dialogues 14
3.2.5.1 Start analysis 14
3.2.5.2 Online screen KF titrations 15
3.2.6 Menu Structure 17

4 Karl Fischer Water Determination 19
4.1 Measuring Principle 19
4.2 Volumetric water content determination 19

5 Installation 20
5.1 Standard equipment 20
5.1.1 Scope of delivery 20
5.1.2 Unpack the titrator 22
5.1.3 Position the titrator 22
5.1.4 Connect the titrator to the power supply 23
5.1.5 Disconnect the titrator from the power supply 23
5.1.6 Assembling titration stand and titration vessel 24
5.1.7 Recommended positions for sensors, tubes and stoppers 24
5.1.8 Connect the measuring electrode 25
5.1.9 Insert and connect a burette 25
5.1.10 Connect the burette to the titration vessel 25
5.1.11 Assemble the waste bottle 26
5.1.12 Connect the solvent manager to the titrator 26
5.1.13 Connect the waste bottle to the tiration vessel 26
5.1.14 Assemble the solvent bottle 27
5.1.15 Connect the solvent bottle 28
5.2 Optional equipment 28
5.2.1 Connect the Stromboli oven sample changer 28
5.2.2 Set up an InMotion KF 29
5.2.2.1 Connect the sample changer to the titrator 29
5.2.2.2 Connect the KF head to a volumetric titration vessel 29
5.2.2.3 Configure the vial height 30

6 Operating the instrument 31
6.1 Start up the titrator and shut down the titrator 31
6.2 Running a volumetric Karl Fischer titration 31
6.2.1 Preparation 31
6.2.1.1 Rinsing and filling the burette 32
6.2.1.2 Filling the titration vessel 32
6.2.2 Perform the volumetric KF titration 32
6.2.2.1 Configure the method 32
6.2.2.2 Create a direct shortcut 33
6.2.2.3 Start the pretitration 33
6.2.2.4 Perform the analysis 33

6.3 Creating and handling Shortcuts ... 33
6.4 Creating Methods ... 35
6.5 Modifying or Deleting Methods ... 35
6.6 Starting Methods ... 36
6.7 Stopping an analysis ... 36
6.8 Customizing touch screen and signals ... 36
6.8.1 Changing the language ... 37
6.8.2 Changing the screen settings ... 37
6.8.3 Configuring the audio-signals ... 37
6.8.4 Configuring the keyboards ... 37
6.9 Monitoring the expiry date and life span of Resources ... 38

7 Methods 40
7.1 Method templates ... 40
7.1.1 Standard method templates ... 40
7.1.2 Mettler method templates ... 41
7.2 Method syntax – rules for establishing a method ... 42
7.2.1 Types and possible number of loops ... 42
7.2.2 Possible number of method functions ... 42
7.2.3 Inserting and deleting loops ... 43
7.2.4 Method functions within a loop ... 44
7.2.5 Method functions outside of a loop ... 45
7.3 Overview of Method Functions ... 45
7.4 Description of method functions ... 46
7.4.1 Title ... 46
7.4.2 Drift determination ... 46
7.4.3 Sample (KF) ... 47
7.4.4 Titration stand ... 50
7.4.4.1 KF Stand ... 50
7.4.4.2 InMotion KF ... 51
7.4.4.3 Stromboli ... 53
7.4.5 Homogenizer ... 53
7.4.6 Mix time ... 53
7.4.7 Titration (KF Vol) ... 53
7.4.7.1 Titrant ... 53
7.4.7.2 Sensor ... 53
7.4.7.3 Stir ... 54
7.4.7.4 Predispense ... 54
7.4.7.5 Control ... 54
7.4.7.6 Termination ... 55
7.4.8 Scan (KF Vol) ... 55
7.4.8.1 Titrant ... 55
7.4.8.2 Sensor ... 55
7.4.8.3 Temperature program ... 56
7.4.8.4 Stir ... 56
7.4.8.5 Control ... 56
7.4.8.6 Termination ... 57
7.4.9 Auxiliary value ... 57
7.4.10 Blank ... 58
7.4.11 Instruction ... 58
7.4.12 Calculation ... 59
7.4.13 Record ... 62
7.4.14 End of sample ... 63
7.4.15 Standby ... 63
7.4.16 Hidden method functions ... 63

8 Series templates 64
8.1 Sample series ... 64
8.2 Sample parameters ... 64

9 Results 66
9.1 All results ... 66

9.2 Add result 66
9.3 Statistics 67
9.3.1 Outlier test 67
9.4 Recalculate 68
9.5 Samples 69
9.6 Undo all 69
9.7 Delete all results 69

10 Setup **70**
10.1 Chemicals 70
10.1.1 Titrant 70
10.1.2 Concentration standards 71
10.2 Hardware 72
10.2.1 Sensors 72
10.2.2 Pumps 73
10.2.3 Peripherals 73
10.2.3.1 Balance 73
10.2.3.2 Barcode reader 74
10.2.3.3 USB-Stick 75
10.2.3.4 Printer and USB data export 75
10.2.3.5 PC settings 77
10.2.3.6 Network settings 77
10.2.3.7 Network storage 78
10.2.3.8 Fingerprint reader 78
10.2.3.9 LevelSens 79
10.2.4 Titration stands 80
10.2.4.1 InMotion KF 80
10.2.4.2 Stromboli TTL 81
10.2.4.3 KF stand 81
10.2.5 Homogenizer 81
10.3 User settings 82
10.3.1 Language 82
10.3.2 Screen 82
10.3.3 Audio signals 82
10.3.4 Shortcuts 82
10.3.5 Keyboards 83
10.4 Global settings 83
10.4.1 System 83
10.4.2 User Management 84
10.4.2.1 Configure titrator as stand alone instrument without storage of results 86
10.4.3 Analysis and resources behavior 87
10.4.4 Solvent Control 90
10.5 Maintenance & Service 91
10.5.1 MT service 91
10.5.2 Import/Export 92
10.5.3 Reset to factory settings 93
10.5.4 Titrator firmware history 93
10.5.5 Board firmware 93
10.5.6 Terminal 93
10.5.7 Board data 94
10.5.8 Drives 94
10.5.9 Burettes 94
10.5.10 Update 94
10.5.11 Delete Mettler method template 94
10.6 Values 94
10.6.1 Blanks 95
10.6.2 Auxiliary values 95

11 Manual operations **97**
11.1 Stirrer 97
11.2 Sensor 97
11.2.1 Polarized sensor 98

11.3 Burette ... 98
11.3.1 Rinse burette ... 98
11.3.2 Dispense ... 99
11.4 Pump ... 99
11.4.1 Drain ... 99
11.4.2 Fill ... 100
11.4.3 Replace solvent ... 100
11.4.4 Reset counter ... 100
11.4.5 Stirrer ... 100

12 Analysis Sequences 101
12.1 Starting an Analysis ... 101
12.2 Analysis sequence steps ... 102
12.2.1 KF Analysis sequence ... 102
12.2.1.1 Series analyses with the "Stromboli" oven sample changer ... 105
12.2.1.2 External extraction ... 106
12.2.1.3 Switching between determination types ... 106
12.2.1.4 Analysis records ... 106
12.2.1.5 Replacing the titrant ... 106

13 Analysis data 108

14 Evaluate and calculate 109
14.1 Formulas ... 109
14.1.1 Using analysis data in formulas ... 109
14.1.2 Indexing of method functions ... 110
14.2 Result proposals ... 110
14.2.1 Internal calculations ... 113
14.3 Mathematical functions and operators ... 114
14.4 Naming conventions for using analysis data in calculations ... 115
14.4.1 Sample data ... 115
14.4.2 Resource data ... 115
14.4.3 Raw results ... 116
14.4.4 Results ... 116

15 Transporting the titrator 117

16 Care and maintenance 118
16.1 Cleaning ... 118
16.2 Maintenance ... 118

17 Disposal 119

18 Technical data 120
18.1 Titrator ... 120
18.2 Supported devices (periphery) ... 122

19 Optional accessories 124
19.1 Titration stands ... 124
19.2 Homogenizer sets ... 126
19.3 Drying tubes ... 126
19.4 Sensors ... 127
19.5 Software ... 127
19.6 Sample changers and ovens ... 128
19.7 Dosing and pumps ... 128
19.8 Printers ... 130
19.9 Balances ... 131
19.10 Miscellaneous peripherals ... 131
19.11 Miscellaneous accessories ... 133

20 Appendix 134
20.1 System validation ... 134

Index **135**

21 User Manual **140**
21.1 Introduction ... 140
21.2 Safety information ... 141
21.2.1 Definition of signal words and warning symbols ... 141
21.2.2 Product-specific safety notes ... 141
21.3 Design and Function ... 143
21.3.1 Instrument ... 143
21.3.1.1 Overview ... 143
21.3.1.2 Rear panel connections ... 143
21.3.1.3 Terminal ... 144
21.3.2 User interface ... 145
21.3.2.1 Home screen ... 145
21.3.2.2 Footer buttons ... 145
21.3.2.3 Input field types ... 147
21.3.2.4 Keypads ... 147
21.3.2.5 Specific user dialogues ... 147
21.3.2.6 Menu Structure ... 150
21.4 Installation ... 151
21.4.1 Standard equipment ... 151
21.4.1.1 Scope of delivery ... 151
21.4.1.2 Unpack the titrator ... 153
21.4.1.3 Position the titrator ... 153
21.4.1.4 Connect the titrator to the power supply ... 154
21.4.1.5 Disconnect the titrator from the power supply ... 154
21.4.1.6 Assemble titration stand and measuring cell ... 154
21.4.1.7 Connect the electrodes ... 155
21.4.1.8 Assemble the waste bottle ... 156
21.4.1.9 Connect the solvent manager to the titrator ... 156
21.4.1.10 Exchange the solvent manually ... 156
21.4.2 Optional equipment ... 157
21.4.2.1 Assemble the solvent bottle ... 157
21.4.2.2 Connect the solvent bottle ... 157
21.4.2.3 Exchange the solvent automatically ... 158
21.4.2.4 Connect the Stromboli oven sample changer ... 158
21.4.2.5 Set up an InMotion KF ... 158
21.5 Operating the instrument ... 160
21.5.1 Start up the titrator and shut down the titrator ... 160
21.5.2 Running a coulometric Karl Fischer titration ... 160
21.5.2.1 Preparation ... 160
21.5.2.2 Performing the coulometric KF titration ... 161
21.5.3 Creating and handling Shortcuts ... 162
21.5.4 Creating Methods ... 163
21.5.5 Modifying or Deleting Methods ... 164
21.5.6 Starting Methods ... 164
21.5.7 Stopping an analysis ... 165
21.5.8 Customizing touch screen and signals ... 165
21.5.8.1 Changing the language ... 165
21.5.8.2 Changing the screen settings ... 165
21.5.8.3 Configuring the audio-signals ... 166
21.5.8.4 Configuring the keyboards ... 166
21.5.9 Monitoring the expiry date and life span of Resources ... 166
21.6 Transporting the titrator ... 167
21.7 Care and maintenance ... 167
21.7.1 Cleaning ... 167
21.7.2 Maintenance ... 168
21.8 Disposal ... 168
21.9 Technical data ... 168

1 Introduction

Thank you for choosing a METTLER TOLEDO Volumetric KF Titrator. The Volumetric KF Titrator is an easy-to-operate instrument for volumetric Karl Fischer titrations.

About this document

The instructions in this document refer to titrators running firmware version 5.2.0 or higher.

For third party licenses and open source attribution files, see the following link:

▶ www.mt.com/licenses

If you have any additional questions, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

Conventions and symbols

Refers to an external document.

Note for useful information about the product.

Elements of instructions

- Prerequisites

1 Steps

2 …

  ⇨ Intermediate results

⇨ Results

2 Safety information

- Read and understand the information in these Operating Instructions before you use the instrument.
- Keep these Operating Instructions for future reference.
- Include these Operating Instructions if you pass on the instrument to other parties.

If the instrument is not used according to the information in these Operating Instructions or if it is modified, the safety of the instrument may be impaired and Mettler-Toledo GmbH assumes no liability.

2.1 Definition of signal words and warning symbols

Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results.

Signal words

WARNING	for a hazardous situation with medium risk, possibly resulting in death or severe injury if not avoided.
NOTICE	for a hazardous situation with low risk, resulting in damage to the instrument, other material damage, malfunctions and erroneous results, or loss of data.

Warning symbols

Electrical shock

2.2 Product-specific safety notes

Intended use

This instrument is designed to be used in laboratories by trained staff. The instrument is suitable for the processing of reagents and solvents.

Any other type of use and operation beyond the limits of technical specifications without written consent from Mettler-Toledo GmbH is considered as not intended.

Responsibilities of the instrument owner

The instrument owner is the person that uses the instrument for commercial use or places the instrument at the disposal of the staff. The instrument owner is responsible for product safety and the safety of staff, users and third parties.

METTLER TOLEDO assume that the instrument owner provides the necessary protective gear, appropriate training for the daily work and for dealing with potential hazards in their laboratory.

Safety notes

⚠ WARNING

Danger of death or serious injury due to electric shock!

Contact with parts that contain a live current can lead to injury and death.

1 Only use a METTLER TOLEDO power cable and AC adapter designed for your instrument.
2 Connect the power cable to a grounded power outlet.
3 Keep all electrical cables and connections away from liquids.
4 Replace damaged power cables and AC adapters immediately.

NOTICE

Danger of damaging the touch screen with pointed or sharp objects!

Pressing on the touch screen with pointed or sharp objects may damage it.

– Operate the touch screen by applying gentle pressure with the pad of your finger.

NOTICE

Danger of damage to the instrument due to incorrect parts!

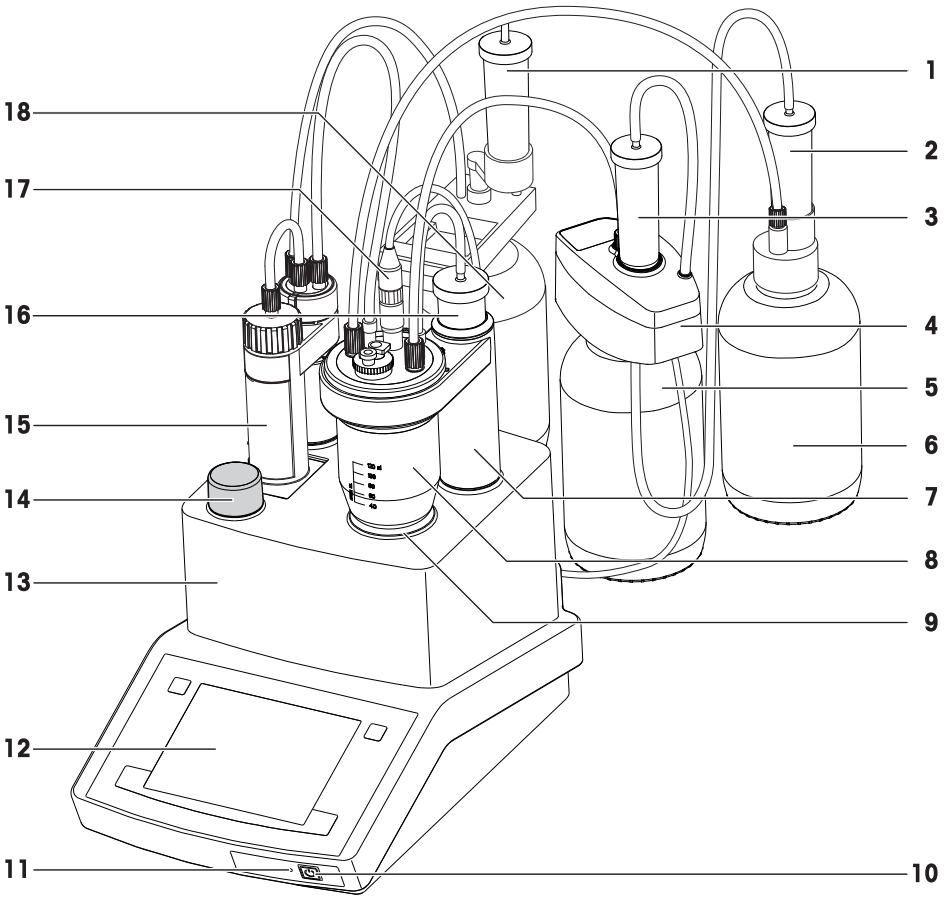
Using incorrect parts with the instrument can damage the Instrument or cause the instrument to malfunction.

– Only use parts supplied with the instrument, listed accessories and spare parts from METTLER TOLEDO.

3 Design and Function

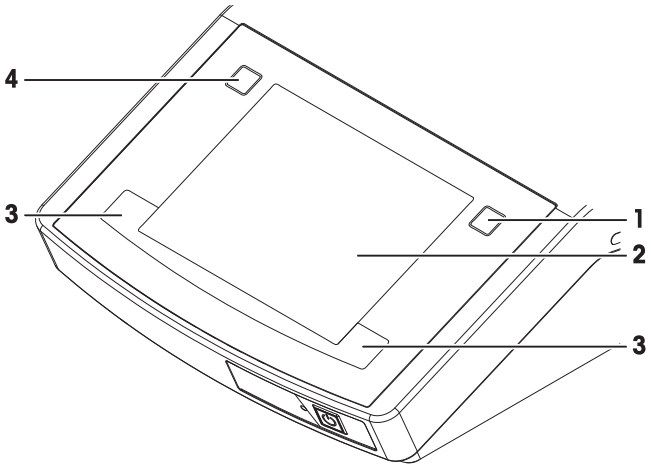
3.1 Instrument

3.1.1 Overview



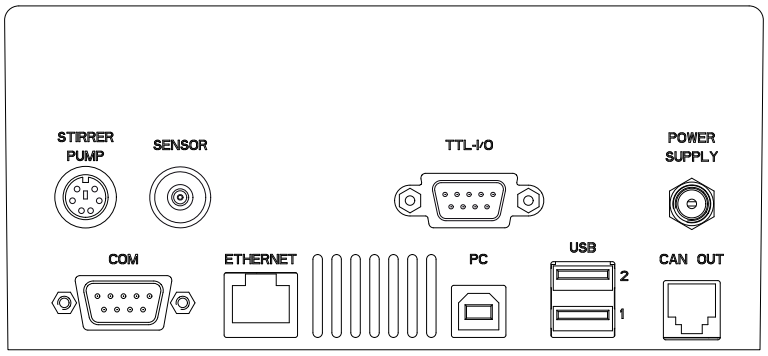
1	Titrant bottle drying tube	**10**	Power button
2	Solvent bottle drying tube	**11**	Indicator light (LED)
3	Waste bottle drying tube	**12**	Touchscreen
4	Solvent manager	**13**	Burette drive
5	Waste bottle	**14**	Burette arrestment knob
6	Solvent bottle	**15**	Burette 5 mL
7	Titration arm	**16**	Drying tube for the titration beaker
8	Titration beaker	**17**	Double platinum pin electrode
9	Internal magnetic stirrer	**18**	Titrant bottle

3.1.2 Terminal



Nr.	Name	Function
1	Info button	Accesses the interactive online help for the content of the current dialog.
2	Touch screen	Displays information and can be used to enter information.
3	Home button	Returns you to the home screen from any menu position.
4	**Reset** button	Ends all tasks that are currently running.

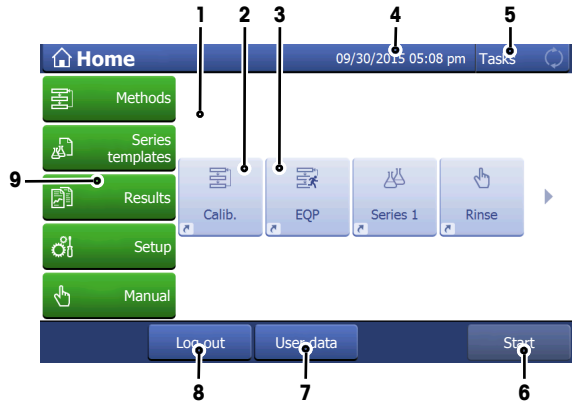
3.1.3 Titrator rear panel connections



Socket	Use	Example
STIRRER PUMP	Stirrer/pump	Solvent manager/stirrer
SENSOR	Measuring electrode	DM143-SC
TTL-I/O	Sample changer/homogenizer	Stromboli/homogenizer via TBox
POWER SUPPLY	AC adapter	AC adapter
COM	Balance	XS analytical balance
ETHERNET	Network	Link to LabX PC software via network
PC	PC connection via USB	Link to LabX PC software via USB interface
USB 1	Printer/barcode reader/memory stick/ USB hub/sample changer	USB-P25 compact printer/InMotion KF
USB 2	Printer/barcode reader/memory stick/ USB hub/sample changer	Barcode reader/InMotion KF
CAN OUT	CAN connection	For service use

3.2 User interface

3.2.1 Home screen



	Name	Explanation
1	**Shortcut area**	Shows indirect and direct shortcuts for frequently used methods. Shortcuts are saved in the user profile and can be defined, changed and deleted by the user.
2	**Indirect shortcut**	An indirect shortcut opens the window **Start analysis** of the method.
3	**Direct shortcut**	A direct shortcut starts the method without opening the window **Start analysis**.
4	**Status bar**	The status bar contains the current menu item, user name as well as date and time.
5	**Instrument status**	Shows the current working status of the instrument. **Blue** No measurement running **Green** Measurement running
6	**Start**	Switch to direct measurement (quick start for the defined standard measurement of this instrument).
7	**User data**	Opens a window with information about the currently logged in user.
8	**Log out**	Directly log out the current user. The window **Login** opens after logging out.
9	**Menus**	**Methods** Create and handle methods for every measurement type.
		Series templates Open the menu for series templates for every method available on the instrument.
		Results Display all measurement results, print out or export them. Visit detail information about every single result.
		Setup Define all system settings in this menu, e.g,, hardware settings, user management or user preferences. These settings are usually made during installation of the instrument.
		Manual Display the manual operations available on the instrument.

3.2.2 Footer buttons

Depending on the selected submenu there are specific buttons in the footer.

AddToHome Create a shortcut of a quick analysis.

Axes Opens the **Axes selection**.

Back Go back one step in the menu structure.

Cancel Cancel the current input without saving.

Calculate	Performs the calculation of an additional result and adds the result to the results of the analysis.
Continue	Continues a suspended analysis.
Columns	Opens the **Column selection**.
Delete	Deletes the selected item.
Delete all results	Deletes all results of the selected series.
Delete method	Delete the selected method. Shortcuts which reference to this method will also be deleted.
Expired resources	Shows the expired resources connected to this instrument.
Graphic	Shows the measured values as graphic.
Insert	Insert a method function in an existing method.
Log out	Log out the current user.
Measured values	Shows the measured values as table.
New	Create a new method.
OK	Confirm the entered settings.
Outlier test	Performs an outlier test.
Overview	Goes back one step in the menu structure.
Password login	Opens the menu **Password login**.
Preview	When entering a text with an alphanumeric keypad, you can preview your input.
Print	Print out the currently shown screen in tabular form. A printer must be connected to the instrument.
Results	Shows the current results of the running measurement (only during a running method).
Result proposals	Opens a list with predefined results.
Samples	Open the list with your defined samples.
Select Series	Opens a list with the results of the last series.
Shut down	Shut down the titrator.
Start	Start a quick analysis directly from the homescreen.
Statistics	Shows statistics for results within a sample loop.
Stop	Stops a manual operation.
Stop definitely	Stops the analsysis
Suspend	Suspends the analysis.
Test	Testing your current audio-signal settings.
Update	Command button for updating your board firmware.
User data	Information about the logged user.

3.2.3 Input field types

Various fields and lists allow you to enter or view data. Buttons on the right side show the type of the field or list.

Text input field

Any text comprised of letters (up tp 30 characters), numbers and symbols can be entered into these fields.

Text input field (extended)

Any text comprised of letters (up to 500 characters), numbers and symbols can be entered into these fields.

Number input field

Numbers, formulas and auxiliary values can be entered into these fields.

Drop-down list

A drop-down list opens from which you can select an entry.

Shortlist

A shortlist opens from which you can select an entry.

Formula field

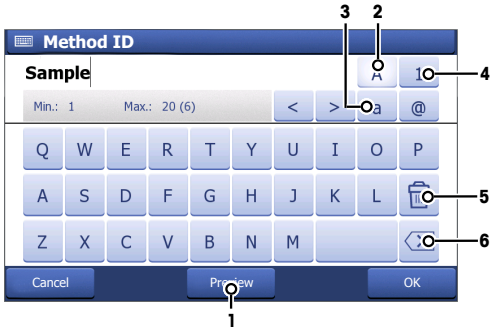
A formula must be entered in these fields.

Info field

The displayed content is only for information (read only).

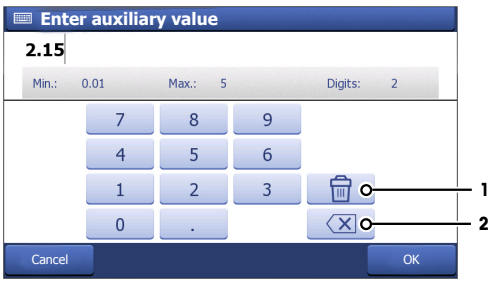
3.2.4 Keypads

Alphabetic keypad



- Tap (1) to see how your input looks like.
- Tap (2) for capital letters.
- Tap (3) for lowercase letters.
- Tap (4) to switch to a numeric keypad and (2) to turn back to alphanumeric.
- Tap (5) to delete all entered letters or numbers.
- Tap (6) to delete the last entered letter or number.

Numeric keypad



- Tap (1) to delete all entered numbers.
- Tap (2) to delete the last entered number.

3.2.5 Specific user dialogues

3.2.5.1 Start analysis

There are several different ways to start an analysis on the titrator:

- By choosing **Start** from the Method editor.
- By choosing **Start** from the **Home** dialog.
- By using a shortcut (or direct shortcut) from the **Home** dialog.
- By choosing **Start** from the **Series** dialog.

The **Start analysis** dialog is always the first dialog that appears after you choose "**Start**" or the relevant shortcut.

When a direct shortcut is activated, the **Start analysis** dialog does not appear and the respective method starts immediately, provided that the other settings allow this.

The parameters for the previously used method or series appear in the **Start analysis** dialog so that the same method can immediately be restarted.

Of course, all of the settings can also be adjusted prior to pressing "**Start**" The type and number of settings displayed in the **Start analysis** dialog depends on the type of analysis to be started and the resources used.

3.2.5.2 Online screen KF titrations

The Online screen is displayed when an analysis or manual operation is being performed.

The method ID of the current method or the type of manual operation is displayed in the title bar. In the navigation bar below, the sample index, e.g. displayed as "Sample 2/5" (second of a total of five samples) and loop index, displayed as "Loop 1/3" (first of three loops) are shown. (The Loop index is only displayed if the method actually contains more than one loop). The navigation path is displayed in the navigation bar while a manual operation is being performed. The remainder of the online dialog is divided into a graphical area (left) and a data area (right). During a titration or measurement, the graphical area displays the measurement curve.

3.2.5.2.1 Pretitration

Immediately following the start of a Karl Fischer titration, the online window for pretitration appears. In this window, the following buttons are available:

Results

Tap **Results** to display the results and statistics for the samples to be analyzed following the analysis. The system displays the results of the active determination type (sample, blank value). Furthermore, the dialog **Results** also contains the following buttons:

- **Add result**
- **Recalculate**
- **Undo all**
- **Outlier test**

Samples

You can change sample and series data. However, the number of samples cannot be changed while a blank determination is in progress. For changes to the sample data, refer to the analysis sequences:Starting an analysis

More

The **More** button provides you with additional functions. Using the More button in **Pretitration** mode, you can perform the following:

End series

You can end a series if all predefined samples have been processed. Any changes made in the **Start analysis** dialog or later are no longer taken into account. After the series has ended, you return to the pretitration or standby mode and the series can be restarted again. A new series is entered in the results. The system then uses the original sample parameters.

Note

- The **End series** function triggers printouts defined **Per series**.

Stop method

The current method is stopped immediately. No printout is generated.

Note

- Before actually stopping the process, the system displays a system message asking you to confirm the action.

Save series data

The analysis of a series is saved in its entirety under a name freely chosen by the titrator in the form "SeriesXY". Only sample data is included in the series. Blank value data is not included in the generated series. If the maximum number of permitted series has already been reached, the series is not saved.

Axes

You can select the units for the horizontal and vertical axes from a list.

Drift determination (only KF vol)

You have to add at least one titrant increment for a drift determination. When the determination has been completed successfully, the determined drift value is entered in the setup of the titration stand. The system then generates an automatic printout containing the sample data, raw results, and resource data.

Note

- The message **No titrant added / generated. Drift not determined.** can be confirmed, or the message disappears after a certain period of time (60s).
- If the drift falls below a defined value, the system automatically switches to **Standby** mode.

Sample size calculation

The optimum sample size can be calculated from the standby of an analysis.
The determined limits for the sample size do not have any impact on the lower and upper limits in the method or for the sample data memory.

You can determine the following parameters:

Parameters	Description	Values
Content	Expected water content of the sample.	0 .. 10^6
Unit	Unit for the content.	[%] I [ppm]

Use the **Calculate** button to obtain the upper and lower sample size limits for optimum titration.

Concentration determination (only KF vol)

You use this button to determine the concentration of the titrant. No predispensing is performed. The determined concentration or the mean value for a series of concentration determinations is entered in the Setup for the relevant titrant, if this falls within the limits. If the mean value falls outside the specified limits, this is not transferred to the Setup, but the system still switches to Standby. After the concentration has been determined successfully, the user receives a printout. If the value is not transferred to Setup, the system issues a message to inform you of this.

Tapping the **Start conc.** button opens the **Concentration sample** window. You can enter a comment and the temperature. When you tap **OK**, an **Info** dialog is displayed as a prompt to add the standard.

See also

Starting an Analysis ▶ Page 101

3.2.5.2.2 Standby

If the drift drops below a predefined value, the system automatically switches from **Pretitration** to **Standby** mode (see "Analysis flows: Analysis flow diagram").

In **Standby** mode, you can start the drift determination or sample analysis, or conduct a blank determination for the "external extraction" method type. The following buttons are available for this:

Start drift

For a drift determination, at least one increment of titrant must be generated.When the determination has been completed successfully, the determined drift value is entered in the setup of the titration stand. The system then generates an automatic printout containing the sample data, raw results, and resource data.

Start sample

This button is used to perform a sample analysis. When you press this button, an **Info** dialog is displayed prompting you to add the sample.

Once a sample has been added and the analysis started, you can use the **Samples** button to enter the sample size (see Method Function: **Sample (KF)** > **Sample**.

Start blank determination

Blank value determination can be performed for the method type **Ext. Extr.**. No predispensing is performed. The determined blank value or the mean value for a series of blank determinations is entered in the Setup for the relevant titrant, if this falls within the limits. If the mean value falls outside the specified limits, this is not transferred to the **Setup**, but the system still switches to **Standby**. After the blank value has been determined successfully,you receive a printout. If the value is not transferred to **Setup**, the system issues a message to inform you of this. When you tap this button, an **Info** dialog is displayed prompting you to add the sample.

Measured values

You can use the **More** and **Measured values** buttons to display a table of measured values during an analysis as an alternative to the online dialog.

Samples

You can use this button to change the sample size of the sample currently being processed or to define the sample size for a new sample.

Stop analysis

You can use this button to cancel the measurement immediately during a sample or blank determination.

Before actually terminating the process, the system displays a system message asking you to confirm the termination.

3.2.6 Menu Structure

Methods

The menu **Methods** has no submenus.

Series templates

The menu **Series templates** has no submenus.

The menu **Results** has the following submenus.

- **All results**
  Statistics
- **Samples**
- **Add result**
- **Recalculate**
- **Undo all**

Menu level 2	Menu level 3
Chemicals	**Titrants**
	Concentration standards
User settings	**Language**
	Screen
	Audio signal
	Shortcuts
	Keyboard
Values (only V30S)	**Blanks** (only V30S)
	Auxiliary values (only V30S)
Hardware	**Sensors**
	Pumps
	Peripherals
	Titration Stands
	Homogenizers

Menu level 2	Menu level 3
Global settings	**System**
	User management
	Analysis and resources behavior
	Solvent Control (only V30S)
Mainten. & Service	**MT-Service**
	Import / Export
	Reset to factory settings
	Titrator firmware history
	Board firmware
	Terminal
	Board data
	Drives
	Burettes
	Update
	Delete Mettler method template (only V30S)

Manual

The menu **Manual** has the following submenus.

- **Stirrer**
- **Sensor**
- **Burette**
- **Pump**

4 Karl Fischer Water Determination

4.1 Measuring Principle

The Karl Fischer procedure is a titration method used for the quantitative determination of water content in liquids and solids. Karl Fischer titration is used in a variety of areas, e.g. for determining the water content of groceries, chemicals, pharmaceuticals, cosmetics and mineral oils.

To determine the water content, first sulfur dioxide and water react with iodine:

$2\ H_2O + SO_2 + I_2 \Rightarrow SO_4^{2-} + 2\ I^- + 4\ H^+$

The addition of alcohol (e.g. methanol, ethanol), causes a preliminary reaction to take place in which sulfur dioxide forms an acidic ester, which is then neutralized by the addition of a base (e.g. imidazole, referred to in the following as "RN"):

$CH_3OH + SO_2 + RN \Rightarrow (RNH)\cdot(CH_3OSO_2)$

In the presence of water, the alkyl sulfite anion is oxidized to alkyl sulfate by the iodine. This process reduces the yellow-brown iodine to colorless iodide:

$(RNH)\cdot(CH_3OSO_2) + I_2 + H_2O + 2\ RN \Rightarrow (RNH)\cdot(CH_3OSO_3) + 2\ (RNH)\cdot I$

The overall reaction proceeds as follows:

$H_2O + I_2 + SO_2 + CH_3OH + 3\ RN \Rightarrow [RNH]SO_4CH_3 + 2\ [RNH]I$

The reaction runs until all the water has been consumed and hence free iodine is detected in the titration solution. The end point is determined using bivoltametric indication, i.e. the potential at the polarized double-platinum-pin electrode falls below a certain value (e.g. 100mV).

4.2 Volumetric water content determination

In Karl Fischer (KF) volumetric determination, a titrant containing iodine is gradually added to the water-containing sample until the water is completely displaced and free iodine can be detected in the titration solution. The end point of the titration is recorded using bivoltametric indication. Volumetric Karl Fischer titration is suitable for samples with a water content in the range 100 ppm to 100 %. The optimum recording range is 10mg of water per sample.

For optimal execution of the KF titration, the pH of the solution should be in the range between 4 and 8. Acidic and basic samples should be buffered, ideally with imidazole for acids and salicylic acid for basic samples.

The following two conventional reagents are used for titration:

a) The single-component reagent

The titrant consists of iodine, sulfur dioxide and imidazole.The solvent is methanol.

The single-component reagent is simple to use and cost efficient. However, it is not stable for titration.

b) The two-component reagent

The titrant is an iodine solution containing methanol.The solvent for the sample contains sulfur dioxide and imidazole dissolved in methanol.

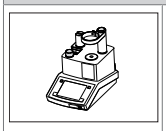
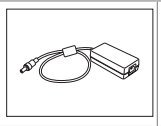
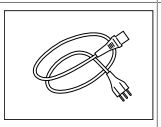
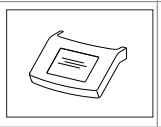
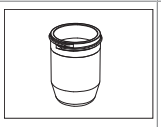
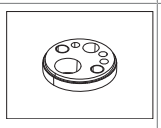
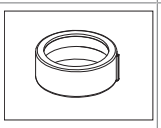
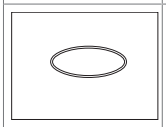
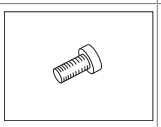
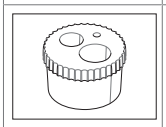
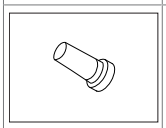
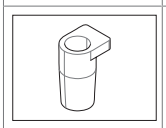
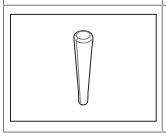
The two-component system can be used to perform very fast titrations (two to three times quicker than with the single-component reagent). Both components can be easily stored. The reagent is stable for titration,however, the solvent capacity is limited.

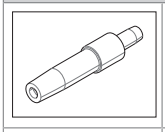
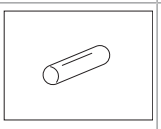
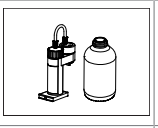
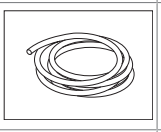
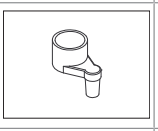
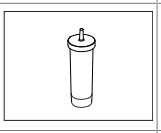
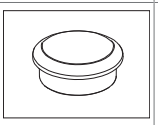
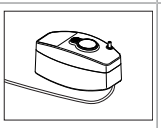
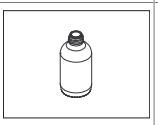
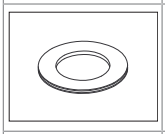
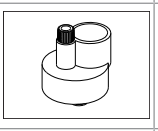
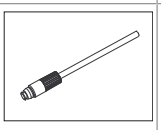
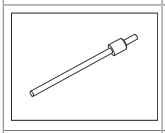
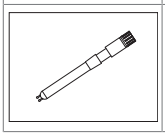
5 Installation

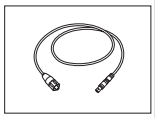
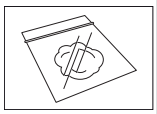
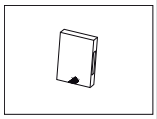
Standard equipment for the titrator types varies. For this reason, installation steps may vary.

5.1 Standard equipment

5.1.1 Scope of delivery

Part		Order number	V10S	V20S	V30S
	Volumetric KF Titrator	–	•	•	•
	External power supply (100...240 V)	–	•	•	•
	Power cable (country-specific)	–	•	•	•
	Protective cover for touchscreen	51105567	•	•	•
	Titration vessel	51107463	•	•	•
	Cover plate for volumetric titration vessel	51107462	•	•	•
	Threaded ring	51107459	•	•	•
	O-ring	51190366	•	•	•
	Fastening screw (for titration vessel)	51107474	•	•	•
	Three-hole adapter	23943	•	•	•
	NS 7.5 stopper	23452	•	•	•
	NS 10 stopper	23836	•	•	•
	Pin-hole stopper	–	•	•	•

Part		Order number	V10S	V20S	V30S
	Connector KF Titrators	23957	•	•	•
	Magnetic stirrer bar	51191159	•	•	•
	Interchangeable burette set, 5 mL	51107500	•	•	•
	Silicone tube, 133 mm	–	•	•	•
	Drying tube holder	23915	•	•	•
	Drying tube with cover (3 pcs)	–	•	•	•
	Seal (titration stand drying tube)	51107492	•	•	•
	Solvent Manager set with: • Silicone tube, 850 mm • Silicone tube, 170 mm • Drying tube with cover • Flat seals (2 pcs.)	51105600	•	•	•
	Clear glass bottle, 1 L	30079610	•	•	•
	Flat seals (2 pcs.)	–	•	•	•
	Screw top (for bottles)	23937	•	•	•
	2 Draining tubes / dispensing tubes	51107481	•	•	•
	Adapter for immediate draining	51105594	•	•	•
	Dual platinum pin electrode, DM143-SC	51107699	•	•	•

Part		Order number	V10S	V20S	V30S
	Triaxial SC LEMO cable, 70 cm	89601	•	•	•
	Glass wool (2 g)	51108143	•	•	•
	Molecular sieve, 250 g	71478	•	•	•
	CD Titration User Documentation	30297239	•	•	•
	User Manual	–	•	•	•
	Memo Card	–	•	•	•
	Test report	–	•	•	•
	EC declaration of conformity	–	•	•	•

5.1.2 Unpack the titrator

1 Remove the titrator (and accessories) from the protective packing material.
2 Store the packing material for later transport over long distances.
3 Check if you received all parts listed in the scope of delivery.
4 Inspect the parts visually for flaws or damage.
5 If parts are missing or damaged, report it immediately and file a freight claim if needed.

5.1.3 Position the titrator

The instrument has been developed for indoor operation in a well-ventilated area. The following site requirements apply:

- The ambient conditions are within the limits specified in the technical data.
- No powerful vibrations
- No direct sunlight
- No corrosive gas atmosphere
- No explosive atmosphere
- No powerful electric or magnetic fields

5.1.4 Connect the titrator to the power supply

⚠ WARNING

Danger of death or serious injury due to electric shock!

Contact with parts that contain a live current can lead to injury and death.

1 Only use a METTLER TOLEDO power cable and AC adapter designed for your instrument.
2 Connect the power cable to a grounded power outlet.
3 Keep all electrical cables and connections away from liquids.
4 Replace damaged power cables and AC adapters immediately.

NOTICE

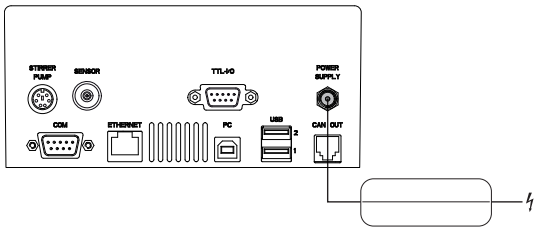
Danger of damage to the AC adapter due to overheating!

If the AC adapter is covered or in a container, it is not sufficiently cooled and overheats.

1 Do not cover the AC adapter.
2 Do not put the AC adapter in a container.

The titrator is operated using an AC adapter. The AC adapter is suitable for all supply line voltages ranging from 100...240 V AC ±10 % and 50-60 Hz.

1 Install the cables in such a way that they cannot be damaged or interfere with operation.
2 Insert the plug of the power cable in the socket of the AC adapter.
3 Insert the plug of the AC adapter in the **POWER SUPPLY** socket at the back of the titrator.
4 To secure the connection at the titrator, screw the plug connector firmly into place.
5 Insert the plug of the power cable in a grounded power outlet that is easily accessible.



5.1.5 Disconnect the titrator from the power supply

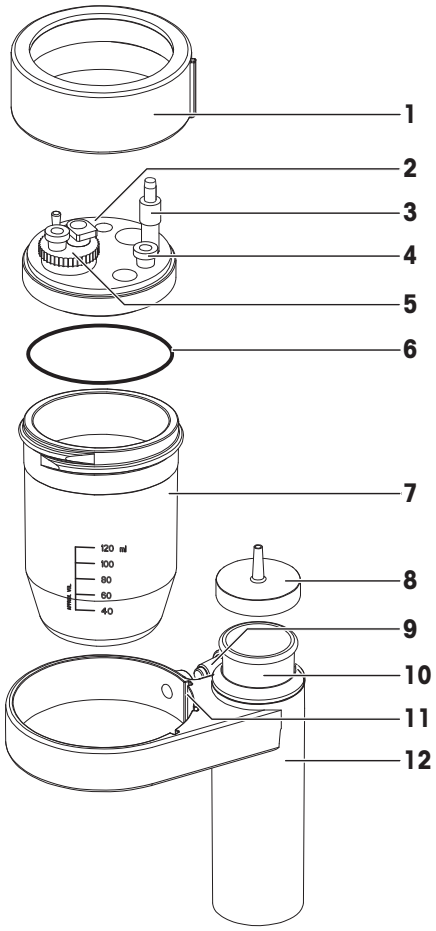
- The titrator has shut down.

1 Pull the plug of the power cable out of the power outlet.
2 Pull the plug of the AC adapter out of the **POWER SUPPLY** socket at the back of the titrator.

5.1.6 Assembling titration stand and titration vessel

The titration arm can be pivoted in both directions.

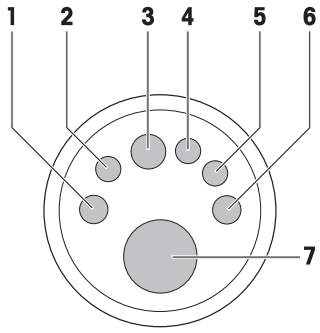
1 Carefully slide the magnetic stirring rod supplied into the titration vessel (7).
2 Place the O-ring (6) on the opening of the titration vessel (7).
3 Place the cover plate (2) over the opening of the titration vessel (7).
4 Place the threaded ring (1) on the titration vessel (7) and tighten the threaded ring (1).
   ⇨ The titration vessel is assembled.
5 Orient the titration vessel so the lobe on the threaded ring (1) is aligned with the center groove (11) of the titration arm (12).
6 Slide the titration vessel (7) into the opening of the titration arm (12) and press it down until it rests on the internal magnetic stirrer.
7 To secure the titration vessel (7), tighten the fastening screw (9).
8 Place the three hole adapter (5), NS stopper (4) and connecting piece (3) into the lid openings.
9 Fill a drying tube (10) with molecular sieve and press it into the titration stand (12).
10 Push a silicon tube over the opening of the drying tube (8) and the connecting piece (3).



5.1.7 Recommended positions for sensors, tubes and stoppers

The titration vessel is normally connected as illustrated.

1 Dispensing tube for solvent
2 Dispensing tube for titrant
3 Measuring electrode
4 Stopper
5 Connection to drying tube on titration stand
6 Suction tube for used solvent
7 Three hole adapter

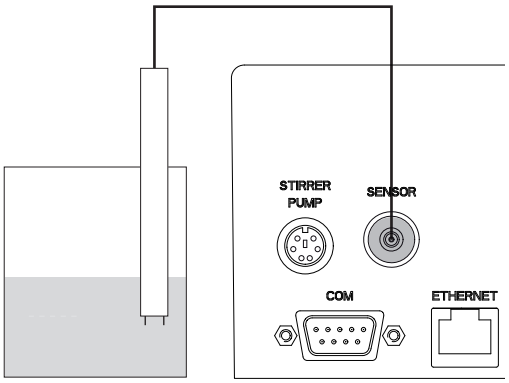


5.1.8 Connect the measuring electrode

- No task is running on the titrator

1 Place the measuring electrode into the appropriate opening of the titration vessel.

2 To connect the measuring electrode, plug the triaxial cable into the **SENSOR** socket on the rear of the titrator.



5.1.9 Insert and connect a burette

Current generation burettes are equipped with an Smart Tag on the holder (visible by the small, black cover plate). The Smart Tag is used for reading and writing properties such as titrate name, concentration or usable life.

For a description of the burette, refer to the operating instructions supplied with burettes.

- The burette is assembled.
- The burette holder is mounted on the titrant bottle.
- The piston rod (5) is in the home position.

1 Turn the arrestment knob (6) in the opposite direction of the arrow.

2 Orient the burette so that the recesses on the driver arm (3) are parallel to the groove (7) on the base of the burette housing.

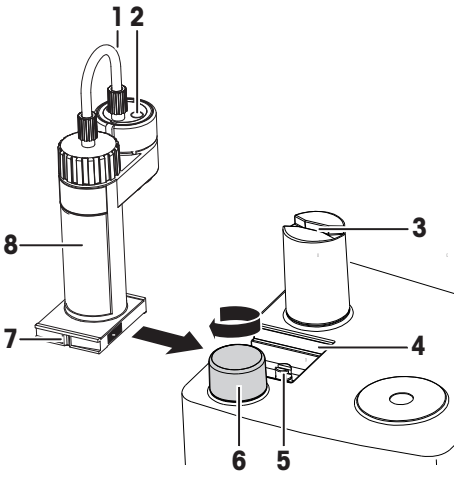
3 Slide the burette (8) on the guides (4) of the titrator.

4 Turn the arrestment knob (6) in the direction of the arrow to secure the burette.

5 Place the suction tube from the titrant botttle into the left hole (1) of the burette.

6 Place the dispensing tube into the right hole (2) of the burette.

7 To prevents spills, place the free end of the dispensing tube into the titration vessel, the waste bottle or another suitable container.



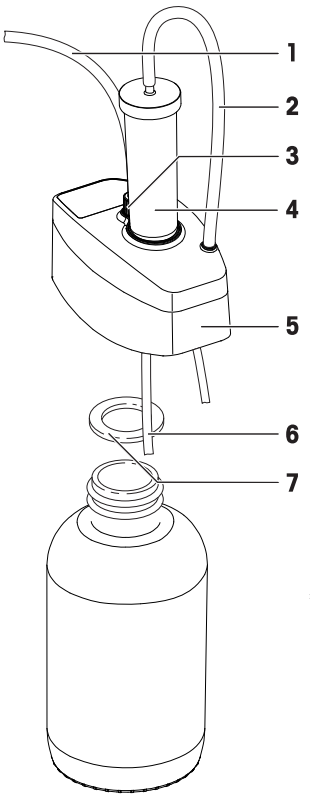
5.1.10 Connect the burette to the titration vessel

- The burette is installed and connected to the titrant bottle. See [Insert and connect a burette ▸ Page 25].

– Insert the free end of the dispensing tube for titrant into the next available opening in the titration stand, which is located counterclockwise from the electrode.

5.1.11 Assemble the waste bottle

1 Place the flat seal (7) on the opening of the bottle.
2 Screw the solvent manager (5) onto the bottle.
3 Loosen the threaded sleeve (3) on the solvent manager (5).
4 Push the thin end of the suction tube (1) through the threaded sleeve (3), so that it is just below the screw top.
5 Tighten the threaded sleeve (3).
6 Fill a drying tube (4) with molecular sieve.
7 Press the drying tube (4) into the appropriate opening of the solvent manager.
8 With a silicone tube (167 mm) (2), connect the drying tube (4) of the bottle to the appropriate adapter of the solvent manager.
9 To ensure that the system has no leaks, check all tubes and closing points for firm seating.



5.1.12 Connect the solvent manager to the titrator

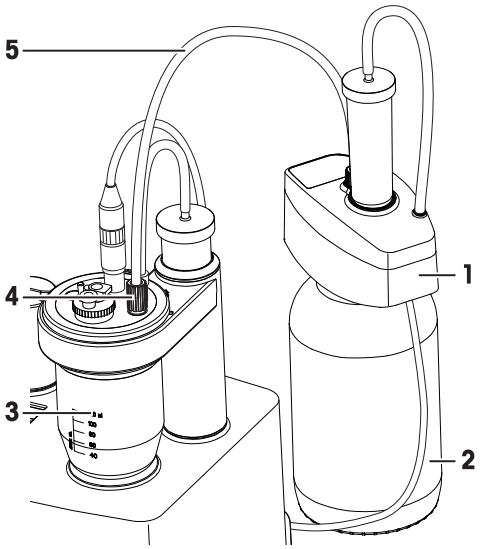
1 Shut down the titrator.
2 Plug the cable supplied with the solvent manager into the **STIRRER PUMP** socket on the rear of the titrator.
3 Start up the titrator.
⇨ The titrator automatically detects the solvent manager.

5.1.13 Connect the waste bottle to the tiration vessel

Manual exchange of solvent

- The solvent manager (1) is installed on the waste bottle (2).

1 Screw the adjusting sleeve (4) on the free end of the suction tube (5) into the cover plate.
2 To extract used solvent, push the suction tube (5) into the titration vessel (3) until it touches the bottom of the titration vessel.



Automatic exchange of solvent

NOTICE

Danger of blockage due to undissolved material

If a sample is not completely dissolved it can block tubes.

– Do not use the adapter for immediate draining if you work with samples that are not dissolved completely.

NOTICE

Danger of damage to the adapter for immediate draining by a homogenizer

The adapter for immediate draining can be damaged if it is sucked into the homogenizer.

– Do not use the adapter for immediate draining in connection with a homogenizer.

- The solvent manager is installed on the waste bottle. See Installing the solvent manager.

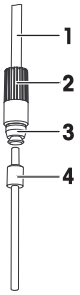
1 On the free end of the suction tube (1), push the adjusting sleeve (2) and PTFE ring (3) back a little.

2 Take the adapter for immediate draining (4) and carefully insert it into the suction tube (1).

3 Insert the suction tube (1) with the adapter for immediate draining (4) into one of the openings of the titration vessel.

4 Screw the adjusting sleeve (2) into the cover plate.

5 Push the suction tube (1) into the titration vessel until the adapter for immediate draining (4) touches the bottom of the titration vessel.



See also

Assemble the waste bottle ▸ Page 26

5.1.14 Assemble the solvent bottle

1 Place the flat seal (4) on the opening of the bottle (5) and screw the screw top (3) onto the bottle.

2 Loosen the threaded sleeve (2) on the screw top (3).

3 Push the dispensing tube through the threaded sleeve (2) and the screw top (3) and down to the bottom of the bottle.

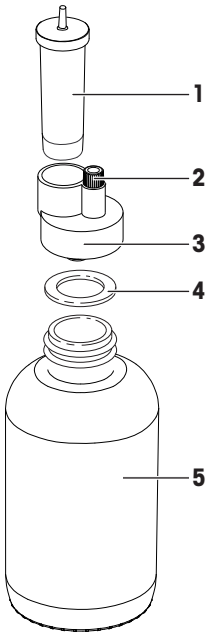
4 Tighten the threaded sleeve (2).

5 Fill a drying tube (1) with a molecular sieve and press the drying tube (1) into the screw top (3) of the bottle (5).

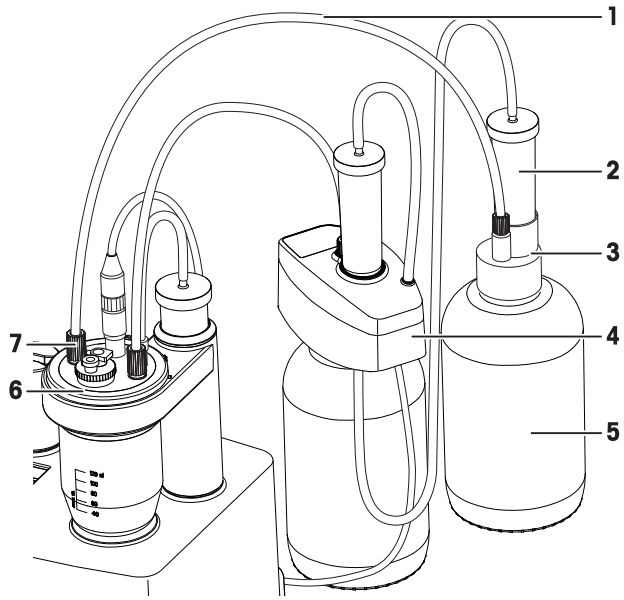
6 Connect the drying tube of the screw top to the appropriate connection of the solvent manager.

7 Press the park sleeve into the opening on the titration stand.

8 To ensure that the system has no leaks, check all tubes and closing points for firm seating.



5.1.15 Connect the solvent bottle



- The solvent manager (4) is installed on the waste bottle.
- The solvent bottle is assembled.

1 Connect the drying tube (2) to the solvent manager (4).

2 Screw the free end of the dispensing tube (1) with the adjusting sleeve (7) into an opening of the cover plate (6).

See also

- Assemble the waste bottle ▸ Page 26
- Assemble the solvent bottle ▸ Page 27

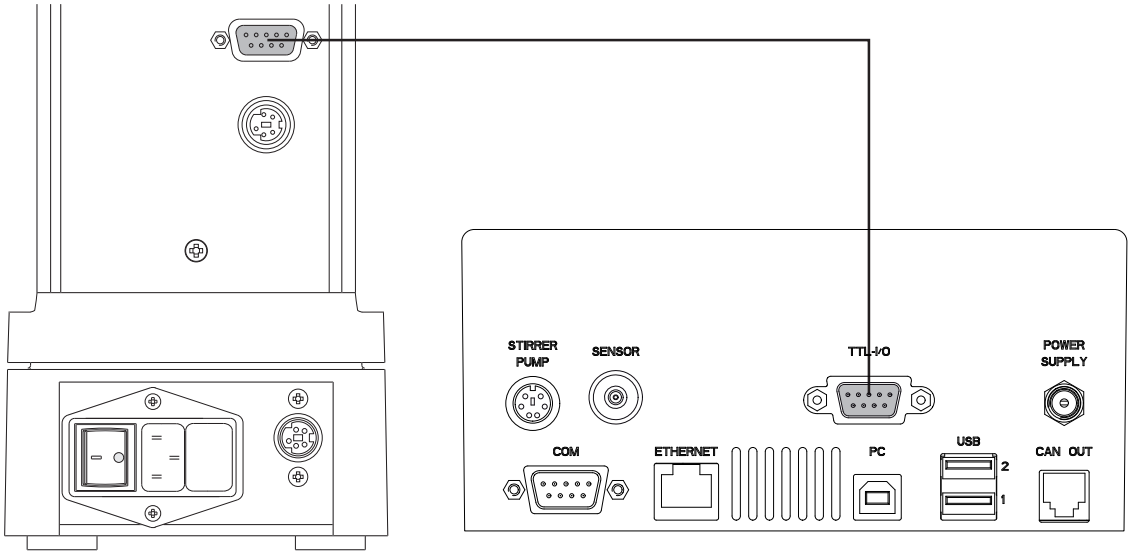
5.2 Optional equipment

5.2.1 Connect the Stromboli oven sample changer

The Stromboli oven sample changer is controlled by TTL signals from the titrator. The flow of gas is led from the gas drying unit through the sample in the oven and from here to the measuring cell of the titrator via the transfer tube.

Further information can be found in the operating instructions for the Stromboli oven sample changer.

- The sample changer is switched off.



1 Shut down the titrator.
2 Plug the cable supplied with the sample changer into the **TTL-I/O** socket of the oven sample changer.
3 Plug the cable into the **TTL-I/O** socket on the rear of the titrator.

5.2.2 Set up an InMotion KF

The installation of the sample changer is described in the separate InMotion KF Operating Instructions.

5.2.2.1 Connect the sample changer to the titrator

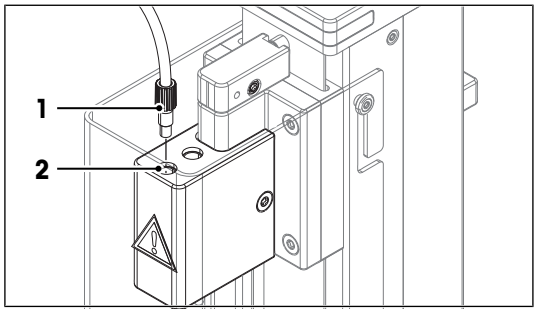
- The sample changer is installed and shut down.

1 Plug the cable supplied with the sample changer into the **INSTRUMENT** socket on the sample changer.
2 Plug the cable into the **USB 1** or **USB 2** socket on the rear panel of the titrator.
3 Start up the sample changer.
⇨ The titrator automatically detects the sample changer.

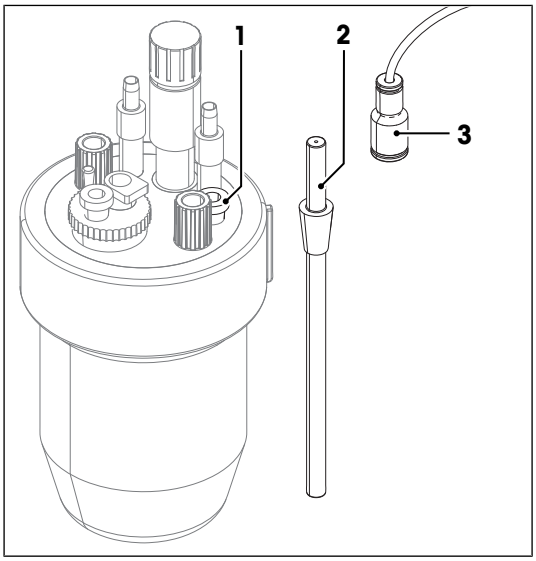
5.2.2.2 Connect the KF head to a volumetric titration vessel

- The sample changer is shut down.
- The titrator is set up for a volumetric Karl Fischer titration.

1 Screw the M8 connector (1) of the transfer tube into the gas outlet (2) of the KF head.



2 Remove the NS stopper (1) from the cover plate.
3 Insert the gas inlet for volumetric KF (2) in the opening.
4 Push the gas inlet as far as you can into the coupling (3) of the transfer tube.
   ⇨ You can no longer pull the gas inlet out without using force.



5.2.2.3 Configure the vial height

Set the vial height

- The sample changer is installed and connected to the titrator.
- The sample changer is running.

1 Make sure the screw cap sits tightly on the vial.
2 Measure the vial height including the screw cap.
3 Go to **Home** > **Setup** > **Hardware** > **Titration Stands**.
4 Select the **InMotion KF** titration stand that is connected to the titrator.
5 Set **Vial height** to the height you have measured.
6 Tap **Save**.

Test the vial height setting

1 Place the vial in the drift position of the sample changer.
2 Go to **Home** > **Methods** > **New** > **Standard method templates**.
3 Select the method **InMotion KF Vol.**
4 Tap **Save**.
5 Tap **Start**.
   ⇨ The sample changer moves the drift position to the oven position.
   ⇨ If the drift determination starts, the setting is correct.
6 If the error message **No vial detected. Check vial height or height setting.** opens, increase the setting for **Vial height** by 1 mm.
7 If the error message **Tower lift blocked. Check vial cap or needle. Use vial with appropriate height or remove obstacle. Check height setting.** opens, decrease the setting for **Vial height** by 1 mm.

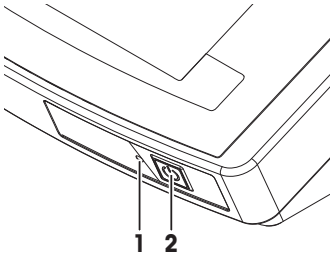
6 Operating the instrument

6.1 Start up the titrator and shut down the titrator

The power button is fitted with an LED and mounted on the front of the titrator. The LED indicates the operating status.

Start up the titrator

– Press the power button (2).
  ⇨ The titrator starts up and detects connected devices.
  ⇨ The LED (1) flashes as the system starts up.
  ⇨ The titrator is ready for use when the LED (1) remains permanently lit.



Shut down the titrator from the touch screen

– Tap **Home** > **Log out** > **Shut down**.
  ⇨ The titrator stops running tasks and shuts down.
  ⇨ The LED (1) flashes as the system shuts down, which can take up to 60 seconds.

⇨ When the LED goes out, the titrator has shut down. The built in AC adapter and the control circuit for the power button are energized. The rest of the titrator is no longer energized.

Shut down the instrument using the power button

– Press the power button for less than 1 second.
  ⇨ The titrator stops running tasks and shuts down.
  ⇨ The LED (1) flashes as the system shuts down, which can take up to 60 seconds.

⇨ When the LED goes out, the titrator has shut down. The built in AC adapter and the control circuit for the power button are energized. The rest of the titrator is no longer energized.

Shut down of the instrument in emergency situations

– Pull the plug of the power cable out of the power outlet.

6.2 Running a volumetric Karl Fischer titration

The following chapters show how to perform a simple volumetric Karl Fischer titration using the standard method KFVol 1-comp 5.

Chemicals

For this titration you need the chemicals listed below.

- 1% KF standard solution as sample
- KF 1-comp 5 as titrant
- Water-free methanol as KF solvent

6.2.1 Preparation

- The titrator is installed.
- The titration stand is installed and the titration vessel is assembled.
- The measuring electrode is connected.
- The solvent manager is installed on the waste bottle and connected to the titrator and the measuring cell.
- The reagent exchange set is installed and the solvent bottle is connected to the measuring cell.
- The burette is assembled.
- A USB printer is connected to port "USB1" or "USB2" of the titrator and configured.

1 Pivot the titration arm so the titration vessel is positioned over the internal magnetic stirrer.

2 Tap **Setup** > **Hardware** > **Titration Stands** > **KF stand**.
  ⇨ The menu **Titration stand parameters** opens.

3 Set **Stirrer output** to **Internal stirrer** and tap **Save**.
4 Insert the burette.
5 Insert the dispensing tube for the titrant into the opening on the titration vessel.
6 Follow the instructions on the Touchscreen until the PnP burette containing the titrant is displayed in the Setup.

6.2.1.1 Rinsing and filling the burette

To fill the burette and tubes with titrant and remove any air bubbles from the system, rinse the burette three times with titrant with the manual operation **Rinse**.

- The titrator is prepared as described in [Preparation ▸ Page 31].

1 To ensure that the system has no leaks, check all tubes and closing points for firm seating.
2 Make sure that the free end of the dispensing tube for the titrant is placed in the titration vessel or another container.
3 Tap **Manual** > **Burette** > **Rinse**.
⇨ The dialog **Rinse** opens.
4 Set **Titrant** to **KF 1-comp 5**.
5 Set **Cycles** to "3".
6 To start the rinse procedure, tap **Start**.
⇨ The rinse procedure starts. An animation shows the progress.
7 When the rinse procedure is complete, tap **OK**.
⇨ The dialog **Rinse** opens.

⇨ The burette is filled and the tubes are free of air bubbles.

6.2.1.2 Filling the titration vessel

- The titrator is prepared as described in [Preparation ▸ Page 31].

1 Tap **Manual** > **Pump**.
⇨ The dialog **Pump** opens.
2 Set **Action** to **Fill**.
3 Make sure **Reset counter** is activated.
4 Tap **Start**.
⇨ Solvent is pumped into the titration vessel.
5 To prevent the solvent from overflowing, watch the amount of solvent and tap **Stop** if too much solvent is added.

⇨ The titration vessel is filled with solvent.

6.2.2 Perform the volumetric KF titration

The following provides a brief description of the sequence involved in a volumetric KF titration. The analysis process is described as an example for the following sequence steps:

- Pretitration
- Standby
- Sample analysis.

6.2.2.1 Configure the method

- The titrator is prepared as described in [Preparation ▸ Page 160].
- The burette is rinsed and filled.
- The titration vessel is filled.

1 Tap **Methods** > **New** > **Standard method template** > **KFVol 1-comp 5**.
⇨ A list with of method functions appears.
2 Tap **Sample**.
⇨ The **Sample (KF)** dialog is opened.

3 Tap **Sample**.
4 Set **Entry type** to **Weight** and typ **OK**.
5 Tap **OK**.
⇨ A list of method functions appears.
6 Tap **Save**.

6.2.2.2 Create a direct shortcut

1 Tap **Start**.
⇨ The **Start analysis** window opens.
2 Tap **AddToHome**.
⇨ The **Shortcut parameters** window opens.
3 Enter a name for the shortcut in **Description**.
4 Activate **Immediate start**.
5 Tap **Save**.
⇨ The home screen with the new shortcut opens.

6.2.2.3 Start the pretitration

1 To ensure that the system has no leaks, check all tubes and closing points for firm seating.
2 Select the shortcut on the home screen.
⇨ The system performs the pretitration to remove any water from the solvent.
⇨ As soon as the continually determined drift value falls below a defined value, the system automatically switches to **Standby** mode and the **Start sample** button is active.

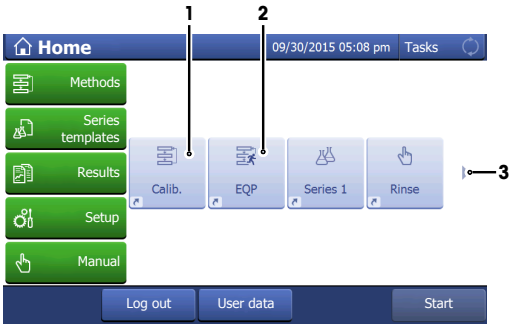
6.2.2.4 Perform the analysis

- The system is in **Standby** mode.

1 Measure 500 mg of a 1 % KF standard solution into a syringe.
2 Tap **Start sample**.
⇨ You are prompted to add the sample.
3 Inject the measured sample into the titration beaker.
4 Enter the sample weight, 0.5 [g], on the touch screen and tap **OK**.
⇨ The analysis starts.
⇨ Once the titration is completed, the **Results** dialog is displayed. The dialog shows **R1**, the water content.

6.3 Creating and handling Shortcuts

- Shortcuts (1, 2) can be created for methods, series templates and manual operations.
- With a shortcut (1) it is possible to access the dialog **Start analysis** with one tap on the homescreen.
- With a shortcut (2) it is possible to start a method, series or manual operation with one tap on the homescreen.
- The number of shortcuts depends on the type of titrator. If more than 12 shortcuts can be created, they can be placed on two screens. Tap (3) to switch between these two screens.
- Each user can manage the shortcuts that he has created in the instrument setup.



Types of shortcuts

Method

Sample Series

Manual operation

Creating a shortcut

1 Select **Methods** and choose your method category.
2 Create a new method or choose an existing method in the list.
3 Tap **Start**.
   ⇨ The **Start analysis** dialog opens. You can change some parameters or add some information to this method.
4 Tap **AddToHome** to create a shortcut.
5 Define the shortcut parameters.
6 Tap **Save**.

⇨ The shortcut is now set on the homescreen.

Deleting a shortcut

1 Select **Setup** > **User settings** > **Shortcuts**.
2 Select the shortcut which you want to delete in the list.
3 Tap **Delete**.

⇨ The shortcut is deleted.

Changing an existing shortcut

- At least one shortcuts has been created.

1 Tap **Setup** > **User settings** > **Shortcuts**.
   ⇨ A list of existing shortcuts opens.
2 Tap the shortcut you want to change.
3 If needed, change the settings for **Description** and **Immediate start**.
4 To change the position of the shortcut on the homescreen, tap  .
   ⇨ A dialog opens that shows the free positions and the occupied positions on the homescreen.
5 Tap on the free position, where the shortcut should be placed.
   ⇨ The dialog closes.
6 To save the settings, tap **Save**.

Parameters	Description	Values
Type	Shows the type of action the shortcut stands for.	Method I Series I Manual operation
Description	Any name for the shortcut.	Arbitrary
Immediate start	The method, series, or manual operation can be started immediately. This enables you to start the analysis without any interfering dialog.	Activ I Inactive
Homescreen position	Defines the position of the shortcut on the homescreen.	-

Created by	Shows the name of the user who created the shortcut.	-

6.4 Creating Methods

You create a new method by changing the parameters of a delivered method template and saving it under a new method ID.

Navigation: **Home** > **Methods**

1 Tap **New** to create a new method on the basis of a template.

2 From the available templates, in **Mettler method templates** or **Standard method templates**, choose the one that is most similar to the method you wish to create.

⇨ You can now modify this method in line with your requirements by inserting or removing method functions or modifying its parameters.

3 In the method function **Title**, enter a new method ID. Afterwards, a new method will be stored under this method ID.

4 Assign a title to your new method.

5 Select available method functions to modify their parameters in line with your requirements.

6 Tap **Insert** to add additional method functions to the template.

7 Now use the arrow-shaped button to select the required position for the new method function in the method. (You will only be able to insert the method functions that are allowed in the corresponding location based on the method syntax.)

8 From the list, select the method function that you want to insert.

9 Modify the individual parameters of the method function in line with the resources.

⇨ The new method function appears in the method.

10 To delete a method function, select the function in question and then tap **Delete**.

⇨ The method function disappears from the method.

11 After inserting all required method functions, tap **Save**.

⇨ The method is saved under the method ID and appears in the list of available methods.

Note

- When establishing a new method, follow the rules specified by the instrument.

6.5 Modifying or Deleting Methods

You can change user methods or Mettler methods and store them under new method IDs.

Note

- Once a Mettler method has been modified, you will only be able to save it as a copy (or as a user method) with a new method ID.

Navigation: **Home** > **Methods**

1 From the displayed list of methods, select the method that you want to modify.

2 As soon as the methods functions of the selected method appear on the screen, you can modify the method.

3 In the method function **Title**, enter a new method ID. Afterwards, a new method will be stored under this method ID. You can enter up to twenty alphanumeric characters.

4 Select available method functions to modify their parameters in line with your requirements.

5 Choose **Insert** to add additional method functions to the template.

6 Now use the arrow-shaped **Insert** button to select the required position for the new method function in the method. (You will only be able to insert the method functions that are allowed in the corresponding location based on the method syntax.)

7 From the list, select the method function that you want to insert.

8 Modify the individual parameters of the method function.

⇨ The new method function appears in the method.

1 To delete a method function, select the function in question and then choose **Delete**.

2 After you have made all of the necessary adjustments, you can store the method in the titrator by choosing **Save**.

Deleting Methods

You can easily delete user-defined methods from the titrator. Select:

Navigation: **Home** > **Methods**

1 Select the method that you want to delete.

2 Choose **Delete method** to delete the method from the titrator's memory.

6.6 Starting Methods

The titrator offers various ways of starting a method:

- From the method editor
- By choosing **Start** from the Home dialog
- By using a shortcut on the Home screen
- Via the **Series** dialog
- By using the **Setup** dialog (to perform a calibration or titer determination)

You can use the method editor to start any method stored in the titrator.

1 From the displayed list in the **Methods** dialog, select the method that you wish to start (Home > Methods).

2 As soon as the method functions of the selected method appear on the screen, you can open the **Start analysis** screen by choosing **Start**.

3 Choose **Start** again to reach an overview screen on the resources required for the method. (Only if this was defined in the analysis sequence settings.)

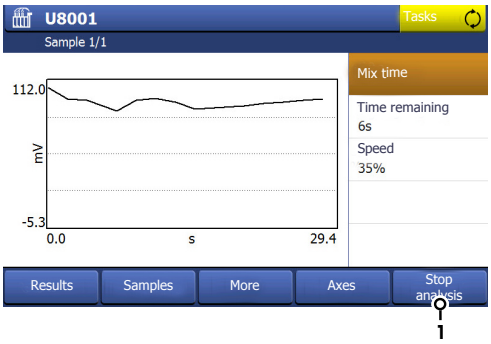
4 To execute the method, confirm the screen by choosing **OK**.

6.7 Stopping an analysis

Stop method directly on the measurement screen

1 Tap **Stop analysis** (1) to stop the current analysis.

⇨ A dialog opens where you have to confirm the stop.



Stop method in the dialog More KF functions

2 Tap **More** (1) to enter the dialog **More KF functions**.

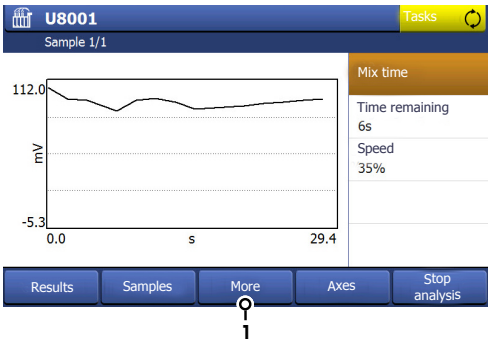
⇨ Depending on the measurement status, you will find different opportunities in this dialog.

3 Tap **End series** to end the current series.

4 Tap **Stop method** to stop the current method.

⇨ A dialog opens where you have to confirm the stop.

5 Tap **Back** to exit the dialog **More KF functions**.



6.8 Customizing touch screen and signals

Navigation: **Setup** > **User settings**

6.8.1 Changing the language

In the menu **Language** you can set the language of the touch screen and the language for printing.

1 Tap **Setup** > **User settings** > **Language**.

2 Customize the settings.

3 To save the settings, tap **Save**.

Parameters	Description	Values
Touchscreen	Defines the language for operation of the terminal.	German I English I French I Italian I Spanish I Portuguese I Chinese I Russian I Polish I Korean
Record	Defines the language in which the reports are to be printed out.	German I English I French I Italian I Spanish I Portuguese I Chinese I Russian I Polish I Korean

6.8.2 Changing the screen settings

In the menu **Screen** you can customize following features.

- The color of the status bar, the borders and the buttons.
- The brightness of the touch screen.
- Activate or deactivate the screen saver and set the time before the screen saver is activated.

1 Tap **Setup** > **User settings** > **Screen**.

2 Customize the settings.

3 To save the settings, type **Save**.

Parameters	Description	Values
Primary color	Here various color schemes for the user interface can be selected.	Gray I Blue I Green I Red
Brightness	Specifies the display brightness in [%].	50 I 60 I 70 I 80 I 90 I 100 [%]
Screen saver	Here you can define whether the screen saver should be used.	Activ I Inactive
Wait time	Defines how long in [min] the system should wait after the user's last action on the terminal before activating the screen saver.	1…1000

6.8.3 Configuring the audio-signals

In the menu **Audio signal** you can define if a tap on a button is confirmed by a beep.

1 Tap **Setup** > **User settings** > **Audio signal** .

2 Customize the settings.

3 To save the settings, type **Save**.

Parameters	Description	Values
At push of a button	Enables a beep when tapping on the touch screen.	Activ I Inactive

6.8.4 Configuring the keyboards

In the menu **Keyboards** you can set the layout of the alphanumeric and the numeric keyboards.

1 Tap **Setup** > **User settings** > **Keyboards**.

2 Customize the settings.

3 To save the settings, type **Save**.

Parameters	Description	Values
ABC keyboard	Determines the layout of the alphanumeric input field.	English I French I German
123 keyboard	Defines the organization of the keys for the numeric input field.	Calculator I Phone

6.9 Monitoring the expiry date and life span of Resources

For certain resources, the titrator provides automatic monitoring of the usable life/life span.

Monitoring the expiry date and life span of resources is only available on V30S.

Monitoring the expiry date of a resource

The expiration date is the period after which the values for a specific resource should be remeasured. These values depend on the nature of the resource:

- The numerical value of an auxiliary value.
- The numerical value of a blank.

Whether the expiration dates should be monitored can be defined in the setup for each individual resource.

If monitoring is activated then additional parameters become available in the respective resource with which the duration of the expiration dates can be determined. In addition a reminder may optionally be issued by the titrator before the expiration dates expire.

You can define the following parameters:

Parameters	Description	Values
Time period	Specifies the time range. Only if **Monitoring usable life** = **Active**.	Days I Hours
Usable life	Defines the time span of the expiration dates either in days or hours (depending on: **Time period**). Only if **Monitoring usable life** = **Active**.	Days: 1…1000 Hours: 1…10^4
Reminder	Determines whether the titrator should issue a warning before the usable life of a resource or a value elapses. Only if **Monitoring usable life** = **Active**.	Activ I Inactive
Days before expirat.	Determines the number of days before the service life of the resource that the titrator should issue a warning. The value entered must be less than the value in **Usable life**. Only if **Monitoring usable life** = **Active**, **Time period** = **Days** and **Reminder** = **Active**.	0…1000

Note

If a resource is updated, the Date/Time field in Setup of the affected resource is automatically adjusted and the expiration date (or time) is recalculated.

In the "Global settings" under "Analysis and resources behavior", you can define how the titrator deals with the relevant resource if the expiration dates have been exceeded at the start of the analysis (see "[Action when exceeding usable life ▸ Page 89]").

Monitoring the life span of a resource

The life span describes the period of time after which a resource is consumed and should be replaced. In the sensor Setup (accessible via the Hardware button), you can determine whether or not the titrator should monitor the life span.

If monitoring is activated then additional parameters become available in the respective resource with which the date of initial operation of the resource and the duration of its life span can be defined.

You can define the following additional parameters:

Parameters	Description	Values
Initial operation	Here you can enter the date of initial activation of the resource.	Date
Life span	Defines the life span of the resource in months.	0…100

In the "Global settings" under "Analysis and resources behavior", you can define how the titrator deals with the relevant resource if the life span has been exceeded at the start of the analysis (see "[Action when exceeding life span ▶ Page 89]").

7 Methods

To carry out an analysis with the titrator, you require a **method**. A method is an analysis program and consists of a sequence of method functions (some with method subfunctions), which are processed by the titrator in sequence.

In this chapter, you will learn how to access and define methods.

The basic building blocks of a titration method consist of sample preparation, stirring and wait times, the actual titration, result calculation and a record. The titrator defines these partial steps as functions that consist of parameters whose values can be changed.

Types of Methods

The titrator distinguishes between the following method types with different objectives:

- **KF-vol**
  Method for volumetric water content determination with the Karl Fischer method.
- **External Extraction Volumetric (Ext. Extr. V.)**
  Ext. Extr. V. is a Karl Fischer method for samples with extremely inhomogeneous water dissipation. It is also used for insoluble solids which only release water slowly, even if broken into smaller pieces. The water content is determined with a volumetric Karl Fischer Titration.
- **InMotion KF Volumetric (IM KF V.)**
  IM KF V. is a volumetric Karl Fischer titration with an InMotion KF sample changer as titration stand.
- **Scan KF Volumetric (Scan KF V.)**
  Scan KF V. is a volumetric Karl Fischer titration where the sample is heated at a constant rate from a defined start to a defined end temperature.
- **Stromboli Volumetric (Stromb. V.)**
  Stromb. V. is a volumetric Karl Fischer titration with a Stromboli oven sample changer as titration stand.

Predefined methods

- **Mettler method templates**
  A number of methods have already been stored in the instrument. These methods were developed by METTLER TOLEDO for specific uses and can be used for the corresponding analysis.
- **Standard method templates**
  When creating methods you can revert to method templates, which specify the structure of the method, and whose parameters already contain the most suitable default values.

Method ID

You can distinguish between different types of method and single methods of the same type using their ID:

- Each method has its own unique method ID.
- The method ID of the Mettler volumetric Karl Fischer methods is composed of the starting letter "KFV", followed by a sequential number (KFV01, KFV02, ...). However, the method ID can be freely chosen when you save a method.

7.1 Method templates

7.1.1 Standard method templates

When you create a new method, the method templates prescribe the sequence of the method functions. These method templates are not application-specific but the availability of standard methods depends on the device type. They allow the user to establish user methods quickly and easily. Most of the parameters in the method functions that occur in a standard method already have default values.

To convert a method template into a user method, it has to be saved under a method ID.

Title	Description	Instrument type	Method type
KFVol 1-comp 5	Titration with 1-comp 5 titrant, weight as sample input and the calculation of water content in %.	V10S/V20S/V30S	Volumetric Karl Fischer titration
KFVol 1-comp 5 fast	Titration with 1-comp 5 titrant, fast control parameters, weight as sample input and calculation of water content in %.	V30S	Volumetric Karl Fischer titration

Title	Description	Instrument type	Method type
KFVol 2-comp 5	Titration with 2-comp 5 titrant, weight as sample input and the calculation of water content in %.	V30S	Volumetric Karl Fischer titration
KFVol 2-comp 5 fast	Titration with 2-comp 5 titrant, fast control parameters, weight as sample input and calculation of water content in %.	V30S	Volumetric Karl Fischer titration
External Extraction/ dissolution	External extraction/dissolution. The calculation formula that is appropriate for the extraction method can be selected in the calculation function. This standard method is also used for determining the blank of the solvent.	V30S	External Extraction/ dissolution
Stromboli	Gas phase extraction with Stromboli (one blank and one Sample Loop).	V30S	Stromboli
KFVol 1-comp 1	Titration with 1-comp 1 titrant, weight as sample input and the calculation of water content in %.	V30S	Volumetric Karl Fischer titration
InMotion KF Vol.	Gas phase extraction with InMotion KF (one blank and one sample loop) (Volumetric standard KF method)	V30S	InMotion KF volumetric
Scan KF Vol.	Volumetric Karl Fischer titration of a sample that is heated at a constant rate.	V30S	Scan volumetric

7.1.2 Mettler method templates

A number of methods have already been stored in the instrument. These methods were developed by METTLER TOLEDO for specific uses and can be used for the corresponding analysis. These methods not only provide the sequence of the method functions, but they also define all of the method function settings. You create a new method by changing the parameters of a delivered method template and saving it under a new method ID.

The assortment of available methods depends on the device type.

Title	Description	ID	Method type
Water standard 10.0 mg/ g	Concentration determination with standard 10 ppm	M300	KF Vol
Water standard 10.0 mg/ g fast	Fast concentration determination with standard 10 ppm	M656	KF Vol
Di-Sodium-Tartrate 15.66 %	Concentration determination with sodium tartrate	M301	KF Vol
Toluene dry	Water determination for a sample with a water content in the ppm range	M302	KF Vol
Acetone dry	Water determination for a sample containing ketone with a water content in the ppm range	M303	KF Vol
Milk powder (homog- enizer)	Internal extraction of a sample with a water content in the % range, with the use of a homogenizer	M304	KF Vol
Tobacco (ext. extraction)	External extraction of a sample with a water content in the % range	M305	Ext. Extr. V
Corn Starch (manual oven)	Manual gas phase extraction of a sample with a water content in the % range, with the use of the DO308 oven	M306	KF Vol
Air (gaseous samples)	Water content determination for a gaseous sample with a water content in the ppm range	M307	KF Vol

Title	Description	ID	Method type
Oven stand. 5.55 % (Stromboli)	Stromboli check with oven standard from Riedel-de Haën with a water content of 5.55 %, with the use of the Stromboli oven sample changer. **Note**: This method contains one Sample Loop for blank determination and one for water determination.	M312	Stromb. V.
Temperature ramp (Stromboli)	Automatic gas phase extraction with a blank loop and 13 Sample Loops with various temperatures: increasing from 120 °C to 300 °C in increments of 15 °C with copper sulfate pentahydrate	M313	Stromb. V.

7.2 Method syntax – rules for establishing a method

A method consists of a sequence of method functions that are executed consecutively when a method is processed.

Method functions can be located within a loop or outside of a loop. Method functions within a loop are performed for each sample if the loop contains more than one sample. Method functions outside of a loop are only performed once.

As an example, the list below shows the method functions for **KF Vol** method.

- **Title**
- **Sample (KF)**
- **Titration stand (KF stand)**
- **Mix time**
- **Titration (KF Vol)**
- **Calculation R1**
- **End of sample**
- **Record**

The method function **Sample (KF)** marks the beginning of the loop and the method function **End of sample** marks the end of the loop. This means, that if this loop contains two samples, the method functions **Sample (KF)**, **Titration stand (KF stand)**, **Mix time**, **Titration (KF Vol)** and **Calculation R1** are performed for each sample. The method function **End of sample** is performed, after the second sample is analysed. The loop is stopped and the method function **Record** is performed.

The number of loops and method functions allowed in a method differs depending on the method type and titrator type. When establishing a method, certain rules (method syntax) must be followed. These fundamental rules are described below.

7.2.1 Types and possible number of loops

The following table shows the maximum number of loops, the maximum numbers of method functions and the allowed loop types for the different types of titrators and method types.

Method type	Maximum number of loops per method			Maximum number of method functions per method		
	V10S	V20S	V30S	V10S	V20S	V30S
KF Vol	1	1	1	10	12	150
Ext. Extr. V.	–	–	1	-	-	150
Scan KF V.	–	–	1	–	–	150
IM KF V.	–	–	20	–	–	180
Stromb. V.	–	–	14	-	-	150

7.2.2 Possible number of method functions

The following table shows the maximum number of method functions that can be used within a method.

Method function	KF Vol, Ext. Extr. V.			Scan KF V.	IM KF V.	Stromb. V.
	V10S	V20S	V30S	V30S	V30S	V30S
Title	1	1	1	1	1	1
Sample (KF)	1	1	1	1	20	14
Titration stand (KF stand)	1	1	1	1	20	14
Drift determination	–	–	–	–	21	15
Homogenizer	–	–	2	–	–	-
Mix time	1	1	1	1	20	14
Titration (KF Vol)	1	1	1	–	20	14
Scan (KF Vol)	–	–	–	1	–	–
Calculation	4	4	40	3	40	40
Record	1	1	10	2	20	14
Auxiliary value	-	-	30	3	30	30
Blank	–	–	–	–	20	10
Instruction	1	1	10	3	20	10
Standby	–	–	–	1	1	1
End of sample	1	1	1	1	20	14

7.2.3 Inserting and deleting loops

Follow the rules listed below when you insert or delete loops.

- You can only insert loops into methods of the method type **Stromb. V.** and **IM KF V.**.
- You can only insert or delete entire loops from a method.
- You can only insert loops outside of existing loops.
- When you insert a loop using the **Sample**, **Sample (Blank)** or **Sample (Standard)** method function, a regular, correct template is inserted.

  Sample (Blank) and **Sample (Standard)** are only available for the **IM KF V.** method type.
- When you insert a sample loop into a method of the **IM KF V.** method type, the new sample loop inherits some of the settings of the first loop of the method.

Templates for loop types

IM KF V.

Sample loop	**Sample** **Titration stand (InMotion KF)** **Mix time** **Titration (KF Vol)** **Calculation** **Record** **End of sample**
Sample (Blank) loop:	**Sample (Blank)** **Titration stand (InMotion KF)** **Mix time** **Titration (KF Vol)** **Calculation** **Record** **End of sample** **Blank**

Sample (Standard) loop:	**Sample (Standard)** **Titration stand (InMotion KF)** **Mix time** **Titration (KF Vol)** **Calculation** **Record** **End of sample**

Stromb. V. without blank value

Sample loop	**Sample** **Titration stand (Stromboli)** **Mix time** **Titration (KF Vol)** **Calculation** **Record** **End of sample**

KF Vol and Ext. Extr. V.

Sample loop	**Sample** **Titration stand (KF stand)** **Mix time** **Titration (KF Vol)** **Calculation** **Record** **End of sample**

Scan KF V.

Sample loop	**Sample** **Titration stand (InMotion KF)** **Mix time** **Scan KF Vol** **Calculation** **Record** **End of sample**

7.2.4 Method functions within a loop

The method functions that are permitted within a loop are limited and depend on the loop type. Follow the rules listed below when you place a method function within a loop.

- The sequence below must be followed in a loop.
  - **Sample (KF)** (only once)
  - **Titration stand** (only once)
  - **Drift determination** (optional, only once)
  - **Homogenizer** (optional)
  - **Mix time** (only once)
  - **Titration (KF Vol)** or **Scan (KF Vol)** (only once)
  - **Calculation** (optional)
  - **Record** (optional)
- The method function **Titration stand** must follow immediately after the function **Sample (KF)** which introduces the loop.
- The method function **Calculation** must be inserted after the method function that determines the raw results for the calculation.

- The method function **Record** must be inserted after the method function that generates the results the record should contain.

The table below shows the method functions allowed within a loop.

Method function	KF Vol	Ext. Extr. V.	Scan KF V.	IM KF V.	Stromb. V.
Titration stand	•	•	•	•	•
Drift determination	–	–	–	•	•
Homogenizer	•	–	–	–	–
Mix time	•	•	•	•	•
Titration (KF Vol)	•	•	–	•	•
Scan (KF Vol)	–	–	•	–	–
Calculation	•	•	•	•	•
Record	•	•	•	•	•
Auxiliary value	•	•	•	•	•
Blank	–	–	–	•	•
Instruction	•	•	•	•	•

7.2.5 Method functions outside of a loop

In addition to the preset method function **Title**, which always appears at the start, additional method functions can be inserted outside of a loop depending on the method type. Follow the rules listed below when you place a method function outside of a loop.

- The method function **Standby** must be the last method function and must only be used once.

The table below shows the method functions allowed outside of a loop.

Method function	KF Vol, Ext. Extr. V.	Scan KF V.	IM KF V., Stromb. V.
Auxiliary value	–	•	•
Blank	–	–	•
Calculation	–	•	•
Drift determination	–	–	•
Instruction	–	•	•
Record	–	•	•
Standby	–	•	•

7.3 Overview of Method Functions

Method function	Explanation	Inside loop	Outside loop
Title	Title and characteristics of the method.	No	Yes
Sample (KF)	Start of a sample loop for a Karl Fischer titration.	Start of loop	
Titration stand	Selects titration stand.	Yes	No
Drift determination	Determines the drift for Karl Fischer titrations.	Yes	Yes
Homogenizer	Controls a homogenizer and defines the speed (only for RS homogenizer) and duration of its usage.	Yes	No
Mix time	Duration of the mixing process. This value is gained from experience. It can be entered specifically for each sample.	Yes	No
Titration (KF Vol)	Conducts a volumetric Karl Fischer titration.	Yes	No

Method function	Explanation	Inside loop	Outside loop
Scan (KF Vol)	Volumetric Karl Fischer titration of a sample that is heated at a constant rate from a defined start to a defined end temperature.	Yes	No
Calculation	Converts the analysis results.	Yes	Yes
Record	Defines the record data to be output to the printer.	Yes	Yes
Auxiliary value	Assigns a result or an arbitrary value to an auxiliary value and updates the value stored in **Setup**.	Yes	Yes
Blank	Assigns a result or an arbitrary value to a blank and updates the value stored in **Setup**.	Yes	Yes
Instruction	Halts the analysis and displays instructions on the screen for the user.	Yes	Yes
Standby	Returns the titrator to standby mode on completion of a series, so that a new series can be started quickly.	No	Yes
End of sample	Concludes a sample loop.	End of loop	

7.4 Description of method functions

7.4.1 Title

Defines the title and type of a method of a method, and manages properties such as the creation and change date, the author, and whether or not the method is to be protected.

Parameters	Description	Values
Type	Shows the method type.	Compatible method types
Compatible with	Shows the titrator types for which this method can be loaded and executed.	Compatible titrator types
ID	Unique ID of the method.	Arbitrary
Title	Title of the method.	Arbitrary
Author	Shows the author of the method.	-
Created on	Shows creation date and creation time of the method.	–
Modified on	Shows date and time of the last change to the method.	-
Modified by	Shows the name of the user who made the last change.	–
Protect	Protects the method against changes and deletion by any user other than the author or the administrator.	Activ I Inactive
SOP	Standard operating procedure.	Activ I Inactive
SOP-Text	Text for a standard operating procedure Only if **SOP** = **Text** is selected.	Arbitrary
SOP-ID	ID for the link to a standard operating procedure. Only if **SOP** = **Link** is selected.)	Arbitrary

7.4.2 Drift determination

You can use the **Drift determination** method function to record the drift for Karl Fischer titration after a specific wait time. This method function can be inserted both within the loop (per sample) and outside the loop (per series).

Note

- The method function "Drift determination" applies only for methods of the type "Stromboli".

Parameters	Description	Values
Wait time	Here you can enter the time in [s] until the drift is to be recorded.	0…1000
Duration	You can enter the length of time in [min] for which the drift determination should last.	0 … 10
Interval	Defines the drift determination interval, i.e., after how many samples the drift determination will be performed. Appears only if the method function is used within a loop.	0 … 10

7.4.3 Sample (KF)

The **Sample (KF)** method function for Karl Fischer titration is subdivided into the subfunctions **Sample**, **Concentration**, and **Blank** (only for **Ext. Extraction Vol.**). You can define the following parameters:

Subfunction: Sample

Sample type is only available for the following method types:

- **IM KF V.**

Parameters	Description	Values
Sample type	Defines the type of sample used in the sample loop. The sample type is shown in the method editor, the sample data window and the report.	Sample I Standard I Blank
Number of IDs	Defines the number of sample IDs to be defined.	1…3
ID 1…ID 3	The name defined here will be used as the default name for the respective sample on the sample loop. Only appears subject to the settings made in **Number of IDs**.	Arbitrary
Entry type	Defines whether the sample should be added with a defined mass, defined volume or defined number of pieces. The sample data query will then adjust according to the unit of measurement. **Fixed volume** or **Fixed pieces**: The sampling weight, sample volume or number of pieces will be entered as the parameter in this method function and will not be prompted when conducting the method.	Weight I Fixed weight I Volume I Fixed volume I Pieces I Fixed pieces
Lower limit	Defines the lower limit for the variable entry of data. The unit will depend on the setting for the **Entry type** parameter. Only appears if **Entry type** is set to **Weight**, **Volume** or **Pieces**.	[g]: 0 … 1000 [mL]: 0 … 10^4 [pcs.]: 0…10^6
Upper limit	Defines the upper limit for the variable entry of data. The unit will depend on the setting for the **Entry type** parameter. Only appears if **Entry type** is set to **Weight**, **Volume** or **Pieces**.	[g]: 0 … 10^3 [mL]: 0 … 10^3 [pcs.]: 0 … 10^6
Weight	Weight in [g]. Appears only if **Entry type** = **Fixed weight** was selected.	0…1000
Value	Volume in [mL]. Only appears if for **Entry type** "Fixed" values are selected.	0...10^4
Pieces	The number of sample(s). Appears only if **Entry type** = **Fixed pieces** was selected.	0…10^6
Weight per piece	The weight in [g] per pirece. Appears only if **Entry type** = **Pieces** or **Fixed pieces** was selected.	0 … 1000
Density	The density of a liquid sample substance, in [g/mL]. Appears only if **Entry type** is set to **Weight**, **Volume**, **Fixed weight** or **Fixed volume**.	0.0001…100
Solvent weight	Quantity of solvent in [g] in which the sample was extracted or dissolved. Only for method type = **Ext. Extr.**.	0...1000

Wt. extracted sample	Total weight of sample in [g] which was extracted or dissolved in the solvent. Only for method type = **Ext. Extr.**.	0...1000
Correction factor	Any correction factor that can be used in calculations.	0.0001…10^6
Temperature	The temperature in [°C] during the analysis. If temperature monitoring is activated in a titration function, the system will ignore the sample temperature given here.	-20…200
Autostart	If activated, KF titration starts following a significant signal increase within 30 seconds after the start of the analysis (not for Stromboli or InMotion KF methods). If deactivated, the sample addition must be confirmed before titration can begin.	Activ l Inactive
Analysis start	If **Automatic** is selected, the analysis begins without any user confirmation if the value falls below the maximum start drift and the defined stability criterion **Drift stability**/dt and the set temperature are reached. If the standby is executed by the method function **Standby** (only for Stromboli and inMotion KF), the automatic start is not performed (affects the 2nd, 3rd....series). If the analysis is started manually, the series must be started explicitly in the Standby dialog.	Automatic l Manual
Drift stability	Maximum permitted drift difference in [µg/min]. Only for "Stromboli" method type and if **Analysis start** = **Automatic** is selected.	0...1000
Entry	Determines the input time for the sample size. **Before**: The sample size must be entered before the titration. **Arbitrary**: The sample size will have to be entered at any time during the titration (no later than when it is used during the calculations). Only appears if for **Entry type** no "Fixed" values are selected. **After addition**: You are prompted to enter the sample data once the sample has been added. The sample size - even during the method execution - can be entered later on (however, no later than when required for use in formulas).	Arbitrary l After addition

Subfunction: Concentration

To correctly determine the water content of a sample, the concentration of the titrant should be determined using Karl Fischer water standards. The concentration determination is performed using control and termination parameters.

Any predispensing defined in the method is not performed. A defined blank value is also not taken into account in the calculation. Following a concentration determination, the system always switches to standby mode to enable double and multiple determinations.

The concentration determination can be started manually. You can start the concentration determination of the KF titrant from **Standby** of any volumetric Karl Fischer (KF) method except **Scan KF V.**. You can determine the following parameters:

Parameters	Description	Values
Standard	Select the name of the standard from the standards list.	Select from the standards defined in the setup.
Entry type	Defines whether the sample should be added with a defined mass, defined volume or defined number of pieces. The sample data query will then adjust according to the unit of measurement. **Fixed volume** or **Fixed pieces**: The sampling weight, sample volume or number of pieces will be entered as the parameter in this method function and will not be prompted when conducting the method.	Weight l Fixed weight l Volume l Fixed volume l Pieces l Fixed pieces

Lower limit	Defines the lower limit for the variable entry of data. The unit will depend on the setting for the **Entry type** parameter. Only appears if **Entry type** is set to **Weight**, **Volume** or **Pieces**.	[g]: 0 … 1000 [mL]: 0 … 10^4 [pcs.]: 0…10^6
Upper limit	Defines the upper limit for the variable entry of data. The unit will depend on the setting for the **Entry type** parameter. Only appears if **Entry type** is set to **Weight**, **Volume** or **Pieces**.	[g]: 0 … 10^3 [mL]: 0 … 10^3 [pcs.]: 0 … 10^6
Weight	Weight in [g]. Appears only if **Entry type** = **Fixed weight** was selected.	0…1000
Value	Volume in [mL]. Only appears if for **Entry type** "Fixed" values are selected.	0…10^4
Pieces	The number of sample(s). Appears only if **Entry type** = **Fixed pieces** was selected.	0…10^6
Mix time	The duration of stirring in [s] with the defined "Stir" speed.	0…10^4
Autostart	If activated, KF titration starts following a significant signal increase within 30 seconds after the start of the analysis (not for Stromboli or InMotion KF methods). If deactivated, the sample addition must be confirmed before titration can begin.	Activ I Inactive
Entry	Determines the input time for the sample size. **Before**: The sample size must be entered before the titration. **Arbitrary**: The sample size will have to be entered at any time during the titration (no later than when it is used during the calculations). Only appears if for **Entry type** no "Fixed" values are selected. **After addition**: You are prompted to enter the sample data once the sample has been added. The sample size - even during the method execution - can be entered later on (however, no later than when required for use in formulas).	Arbitrary I After addition
Conc. lower limit	Defines the lower limit of the concentration limit.	0.1…100
Conc. upper limit	Defines the upper limit of the concentration limit.	0.1…100

Note

- Outside of these limits, the actual concentration is not entered in the setup.

Subfunction: Blank

The **Blank** method function assigns a determined water content to the solvent. The blank can be a fixed value, can be taken from the setup, or can be requested by the system.

Note

- The method function **Blank** is only available for the method type **Ext. Extraction Vol.**.

You can determine the following parameters:

Parameters	Description	Values
Source for blank	**Setup**: After the blank value is determined, the value and the unit of the blank are transferred to the settings. **Fix**: The value defined in the method is used. **Request**: The blank value in the relevant unit is requested before each sample. The specified blank value is labeled with "B" in the method function **Calculation**.	Setup I Fix value [%] I Fix value [ppm] I Request [%] I Request [ppm]
Value	Here you can enter a numerical value. Only appears if for **Entry type** "Fixed" values are selected.	0…10^6
Blank	The blank value assigned to the solvent to be determined. You can select a blank value defined in the settings.	Value from the settings

Unit	Defines the unit in which the blank value is calculated and used in a calculation. The unit for calculation with a blank value must be the same as the unit set here. Applies for the **Setup** option only.	% I ppm
Entry type	Defines whether the sample should be added with a defined mass or defined volume. The sample data query will then adjust according to the unit of measurement. For **Fixed weight** or **Fixed volume**, the sample mass and the sample volume are entered as parameters in the method function and not requested in the sequence of the method.	Weight I Fixed weight I Volume I Fixed volume
Lower limit	Defines the lower limit for the variable entry of sample data in [mL] or [g]. The unit will depend on the setting for **Entry type** parameter. Applies only for **Entry type** = **Weight** and **Volume**.	0...1000
Upper limit	Defines the upper limit for the variable entry of sample data in [ml] or [g]. The unit will depend on the setting for the **Entry type** parameter. Applies only for **Entry type** = **Weight** and **Volume**.	0...1000
Weight	Weight in [g]. Appears only if **Entry type** = **Fixed weight** was selected.	0…1000
Volume	Volume in [mL]. Appears only if **Entry type** = **Fixed volume** was selected.	0…1000
Density	The density of the liquid sample in [g/mL] for **Entry type** = **Volume** or **Fixed volume**.	0…1000
Mix time	The duration of stirring in [s] with the defined "Stir" speed.	$0…10^4$
Autostart	If activated, KF titration starts following a significant signal increase within 30 seconds after the start of the analysis (not for Stromboli or InMotion KF methods). If deactivated, the sample addition must be confirmed before titration can begin.	Activ I Inactive
Limits	Determines whether limits should be taken into account for acquisition of a value. If the value is outside these limits, the value is not transferred to Setup.	Activ I Inactive
Upper limit	Defines the upper limit of the blank. Appears only if **Limits** = **Active** was selected. Outside these limits, the blank value is not entered in the setup.	$0…10^6$

See also

Blanks ▶ Page 95

7.4.4 Titration stand

The method type determines which titration stands are available.

Parameters common to all titration stands

Parameters	Description	Values
Type	Defines the type of the titration stand.	Available titration stands
Titration stand	Defines which titration stand is to be used.	List of available titration stands

7.4.4.1 KF Stand

KF stand is available for the following method types:

- **KF Vol**
- **Ext. Extr. V.**

Parameters	Description	Values
Source for drift	Defines the source for the drift value used in the method function **Calculation**. **Online**: Drift value determined in the Standby mode, at the time the user taps **Start sample**. **Determination**: Result of a drift determination started from the **More KF functions** window. The result is saved in the KF titration stand that is used in the method. **Fix value**: Value defined in **Drift** **Request**: Value that the user enters after starting a sample analysis or a series.	Online I Determination I Fix value I Request
Drift	Defines the drift value.	0...1000 µg/min
Max. start drift	The maximum drift for which a sample determination can still be started.	0...1000 µg/min

7.4.4.2 InMotion KF

InMotion KF is available for the following method types:

- **IM KF V.**
- **Scan KF V.**

Controlled heating of the sample

With **Temperature ramp** you can heat a sample to the measurement temperature at a controlled rate. The water that the sample releases while it is heated, is included when the water content is calculated.

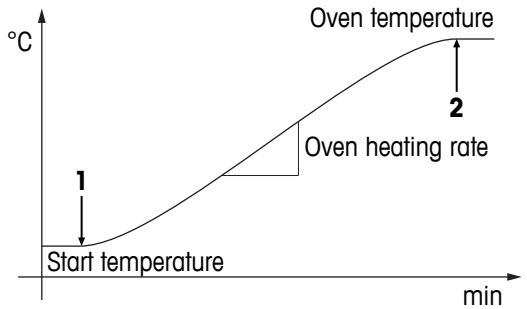
If the ambient temperature is higher than 30°C, the **Start temperature** needs to be at least 10 °C higher than the ambient temperature.

Temperature ramp is available for the following method functions:

- **IM KF V.**

Temperature ramp is activated:

- The sample changer inserts the sample in the oven when the temperature defined in **Start temperature** is reached (1).
- The sample is heated at the rate defined in **Oven heating rate**.
- The measurement starts when the oven reaches the temperature defined in **Oven temperature** (2) and the conditions defined in **Max. start drift** and **Drift stability** are met.
- At the end of the measurement the oven returns to the start temperature before the next sample is inserted.



Temperature ramp is deactivated:

- The sample changer inserts the sample in the oven when the temperature defined in **Oven temperature** is reached.

Define the maximum drift at the start of a measurement

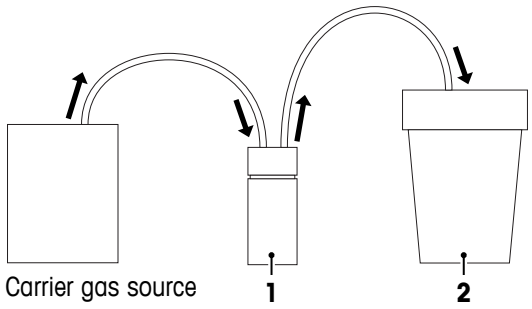
Max. start drift defines the upper limit for the drift at the start of the measurement. The measurement only starts, when the drift is lower than the value defined in **Max. start drift**. Drift is caused by water that continually diffuses into the titration stand and that is not part of the sample. The drift should be small and stable, because it is subtracted from the measured value when the water content is calculated. METTLER TOLEDO recommends a drift <10 µg/mL and if possible <5 µg/mL.

Source for drift defines which drift value is used in the method function **Calculation**. **Source for drift** is available for the following method types:

- **IM KF V.**

Define the carrier gas source

A gas flow carries the water from the vial (1) in the oven to the titration vessel (2).



Three basic setups are possible for the carrier gas source:

- An air pump KF from METTLER TOLEDO is installed on the InMotion KF to pump ambient air through the system. Set **Carrier gas source** to **InMotion KF** and define the flow rate of the carrier gas in **Flow rate**.
- A gas stop valve from METTLER TOLEDO is installed on the InMotion KF to control the gas flow from a pressurized gas cylinder or gas pipes. Set **Carrier gas source** to **InMotion KF** and define the flow rate of the carrier gas in **Flow rate**.
- It is possible to use another system. In this case the titrator cannot control the flow rate. If you want to use another system, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

Transfer tube heating

To minimize the amount of water that is lost due to condensation in the transfer tube, you can use a heated transfer tube and activate **Transfer tube heating**. If **Transfer tube heating** is activated, the heated transfer tube is heated.

Parameters	Description	Values
Temperature ramp	Defines whether a sample is heated at a controlled rate or not.	Activ I Inactive
Start temperature	Defines the start temperature of the temperature ramp. If the ambient temperature is higher than 30°C, the start temperature needs to be at least 10 °C higher than the ambient temperature.	40…280 °C
Oven heating rate	Defines the maximum heating rate of the temperature ramp.	0.1…75 °C/min
Oven temperature	Defines the measurement temperature of the oven sample changer.	40…280 °C
Source for drift	Defines the source for the drift value used in the method function **Calculation**. **Determination**: Result of a drift determination started from the **More KF functions** window. The result is saved in the KF titration stand that is used in the method. **Fix value**: Value defined in **Drift** **Request**: Value that the user enters after starting a sample analysis or a series.	Determination I Fix value I Request
Drift	Defines the drift value.	0…1000 µg/min
Max. start drift	The maximum drift for which a sample determination can still be started.	0…1000 µg/min
Carrier gas source	Defines the source of the carrier gas. **InMotion KF**: Either the air pump KF or the gas stop valve installed on the sample changer are used. **External**: A source independent of the sample changer is used.	InMotion KF I External
Flow rate	Defines the flow rate of the carrier gas.	20…200 mL/min
Transfer tube heating	Defines whether the titrator switches the heating of a heated transfer tube on or off.	Activ I Inactive

7.4.4.3 Stromboli

Stromboli is available for the following method types:

- **Stromb. V.**

Parameters	Description	Values
Oven temperature	Defines the measurement temperature of the oven sample changer.	50...300 °C
Source for drift	Defines the source for the drift value used in the method function **Calculation**. **Determination**: Result of a drift determination started from the **More KF functions** window. The result is saved in the KF titration stand that is used in the method. **Fix value**: Value defined in **Drift** **Request**: Value that the user enters after starting a sample analysis or a series.	Determination I Fix value I Request
Drift	Defines the drift value.	0...1000 µg/min
Max. start drift	The maximum drift for which a sample determination can still be started.	0...1000 µg/min

7.4.5 Homogenizer

The method function **Homogenizer** applies only for Karl Fischer titrations when not using the Stromboli oven sample changer, and does not apply for the method type **Homogenizer**. The TTL homogenizer can be switched on for a defined period of time.

For the TTL homogenizer, you can also determine the stir time:

Parameters	Description	Values
Name	Shows the type of homogenizer.	Homogenizer TTL
Duration	Duration in [s].	1...10^4

7.4.6 Mix time

You can use the **Mix time** method function to define the stir time in [sec] for Karl Fischer titration. This value is obtained from experience and can be entered individually for each sample.
The stir speed, however, is entered in the method function **Titration** using the **Stir** parameter. This applies for the whole method.

Parameters	Description	Values
Duration	Duration in [s].	1...10^4

7.4.7 Titration (KF Vol)

A volumetric Karl Fischer titration is performed using the **Titration (KF Vol)** method function. This function contains subfunctions which each have their own parameters.

7.4.7.1 Titrant

Parameters	Description	Values
Titrant	Select a titrant from the list of the defined titrants.	Titrant list
Nominal conc.	Specified concentration of the Karl Fischer titrant in [mg/mL].	0.1...100
Reagent type	Defines the type of Karl Fischer titrant used in the titration.	1-comp I 2-comp

See also

Titration (KF Vol) ▸ Page 53

7.4.7.2 Sensor

For Karl Fischer titrations, only polarized sensors are used.

Parameters	Description	Values
Type	Shows the type of sensor used to perform the measurement	Polarized
Sensor	Defines the sensor used to perform the measurement.	List of available sensors
Unit	Defines the unit of measure that is used for the measurement.	mV
Indication	Shows how the indication is done.	Voltametric
Ipol	Ipol is the polarization current for the voltametric indication.	0.0…24.0 µA

7.4.7.3 Stir

Parameters	Description	Values
Speed	Defines the stirring speed in [%].	0…100

7.4.7.4 Predispense

Parameters	Description	Values
Mode	Specifies the type of addition: **Volume**: predispenses a specific volume. **None**: does not predispense.	Volume I None
Volume	The volume to be predispensed in [mL]. Only for **Mode** = **Volume**.	0.0001…1000 I Auxiliary value I Formula
Wait time	Defines a waiting time, in [sec]. After predispensing or, if **Mode** = **None**, before the start of titration.	0…32000

7.4.7.5 Control

The maximum dosing rates are dependent on the size of the burette. The user is able to edit the entire value range. When Start is pressed, the system then checks whether the entered values are actually possible with the current burette size.

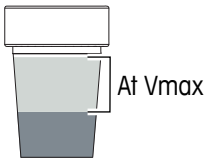
Burette size [ml]	Maximum dosing rate [mL/min]
1	3
5	15
10	30
20	60

Parameters	Description	Values
End point	End point in [mV] of the Karl Fischer titration and the standby titration.	-2000 … 2000
Control band	The value in [mV] defines the width of the control band. Outside the control band, the system will titrate with the maximum dispensing rate. The control band allows the dynamic behavior of the controller to be influenced. Reducing the control band causes a more aggressive control behavior, while increasing the control band gives a gentler control behavior. When the measurement curve reaches the control band, the titrator slows down the addition of titrant to approach the end point cautiously.	0.1...2000
Dosing rate (max)	The maximum dosing rate in [mL/min].	0.001…60
Dosing rate (min)	The minimum dosing rate in [µL/min].	1…10^4
Start	Cautious or normal start of a Karl Fischer titration.	Cautious I Normal

7.4.7.6 Termination

The titration is terminated when the value of **Max. time** or of **Drift** is reached and the time defined in **Min. time** has not passed.

To prevent the sample vessel from overflowing, the analysis is stopped at the latest when a defined maximum volume of titrant has been added. If the maximum volume of titrant has been added, the analysis is stopped even if other criteria are not met. The maximum volume is defined in **At Vmax**.



Parameters	Description	Values
Type	Termination of titration following defined drift and if the value falls below the end-point value (EP). **Drift stop relative**: Actual drift stop value = online drift + drift **Drift stop absolute**: Actual drift stop value = drift **Delay time**: Termination after a delay time below the EP.	Drift stop relative I Drift stop absolute I Delay time
Drift	The drift value in [µg/min] for the termination criterion drift stop relative or drift stop absolute.	1.0 ... 10^6
Delay time	Time in [s] from the time the end point is first reached until the termination of the titration.	0...6000
Min. time	Titration is not to be terminated before this time in [s] is reached (exception: the maximum volume has been reached).	0...10^8 I Auxiliary value
Max. time	Defines the maximum duration of the titration.	0...10^8 I ∞ I Auxiliary value
At Vmax	Defines the maximum volume of titrant that can be added before the analysis is stopped at the latest.	Activ I Inactive

7.4.8 Scan (KF Vol)

Scan (KF Vol) is available on the following titrator types:

- V30S

7.4.8.1 Titrant

Parameters	Description	Values
Titrant	Select a titrant from the list of the defined titrants.	Titrant list
Nominal conc.	Specified concentration of the Karl Fischer titrant in [mg/mL].	0.1...100
Reagent type	Defines the type of Karl Fischer titrant used in the titration.	1-comp I 2-comp

See also

Titration (KF Vol) ▸ Page 53

7.4.8.2 Sensor

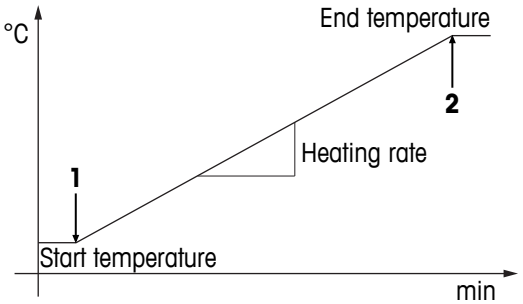
For Karl Fischer titrations, only polarized sensors are used.

Parameters	Description	Values
Type	Shows the type of sensor used to perform the measurement	Polarized
Sensor	Defines the sensor used to perform the measurement.	List of available sensors
Unit	Defines the unit of measure that is used for the measurement.	mV
Indication	Shows how the indication is done.	Voltametric
Ipol	Ipol is the polarization current for the voltametric indication.	0.0...24.0 µA

7.4.8.3 Temperature program

The parameters of the temperature program defines the temperature range and heating rate for the measurement. If the ambient temperature is higher than 30°C, the **Start temperature** needs to be at least 10 °C higher than the ambient temperature.

- The measurement starts (1) when the start temperature is reached and the conditions defined in **Max. start drift** and **Drift stability** are met..
- The measurement ends (2) when the end temperature is reached.



Parameters	Description	Values
Start temperature	Defines the temperature at which the measurement starts. If the ambient temperature is higher than 30°C, the start temperature needs to be at least 10 °C higher than the ambient temperature.	40…280 °C
Heating rate	Defines the rate at which the oven is heated during the measurement.	0.5…75 °C/min
End temperature	Defines the final temperature at the end of the measurement.	40…280 °C

7.4.8.4 Stir

Parameters	Description	Values
Speed	Defines the stirring speed in [%].	0…100

7.4.8.5 Control

The maximum dosing rates are dependent on the size of the burette. The user is able to edit the entire value range. When Start is pressed, the system then checks whether the entered values are actually possible with the current burette size.

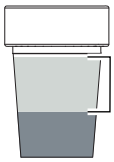
Burette size [ml]	Maximum dosing rate [mL/min]
1	3
5	15
10	30
20	60

Parameters	Description	Values
End point	End point in [mV] of the Karl Fischer titration and the standby titration.	-2000 … 2000
Control band	The value in [mV] defines the width of the control band. Outside the control band, the system will titrate with the maximum dispensing rate. The control band allows the dynamic behavior of the controller to be influenced. Reducing the control band causes a more aggressive control behavior, while increasing the control band gives a gentler control behavior. When the measurement curve reaches the control band, the titrator slows down the addition of titrant to approach the end point cautiously.	0.1…2000
Dosing rate (max)	The maximum dosing rate in [mL/min].	0.001…60
Dosing rate (min)	The minimum dosing rate in [µL/min].	1…10^4

7.4.8.6 Termination

The analysis stops when the end temperature is reached.

To prevent the sample vessel from overflowing, the analysis is stopped at the latest when a defined maximum volume of titrant has been added. If the maximum volume of titrant has been added, the analysis is stopped even if other criteria are not met. The maximum volume is defined in **At Vmax**.



Parameters	Description	Values
At Vmax	Defines the maximum volume of titrant that can be added before the analysis is stopped at the latest.	Activ I Inactive

7.4.9 Auxiliary value

This method function assigns a result or arbitrary value to an auxiliary value.

Define limits for the auxiliary value

If **Limits** is activated, the titrator checks if the auxiliary value falls within the limits defined in **Lower limit** and **Upper limit**. If the auxiliary value lies outside the limits, it is marked as such.

Configure the action of the system if the auxiliary value lies outside the limits

The table below shows the settings for the four possible actions of the system if the auxiliary value lies outside of the limits.

Action of the system	Message outside limits	Stop outside limits
The analysis continues. The user is not informed that the value lies outside of the limits.	**Inactive**	**Inactive**
A message opens and informs the user that the value lies outside of the limits. The analysis is interrupted until the user confirms the message.	**Active**	**Inactive**
The analysis is stopped. A message opens and informs the user that the value lies outside of the limits.	**Active**	**Active**
The analysis is stopped. The user is not informed that the value lies outside of the limits.	**Inactive**	**Active**

Parameters	Description	Values
Name	Specify a descriptive name of your choice.	Arbitrary
Formula H=	Here you can enter a formula that will be used to convert the result of the sample loop to the auxiliary value. You can also enter a number or an auxiliary value.	Formula (see "Evaluation and calculation") I Auxiliary Value I Number
Limits	Determines whether limits should be taken into account for acquisition of a value. If the value is outside these limits, the value is not transferred to Setup.	Activ I Inactive
Message outside limits	Defines whether a message opens that informs the user that the value lies outside of the limits.	Activ I Inactive
Stop outside limits	Defines whether the analysis is stopped if the value lies outside the defined limits.	Activ I Inactive
Lower limit	Defines the lower limit of the value. Only if **Limits** = **Active**	-10^8 … 10^8

Upper limit	Defines the upper limit of the value. Only if **Limits** = **Active**	-10^8 … 10^8

7.4.10 Blank

This method function assigns a result or an arbitrary value to a blank value, including units (only for methods of type **Stromboli**).

Define limits for the blank value

If **Limits** is activated, the titrator checks if the blank value falls within the limits defined in **Lower limit** and **Upper limit**. If the blank value lies outside the limits, it is marked as such.

Configure the action of the system if the blank value lies outside the limits

The table below shows the settings for the four possible actions of the system if the blank value lies outside of the limits.

Action of the system	Message outside limits	Stop outside limits
The analysis continues. The user is not informed that the value lies outside of the limits.	**Inactive**	**Inactive**
A message opens and informs the user that the value lies outside of the limits. The analysis is interrupted until the user confirms the message.	**Active**	**Inactive**
The analysis is stopped. A message opens and informs the user that the value lies outside of the limits.	**Active**	**Active**
The analysis is stopped. The user is not informed that the value lies outside of the limits.	**Inactive**	**Active**

Parameters	Description	Values
Name	Specify a descriptive name of your choice.	Arbitrary
Value B=	Here you can enter a formula that will be used to convert the sample loop result to the blank. You can also enter a number or an auxiliary value.	Formula (see "Evaluation and Calculation") I Auxiliary value I Number
Unit	The units in which the blank is specified.	Arbitrary
Limits	Determines whether limits should be taken into account for acquisition of a value. If the value is outside these limits, the value is not transferred to Setup.	Activ I Inactive
Message outside limits	Defines whether a message opens that informs the user that the value lies outside of the limits.	Activ I Inactive
Stop outside limits	Defines whether the analysis is stopped if the value lies outside the defined limits.	Activ I Inactive
Lower limit	Defines the lower limit of the value. Only if **Limits** = **Active**	-10^8 … 10^8
Upper limit	Defines the upper limit of the value. Only if **Limits** = **Active**	-10^8 … 10^8

7.4.11 Instruction

Interrupts the analysis and outputs an on-screen instruction to the user. Either the user has to confirm the instructions or they will disappear automatically after a certain period.

Parameters	Description	Values
Instruction	The text of the instructions to be output to the display. This text can also contain a formula or auxiliary values, enclosed in percent symbols. Example: "Add %VEQ*m/z% g".	Arbitrary, including enclosed formula (control characters: %)
Continue after	**Confirmation**: The analysis will continue as soon as the user confirms the instructions. **Time interval**: The analysis is continued after the defined time period has elapsed.	Confirmation I Time interval
Time interval	The time period, in [sec], during which the analysis is terminated and the instructions are displayed on the screen. Only appears if **Continue after** = **Time interval** is selected.	0…10^6
Print	If selected, the instructions will be output to a connected printer.	Activ I Inactive

7.4.12 Calculation

For converting the titration results.

The **Result type** cannot always be changed by the user. If **Result type** is not available, it is set to **Predefined** or **User defined** depending on the type of titrator and the type of titration.

Define limits for the results

If **Result limits** is activated, the titrator checks if the result falls within the limits defined in **Lower limit** and **Upper limit**. If the result lies outside the limits, it is marked as such.

Configure the action of the system if the result lies outside the limits

The table below shows the settings for the four possible actions of the system if the value of the result lies outside of the limits.

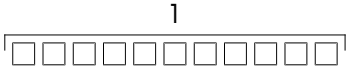
Action of the system	Message outside limits	Stop outside limits
The analysis continues. The user is not informed that the value lies outside of the limits.	**Inactive**	**Inactive**
A message opens and informs the user that the value lies outside of the limits. The analysis is interrupted until the user confirms the message.	**Active**	**Inactive**
The analysis is stopped. A message opens and informs the user that the value lies outside of the limits.	**Active**	**Active**
The analysis is stopped. The user is not informed that the value lies outside of the limits.	**Inactive**	**Active**

Define a maximum relative standard deviation for all samples or groups of samples

You can only define a maximum relative standard deviation if you use the **Calculation** method function within a loop.

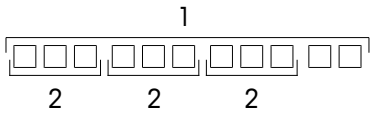
Activate **Extra statistical functions** to define a maximum relative standard deviation for all samples in the sample loop. If the calculated relative standard deviation (srel) is higher than the value defined in **Max. srel**, it is marked in the record.

- Example: The relative standard deviation is calculated for all 11 samples in the loop (1). This realtive standard deviation is compared to the value defined in **Max. srel**.



Activate **Extra statistical functions** and **Multiple determination** to calculate the relative standard deviation for groups of samples in addition to the relative standard deviation of all samples. **Number of samples** defines how many results are combined to calculate the relative standard deviation of groups. The relative standard deviation of each group is compared to the value defined in **Max. srel** and marked if it exceeds the value.

- Example: The relative standard deviation is calculated for all 11 samples in the loop (1). In addition the relative standard deviation is calculated for groups of three samples (2) because **Multiple determination** is activated and the **Number of samples** is set to 3.



Configure the action of the system if the maximum relative standard deviation is exceeded

You can only configure the action of the system if **Multiple determination** is activated.

The table below shows the settings for the four possible actions of the system if the relative standard deviation exceeds the maximum relative standard deviation.

Action of the system	Message above max. srel	Stop above max. srel
The titrator only records that the relative standard deviation of a group is higher than the value defined in **Max. srel**.	**Inactive**	**Inactive**
A message opens and informs the user that the relative standard deviation of a group is higher than the value defined in **Max. srel**. The analysis is interrupted until the user confirms the message.	**Active**	**Inactive**
The analysis is stopped. A message opens and informs the user that the relative standard deviation of a group is higher than the value defined in **Max. srel**.	**Active**	**Active**
The analysis is stopped. The user is not informed that the relative standard deviation of a group is higher than the value defined in **Max. srel**.	**Inactive**	**Active**

Parameter description

Parameters	Description	Values
Result type	**Predefined**: a predefined result from the proposal list has to be used and the parameters **Result unit**, **Formula**, and **Constant C=** cannot be changed. The parameters **Result**, **Result unit**, **Formula**, and **Constant C=** are adjusted automatically in accordance with the parameter settings in the method function **Sample (KF)**. **User defined**: a predefined result from the proposal list or a user defined result can be used. All parameters can be changed. There is no automatic adjustment of the parameters **Result**, **Result unit**, **Formula**, and **Constant C=**	Predefined I User defined
Result	Defines the name for the result of the calculation. If you select a result from the dropdown list **Result proposals**, the system automatically sets the parameters **Result unit**, **Formula** and **Constant C=** parameters. You can change the parameters **Result**, **Result unit**, **Formula** and **Constant C=** independently from each other, if **Result type** is set to **User defined**.	Results list I Arbitrary
Result unit	Defines the unit of the result. If you select a result from the dropdown list **Result proposals**, the system automatically sets the parameter **Result unit**. You can change the parameter **Result unit** independently, if **Result type** is set to **User defined**.	Results list I Arbitrary

Formula	Defines the formula for calculating the result. If you select a result from the dropdown list **Result proposals**, the system automatically sets the parameter **Formula**. You can change the parameter **Formula** independently, if **Result type** is set to **User defined**.	Results list I Arbitrary
Constant C=	Defines the constant C which can be used in the calculation. The constant C can itself be a formula. If you select a result from the dropdown list **Result proposals**, the system automatically sets the parameter **Constant C=**. You can change the parameter **Constant C=** independently, if **Result type** is set to **User defined**.	Results list I Arbitrary
Decimal places	The number of decimal places for the result.	0…6
Result limits	Defines whether limits should be observed for the result. If this function is activated, there will be a message in the record if the result falls outside the defined limits.	Activ I Inactive
Lower limit	Defines the lower limit of the result.	-10^8 … 10^8
Upper limit	Defines the upper limit of the result.	-10^8…10^8
Message outside limits	Defines whether a message opens that informs the user that the value lies outside of the limits.	Activ I Inactive
Stop outside limits	Defines whether the analysis is stopped if the value lies outside the defined limits.	Activ I Inactive
Record statistics	Specifies whether statistics should also be issued with the results in the report along with the result. The statistics are not printed, if in the method function **Record** the parameter **Results** is not selected.	Activ I Inactive
Extra statistical functions	Defines whether the relative standard deviation is compared to a maximum relative standard deviation. **Active**: the relative standard deviation of all samples in a loop is compared to the value defined in **Max. srel**. If the relative standard deviation is higher than **Max. srel**, it is marked in the record. **Inactive**: the relative standard deviation is not evaluated.	Activ I Inactive
Multiple determination	Defines whether the relative standard deviation is calculated for groups of samples and compared to a maximum relative standard deviation. **Active**: the relative standard deviation of groups of samples is compared to the value defined in **Max. srel**. If the relative standard deviation is higher than **Max. srel**, it is marked in the record. **Inactive**: the relative standard deviation is only calculated for all samples in a loop.	Activ I Inactive
Max. srel	Defines the maximum relative standard deviation.	0…100
Number of samples	Defines the sample groups for a multiple determination. For example, a value of 3 means that the system will run a statistical evaluation on three consecutive samples.	2…9
Message above max. srel	Defines whether a message opens as soon as the relative standard deviation of a sample group within a multiple determination is above the value defined in **Max. srel**.	Activ I Inactive
Stop above max. srel	Defines whether the analysis is stopped if the relative standard deviation of a group is higher than the value defined in **Max. srel**.	Activ I Inactive

Record	If selected, the multiple determination function will create a record listing the groups after a double determination whose relative standard deviation lies above a "Max. srel" number defined in the method. Appears only if **Extra statistical functions** and **Multiple determination** = **Active**.	Activ I Inactive

7.4.13 Record

This method function defines the type and scope of the data to be output for a report using the printer (see "Peripherals>Printer").

If the method function **Record** is placed within a sample loop, the record will include all previous method functions within the current sample loop.

If the method function **Record** is placed outside of a sample loop, the record will include all previous method functions listed after the last sample loop in the method procedure. A few settings are not available outside of a loop.

Parameters	Description	Values
Summary	States whether or not a short summary of the results should appear at the top of the protocol.	Inactive I Per sample I Per series out of loop: Activ I Inactive
Results	The results from the **Calculation** method functions. Any statistic selected will be recorded after the last sample of a series or multiple determination.	within loop: Per sample I Per series I Inactive Out of Loop: Activ I Inactive
Raw results	The raw results produced during the determination	within loop: Per sample I Per series I No Out of Loop: Activ I Inactive
Measure (Measured values table)	The table of measured values of the current sample (not available out of loop).	Activ I Inactive
Sample data	The sample data of a sample loop. (Not available outside of loop)	Per sample I Per series I Inactive
Resource data	All data in the setup regarding the resources used in the method.	Per sample I Per series I Inactive
E – V	Titration curve of the current sample. The potential is plotted against the volume (not available out of loop).	Yes I No
E - t	Titration curve of the current sample. The potential is plotted versus the time (not available outside of loop).	Activ I Inactive
V – t	Titration curve of the current sample. The volume is plotted versus the time. (not available outside of loop)	Yes I No
H2O - t	Titration curve of the current sample. The water content is plotted against the time (not available out of loop).	Activ I Inactive
Drift - T	The titration curve "Drift" against "Time" (not available out of loop).	Activ I Inactive
H2O - T & Drift - T	Two overlaid titration curves "H_2O – t" and "Drift-t" of the current sample (not available out of loop).	Activ I Inactive
V - t & Drift - t	Two overlaid titration curves "V – t" and "Drift-t" of the current sample (not available out of loop).	Yes I No
Method	Printout of the method used.	Activ I Inactive
Series data	All data from the series run.	Activ I Inactive

7.4.14 End of sample

The **End of sample** method function closes a sample loop. A sample loop refers to the range of a method through which a sample series will pass for each sample. The commencement of a sample loop is specified using the **Sample** or **Sample (KF)** method function.

Parameters	Description	Values
Open series	Determines whether the subsequent method functions are processed after the method function **End of sample**, or if the titrator returns to Standby mode.	Activ I Inactive

Note

- The parameter **Open series** is only available for Karl Fischer titration without the Stromboli oven sample changer. If **Open series** is set, the titrator enters **Standby** mode at the end of the analysis and the method remains active. If **Open series** is not set, the method is ended after the final sample.

7.4.15 Standby

The **Standby** method function can only be inserted in methods of the type Stromboli after the method function **End of sample**. This method function determines whether the method is terminated at the end of the series, or if the method remains active and then enters standby mode for the first loop.

7.4.16 Hidden method functions

The following hidden functions exist for Karl Fischer methods: Pretitration and standby.

When a Karl Fischer method is started, the system first performs a pretitration. The titrator then switches to Standby mode. The system switches automatically between Standby and Pretitration. The switch criterion is the drift value.
If the pretitration lasts longer than 30 minutes, a system message is displayed informing you that the pretitration cannot be ended because the drift value is too high. You can end the pretitration, and then cancel the method or series or restart the pretitration.

8 Series templates

Series templates are used for a sequential series of samples processed using the same method (templates for sample series (SAS)).

Using series templates, you can group multiple (up to 303) individual samples into one **sample series**, so that all the samples in the series can be analyzed consecutively using a defined method.

The list of series templates shows you all the series templates defined in the titrator. Each series template is shown in the list with its type (SAS = Sample series) and name.

If you select a series template from this list, you can change its parameters or delete the entire template.

Note

- You can create a shortcut on the Home screen for all series templates.
- A maximum of 60 sample series can be saved in the titrator.
- Series templates cannot be created for concentration and blank samples.

8.1 Sample series

Navigation: **New** > **Series templates**

Parameters	Description	Values
Sample series ID	Here you can assign any ID to the sample series.	Arbitrary
Method ID	Here you can select the Method ID for the relevant method.	Method list
Comment	You can enter a brief comment about the series.	Arbitrary
Number of samples	Defines the number of samples to be analyzed. The number depends on the selected titration stand.	1…303

Note

If you select a template of type **Stromboli**, the **Loop** and **No. of samples** parameters are repeated according to the number of loops in the assigned method (maximum 14).

During the creation of a sample series, you can use the **Samples** button to go to the loop list (if the assigned method includes more than one loop) or go directly to the sample list (if the assigned method only contains one loop).
From the loop list, you can select a loop to go to the sample list for that loop.

8.2 Sample parameters

The sample list, which can be opened by choosing **Samples** in the series template, displays all samples of a loop with a number, the first ID, and the sample size (depending on entry type - see "[Method functions: Sample" ▸ Page 47]). You can also edit the samples here.

Note

Series IDs must be unique, although sample IDs do not have to be.

If you want to select an entry from the list or use the **New** button to create a new list entry, you can define the following parameters for each sample:

Parameters	Description	Values
Number	Defines the number of the sample.	1…303

A number is automatically assigned when you create a new list entry.

ID	A user-defined name for the ID of the sample, in accordance with the "Sample" method function.	Arbitrary
Sample size	You can enter the sample size here. For fixed entry types, this field only appears as an info field.	0…1000 [g] l [mL] 0…10^6 [pcs.]
Density	The density of the sample for the entry types "Weight", "Fixed weight", "Volume" and "Fixed volume".	0.0001…100
Weight per piece	The weight in [g] per pirece. Appears only if **Entry type** = **Pieces** or **Fixed pieces** was selected.	0 … 1000

Solvent weight	Quantity of solvent in [g] in which the sample was extracted or dissolved. Only for method type = **Ext. Extr.**.	0...1000
Wt. extracted sample	Total weight of sample in [g] which was extracted or dissolved in the solvent. Only for method type = **Ext. Extr.**.	0...1000
ID 2…ID 3	The name defined here will be used as the default name for the respective sample on the sample loop. Only appears subject to the settings made for **Number of IDs**.	Arbitrary
Comment	You can enter a brief comment about the series.	Arbitrary
Correction factor	Any correction factor that can be used in calculations.	$0.0001…10^6$
Temperature	The temperature in [°C] during the analysis.	-20…200

Note

For entering the sample parameters, particularly for numerous samples, the titrator provides you with assistance in the entry windows of the **ID 1** and **Sample size** parameters:

These extra icons are a quick, direct way to jump to the entry window of the previous sample or next sample.

9 Results

The dialog **Results** can be accessed directly from **Home** using the button **Results**.

Note

- In the V10S and the V20S, only the results of the last analysis are saved, in the V30S, the results of the last four analyses can be selected by pressing the button **Select Series**.
- When you start a new analysis on V10S and V20S, you will lose the results from the previous analysis.
- If you have run four analyses on V30S and start a new analysis, you lose the results from the fourth last analysis.
- You can view results immediately after they have been recorded (for the same determination type: sample, concentration, or blank determination).

You can use the various buttons in the **Results** dialog to call up different functions. Some examples are listed below:

- View all results of the last analysis (V10S and V20S) or the last four individual samples or series (V30S).
- Add a supplementary result calculation both within the loop (for all samples in the analysis), and outside a loop (once for the entire analysis).
- View statistics, perform an outlier test and if necessary, exclude samples from the statistics.
- Perform recalculations for results in which certain raw data (e.g. sample sizes) have to be adapted retrospectively for a single sample or for all samples in a series.
- View and print the status and the calculated results of each individual sample.

Results are retained until new results are generated by methods. The results of the "older" of the two sample series are replaced.
In KF methods, the function **End series** can be used to generate a new result entry during the execution of a method. After the series is finished, the original sample parameters are used, i.e. the changes made in the dialog **Start analysis** or later are not taken into account. A new series is entered in the results.

Note

- In Karl Fischer (KF) titrations, the results are divided into the three determination types **Sample type**, **Concentration**, and **Blank**. All options for managing results only have an effect on the determinations of one particular determination type.
- While an analysis is running, only the current determination type is available.

If a determination type (**Sample type**, **Concentration**, or **Blank**) is started for a second time, existing data are overwritten.

All the changes performed on the saved results can be reversed by tapping **Undo all**.

Note

- Changes to results are indicated by an asterisk in the record. Example: VEQ*.

9.1 All results

You can use the **All Results** button to view the results of the last analysis and print them if a printer is connected to the titrator (see "Printer").

From the **Results** dialog, you also have the following additional options:

- **New** Add an additional result
- **Samples** View or print the results of an individual sample or exclude the entire sample
- **Statistics** Switch to the "Statistics" dialog

9.2 Add result

Tap **Add result** to add a subsequent result calculation to your analysis results. To do that, you will first have to specify whether the calculation should be run inside or outside a loop. For calculations within a loop, the result will be added for all the samples (of the same loop) of a series. You may still be able to select the required loop. The other parameters must be entered in accordance with the method function **Calculate**.

Tap **Calculate** to calculate the additional result and add it to your analysis results. If you are missing raw data or raw results for the calculation and cannot calculate the result for that reason, the result **NaN** (not a number) will be added.

To view predefined result proposals for KF vol titration, tap **Results** > **Add result** > **Result proposals**.

See also

Result proposals ▶ Page 110

9.3 Statistics

For results within a sample loop, you can display and print out statistics.

Note

- The statistics are only created if more than one sample was analyzed in the corresponding loop.
- If you selected "Statistics functionalities" = "Yes" and "Multiple determination" = "Yes" in the associated "Calculate" method function, the system will create the statistics for the entire series and also individually for multiple samples within the series.

The following calculated values will be displayed as statistical components:

- Mean value x `of a result` Rx (Mean [Rx])
- Standard deviation `s`
- Relative standard deviation `srel`
- Number of samples per loop `nTOT`

If a result was excluded from the statistics, all the results from that sample will always be excluded as well. The system will then recalculate the statistics without the excluded sample and label them accordingly. If the sample's results are then put back into the statistical evaluation, the label will be removed from the statistics.

From the **Statistics** dialog, you also have the following additional options:

- **Samples** View, print, or exclude the results of an individual sample
- **Results** View or print all results
- **Outlier test** Perform a test for outliers in the statistical evaluation.

9.3.1 Outlier test

If the results of individual samples in a measurement series deviate greatly from the calculated mean value, it may make sense to question the significance of these (few) results and treat them as "outliers".

Outliers will have the following effects on the overall result of an analysis:

- The mean value is significantly shifted higher or lower.
- The standard deviation is increased.
- The distribution of the individual values around the mean value is distorted and no longer follows a normal distribution.

The titrator has an automatic function for identifying and labeling outliers. You can call this function from the **Statistics dialog** using the "**Outlier test**" softkey.

Note

You can run an outlier test if you have the results from more than three samples.

The procedure used by the titrator is the Grubbs outlier test. For this procedure, the measured value [x*] that has the greatest deviation from the calculated mean value is analyzed.This number is used in the following equation, together with the mean value [$\overline{x}$] and the standard deviation [s]:

$$PG = \frac{|x^* - \overline{x}|}{s}$$

The test variable [PG] is then compared with the corresponding value in the Grubbs table G (N, 90%), which in turn depends on the number of measured values N:

N (number of samples)	1	2	3	4	5	6	7	8	9	10
90 %	-	-	1.15	1.46	1.67	1.82	1.94	2.03	2.11	2.18
N (number of samples)	11	12	13	14	15	16	17	18	19	20
90 %	2.23	2.29	2.33	2.37	2.41	2.44	2.48	2.5	2.53	2.56
N (number of samples)	21	22	23	24	25	26	27	28	29	30

90 %	2.58	2.6	2.61	2.63	2.65	2.67	2.69	2.7	2.72	2.74
N (number of samples)	31	32	33	34	35	36	37	38	39	40
90 %	2.75	2.77	2.78	2.79	2.81	2.82	2.83	2.84	2.86	2.87
N (number of samples)	41	42	43	44	45	46	47	48	49	50
90 %	2.88	2.89	2.9	2.91	2.92	2.92	2.93	2.94	2.95	2.96
N (number of samples)	51	52	53	54	55	56	57	58	59	60
90 %	2.97	2.97	2.98	2.99	3	3	3.01	3.02	3.02	3.03
N (number of samples)	61	62	63	64	65	66	67	68	69	70
90 %	3.03	3.04	3.04	3.05	3.05	3.06	3.06	3.07	3.07	3.08
N (number of samples)	71	72	73	74	75	76	77	78	79	80
90 %	3.08	3.08	3.09	3.09	3.1	3.1	3.11	3.11	3.12	3.12
N (number of samples)	81	82	83	84	85	86	87	88	89	90
90 %	3.12	3.13	3.13	3.14	3.14	3.15	3.15	3.16	3.16	3.17
N (number of samples)	91	92	93	94	95	96	97	98	99	100
90 %	3.17	3.17	3.18	3.18	3.19	3.19	3.2	3.2	3.21	3.21
N (number of samples)	101	102	103	104	105	106	107	108	109	110
90 %	3.21	3.22	3.22	3.22	3.23	3.23	3.23	3.23	3.24	3.24
N (number of samples)	111	112	113	114	115	116	117	118	119	120
90 %	3.24	3.22	3.25	3.25	3.26	3.26	3.26	3.26	3.27	3.27

If the calculated test variable PG is greater than the corresponding value taken from the table, the measured value x* is identified as an outlier and marked accordingly.
After an outlier has been identified, the test is repeated with the remaining measured values (without the already identified outlier) using the newly calculated mean value and new standard deviation. This process is repeated continually until no further outlier can be identified.
It is then the user's responsibility to exclude any identified outliers from the statistics. After confirmation, the entire sample is excluded and the statistics are recalculated without the identified and excluded outliers.

9.4 Recalculate

The function **Recalculate** lets you subsequently recalculate existing results from one sample or from an entire series. On the basis of this new calculation, specific sample data can be subsequently changed or a new formula can be entered.
For example, the sample size or the correction factor can be adjusted, if these values were erroneously entered incorrectly in the method or in the method start.

A recalculation can be performed for:

- Samples or determinations within a sample or titer loop, and for all concentration or blank determinations.
- Karl Fischer determination (sample, blank or concentration).

Note

- New raw data cannot be generated, therefore changes can only be made to existing data.
- If you change data in the function **Recalculate**, all the calculations that depend on that data (both directly and indirectly), inside and outside loops, are rerun and labeled accordingly.
  These calculations refer only to the current determination type. The original raw results are not deleted.

The following sample data can be subsequently changed:

For titrations of type KF

Changeable parameters	**Can be changed in recalculations**					
	Individual determination of type			**All determinations of loop type**		
	Sample	**Blank**	**Concentration**	**Sample**	**Blank**	**Concentration**
Sample size	Yes**	Yes**	-	Yes*	Yes*	-
Standard size	-	-	Yes**	-	-	Yes*

Changeable parameters	Can be changed in recalculations					
	Individual determination of type			All determinations of loop type		
	Sample	Blank	Concen-tration	Sample	Blank	Concen-tration
Density	Yes	Yes	-	Yes	Yes	-
Weight per piece	-	-	-	Yes	-	Yes
Correction factor	Yes	-	-	Yes	-	-
Water content	-	-		-	-	Yes
Standard density	-	-	Yes	-	-	Yes

* Only for **Entry type** = Fix

** Only for **Entry type** = Variable

9.5 Samples

You can use the **Samples** button to display and print the status and calculated results for each individual sample. The same applies for a series of additional data sets that can be accessed via "**Data**". This will let you view and print the sample, method and resource data for each sample and view and print the raw results and the measured values.

You can use the **Exclude** button in the Results: **Samples** dialog to exclude individual samples from the statistical evaluation. The system will not delete the results of the samples excluded in this way but merely label them as excluded. They will no longer be included in the statistics. Samples that have been excluded can be returned to the statistics at any time by choosing "**Include**".

After a sample is excluded, all affected calculations (inside and outside of loops) are performed again. In KF titrations, the new calculations refer only to the current determination type.

Note

If you exclude a sample from a sample group in a multiple determination, no more statistics will be generated for that group. The system will continue to create individual statistics for the remaining sample groups and for all the remaining samples overall.

9.6 Undo all

If you make changes to the results saved by the titrator after the analysis, you can use **Undo all** to discard them. Afterward, the system will reinstate the initial status directly after the conclusion of the analysis, in its original and unchanged state.

9.7 Delete all results

You can use this button to delete all the data (raw data, raw results, and results) saved by the titrator in the results area. The deletion only ever refers to one determination type. If the last determination type in the sample series is deleted, the whole sample series is automatically deleted.

10 Setup

This section tells you how to set up the titrator in accordance with your requirements so that you can carry out titration.

Chemicals	**Titrant**
	Concentration standards
Hardware	**Sensors**
	Pumps
	Peripherals
	Titration Stands
	Homogenizer
User settings	**Language**
	Screen
	Audio signal
	Shortcuts
	Keyboard
Global settings	**System**
	User management
	Analysis and resources behavior
	Solvent Control
Values	**Blank**
	Auxiliary values
Mainten. & Service	**MT-Service**
	Import / Export
	Reset to factory settings
	Titrator firmware history
	Board firmware
	Terminal
	Board data
	Drives
	Burettes
	Update

Expired resources

Navigation: **Home** > **Setup**

Resources for which monitoring was selected in the settings can expire. Tap **Expired resources** to open an overview of all expired resources with the type, name and date of expiry of the respective resource.

10.1 Chemicals

You can use the **Chemicals** dialog to configure and manage titrants and concentration standards. You can view and print out lists of chemicals that have already been defined. You can also define new chemicals or delete existing chemicals.

10.1.1 Titrant

Navigation: **Home** > **Setup** > **Chemicals** > **Titrants**

Titrants are managed together with burettes and burette drive (PnP with chip and traditional burettes without chips).
For classical burettes, the relevant titrant data is entered manually. For PnP (Plug&Play) burettes, the data is automatically read from the chip and automatically transferred to the instrument. If the chip is still blank, the data must be entered in **Setup** or assigned to a titrant. The data is saved in both the titrator and in the chip.

Add a titrant

1 In **Titrants** choose **New**.
2 Check the parameter settings and if needed, adjust them.
3 Tap **Save**.

Parameters	Description	Values
Name	Specify a descriptive name of your choice.	Arbitrary
Reagent type	Defines the type of Karl Fischer titrant used in the titration.	1-comp I 2-comp
Nominal conc.	Specified concentration of the Karl Fischer titrant in [mg/mL].	0.1…100
Current conc.	Actual concentration of the Karl Fischer titrant in [mg/mL].	0.1…100
Monitoring usable life	Specifies whether the usable life of a resource or a value is to be monitored.	Activ I Inactive
Monitoring life span	Specifies whether the life span of the resource is to be monitored.	Activ I Inactive
Shelf life	Defines the expiration date of the chemical as given by the supplier.	Date
Lot/Batch	The lot or batch of the reagent. Enter any designation.	Arbitrary
Fill rate	The filling rate of the burette in percent. 100% stands for maximum filling rate.	30…100
Burette volume	Select the burette volume in [mL].	1 I 5 I 10 I 20
Drive	Defines the drive on which you will use the burette containing the titrant. Select the "PnP" entry for available but unused PnP burettes.	1…8 I PnP
Serial number	The serial number of the relevant device type.	Arbitrary

Note

- Titrants (independently of the type) must each be assigned to a drive.
- In PnP burettes, the serial number is entered automatically. These can, however, be changed.

See also

Titration (KF Vol) ▸ Page 53

10.1.2 Concentration standards

Navigation: **Home** > **Setup** > **Chemicals** > **Concentration standards**

The concentration standards required for determining the concentration of the titrant you use can also be saved and managed in the titrator.

Add a standard

1 In **Concentration standards**, choose **New**.
2 Check the parameter settings and if needed, adjust them.
3 Tap **Save**.

Parameters	Description	Values
Name	Specify a descriptive name of your choice.	Arbitrary
Water content	The water content of a Karl Fischer standard.	0.00001…10^6
Unit	Unit for the water content of the Karl Fischer standard.	mg/g I mg/mL I % I ppm I mg/piece

Density	The density of a liquid standard, in [g/mL]. Only for **Type** = **liquid** or **KF**.	0.0001…100
Lot/Batch	The lot or batch of the reagent. Enter any designation.	Arbitrary
Container ID	Defines the ID of the container that contains the chemical.	1…30 characters
Article number	Defines the article number of the chemical.	1…30 characters
Supplier	Defines the name of the company that supplied the chemical.	1…30 characters
Monitoring usable life	Specifies whether the usable life of a resource or a value is to be monitored.	Activ l Inactive
Shelf life	Defines the expiration date of the chemical as given by the supplier.	Date

Note

- All fields except for "Lot/Batch" must be filled before the standard can be saved.
- A maximum of 50 concentration standards can be defined in the device.

The following Karl Fischer standards are predefined:

1. Water standards in [mg/g] :
   0.1
   1.00
   10.0
2. Sodium tartrate dihydrate 15.66%
3. For solid samples: Water standard for KF oven 5.55 %

10.2 Hardware

Navigation: **Home** > **Setup** > **Hardware**

In this dialog window you can configure all the hardware components connected to the titrator, such as:

- Sensors
- Pump
- Peripherals (instruments such as printers or balances)
- Titration stands (KF stand and additional Stromboli TTL for V30S)
- Homogenizer TTL (V30S only)

10.2.1 Sensors

Navigation: **Setup** > **Hardware** > **Sensors**

In this dialog you can configure and manage the sensors to be used with the titrator. A maximum of 50 sensors can be defined in a device.
A polarized sensor is used for the Karl Fischer titration. The measurement unit is [mV]. Monitoring life span is only available for x30S models.

To create a new sensor in the titrator, open the **Sensor parameters** dialog using the **New** button in the **Sensors** dialog. You can determine the following parameters:

Parameters	Description	Values
Type	Shows the type of sensor used to perform the measurement	Polarized
Name	Specify a descriptive name of your choice.	Arbitrary
Unit	Defines the unit of measure that is used for the measurement.	mV
Sensor input	Information on the used input.	SENSOR
Serial number	The serial number of the relevant device type.	Arbitrary
Monitoring life span	Defines if the life span of the sensors is monitored.	Activ l Inactive
Initial operation	Defines the date of initial activation of the sensor. Only if **Monitoring life span** is activated.	Date
Life span	Defines the life span of the sensor in months. Only if **Monitoring life span** is activated.	0…100

Expiry date	Shows the expiry date of the sensor. Only if = **Active**.	-

Note

- If a PnP sensor is connected to the sensor input, this automatically generates an entry in the setup. The titrator updates all the details (sensor name, type or inputs).

10.2.2 Pumps

Navigation: **Home** > **Setup** > **Hardware** > **Pumps**

Solvent Managers

One Solvent Manager can be defined on a titrator. You cannot configure a Solvent Manager individually. Predefined settings are used when you connect a Solvent Manager to the back of the titrator or the sample changer.

Parameters	Description	Values
Type	Defines the type of pump.	Available pump types
Name	Specify a descriptive name of your choice.	Arbitrary
Pump output	The output where you want to operate the pump.	Available outputs

Peristaltic and membrane pumps

On a V30S you can configure a maximum of 2 pumps for use with the titrator. Starting from the pump list, you can add new pumps or select existing ones and change their settings. The list can also be printed and pumps can be deleted.

You can set up different pumps. For each pump, you need to specify an explicit, user-defined name, the pumping rate and the connection from which the pump should operate.

Steps to add a pump:

– In **Pumps** choose [**New**].

⇨ The window to edit the parameters opens.

Parameters	Description	Values
Type	Defines the type of pump.	Available pump types
Name	Specify a descriptive name of your choice.	Arbitrary
Pump output	The output where you want to operate the pump.	Available outputs
Max. pump rate	Displays the pump rate in [mL/min] when the pump is operated at 100%. This is stated by the manufacturer or determined experimentally.	0.1…1000

10.2.3 Peripherals

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals**

These settings encompass all input and output devices that belong to the titrator environment but that are not essential instruments for processing an analysis (peripherals cannot be accessed in methods). The computer also counts as a peripheral device. The list of all peripheral instruments defined in the titrator, together with the parameters of each individual instrument can be printed out by a printer.

10.2.3.1 Balance

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **Balance**

Before defining a balance, you need to select the balance type. The titrator supports the following types of balance:

Balance type	Supported balances
Mettler	AB I PB I PB-S I AB-S I PB-E I AB-E I College-S I SB I CB I GB I College-B I HB I AG I PG I PG-S I SG I HG I XP I XS I XA I XPE I XSE I XVE I AX I MX I UMX I PR I SR I HR I AT I MT I UMT I PM I AM I SM I CM I MS I ML
Sartorius	Sartorius
More	--

METTLER TOLEDO Balances

These balances support Plug'n'Play and are automatically recognized and configured by the titrator.

For automatic balance recognition, you need to ensure the following:

1. The balance has been started up and is connected to the titrator by a suitable cable,
2. The balance has been set to "Bidirectional" (if necessary, set the "Host" parameter accordingly),
3. The parameters for the RS-232 interface on the balance correspond with those on the titrator.

Note

- As long as the balance is not connected to the titrator, the settings "Baud Rate", "Data Bit", "Stop Bit", "Parity" and "Handshake" can be entered manually. These are however automatically overwritten with the values identified by the PnP as soon as the user sets the same transmission parameters at the balance and the titrator.

Sartorius I Others

After you have selected this option and the system has recognized the balance, you can define the following parameters:

Parameters	Description	Values
Name	Specify a descriptive name of your choice.	Arbitrary
Serial number	The serial number of the relevant device type.	Arbitrary
Connection	The serial port to which the device is connected. Possible connections are located on the mainboard, the analog board and the conductivity board.	MB/COM1 I MB/COM2
Baud rate	The baud rate for data transmission via the RS-232 interface.	1200 I 2400 I 4800 I 9600 I 19200
Data bit	Defines the number of data bits.	7 I 8
Stop bit	Defines the number of stop bits. (2 stop bits can only be selected if 7 data bits are also selected at the same time.)	1 I 2
Parity	Defines the parity protocol.	Even I Odd I None
Handshake	Data transmission via the RS-232 interface. (Only the handshake option "Xon-Xoff" is available for serial connections on the analog and conductivity board in conjunction with a baud rate of 9600.)	None I Xon-Xoff

Note

- The settings for the baud rate, data bit, stop bit, parity, and handshake must agree for the balance and titrator!
- If **None** is selected as balance type that means that no balance is to be connected to the titrator.

10.2.3.2 Barcode reader

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **Barcode reader**

When a barcode is imported, the system checks whether the imported barcode is suitable for starting the method. If so, the analysis start dialog is opened; all known data is entered there. If not, the barcode is ignored. If an analysis is already running with the same method ID, the sample is added to the end of the current analysis. An exception to this occurs if the **End series** barcode has previously been read. In this case, a new analysis is started (with the same method).

Note

- Only one barcode reader can be defined.

Define the following parameters for a barcode reader:

Parameters	Description	Values
Name	Specify a descriptive name of your choice.	Arbitrary
Serial number	The serial number of the relevant device type.	Arbitrary
Transfer SmartCodes to LabX	Transfer barcode to LabX.	Activ I Inactive

10.2.3.3 USB-Stick

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **USB-Stick**

Commercially available USB sticks from USB Version 1.1 are supported.

You can assign a relevant name to the USB stick.

10.2.3.4 Printer and USB data export

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **Printer**

The type of printer and data export via the USB interface is defined by **Printer type**.

Parameters	Description	Values
Printer type	Selection of a printer.	USB printer I USB compact printer I USB data export I PDF file writer I XML file writer

The available printers can be divided in 3 groups depending on the kind of output.

Printer	Paper	Files	XML stream
USB printer	•	-	-
USB compact printer	•	-	-
USB data export	-	-	•
Network printer	•	-	-
PDF file writer	-	•	-
XML file writer	-	•	-

Printing and data export can be triggered by the options listed below. Not all printers support all options.

- Method function **Record** inside or outside of loops
- **Print** button at the bottom of setup screens or result screens.
- Specific settings in the method function **Calculation**and **Instruction**. Only supported by USB printer and Network printer.
- **Print autom. KF protocols** in **Setup** > **Global settings** > **Analysis and resources behavior** > **Analysis sequence settings**. Supported by all printers.
- **Save results CSV** in **Setup** > **Global settings** > **Analysis and resources behavior** > **Analysis sequence settings**

Record

With the method function **Record** you can define which types of data are output. Not all printers support all types of data. For a detailed description of the parameters see chapter "Record".

MF Record inside of loop

Parameter	USB Printer / Network printer / PDF file writer	USB compact printer	USB data export / XML file writer
Summary	•	•	Export of predefined data (sample data, results and table of measures values) if set to **Per sample** or **Per series**.
Results	•	•	Settings are ignored.
Raw results	•	•	
Table of measured values	•	-	•
Sample data	•	•	Settings are ignored.
Resource data	•	•	
Charts	•	-	
Method	•	•	
Series data	•	•	

MF Record outside of loop

Parameter	USB Printer / Network printer / PDF file writer	USB compact printer	USB data export / XML file writer
Summary	•	•	Predefined data export if activated.
Results	•	•	Settings are ignored.
Raw results	•	•	
Resource data	•	•	
Method	•	•	
Series data	•	•	

Print button

The print button allows you to print out lists and parameter settings. In the menu **Results**, statistics can be printed in addition.

Printing with the print button is only supported by the printers listed below.

- USB printer
- USB compact printer
- Network printer
- PDF file writer

The parameters depend on the selected printer type and are described below.

USB printer, USB compact printer

The USB printer supports printers with PCL protocol version 4 and higher.

The USB compact printer does not support all languages.

Parameters	Description	Values
Status	Indicates whether the selected printer type is installed.	Installed
Name	Specify a descriptive name of your choice.	Arbitrary
Serial number	The serial number of the relevant device type.	Arbitrary
Connection	Information on the USB port to which the printer is connected. **PnP** is displayed if the printer is not connected to the titrator.	USB 1/2

USB data export

For USB data export to an RS interface you will need the USB data export box. If the USB data export box is connected to the titrator using the USB interface, it is automatically detected (PnP detection).

Parameters	Description	Values
USB data export box	Indicates whether the USB data export box is installed (info field).	Installed I Not installed
Connection	The USB port to which the USB data export box is connected (info field). **PnP** is displayed if the box is not connected to the titrator.	USB I PnP
Baud rate	The baud rate for data transmission via the USB interface.	1200 I 2400 I 4800 I 9600 I 19200
Data bit	Information on the number of data bits is displayed.	8
Stop bit	Information the number of stop bits is displayed.	1
Parity	Defines the parity protocol.	Even I Odd I None
Handshake	Data transmission via the USB interface.	None I Xon-Xoff

The max. Xoff duration for outgoing data is around 30 s.

Network printer

Printers with PCL protocol version 4 and higher are supported.

Parameters	Description	Values
Type	Defines the printing protocol used by the network printer.	HP PCL 3 I Epson ESC/ P 2

Network name	Defines the network name of the connected printer.	-
Port number	Enter the specific port number for the connected printer.	-
Paper size	Defines the paper size for the printout of your data export.	A4 I Letter

PDF file writer

The data is written to a PDF file.

Parameters	Description	Values
Storage location	Defines where the file containing the exported data is stored. **USB-Stick**: Export to the connected USB-stick. **Ethernet**: Export to the shared folder defined in **Network storage**.	USB-Stick I Ethernet

XML file writer

The data is written to an XML file. XML files created with **XML file writer** cannot be imported in LabX.

Parameters	Description	Values
Storage location	Defines where the file containing the exported data is stored. **USB-Stick**: Export to the connected USB-stick. **Ethernet**: Export to the shared folder defined in **Network storage**.	USB-Stick I Ethernet

In the xml filed the method type is represented by a number in the tag <type></type>. The number 54 stands for a **Titration (KF Vol)**.

10.2.3.5 PC settings

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **PC settings**

PC settings is not available on the x10S titrators.

Configure these settings if you have your instrument connected to the PC software **LabX**.

Note

- The PC with LabX installed must always be connected to the PC (USB) or Ethernet port on the rear panel.
- After the settings have been modified, it may be necessary to restart the instrument.

Parameters	Description	Values
Connect to LabX at start-up	If this parameter is activated, a connection to LabX will be established on startup.	Activ I Inactive
Connection type	Defines how the titrator is connected to the PC, either via the network connection or via the USB connection.	Ethernet I USB
Status	Information on the connection status from the instrument to LabX.	Connected I Disconnected
Port number	Defines the port for a network connection of the titrator to LabX. Only appears for **Connection type** = **Ethernet**.	1024…65535

10.2.3.6 Network settings

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **Network settings**

Configure these settings if you have your instrument connected to a network.

Parameters	Description	Values
Obtain IP address automatically	Indicates whether the IP address should be automatically obtained over the network.	Activ I Inactive
IP address	If the IP is not to be automatically obtained, you can enter it here.	000.000.000.000 … 255.255.255.255
Subnet mask	If you want to run the instrument on a local subnetwork, you can define the subnet mask here that you want to use to link the subnet's IP address.	000.000.000.000 … 255.255.255.255

Standard gateway	This is where you can enter the address of the standard gateway for communication between the various networks.	000.000.000.000 … 255.255.255.255

10.2.3.7 Network storage

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **Network storage**

Configure these settings if you want to save data on a shared folder of a network drive. The instrument and the network drive have to be in the same subnet.

Parameters	Description	Values
Transfer via	Method for transferring data (only **Network share**).	-
Server	PC or server name. Users should have read-write access. Maximum 60 alphanumeric characters.	-
Share name	Name of the share which is defined for the shared folder.	-
User name	Type in the user name for accessing the shared folder. The user name must be defined in the setup for the shared folder.	-
Domain	Domain name of the server where the shared folder is located.	-
Password	Password for the network share.	-
Target folder	Defines the name of the **Target folder** where the data is saved. The **Target folder** is a subfolder in the shared folder.	-
First folder level	Defines if a subfolder is created in the folder defined in **Target folder** and how the subfolder is named. **None**: No subfolder is created. **User name**: A subfolder is created. The user name is used as name for the subfolder. **Titrator ID**: A subfolder is created. The titrator ID is used as name for the subfolder. **Date**: A subfolder is created. The date is used as name for the subfolder. **Method ID**: A subfolder is created. The method ID is used as name for the subfolder.	None I User name I Titrator ID I Date I Method ID
Second folder level	Defines if a subfolder is created in the folder defined in **First folder level** and how the subfolder is named. **None**: No subfolder is created. **User name**: A subfolder is created. The user name is used as name for the subfolder. **Titrator ID**: A subfolder is created. The titrator ID is used as name for the subfolder. **Date**: A subfolder is created. The date is used as name for the subfolder. **Method ID**: A subfolder is created. The method ID is used as name for the subfolder. Only if **First folder level** is activated.	None I User name I Titrator ID I Date I Method ID

10.2.3.8 Fingerprint reader

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **Fingerprint reader**

Fingerprint readers are not supported by the x10S and x20s titrators.

You can use a fingerprint reader to authenticate users on the titrator. In order to do this, the fingerprint reader must be activated on the titrator. The following parameters are available for this:

Parameters	Description	Values
Activate fingerprint reader	Activates the fingerprint reader for authenticating users when logging onto the titrator.	Activ I Inactive
Status	Indicates whether the fingerprint reader is connected to the titrator.	Installed I Not installed
Name	The designation of the fingerprint reader.	Arbitrary

Connection	Information on the USB port to which the fingerprint reader is connected. **PnP** is displayed if the fingerprint reader is not connected to the titrator.	PnP I USB 1

Register fingerprint

Navigation: **Home** > **User data**

The following procedure must be performed in order to register each user:

1 Log on to the titrator with your user name (and possibly your password).

2 In **Home**, tap [**User data**] to open the corresponding window.

3 In **User data**, tap [**Register fingerprint**] to open the corresponding window.

4 Place the preferred finger on the fingerprint reader and repeat the step as prompted.

⇨ When completed, the message **Registration successful.** appears.

5 Confirm the message with the [**OK**] to return to the **User data** window.

6 Confirm with [**OK**] to return to the homescreen.

⇨ The next time you log on, the **Fingerprint login** window will appears. To log on, place the appropriate finger on the fingerprint reader.

Note

- You can only log on using the fingerprint reader if **Activate fingerprint reader** is selected.
  Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **Fingerprint reader**
- You are still able to log on using a password. To do this, tap [**Password login**].

10.2.3.9 LevelSens

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **LevelSens**

LevelSens is not supported by the x10S and x20s titrators.

The level sensor (**LevelSens**) can be used either to monitor the fill level of titration or solvent vessels or to prevent the overflow of waste vessels.

The level sensor is connected to the "LevelSens box", which is connected to the titrator via the CAN interface. The titrator automatically recognizes up to two of these boxes (PnP recognition). These appear in the settings.

Navigation: **Home** > **Setup** > **Hardware** > **Peripherals** > **LevelSens**

1 In **LevelSens**, tap on a "LevelSens box".

⇨ The windows to edit the parameters opens.

2 The parameters **Level**, **Waste** or **Inactive** can be defined for the relevant sensor type

Activating level monitoring

- At the start of a method or a manual operation.
  The level is checked for all activated and connected sensors, regardless of whether they are used in the method.
- At the start of each sample (GT).
- After completion of a Karl Fischer analysis (KF).
- Before the start of a KF Stromboli method.
- Before replacing the solvent.
- During the course of the following manual operations: **Burette** (**Rinse**, **Rinse multiple burettes**, **Dispense**, **Manual titration**), **Pump**, **Auxiliary instrument** (output 24V), **Sample changer** (**Pump**, **Rinse**).

If the fill level is not reached or exceeded, a message appears with a prompt either to empty or fill the vessel (depending on the Setup setting: **Waste** or **Level**). The analysis is interrupted during this time. After the vessel has been emptied or filled and the message has been confirmed, the analysis is resumed.

Note

- Only two LevelSens boxes can be entered in the settings. Additional boxes do not generate an additional entry.
- Entries in the settings can only be deleted if the corresponding LevelSens box is not installed.

- The sensor must be fitted in such a way that when the maximum fill level is reached, the analysis of a sample, the entire loop of a Stromboli method or a solvent replacement can be performed.
- The fill level is only checked before a sample analysis, at the start of a Stromboli method or before a solvent replacement.

Parameters	Description	Values
Name	Information on the designation of the LevelSens box. In the settings, the first detected box is entered as LevelSens Box 1, the second as LevelSens Box 2.	-
Chip ID	Information on the Chip-ID of the detected LevelSens box.	-
Position	Information on the position of the LevelSens box connected to the titrator.	PnP I PnP1 I PnP2
Sensor 1 type… Sensor 4 type	Specifies the sensor type to be used.	Level I Waste I Inactive

10.2.4 Titration stands

The following types of titration stand can be connected:

- **InMotion KF** , available on:
  - V30S
- **Stromboli TTL** , available on:
  - V30S
- **KF stand**

Add a titration stand

1 Go to **Home** > **Setup** > **Hardware** > **Titration Stands**
2 In **Titration Stands** tap **New**.
   ⇨ The window to edit the parameters opens.
3 In **Type** choose the type of titration stand to be added.
   ⇨ The parameters for the selected titration stand are displayed.
4 Edit the parameters according to the type of titration stand.

Parameters	Description	Values
Type	Defines the type of the titration stand.	Available titration stands

10.2.4.1 InMotion KF

InMotion KF titration stands are available on the following titrator types:

- V30S

Parameters	Description	Values
Type	Defines the type of the titration stand.	Available titration stands
Name	Defines the name of the titration stand. Additional titration stands of a kind will have an index number assigned.	List of available names
Base type	Indicates the sample changer type.	Available types
Stirrer output	Defines the stirrer output.	Available stirrer outputs
Connection	Indicates the connection type.	Available connections
Chip ID	Shows the ID of the identification chip of the sample changer.	Unique number
Gas stop valve	Indicates whether a gas stop valve is installed on the sample changer.	Installed I Not installed
Air pump KF	Indicates whether an air pump is installed on the sample changer.	Installed I Not installed
Heated transfer tube	Indicates whether a heated transfer tube is installed on the sample changer.	Installed I Not installed

Rack	Indicates the type of the installed rack. **KF**: a standard rack is detected. **PnP**: no rack is detected.	KF I PnP
Rack size	Indicates the size of the installed rack.	Number of positions on the rack
Vial height	Defines the height of the vials used on the rack.	34…60 mm
Drift	Value of the last drift determination [µg/min].	0.0…10^6
Determination method	Method name of the method used for the determination.	Method name
Date / Time	Date and time of the determination.	Date and time
Performed by	Name of the user performing the determination.	User name

10.2.4.2 Stromboli TTL

The Stromboli oven sample changer can hold 14 sample vials and one drift vial. The Stromboli connects to the TTL port on the titrator.

Parameters	Description	Values
Type	Defines the type of the titration stand.	Available titration stands
Name	Defines the name of the titration stand. Additional titration stands of a kind will have an index number assigned.	List of available names
Stirrer output	Defines the stirrer output.	Available stirrer outputs
Connection	Indicates the connection type.	Available connections
Drift	Value of the last drift determination [µg/min].	0.0…10^6
Determination method	Method name of the method used for the determination.	Method name
Date / Time	Date and time of the determination.	Date and time
Performed by	Name of the user performing the determination.	User name

10.2.4.3 KF stand

The selected titration stand defines the stirrer output used in following method functions requiring a function **Stir**.

Parameters	Description	Values
Type	Defines the type of the titration stand.	Available titration stands
Name	Defines the name of the titration stand. Additional titration stands of a kind will have an index number assigned.	List of available names
Stirrer output	Defines the stirrer output.	Available stirrer outputs
Drift	Value of the last drift determination [µg/min].	0.0…10^6
Determination method	Method name of the method used for the determination.	Method name
Date / Time	Date and time of the determination.	Date and time
Performed by	Name of the user performing the determination.	User name

10.2.5 Homogenizer

Navigation: **Setup** > **Hardware** > **Homogenizer**

The **Homogenizer** dialog displays the available homogenizers (control type TTL).

You can assign a titrator output to the listed homogenizer:

Parameters	Description	Values
Output	Indicates which port on the titrator you want to use.	TTL-Out 3 I TTL-Out 4

10.3 User settings

Navigation: **Home** > **Setup** > **User settings**

These settings contains the options that can be made specifically for each currently logged in user.

You can configure the language, the screen settings (for the touchscreen), the layout of the alphanumeric and numeric keyboard, the use of beeps, and shortcuts for each user.

10.3.1 Language

Navigation: **Home** > **Setup** > **User settings** > **Language**

Define the following parameters:

Parameters	Description	Values
Touchscreen	Defines the language for operation of the terminal.	German I English I French I Italian I Spanish I Portuguese I Chinese I Russian I Polish I Korean
Record	Defines the language in which the reports are to be printed out.	German I English I French I Italian I Spanish I Portuguese I Chinese I Russian I Polish I Korean

Note

- For the Chinese and Korean language settings, it is not possible to print using the USB-P25 tape printer.
- For Polish, records can be printed on the USB-P25 tape printer without special characters.

10.3.2 Screen

Navigation: **Home** > **Setup** > **User settings** > **Screen**

Define the following parameters:

Parameters	Description	Values
Primary color	Here various color schemes for the user interface can be selected.	Gray I Blue I Green I Red
Brightness	Specifies the display brightness in [%].	50 I 60 I 70 I 80 I 90 I 100 [%]
Screen saver	Here you can define whether the screen saver should be used.	Activ I Inactive
Wait time	Defines how long in [min] the system should wait after the user's last action on the terminal before activating the screen saver.	1…1000

10.3.3 Audio signals

Navigation: **Home** > **Setup** > **User** > **Audio signal**

Define the following parameter:

Parameters	Description	Values
At push of a button	Enables a beep when tapping on the touch screen.	Activ I Inactive

10.3.4 Shortcuts

Navigation: **Home** > **Setup** > **User settings** > **Shortcuts**

The number of shortcuts depends on the titrator type.

Each user can manage the shortcuts that they have created. Individual shortcuts can be selected and deleted and the following parameters of a shortcut can be changed:

Parameters	Description	Values
Type	Shows the type of action the shortcut stands for.	Method I Series I Manual operation
Description	Any name for the shortcut.	Arbitrary
Immediate start	The method, series, or manual operation can be started immediately. This enables you to start the analysis without any interfering dialog.	Activ I Inactive
Homescreen position	Defines the position of the shortcut on the homescreen.	-
Created by	Shows the name of the user who created the shortcut.	-

10.3.5 Keyboards

Navigation: **Home** > **Setup** > **User settings** > **Keyboards**

In this dialog, you can define the layout for the alphanumeric and the numeric input fields. The following settings are available:

Parameters	Description	Values
ABC keyboard	Determines the layout of the alphanumeric input field.	English I French I German
123 keyboard	Defines the organization of the keys for the numeric input field.	Calculator I Phone

10.4 Global settings

Navigation: **Setup** > **Global settings**

In the **Global Settings** dialog, you can make general settings on the titrator that apply for all users. The settings in this dialog can only be changed by users with the appropriate authorizations.

Global settings include:

- **System settings** that apply for all users.
- **User management** for creating user accounts and assigning rights.
- The settings for **Analysis and resources behavior** regarding the sequence and monitoring the expiration dates and life span of resources (determining the actions of the titrator before, during and after the performance of an analysis), and the response of the titrator when resources are deleted or when PnP resources are identified.
- **Solvent control** instructs the user to replace the reagent solution. For information on the process for replacing the solution.

10.4.1 System

Navigation: **Home** > **Global settings** > **System**

Titrator identification

You can enter and assign any ID consisting of at least four characters to the titrator.

Parameters	Description	Values
Titrator ID	Define the instrument identification.	-
Titrator	Indicates the titrator type.	Titrator types
Serial number	Information on the serial number of the instrument.	-
Titrator FW version	Information on the firmware version of the instrument.	-

Date / Time

You can define the format used to display the date and time and set the titrator date and time.

Parameters	Description	Values
Date format	Defines the format for displaying the date.	mm/dd/yyyy I dd/mm/yyyy
Time format	Defines the format for displaying the time.	24h I a.m./p.m.

Date	Enter the current date.	-
Time	Enter the current time.	-

Header and footer

Define whether all printouts generated by the titrator should have a header or footer. The content of these headers and footers can be entered directly into the respective setting.

As part of the end of record, signature fields are appended to the respective printout consisting of a declaration (e.g. **Approved by**) followed by an empty line. A personal signature can be then be entered on this line.

Parameters	Description	Values
Header	Activates the header on print outs.	Activ I Inactive
Text	Defines the text for the header. Only for **Header** = **Active**.	Arbitrary
Footer	Activates the footer on print outs.	Activ I Inactive
Text	Defines the text for the footer. Only for **Footer** = **Active**.	Arbitrary
End of report	Select the information to be printed at the end of a report.	Created by I Modified by I Checked by I Approved by

Data storage

In this menu you can define if data is stored and if data is deleted when the instrument shuts down.

Parameters	Description	Values
Delete data on shut down	Define if analysis data is to be deleted from the titrator memory when the titrator is shut down.	Activ I Inactive
No storage of results	Results are not stored and cannot be viewed anymore after termination of a method.	Activ I Inactive

10.4.2 User Management

Navigation: **Global settings** > **User management**

Here you manage users, user groups, and account policies for the titrator.
A maximum of 30 different users can be defined for the titrator, but only one user at a time can be logged onto the instrument (single user operation). One user with administrative rights is already saved on the instrument. In a user profile you can define different access rights (e.g. possibility for using or changing shortcuts, methods, series etc.). This can be helpful to reduce the changing possibilities for the logged in user to the minimum which means, the user has no possibilities to change defined measurement methods.

User accounts can be deleted, printed out and edited.

Users

1 In **User management** tap **Users** to open the list of users.

2 To add a new user, tap **New**.
- or -
Edit an existing user.

You can define the following parameters for each user account:

Parameters	Description	Values
User name	The user's login ID.	Arbitrary
Full name	The user's full name.	Arbitrary
Groups	User group that is assigned to the user.	Experts I Routine-User
Description	Any description for the user account or for the user.	Arbitrary
Reset password	If activated, the user's password is reset to "123456" and the user is prompted to change their password the next time they log in. Only appears if **Enforce password/fingerprint** = **Active** is selected in **Account policies**.	Activ I Inactive

Block user	If activated, the user account is locked. Only appears if **Enforce password/fingerprint** = **Active** is selected in **Account policies**.	Activ I Inactive
Enforce password change	If activated, the user is forced to change their password the next time they log on to the titrator. Only appears if **Enforce password/fingerprint** = **Active** is selected in **Account policies**.	Activ I Inactive
Created by	Shows the name of the administrator who created the user account.	-
Created on	Shows the date and time the user account was created.	-
Modified by	Shows the name of the administrator who modified the user account.	-
Modified on	Shows the date and time of the last change to the user account.	-

Note

- If the parameter **Reset password** is activated, the parameter **Enforce password change** will be automatically activated.
- The default password for this user (User ID: "Administrator") is "123456" (do not enter inverted commas).

User group

Two fixed user groups are defined in the titrator: **Experts** and **Routine-User**. Any user can belong to one of the user groups (with different authorizations). User management for "x10S" and "x20S" models only contain the **Experts** group.

1 In **User management** select [**Groups**].
   ⇨ The two fixed defined groups are listed in this window.
2 Select one of these groups to access the **Group parameters** dialog.

⇨ This is where the parameters and authorization rights of the user groups are defined.

- Users in the **Experts** (system administrators) group have all the rights listed below:
  - Editing methods Users can create methods in the Method editor and have full editing rights.
  - Editing series and samples Users can create series templates and samples and have full editing rights.
  - Editing resources and peripherals Users can create resources and peripherals and have full editing rights.
  - Editing global and analysis sequence settings: Users can edit the global settings in Setup.
  - Editing user-specific settings: Users can edit the user-specific settings in Setup.
  - Editing results: Users can edit the saved results.
  - Starting methods and series: Users can start methods from the method list or the Start analysis dialog.
  - Executing manual operations: Users can execute manual operations.
- Users in the **Routine-User** (operators) group can start methods and series and execute manual operations.

*Basic functions: Starting drift or blank determination.

Account policies

In **Account policies** define the actions of the titrator when it is started up. **Account policies** is only available for the x30S models.

Parameters	Description	Values
Enforce password/ fingerprint	If this parameter is activated, the titrator always starts with the login screen (even if only one user is defined for the instrument). The user name must always be entered in the login screen manually (the corresponding input box is always initially empty).	Activ I Inactive

Note

- If this option is selected for an instrument with factory settings, the titrator will demand the password for the predefined user (User ID: "Administrator") the next time it is booted up. This password is "123456" (do not enter inverted commas).

Min. no. of characters	Specifies the minimum number of characters required for user passwords. If this parameter is changed, then users whose password does not meet this requirement will be requested to change their password accordingly the next time that they log in.	Activ I Inactive
No identification for routine-user	If this parameter is activated, a routine user will be logged in automatically on startup. This routine user profile can be defined in the setup. During startup the dialogue for user selection will be skipped and the button **Continue** will appear instead of **Login**. If you want to log in as an administrator during startup, the button **Password login** will be available.	Activ I Inactive

10.4.2.1 Configure titrator as stand alone instrument without storage of results

Only the V30S and C30S titrators can be configured as stand alone instrument without storage of results.

For regulations purposes the instruments need a function to forget all results after printing. This has to be set up once before the installation is approved. The advantage of this function is easier validation. The instrument is no longer handled as a computer-based system and does not fall under the electronic signature regulations. Each record is printed with the time and date and has to be approved manually with the operator's signature(s). An instrument in this mode is considered a **stand alone instrument**. In this mode it is important that results can only be printed once.

Generally the routine user has no possibilities to change any parameters on the instrument. The routine user can only start methods and manual operations via shortcut(s) which have to be defined by the administrator.

Note

- This configuration is only possible when the instrument is used in stand alone mode. Stand alone mode means that the instrument is not connected to LabX® or to a network.
- This configuration is only possible if exactly 2 users are defined, the predefined "Administrator" and the routine user.
- A printer must be connected to the instrument (**USB printer** or **USB compact printer**). If no printer is connected, methods cannot be started.
- When using the instrument as a stand alone instrument without storage of results, the installation of a fingerprint reader is unnecessary.

The steps needed to configure a stand alone instrument without storage of results are described below.

The steps needed to configure the instrument for category 3 usage are described below.

Parameter configuration (creating a routine user profile)

1 Go to **Setup** > **Global settings** > **User management** > **User**.
2 If other users than the predefined **Administrator** are configured, delete those users.
3 Tap **New**.
   ⇨ The dialog **User parameters** opens.
4 For **User name** define **Routine User**.
5 For **User group 1** select **Routine-User** and tap **Save**.
6 Go to **Setup** > **Global settings** > **User management** > **Groups** > **Routine-User**.
   ⇨ The dialog **Group parameters** opens.
7 Make sure that all rights are disabled (no checkmarks set) and tap **Save**.
8 Go to **Setup** > **Global settings** > **User management** > **Account policies**.
   ⇨ The dialog **Account policies** opens.
9 Enable **Enforce password/fingerprint** and check the setting of **Min. no. of characters**.
10 Enable **No identification for routine-user** and tap **Save**.

11 Go to **Setup** > **Global settings** > **System** > **Data storage**.
⇨ The dialog **Data storage** opens.
12 Enable **No storage of results** and tap **Save**.
13 Go to **Setup** > **Hardware** > **Peripherals** > **Printer**.
⇨ The dialog **Printer** opens.
14 Configure a **USB printer** or **USB compact printer** and tap **Save**.
15 Go to **Setup** > **Global settings** > **Analysis and resources behavior** > **Analysis sequence settings**.
⇨ The dialog **Analysis sequence settings** opens.
16 Enable **Check local printer connection and wait**.
17 For **Save results CSV** select **Inactive** and tap **Save**.
18 Go to **Setup** > **Hardware** > **Peripherals** > **PC settings**.
⇨ The dialog **PC settings** opens.
19 Disable **Connect to LabX at start-up** and tap **Save**.

Creating methods for routine user

Note

- For each task the routine user needs to perform, a shortcut must be created. In the routine user profile, methods and manual operations can only be started via shortcut.
- After finishing a measurement, the results are printed automatically. The results are not stored and cannot be printed again.

▪ A routine user profile must have been created.
1 Go to **Setup** > **Global settings** > **User management** > **User** and select **Routine User**.
⇨ The dialog **User parameters** opens.
2 For **User group 1** select **Experts** and tap **Save**.
3 Create your specific measurement methods and manual operations with shortcuts.
4 Go to **Setup** > **Global settings** > **User management** > **User** and select **Routine User**.
⇨ The dialog **User parameters** opens.
5 For **User group 1** select **Routine-User** and tap **Save**.
6 Go to **Home** and tap **Log out**.
7 For the settings to take effect, tap **Shut down** and restart the instrument.

Login as routine user

▪ A routine user profile but also the measurement methods must have been created.
– On the **Login** screen, tap **Continue** to login as routine user.
⇨ **Results** is no longer visible on the homescreen. The routine user has no possibilities to change any parameters on the instrument.

Login as administrator

1 On the **Login** screen, tap **Password login**.
2 Set **User name** to "Administrator".
3 Enter the password and tap **Login**.

10.4.3 Analysis and resources behavior

The settings that you make here relate to the sequence of the analysis of samples or series with the aid of methods.

- You can define the actions of the titrator when started, during an analysis and afterward.
- You can also program the response of the titrator to the deletion of resources or when it identifies PnP resources.

Navigation: **Home** > **Setup** > **Global settings** > **Analysis and resources behavior**

Analysis sequence settings

The analysis sequence settings can only be modified if no tasks are currently being performed by the titrator.

You can make the following settings that influence the sequence of an analysis.

Parameters	Description	Values
Show required resources at start	When an analysis is started a screen appears displaying all resources required for the analysis and their status (available, not-available, locked or in use). If an individual entry is selected from this screen then the user receives additional information about the respective resource. However, if "no" is selected, then the required resources are still checked when the analysis is started and if necessary, an appropriate error message is issued.	Activ I Inactive
Show SOP	If an SOP (standard operating procedure) has been defined in the **Title** method function then this will be displayed before the method is started provided that **Active** has been selected.	Activ I Inactive
Show results after analysis	Defines if the results are automatically displayed after the sample is analyzed. **Active**: If a KF stand is used, the results for a sample are automatically displayed after it has been analyzed and must be acknowledged by the user before the analysis can continue. If a Stromboli TTL is used, the results are automatically displayed until the mix time for the next sample has been processed. If there are no other samples, the results are displayed until the MF End of sample is reached. **Inactive**: The results are not automatically shown for a KF stand or a Stromboli TTL. No additional user interaction is required to continue the analysis.	Activ I Inactive
Check local printer connection and wait	When selected, the availability of a printer is checked at the beginning of the method. If not selected and no printer is connected, the method function **Record** is skipped. If a printer is connected, the method function **Record** is executed even if this parameter is not selected. Only for **USB printer**, **USB compact printer**.	Activ I Inactive
Print autom. KF protocols	Controls the printouts in manual drift or blank determination.	Activ I Inactive
Save results CSV	Defines if some of the sample date and some of the results are saved to a CSV file. **No**: No data is saved. **To USB-Stick**: The CSV files are saved on the connected USB stick. If a USB-stick is not detected during the data writing, you can stop the process or you can plug in another USB stick for the data writing. **To network**: The CSV files are saved in the shared folder defined in **Network storage**. **Note** • A CSV file is exported for each sample when the method function **End of sample** is reached. There is no export outside of a loop. • The method function **Calculation** must be included inside the loop. • The export is in the record language. • When importing the CSV file into excel make sure, the data formats match.	To USB-Stick I To network I No
Check USB-Stick connection and wait	If this parameter is activated, the presence of a USB - Stick is validated at the start of the analysis. Only for **Save results CSV** = **To USB-Stick**.	Activ I Inactive

Resources behavior

Use the following parameters to configure how the titrator responds to the deletion of resources and its response to the automatic identification of PnP resources.

Parameters	Description	Values
Information when deleting resources	Defines if a confirmation will be requested before a resource is deleted.	Activ I Inactive
Information when recognizing PnP resources	Defines if a confirmation will be requested every time a PnP resource is identified.	Activ I Inactive

Action when exceeding usable life and **Action when exceeding life span** are only available on V30S.

Action when exceeding usable life

If it is determined by the titrator that the expiration dates of a resource have been exceeded, then the titrator may perform various actions.

Warning The user is warned that the resource's usable life has been exceeded and the raw results and results determined with the respective resource will be labeled accordingly.

Block The user is notified that the usable life of the resource has been exceeded and it is no longer possible to start the analysis with the affected resource. (Methods that result in renewal of this resource can however still be started.)

None If you select "none" then the analysis is started without message in spite of the exceeded usable life. The expiry of the expiration date will, however, be logged.

Parameters	Description	Values
Auxiliary values	This action is performed if the system determines at the start of an analysis that the usable life of an auxiliary value that is to be used in the analysis has been exceeded.	None I Warning I Block
Blank values	This action is performed if the system determines at the start of an analysis that the usable life of a blank value that is to be used in the analysis has been exceeded.	None I Warning I Block

Action when exceeding life span

If, at the start of an analysis, it is determined that the life span of a resource to be used for the analysis has expired, the titrator can set various actions.

Warning The user is warned that the resource life span has been exceeded and the raw results and results determined with the respective resource will be labeled accordingly.

Block The user is notified that the life span of the resource has been exceeded and it is no longer possible to start the analysis with the affected resource.

None The analysis is started in spite of the exceeded life span.

Parameters	Description	Values
Sensors	The action is executed if the system determines at the start of an analysis that the usable life of a sensor has been exceeded.	None I Warning I Block

Pump and stirrer detection

Parameters	Description	Values
Stirrer detection	Defines if the automatic stirrer detection is activated. This may be necessary, for example, if you connect additional devices via the stirrer outputs that are not automatically identified by the titrator.	Activ I Inactive
Pump detection	Defines if the automatic pump detection is activated. This may be necessary, for example, if you connect additional devices via the pump outputs that are not automatically identified by the titrator.	Activ I Inactive

10.4.4 Solvent Control

Solvent control allows you to monitor the solvent for volumetric Karl Fischer titrations. Solvent control is only available on V30S titrators.

For solvent control to work, you need a Karl Fischer titration stand and pumps that can be used to drain or fill the titration vessel. The following table summarizes the options.

Drain pump	Fill pump	Titration stand
• **Solvent Manager**	• **Solvent Manager**	• **KF stand**
• **Peristaltic** (only V30S)	• **Peristaltic** (only V30S)	• **Stromboli TTL 1** (only V30S)
• **Membrane** (only V30S)	• **Membrane** (only V30S)	• **InMotion KF** (only V30S)

The monitoring parameters available are listed below.

- **Monitoring usable life of solvent**: The time interval for the use of the solvent.
- **Monitoring capacity of solvent**: The capacity limit, i.e. a fixed maximum value of the total water volume of samples titrated (including standby and pre-titration) in the same solvent.
- **Monitoring no. of samples**: Maximum number of samples to be titrated in the solvent.

You can configure the action of the system when the defined monitoring parameters reach their limits. The available actions are listed below.

- **Enforce replacement when exceeding usable life**: The user has to replace the solvent before he can start the next titration.
- **Autom. exchange when exceeding usable life**: The solvent manager replaces the solvent or reagent automatically.
- If neither **Enforce replacement when exceeding usable life** nor **Autom. exchange when exceeding usable life** is activated, the system displays a reminder that the solvent should be exchanged. The user can either replace the solvent or start a new titration.

Exchange of solvent with a Stromboli oven sample changer

For sample analysis using the Stromboli oven sample changer, the solvent can only be replaced in standby mode before analysis of the first sample, or at the end of the series, if the titrator returns to standby mode.

Exchange of solvent with an InMotion KF Pro

For sample analysis using an InMotion KF, the solvent can be replaced in standby mode before analysis of the first sample, at the end of the series if the titrator returns to standby mode, or within a series if the **Allow replacement within InMotion KF Pro series** parameter is activated

Parameter description

Navigation: **Home** > **Setup** > **Global settings** > **Solvent Control**

Parameters	Description	Values
Drain pump	Defines, which pump is used for draining.	Available pumps
Fill pump	Defines, which pump is used for filling.	Available pumps
Monitoring usable life of solvent	Defines if the usable life of the solvent is monitored.	Activ I Inactive
Last replacement	Shows date and time of the last solvent-replacement.	-
Performed by	Shows the person or instance who performed the last replacement.	-
Usable life	Defines the time interval in days for the use of the solvent. Only if **Monitoring usable life of solvent** is activated.	1…10^4
Expiry date	Shows the expiry date of the solvent in use. Only if **Monitoring usable life of solvent** is activated.	-
Enforce replacement when exceeding usable life	If activated, the user is forced to replace the solvent before he can start a new Karl Fischer titration. Only if **Monitoring usable life of solvent** is activated.	Activ I Inactive

Autom. exchange when exceeding usable life	The exchange of solvent is performed automatically when exceeding the specified usable life. Only if **Monitoring usable life of solvent** is activated.	Activ I Inactive
Monitoring capacity of solvent	Defines if the capacity of the solvent is monitored.	Activ I Inactive
Max. amount of water	The maximum volume of water in [mg] for a solvent. Only if **Monitoring capacity of solvent** is activated.	0…10^6
Curr. amount of water	Shows the current amount of water [mg] in the solvent.	-
Enforce replacement when exceeding capacity	If activated, the user is forced to replace the solvent before he can start a new Karl Fischer titration. Only if **Monitoring capacity of solvent** is activated.	
Autom. exchange when exceeding capacity	The exchange of solvent is performed automatically when exceeding the specified capacity of the solvent. Only if **Monitoring capacity of solvent** is activated.	Activ I Inactive
Monitoring no. of samples	Defines if the number of samples is monitored.	Activ I Inactive
Max. no. of samples	Defines the maximum number of samples before replacing the solvent. Only if **Monitoring no. of samples** is activated.	0…120
Curr. no. of samples	Shows the current number of samples.	-
Enforce replacement at max. no. of samples	If activated, the user is forced to replace the solvent before he can start a new Karl Fischer titration. Only if **Monitoring no. of samples** is activated.	Activ I Inactive
Autom. exchange at max. no. of samples	The exchange of solvent is performed automatically when exceeding the specified maximum number of samples. Only if **Monitoring no. of samples** is activated.	Activ I Inactive
Stir	Enables the stirrer during solvent exchange.	Activ I Inactive
Drain duration	Defines the pumping time for draining the exhausted solvent from the titration vessel. The pumping time should be as long as possible to ensure that the tubes are completely free of solvent following draining. Only if **Autom. exchange when exceeding usable life**, **Autom. exchange when exceeding capacity** or **Autom. exchange at max. no. of samples** is activated.	0…1000
Drain volume	Defines the volume that is pumped out of the titration vessel.	0…1000 mL
Fill time	Defines the pumping time for filling the titration vessel with new solvent. Only if **Autom. exchange when exceeding usable life**, **Autom. exchange when exceeding capacity** or **Autom. exchange at max. no. of samples** is activated.	0…1000
Fill volume	Defines the volume that is pumped into the titration vessel.	0…1000 mL

See also

Monitoring the expiry date of a resource ▶ Page 38

10.5 Maintenance & Service

Navigation: **Home** > **Setup** > **Mainten. & Service**

10.5.1 MT service

Navigation: **Home** > **Setup** > **Mainten. & Service** > **MT-Service**

In this dialog, you can view and print out a list of the most recent (max. 10) METTLER TOLEDO services. Under each date, the user name of the METTLER TOLEDO service technicians and the date and time of the service appointment are displayed. The most recently performed service always appears at the top of the list.

You can change the service life (in days) of the last service date and configure the titrator to issue a warning at a defined time before the service life elapses (requires administrator rights).

– In **MT-Service** tap [**Settings**].

⇨ The windows to edit the parameters opens.

Parameters	Description	Values
Initial operation	Defines the date of the initial operation of the titrator.	Date
Last service	Shows the date of the last service.	Date
Service life	Defines the service life (in days) from the most recently performed service.	0…10^4
Next service	Shows the due date of the next service.	Date
Reminder	Determines whether the titrator should issue a warning before the service life expires. Only if **Monitoring usable life** = **Active**.	Activ I Inactive
Days before expiration	Determines the number of days before expiry of the service life that the titrator should issue a warning. The value entered here must be smaller than the service life. (Appears only if "Reminder" is activated.)	0…1000

10.5.2 Import/Export

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Import / Export**

You can use this function to save titrator data on a USB stick (export) and reload the data back to a titrator later on (import).

Thus is it possible to create a backup of most data that has been changed from the titrator's default settings.

Uploading data from a backup copy results in the existing data in the titrator being overwritten. In this way you can immediately duplicate the status of one titrator in another one or restore titrator settings after repair.

The following two rules should be observed:

- Memory copies can only be imported from the same titrator type.
- Memory copies, user management and methods can only be imported from the same or from a lower firmware version.

You can select whether you want to export or import a backup copy, an individual method, all methods or the user management.

A memory copy includes the information listed below.

- All parameters of methods and series
- Setup including all resources
- User settings
- Global settings (incl. user management)
- Settings for manual operations

A memory copy does **not** contain all saved results, data saved on a PnP component and the default parameters for manual operations.

Import/export of individual methods

When you import/export an individual method, you can select which method is to be exported or imported. You require the right to edit methods.

Import/export of all methods

When you export all methods, all methods are exported to individual XML files on the USB-stick.

When you Import all methods, all method related XML files on the USB-stick are checked and when a method is compatible with the titrator type, the method is imported. If not enough memory is free, a message is displayed. The user has to delete existing user or mettler methods on the titrator before he can import the methods. The user is asked whether an existing method should be overwritten if a method with the same method ID exists

Import/export of user management settings

When you import/export user management settings, the entire user management settings with all users and their properties are exported or imported.

1 Open **Setup** > **Mainten. & Service** > **Import / Export**.

2 Configure the following parameters:

Parameters	Description	Values
Action	Here you can select whether you wish to export the titrator data to a memory stick or to import it from a memory stick to a titrator.	Export I Import
Data	Defines which data is exported or imported. **Memory copy**: Exports or imports a backup copy. **Single method**: Exports or imports an individual method. **All methods**: Exports or imports all methods. **User management**: Exports or imports the user management.	Memory copy I Single method I All methods I User management
Method ID	Defines which method is imported or exported.	Method list

10.5.3 Reset to factory settings

NOTICE

Danger of data loss due to reset!

In the process of resetting the titrator all data and changes to settings made by users of the titrator are erased.

– Back up all data and settings.

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Reset to factory settings**

10.5.4 Titrator firmware history

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Titrator firmware history**

The **Titrator firmware history** button displays a list of the firmware updates or model upgrades. The first entry in the list represents the initial operation of the titrator.
All list entries are stored with date, type, FW version and the user name of the user who performed the action.

10.5.5 Board firmware

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Board firmware**

Display a list of all boards and burette drives available on the titrator along with the relevant firmware version. You can carry out an update.

10.5.6 Terminal

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Terminal**

Display the chip ID of the terminal and adjust the touchscreen.

If the alignment of the touch-sensitive areas of the screen correspond not exactly with the position of the buttons e.g. after a software update was performed, then you can solve this error by executing this function.

1 In **Terminal** tap [**Adjust touchscreen**].

⇨ The instrument will reboot and the adjustment screen appears.

2 Touch and hold a touch screen stylus (resistive) on the center of the target until it moves to the next position on the screen.

3 Repeat this procedure until a message appears.

4 Tap the screen to confirm or wait for 30 seconds for canceling (timeout).

⇨ The instrument will reboot.

Note

- Tap the center of the target as accurately as possible otherwise the process has to be repeated several times.
- Make sure not to touch any other locations on the screen and the fix key areas while doing this adjustment.
- Make sure not to touch the screen with your hand.
- Keep accurate angle for your usage.
- The adjustment process cannot be aborted.

10.5.7 Board data

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Board data**

Display and print out a list of all the boards fitted in the titrator. Each board is listed by name and module location.

If a board is selected from the list, then its chip ID and all data on available inputs and outputs including the adjustment data will be displayed.

10.5.8 Drives

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Drives**

Display and print a list of all connected drives. The list contains the position, serial number, chip-ID and status of each drive.

10.5.9 Burettes

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Burettes**

Display and print out a list of connected PnP burettes. Each PnP burette is listed with its chip ID, serial number, volume and position of the attached drive.

10.5.10 Update

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Update**

It is possible to update the firmware of your titrator. If you want to update the firmware of your titrator, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

10.5.11 Delete Mettler method template

Navigation: **Home** > **Setup** > **Mainten. & Service** > **Delete Mettler method template**

You can delete Mettler method template from the titrator.

1 Select the method that you want to delete.

2 Choose **Remove** method to delete the method from the titrator's memory.

10.6 Values

Navigation: **Home** > **Setup** > **Values**

Blanks and auxiliary values can be created, edited and deleted and the list of defined blanks or auxiliary values can be viewed and printed out. It is also possible to print out the individual values with their parameters.

Settings	Explanation
Blanks	Blank values can be used in formulas for calculations.
Auxiliary values	You can use auxiliary values in formulas.

10.6.1 Blanks

Navigation: **Home** > **Setup** > **Values** > **Blanks**

Blanks can be used in formulas for calculations. They can either be created manually with the aid of their various parameters or generated as the result of a method. A resulting blank (or calculated mean value) can then be assigned to a blank using the method function **Blank**. The blank will then appear under the assigned name in the Blank list in Setup.

Adding a blank value

– In **Blanks** choose [**New**].

⇨ The windows to edit the parameters opens.

Define the following parameters to define the blank:

Parameters	Description	Values
Name	Specify a descriptive name of your choice.	Arbitrary
Unit	The units in which the blank is specified.	Arbitrary
Value	Here you can enter a numerical value.	$-10^8 \ldots 10^8$
Determination method	Method name of the method used for the determination.	Method name
Date / Time	Date and time of the determination.	Date and time
Performed by	Name of the user performing the determination.	User name
Monitoring usable life	Specifies whether the usable life of a resource or a value is to be monitored.	Activ I Inactive
Time period	Specifies the time range. Only if **Monitoring usable life** = **Active**.	Days I Hours
Usable life	Defines the time span of the expiration dates either in days or hours (depending on: **Time period**). Only if **Monitoring usable life** = **Active**.	Days: 1…1000 Hours: $1 \ldots 10^4$
Expiry date	Shows the expiry date of the resource or the value. Only if **Monitoring usable life** = **Active**.	-
Reminder	Determines whether the titrator should issue a warning before the usable life of a resource or a value elapses. Only if **Monitoring usable life** = **Active**.	Activ I Inactive
Days before expirat.	Determines the number of days before the service life of the resource that the titrator should issue a warning. The value entered must be less than the value in **Usable life**. Only if **Monitoring usable life** = **Active**, **Time period** = **Days** and **Reminder** = **Active**.	0…1000

Note

- A maximum of 100 blanks can be saved in the titrator.
- Blanks cannot be deleted or modified if they are currently in use.
- When a blank is assigned with the "Blank" method function, this is updated in the setup immediately after completion of the method function.

10.6.2 Auxiliary values

Navigation: **Home** > **Setup** > **Values** > **Auxiliary values**

You can use auxiliary values in formulas. They can either be manually created and edited or can be generated using a method. A result, a mean derived from several results or a raw result can be assigned to an auxiliary value by means of the "Auxiliary Value" method function. The auxiliary value then appears under the assigned name in the auxiliary values list in the Setup.

Adding an auxiliary value

– In **Auxiliary values** choose [**New**].

⇨ The windows to edit the parameters opens.

Define the following parameters to define the auxiliary value:

Parameters	Description	Values
Name	Specify a descriptive name of your choice.	Arbitrary
Comment	A brief comment (e.g. unit) to the auxiliary value can be entered .	Arbitrary
Value	Here you can enter a numerical value.	$-10^8 \ldots 10^8$
Determination method	Method name of the method used for the determination.	Method name
Date / Time	Date and time of the determination.	Date and time
Performed by	Name of the user performing the determination.	User name
Monitoring usable life	Specifies whether the usable life of a resource or a value is to be monitored.	Activ l Inactive

Note

- A maximum of 100 auxiliary values can be saved in the titrator.
- Auxiliary values cannot be deleted or modified when they are currently in use.
- When an auxiliary value is assigned with the method function **Auxiliary value**, this is updated in the setup immediately after completion of the method function.

Time period	Specifies the time range. Only if **Monitoring usable life** = **Active**.	Days l Hours
Usable life	Defines the time span of the expiration dates either in days or hours (depending on: **Time period**). Only if **Monitoring usable life** = **Active**.	Days: 1…1000 Hours: $1 \ldots 10^4$
Expiry date	Shows the expiry date of the resource or the value. Only if **Monitoring usable life** = **Active**.	-
Reminder	Determines whether the titrator should issue a warning before the usable life of a resource or a value elapses. Only if **Monitoring usable life** = **Active**.	Activ l Inactive
Days before expirat.	Determines the number of days before the service life of the resource that the titrator should issue a warning. The value entered must be less than the value in **Usable life**. Only if **Monitoring usable life** = **Active**, **Time period** = **Days** and **Reminder** = **Active**.	0…1000

11 Manual operations

You can use manual operations to access various titrator functions that are not directly connected to the execution of an analysis, but that might be useful during the sample preparation, for example.
You can call up the following manual operations from here with the relevant titrator components:

Hardware components	Possible manual operations	Possible usages
Stirrer	**Stir**	Dissolve a solid sample
Sensor	**Measure**	Voltametric indication
Burette	**Rinse**	Rinse burette before changing a titrant
	Dispense	Dispense during sample preparation
Pump	**Pump**	Fill, empty, or replace solvents

Note

- A maximum of four manual operations can be performed at the same time (one per hardware component).
- Manual operations can also be executed while an analysis is running, if the hardware components that you want to operate manually are not already being used by the analysis.
- The resource parameters in all editable fields can be changed temporarily (only for the execution of the manual operation in question) and can vary from the setup settings. The changes made will not be copied over to the setup, however.

11.1 Stirrer

To switch a connected stirrer on or off for a definable time interval and at a definable stirring speed, select the following:

Navigation: **Home** > **Manual** > **Stirrer**

1 Make a selection in **Titration stand**.

2 Enter the stir time in [sec] or select "∞" for an infinite duration.

3 Tap [**Start**] to start the stirrer.

⇨ The stirrer starts. Tap [**Stop**] to stop the stirrer at any time (terminating the manual operation).

Define the following parameters:

Parameters	Description	Values
Titration stand	Defines which titration stand is to be used.	List of available titration stands
Stirrer output	Specifies the stirrer output.	Internal stirrer I STIRRER
Speed	Defines the stirring speed in [%].	0…100
Stir time	The stirring time, in [sec], during which the stirrer should be in operation. Select "∞" for unlimited stirring time.	$0…10^4$ I ∞

Note

- Entries made here will only be applied to the manual operation and will have no effect on the instrument settings.

11.2 Sensor

Navigation: **Home** > **Manual** > **Sensor**

1 Select the sensor you want to use from the list of sensors defined in the settings.

2 Determine the polarization current.

3 Select the relevant titration stand.

4 Select the stirrer output for the stirrer and enter a speed.

5 Enter the duration of the measurement in [sec].

6 Select whether to output a record on the printer.

7 If you want to output a record on the printer, use dt [sec] to define the time interval between measurements.

8 Tap [**Start**] to start the measurement.

9 Tap [**Stop**] to terminate the procedure at any time.

During the measurement, the system will display the online curve (measured values in the selected unit versus time). You can also tap [**Measured values**] to display a table of measured values instead of the curve.

You can define the following parameters for polarized sensors:

11.2.1 Polarized sensor

Parameters	Description	Values
Sensor	Defines the sensor used to perform the measurement.	List of available sensors
Ipol	Ipol is the polarization current for the voltametric indication.	0.0…24.0 µA
Titration stand	Defines which titration stand is to be used.	List of available titration stands
Stirrer output	Defines the stirrer output.	List of available outputs
Speed	Defines the stirring speed in [%].	0…100
Temperature	Input field for the temperature [°C].	-20…200
Duration	The measurement and stirring time, in [sec]. Select "∞" for unlimited measurement time.	0…10^4 I ∞
Record	If activated, the measured values will be printed out.	Activ I Inactive
dt	Defines the time interval in [sec] for outputting measured values to the printer. Only appears if **Record** = **Active** was selected.	1…6000

Note

Changes made in this dialog will only be applied to the manual operations "Sensor" and have no effect on the settings made in the Setup.

11.3 Burette

Navigation: **Home** > **Manual** > **Burette**

In the **Burette** dialog window you can carry out various manual operations with the available burettes.

To rinse an available Burette, dispense a defined quantity of titrant or run a manual titration with a selected burette, select:

11.3.1 Rinse burette

The "Rinse" operation allows you to rinse a burette and its connecting tubes and fill it with fresh titrant, for example if you want to remove air bubbles from the system.

Select:

Navigation: **Home** > **Manual** > **Burette** > **Rinse**

1 Select the titrant that you want to use for rinsing.

2 Enter the number of rinse cycles.

3 Enter the discharge volume in [%] to define the percentage of the burette's total volume that you want to discharge during each rinse cycle.

4 Enter the filling rate in [%] to define the speed at which you want to refill the burette. (100% is the maximum rate.)

5 Select "Start" to start the measurement.

6 You can select "Stop" to terminate the procedure at any time.

You can determine the following parameters:

Parameters	Description	Values
Titrant	Select a titrant from the list of the defined titrants.	Titrant list

Cycles	Defines the number of rinse cycles to be executed.	1…100
Discharge volume	The volume of titrant, in [mL], to be discharged during the rinsing process.	10…100
Fill rate	The filling rate of the burette in percent. 100% stands for maximum filling rate.	30…100

11.3.2 Dispense

Navigation: **Home** > **Manual** > **Dispense**

The **Dispense** operation lets you manually dispense a defined quantity of titrant.

1 Select the titrant you would like to dispense.
2 Select the drive on which the titrant is installed. (For PnP burettes, the system automatically selects the appropriate drive.)
3 Enter the volume to be dispensed in [ml].
4 Enter the filling rate in [%] to define the speed at which you want to refill the burette. (100% is the maximum rate.)
5 Tap [**Start**] to start the measurement.
6 Tap [**Stop**] to terminate the procedure at any time.

You can determine the following parameters:

Parameters	Description	Values
Titrant	Select a titrant from the list of the defined titrants.	Titrant list
Drive	The drive on which the burette with the selected titrant is installed.	1…8
Volume	Defines the volume to be dispensed, in [mL].	0.001…100
Fill rate	The filling rate of the burette in percent. 100% stands for maximum filling rate.	30…100

11.4 Pump

You can use the **Pump** operation to fill or drain (depending on the hose connections) any volume of liquid from the titration beaker using the Solvent manager.

Proceed as follows to start a pump process:

1 Go to **Home** > **Manual** > **Pump**
2 Choose the action that you want to perform (empty, fill, replace solvent).
3 Enter the duration of the relevant action in [sec].
4 Tap **Start** to start the action.
5 Tap **Stop** to terminate the procedure at any time.

Parameters	Description	Values
Action	Determines the actions for the pump process.	Drain I Fill I Replace solvent

The parameters available for each action, stirrers and resetting the counter are described in the following chapter.

11.4.1 Drain

Parameters	Description	Values
Drain pump	Defines, which pump is used for draining.	Available pumps
Pump output	The output where you want to operate the pump.	Available outputs
Drain duration	Defines the pumping time for draining a fluid. The duration of the drain operation for the tubes should be as long as possible to ensure that the tubes are completely free of liquids following draining.	0…1000 s I ∞
Drain volume	Defines the volume that is pumped out of the titration vessel.	0…1000 mL

Max. pump rate	Displays the pump rate in as defined in the settings. Changing this value does not change the rate of the pump, only the time calculated for the addition.	0.1…1000 mL/min

See also

- Reset counter ▶ Page 100
- Stirrer ▶ Page 100
- Replace solvent ▶ Page 100

11.4.2 Fill

Parameters	Description	Values
Fill pump	Defines, which pump is used for filling.	Available pumps
Pump output	The output where you want to operate the pump.	Available outputs
Fill time	Defines the pumping time for filling a titration vessel.	0…1000 s I ∞
Fill volume	Defines the volume that is pumped into the titration vessel.	0…1000 mL
Max. pump rate	Displays the pump rate in as defined in the settings. Changing this value does not change the rate of the pump, only the time calculated for the addition.	0.1…1000 mL/min

See also

- Reset counter ▶ Page 100
- Stirrer ▶ Page 100
- Replace solvent ▶ Page 100

11.4.3 Replace solvent

Replace solvent combines draining and filling the titration vessel.

The parameters for draining, filling, resetting the counter and using a stirrer are the same as in the actions **Drain** and **Fill**.

See also

- Drain ▶ Page 99
- Fill ▶ Page 100
- Reset counter ▶ Page 100
- Stirrer ▶ Page 100

11.4.4 Reset counter

Resetting the counters for monitoring the solvent or the reagent is available on the following titrator types:

- V30S

Parameters	Description	Values
Reset counter	If this parameter is set, all counters are reset when the manual operation starts. The fill date for the titration vessel is also reset.	Activ I Inactive

11.4.5 Stirrer

Parameters	Description	Values
Stirrer	A stirrer can be switched on. Only for **Action** = **Fill** or **Drain**.	Activ I Inactive
Titration stand	The name of the titration stand. only if stirrer is activated.	List of titration stands
Stirrer output	Defines the stirrer output.	Available stirrer outputs
Speed	Speed in [%]. Only if stirrer is activated.	0…100

12 Analysis Sequences

12.1 Starting an Analysis

An analysis, whether it be a single or multiple determination, can be started on the titrator in several different ways:

1. By choosing the following options:
   - **Start** from the method editor
   - **Start** from the home screen
   - **Start** from the **Series** widow
2. Using a user-specific shortcut or a direct shortcut from the home screen.

When you create a shortcut with **AddToHome**, the following parameters are available:

Parameters	Description	Values
Description	Any name for the shortcut.	Arbitrary
Immediate start	The method, series, or manual operation can be started immediately. This enables you to start the analysis without any interfering dialog.	Activ I Inactive
Homescreen position	Defines the position of the shortcut on the homescreen.	-

After you create the shortcut, it appears in the selected position in "Home", from where you can select it by tapping the touchscreen.
When you start an analysis, whether by using a button or with a shortcut, the system always opens the **Start analysis** dialog (see "Descripton of Functions > The User Interface > The Start Analysis Dialog"). The only exceptions are direct shortcuts ("Immediate start" = "Yes"), whose selected settings permit a direct start.

At the start of an analysis, you can still make changes to various settings in the **Start analysis** dialog. It is therefore possible, for example, to modify the sample size and define the number of samples to be determined.

If the analysis you want to start is a single determination, you can enter the sample size or sample ID directly as a parameter in the **Start analysis** dialog.
In general, the sample data can be entered for each individual sample using the **Samples** button in the **Start analysis** dialog. In the **Sample data** dialog that opens when you choose this button, a list of the individual samples is displayed.

In addition, the status is displayed for every sample (regardless of the loop type) in the **Sample data** dialog. The following status levels can be assigned to a sample:

- **Idle**: The sample is not yet running and the sample data can still be edited
- **Running**: The sample is running but the sample data can still be edited
- **Active**: The sample is running and the sample data can no longer be edited
- **Done**: Done – the sample has run and concluded and the sample data can no longer be edited

If you select a sample, you can define the following sample data.

Parameters	Description	Values
ID 1	The ID for the first or only sample of an analysis.	Arbitrary
Sample size	You can enter the sample size here. For fixed entry types, this field only appears as an info field.	0…1000 [g] I [mL] 0…10^6 [pcs.]
Density	You can enter the sample's density, in [g/mL], here. Does not appear for the **Entry type** = **Pieces** and **Fixed pieces**.	0…100
Weight per piece	The weight in [g] per pirece. Appears only if **Entry type** = **Pieces** or **Fixed pieces** was selected.	0 … 1000
Solvent weight	Quantity of solvent in [g] in which the sample was extracted or dissolved. Only for method type = **Ext. Extr.**.	0…1000

Wt. extracted sample	Total weight of sample in [g] which was extracted or dissolved in the solvent. Only for method type = **Ext. Extr.**.	0...1000
ID 2…ID 3	The name defined here will be used as the default name for the respective sample on the sample loop. Only appears subject to the settings made for **Number of IDs**.	Arbitrary
Comment	You can enter a brief comment about the series.	Arbitrary
Correction factor	Any correction factor that can be used in calculations.	0.0001…10^6
Temperature	The temperature in [°C] during the analysis. If temperature monitoring is activated in a titration function, the system will ignore the sample temperature given here.	-20…200

You can enter the following parameters in the **Start analysis** window, depending on the type of analysis to be started and the resources used:

Parameters	Description	Values
Number of samples	Defines the number of samples to be analyzed. The number depends on the selected titration stand.	1…303
ID 1	The ID for the first or only sample of an analysis.	Arbitrary
Loop	Shows the number of the loop to which a sample belongs.	1…max. number of loops
Sample type	Defines the type of sample used in the sample loop. The sample type is shown in the method editor, the sample data window and the report.	Sample I Standard I Blank
Sample size	You can enter the sample size here. For fixed entry types, this field only appears as an info field.	0…1000 [g] I [mL] 0…10^6 [pcs.]
Start position	Defines the start position of the first sample on the sample changer. **CP** means current position.	1...max. number of positions I CP I CP+1 I CP+2

Note

- All the parameters that can be edited in the **Start analysis** dialog or the sample data dialog will overwrite the settings defined in the method for the same parameters.
- All non-editable parameters that are displayed as an info field are only shown for orientation purposes and list the settings from the method.
- If the sample size must be entered before the analysis but the user does not do so, the user will be required to enter it immediately before the start of the analysis.

See also

Sample (KF) ▶ Page 47

12.2 Analysis sequence steps

12.2.1 KF Analysis sequence

The following describes the sample analysis sequence for a Karl Fischer titration using the "KF stand" and "Stromboli" titration stands.
When a KF method is started, the system first performs a pretitration.
The pretitration always takes place to ensure that the Karl Fischer reagent is in a water-free state.
When a particular drift value is reached, the system switches to Standby mode (see "Function description", the user interface Online dialog"). Standby mode is used to stabilize the potential as much as possible around the end point.
The system switches automatically between Pretitration and Standby. The determined drift value is used as the criterion for switching between the different modes. If the pretitration is not finished, the system issues a message after 30 minutes informing you that the pretitration cannot be completed because the drift values are too high. You can then end the pretitration, thus terminating the method or series, or restart the pretitration.
On the other hand, if the system switches from Standby to Pretitration during a parameter request, or if the maximum start drift is exceeded, you can end data entry and save the data by choosing **OK**.

You can start an analysis from Standby mode.Once the analysis has finished, the KF method returns to Standby mode. You have the option to start another sample analysis. A series analysis can be subsequently expanded, i.e., you can start a series with a defined number of samples, but whether further samples in the current series are to be started remains open ("Open Series", see method function: End of sample. Once the loop is complete or **Terminate series** is selected, the analysis returns to Standby mode. If the "Open series" parameter is not set, the series is automatically ended after the final sample.

The start of a new KF method or a spontaneous concentration or blank determination automatically terminates the current series.

<Start>

Dialog: Analysis start

This dialog can be switched off for a start using the "Shortcut parameters" dialog and the "Immediate start" parameter when creating or managing a shortcut.

<Start>

Check: Resources

Can be switched off with the "Display required resources at start" parameter in the analysis sequence settings. (An error message will appear if the resources have already been allocated or are missing.)

<OK>

Online dialog: Pretitration

Selection of function options: **Stop method**, **Samples** (for changing samples and series data), **End series**, **Save series data**, **Results**, **Axes**,
(see " Description of Functions > User Interface > Online Dialog").

Automatic switch between Pretitration and Standby.

Online dialog: Standby

Selection of function options: **Start sample**, **Start concentration**, **Start blank** (for external extraction, **Samples** (for changing samples and series data), **Start drift determination**, **End series**, **Stop method**, **Save series data**, **Results***, **Axes**,**Sample size calculation**
(see " Description of Functions > User Interface > Online Dialog ").

<Start Sample> | <Start Concentration> | <Start Blank>

If the maximum number of samples, concentration determinations, and blank determinations has been reached and a measurement has been started, a message appears informing you that a new series can be started.
From the start of the first sample analysis in a predefined series to the processing of the last sample in the series, the concentration and blank determination functions cannot be selected in the "Standby" dialog.

If the voltage value of the measuring sensor is too low at the start of a sample, concentration, drift, or blank determination, when the user presses **Start**, they are informed that the system is overtitrated.

↓

<OK>

↓

Online dialog: Mix time

Displays the time remaining and stirrer speed.

↓

Online dialog: Titration (KF Vol)

You have the following options during an analysis: Cancel the sample, concentration, drift, blank determination or the method, you can modify sample data, view results or measured values, save a series, or specify the axes of the measurement diagram.

↓

Online dialog: Calculation

↓

Online dialog: Standby

*During Standby or Pretitration mode, you can access the results of the current determination type (sample, concentration, blank determination). Here you can perform the following actions (see "Results"):

- Recalculate (can only be changed for individual samples, and not for a whole loop)[1]
- Exclude samples[1]
- Perform outlier test[1]
- Results
- Display statistics
- Undo changes

[1]For titrations using the "Stromboli" oven sample changer, these functions are only available at the start of the series or in Standby mode and with Analysis start "manual".

Drift determination

There are several different ways to determine the drift:

1. Using the "Drift determination" method function. Here you can enter the duration of determination. The method function can be inserted outside the loop (in determination per series) or inside the loop (in determination per sample) (only for KF methods of the type "Stromboli").
2. Spontaneous drift determinations: The drift can be determined from Standby mode of any KF method. The drift determined here is used if the "Source for drift" parameter in the "Titration stand" method function is set to "Setup".
3. Online drift determination: The drift that is constantly determined during standby operation is the current and correct drift value which is used in the calculations. To enable this, the "Source for drift" parameter in the "Titration stand" method function must be set to "Online" (see "[Method functions: Titration stand ▶ Page 50]").

Concentration determination

The concentration determination of the titrant can only be started spontaneously, and hence only from "Standby" mode.
When a concentration determination is started, as with a sample determination, this opens an "Open series". After every determination, the mean value of the open concentration determination series is assigned to the titrant in Setup. The open concentration determination series is ended by the start of a sample and blank determination (and vice versa). In general, the open series can be terminated by choosing **End series**, **Stop method**, or **Reset**. A spontaneous drift determination, however, does not terminate the series.

See also

Titration stand ▶ Page 50

12.2.1.1 Series analyses with the "Stromboli" oven sample changer

Before starting a Stromboli method, the pump must be switched on and the set temperature specified. Every Stromboli method begins in the Start position (beaker is in the drift position). In this position, the pretitrations, the manual and automatic drift determinations, and the concentration determinations (only for KF Vol) are performed. The pretitration already takes place during the heating process.

Note

- The heating and the pump remain active in Standby mode. When a Stromboli method is active, the set temperature is controlled automatically.

After a series analysis is started via **Start** in the **Standby** dialog or because Analysis start = "automatic" is set, the series is processed automatically. After each sample is processed, the next sample is analyzed without prompting. To enable automatic analysis start, the following conditions must be fulfilled:

- The set temperature must be reached.
- The online drift must be smaller than the maximum start drift.
- The system must not be overtitrated.
- The drift stability must be fulfilled.

Once the titration is complete, Standby mode is active until the end of the loop in the current sample beaker. If the maximum start drift value is exceeded during this time, the sample changer returns to pretitration (drift position). The analysis is then continued automatically when the maximum start drift value is reached. If the last sample in a loop has been processed and further loops still remain, the current position (sample or drift beaker) is maintained until the next sample is approached. The current drift is reviewed before the start of the next sample. The following is a description of the behavior when particular actions are performed:

Analysis start

Each analysis starts in position 1, immediately after the "Drift" position.

When using Stromboli, no positions can be controlled. The sample changer always moves forward by one position and performs an analysis or a blank determination in that position. Stromboli only returns to the "Drift" position to perform a drift determination.

Cancel method

The method is terminated with no further action. The temperature control and the pump are switched off immediately. Stromboli returns to the "Drift" position.

Note

- Before actually stopping the process, the system displays a system message asking you to confirm the termination.

Drift determination

The manual drift determination and the drift determination via method functions always take place in the "Drift" position. After manual drift determination, the sample changer remains in this position. In contrast, with drift determination using the method function, the sample changer moves to the next planned sample position.

Concentration determination (only KFvol)

The manual concentration determination is performed in the drift beaker. The heating and pump remain active.

Canceling the drift determination or concentration determination

Because the drift and concentration determination is performed in the drift beaker, terminating the process has no effect on the actions of the sample changer. The standby titration is started again.

Pressing Reset

If the Reset button is pressed while a KF analysis or manual operations are active, all Karl Fischer methods and manual operations are terminated. For Stromboli, this means that the pumps are switched off, the titrator returns to the resting position (via the drift beaker), and the heating is turned off. If a KF analysis (method or sample series) is terminated, the system continues with the pending analyses from the list. The sample data for the terminated samples or sample series (such as weigh-ins, etc.) are still saved with the results.

12.2.1.2 External extraction

For the Karl Fischer "External extraction" method type, there is no automated sample analysis. Each sample in a series must be started individually from "Standby" mode.
If the "Open series" parameter is set (see "Method Function: End of Sample"), additional samples can be added after a series has been processed. If "Open series" is not set, the series is completed after the specified number of samples, and the method is stopped.

Note

Manual blank value determination can be carried out from "Standby" mode..

12.2.1.3 Switching between determination types

You can determine statistics for sample, blank, and concentration determinations. If you switch between two determination types during an analysis, the determination series is ended. The system displays a message. You can then decide whether to choose **Cancel** to return to Standby mode, or choose **OK** to start the selected determination.

When you end a determination series, the relevant results are not deleted. The results memory of this determination type is not deleted and refilled until a new determination type is started and if results are available. The other determination types are not deleted and no new series entry is created in the results memory.
For example: If you carry out multiple blank determinations and then carry out a concentration determination, the blank value statistics are terminated. The next time a blank determination is started, the memory for the blank determination is deleted and filled with new blank value data.

Note

There are no mean values for drift determinations, each determination generates a new drift value that is transferred to Setup.

12.2.1.4 Analysis records

Analysis records are the printouts specified by the user in the "Records" method function (see "Method functions: Records"). When a manual drift, concentration, and blank determination is created, the system creates a separate expression.

Printouts per series

Printouts "per series" are created if the user presses the **End series** button or if a series is terminated via **Start concentration** or **Start blank**.

An open series does not count as finished until **End series** has been selected or a series is ended by choosing **Start concentration** or **Start blank**. After confirming the corresponding message, the "Record" method function can be used to print out all parts of the record defined for each series.

Printouts per sample

The printouts are created for each sample when the "Records" method function is processed.

12.2.1.5 Replacing the titrant

The reagent in the beaker can be replaced when a certain number of samples is reached, if the solvent capacity is used up, or after a defined period of time (Intelligent Solvent Controlling). This causes a brief interruption in the series sequence.

Note

- The titrant replacement procedure is semi-automatic, i.e. the user has to initiate the replacement.

- Titrant = KF vol
  Reagent = KF coul

13 Analysis data

The "Analysis data" include different types of data that can be used at various times during the planning and execution of an analysis.

The system differentiates between the following types of analysis data:

Displaying raw data	Raw data is defined when you create a method or series. It is automatically generated and stored during the analyses. Raw data is always created for each analysis and cannot be influenced by the user.
Method data	All data for the method run.
Series data	All data from the series run, such as e.g. the series ID and the number of samples.
Sample data	All data from the analyzed samples, such as e.g. the sample size, sample density and sample ID.
Resource data	The data for all resources used during the execution of an analysis (e.g., concentration standards, blank value, homogenizer name, titration stand). The data for a resource are copied from the setup at the time when it is used in an analysis.
Table of measured values	Tables of measured values are created by some method functions during an analysis and can be output in the record.
Raw results	Raw results are data determined by the titrator during an analysis, e.g. the drift value or titrant consumption. The raw results can be converted to the actual analysis results as a part of the "Calculation" method function using suitable symbols and formulas. Some raw results are always created automatically, while others are only generated if used during a calculation.
Results	Results are the results of the conversions of raw results run within the "Calculate" method function. The results of an analysis can be influenced by the user.

Of these, the following can be used in calculations:

- Sample data (such as the sample size or the sample density)
- Resource data (e.g. blank value variable)
- Raw results (e.g. auxiliary value, titrant consumption)
- Results (the results of a calculation can then be used in a subsequent calculation.)

14 Evaluate and calculate

14.1 Formulas

Calculation formulas can be used in the "Calculate" and "Condition" method functions. Some parameters within method functions can also be defined in the form of formulas.

Formulas within the "Calculation" method function

One typical example for a formula within the "Calculation" method function would be the expression **R=VEQ** in the "Formula" parameter. In this case, the consumed volume of titrant up to the point at which the end point is reached is assigned to R. All the symbols can be used for analysis data in relations like this. The analysis data to be used must be generated by the method before the "Calculate" method function.

Formulas for entering values for parameters

Formulas can also be used to specify the values for some parameters. For example, you can enter the stirring time in a "Stir" method function in the form of a formula. The result of the formula will then be copied over as a nondimensional value in the unit of the parameter in question.

Conditions

A condition is a formula whose result comes in the form of "true" or "false". Conditions can be used in various method functions in the "Condition" parameter or subfunction. Depending on the condition's result, the method function in question will be executed (condition true) or not executed (condition false).

Note

- Auxiliary values and blanks defined in the setup can generally be used in formulas in the same manner as symbols. The general form for an auxiliary value is: H[Name] (as defined in the setup).
- Likewise, results from other "Calculation" method functions can be referenced in the "Calculation" method function. (E.g. R3=R2+R1)

  (What is important in this case is to make sure that the results used must already be in existence at the time they are to be used!)

14.1.1 Using analysis data in formulas

All analysis data that can be accessed via a symbol can be used in calculation formulas (see "Naming Conventions for Using Analysis Data in Calculations").

All analysis data must be generated in the method before the point at which they will be used in a calculation formula. For some analysis data, this could be as checked early as during the validation in the processing of a method. For others, whether or not the data are available at the time in question may not be decided until the execution of the method. If the analysis data is not available at the time of the calculation, the result of the calculation formula will be "NaN" ("Not a number").

Note

- The formula must be assigned to a result (Rx) in the "Formula" parameter in the "Calculate" method function.

Shortcuts

- Instead of VEQ, you can also use the relevant short form V in the formulas.
- If you leave out the group index of a symbol, Group Index 1 will be used.

  Example: VEQ stands for VEQ[1]

	Explanation	**Examples**
Basic symbol and symbol extension	Taken together, they serve as an identifier for the analysis data.	**VEQ** represents the end point of the titration.
Group index	Specifies which method function within a method function group generates the analysis data.	**VEQ[3]** represents the titration end point of the third loop of the method of type Stromboli (model V30 only).

14.1.2 Indexing of method functions

The "KF titration" method functions return their own raw results within a method.
These raw results are saved in the titrator in the order in which the generating method functions are processed within the method. To ensure that any time these method functions are used more than once, the raw results can still be given a unique assignment to their individual method functions, they are divided into different groups:

If method functions from a group are used multiple times within a method, they are given indexes (beyond the loop limits). This group index allows unique referencing of the raw results during calculations.

If the structure of a method is changed, the group indices are automatically updated, guaranteeing the serial numbering at all times.

Note

- Make sure your calculations take this into consideration!
- Calculations can be used independently of the method functions that generated the results. For the results, we suggest using the IDs R1…Rn, following the sequence of the calculations in the method.
- Multiple loops are only permitted for the Stromboli method type.
- The group index "1" can be omitted because when a group index is missing, the system automatically assigns the group index "1".

Method function	Group index	Result
Title		
Sample (KF)		
Titration stand (Stromboli)		
Mix time		
Titration (KF vol)	1	
Calculation		R1
Calculation		R2
Calculation		R3
End of sample		
Sample (KF)		
Titration stand (Stromboli)		
Mix time		
Titration (KF vol)	2	
Calculation		R4
End of sample		
Calculation		R5

14.2 Result proposals

The result proposals in the following table are independent of the **Entry type** parameter in the **Sample KF** method function.

Result	Unit	Formula R=	Constant C=
Consumption	mL	VEQ	1
Mean consumption	µL/min	VEQ*1000/TIME	1
Titration duration	min	TIME	1
Total water content	µg	CW	1
Concentration	mg/mL	CONC	1
Drift consumption	µL	DRIFTV*TIME	1

The result proposals for the calculation of the content depend on the setting of the **Entry type** parameter in the **Sample (KF)** method function.

Result proposals for Entry type = Weight or Fixed weight

Result	Unit	Formula R=	Constant C=
Content	mg	(VEQ*CONC-TIME*DRIFT/1000)*C	1
	µg		1000
	%	(VEQ*CONC-TIME*DRIFT/1000)*C/m	0.1
	ppm		1000
	g/kg		1
	mg/g		1
	mg/mL	(VEQ*CONC-TIME*DRIFT/1000)*C/(m/d)	1
	g/mL		0.001
	µg/L		1000000
	µg/mL		1000

Result proposals for Entry type = Volume or Fixed volume

Result	Unit	Formula R=	Constant C=
Content	mg	(VEQ*CONC-TIME*DRIFT/1000)*C	1
	µg		1000
	%	(VEQ*CONC-TIME*DRIFT/1000)*C/(m*d)	0.1
	ppm		1000
	g/kg		1
	mg/g		1
	mg/mL	(VEQ*CONC-TIME*DRIFT/1000)*C/m	1
	g/mL		0.001
	µg/L		1000000
	µg/mL		1000

Result proposals for Entry type = Pieces or Fixed pieces

Result	Unit	Formula R=	Constant C=
Content	mg	(VEQ*CONC-TIME*DRIFT/1000)*C	1
	µg		1000
	%	(VEQ*CONC-TIME*DRIFT/1000)*C/(m*wp)	0.1
	ppm		1000
	g/kg		1
	mg/g		1
	mg/pc	(VEQ*CONC-TIME*DRIFT/1000)*C/m	1

The result proposals in the following table are independent of the **Entry type** parameter in the **Sample KF** method function.

Result	Unit	Formula R=	Constant C=
Consumption	mL	VEQ	1
Mean consumption	µL/min	VEQ*1000/TIME	1
Titration duration	min	TIME	1
Total water content	µg	CW	1
Stromboli blank value	µg	VEQ*CONC-TIME*DRIFT/1000)*C	1000

The result proposals for the calculation of the content depend on the setting of the **Entry type** parameter in the **Sample (KF)** method function.

Result proposals for Entry type = Weight or Fixed weight

Result	Unit	Formula R=	Constant C=
Content blank value compensated (B in µg)	mg	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C	1
	µg		1000
	%	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C/m	0.1
	ppm		1000
	g/kg		1
	mg/g		1
	mg/mL	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C/(m/d)	1
	g/mL		0.001
	µg/L		1000000
	µg/mL		1000

Result proposals for Entry type = Volume or Fixed volume

Result	Unit	Formula R=	Constant C=
Content blank value compensated (B in µg)	mg	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C	1
	µg		1000
	%	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C/(m*d)	0.1
	ppm		1000
	g/kg		1
	mg/g		1
	mg/mL	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C/m	1
	g/mL		0.001
	µg/L		1000000
	µg/mL		1000

Result proposals for Entry type = Pieces or Fixed pieces

Result	Unit	Formula R=	Constant C=
Content blank value compensated (B in µg)	mg	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C	1
	µg		1000
	%	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C/(m*wp)	0.1
	ppm		1000
	g/kg		1
	mg/g		1
	mg/pc	(VEQ*CONC-B[Blank Stromboli]/1000-TIME*DRIFT/1000)*C/m	1

The result proposals depend on the setting of the **Entry type** parameter in the **Sample (KF)** method function.

Result proposals for Entry type = Weight or Fixed weight

Result	Unit	Formula R=	Constant C=
External dissolution (B in %)	%	C*[(msol+mext)/mext]-B*msol/mext	(VEQ*CONC-TIME*DRIFT/1000)*0.1/m
External dissolution (B in ppm)	ppm	C*[(msol+mext)/mext]-B*msol/mext	(VEQ*CONC-TIME*DRIFT/1000)*1000/m
External extraction (B in %)	%	100/(100-C)*(C*msol/mext-B*msol/mext)	(VEQ*CONC-TIME*DRIFT/1000)*0.1/m
External extraction (B in ppm)	ppm	pw(6)/[pw(6)-C]*(C*msol/mext-B*msol/mext)	(VEQ*CONC-TIME*DRIFT/1000)*1000/m

Result proposals for Entry type = Volume or Fixed volume

Result	Unit	Formula R=	Constant C=
External dissolution (B in %)	%	C*[(msol+mext)/mext]-B*msol/mext	(VEQ*CONC-TIME*DRIFT/1000)*0.1/(m*d)
External dissolution (B in ppm)	ppm	C*[(msol+mext)/mext]-B*msol/mext	(VEQ*CONC-TIME*DRIFT/1000)*1000/(m*d)
External extraction (B in %)	%	100/(100-C)*(C*msol/mext-B*msol/mext)	(VEQ*CONC-TIME*DRIFT/1000)*0.1/(m*d)
External extraction (B in ppm)	ppm	pw(6)/[pw(6)-C]*(C*msol/mext-B*msol/mext)	(VEQ*CONC-TIME*DRIFT/1000)*1000/(m*d)

Result proposals for Entry type = Pieces or Fixed pieces

Result	Unit	Formula R=	Constant C=
External dissolution (B in %)	%	C*[(msol+mext)/mext]-B*msol/mext	(VEQ*CONC-TIME*DRIFT/1000)*0.1/(m*wp)
External dissolution (B in ppm)	ppm	C*[(msol+mext)/mext]-B*msol/mext	(VEQ*CONC-TIME*DRIFT/1000)*1000/(m*wp)
External extraction (B in %)	%	100/(100-C)*(C*msol/mext-B*msol/mext)	(VEQ*CONC-TIME*DRIFT/1000)*0.1/(m*wp)
External extraction (B in ppm)	ppm	pw(6)/[pw(6)-C]*(C*msol/mext-B*msol/mext)	(VEQ*CONC-TIME*DRIFT/1000)*1,000/(m*wp)

14.2.1 Internal calculations

Concentration determination

The result proposals depend on the setting of the **Entry type** parameter in the **Sample (KF)** method function.

Result proposals for Entry type = Weight or Fixed weight

Result	Unit	Formula R=	Constant C=
Concentration (Std. in mg/g)	mg/ml	CONC=CONT*m/(VEQ-(DRIFT/CONC(old))*TIME/1000) [1)]	1
Concentration (Std. in mg/ml)	mg/ml	CONC=CONT*(m/d)/(VEQ-(DRIFT/CONC(old))*TIME/1000) [1)]	1
Concentration (Std. in %)	mg/ml	CONC=CONT*m*10/(VEQ-(DRIFT/CONC(old))*TIME/1000) [1)]	1
Concentration (Std. in ppm)	mg/ml	CONC=CONT*m/(1000*VEQ-(DRIFT/CONC(old))*TIME) [1)]	1

[1)]CONC(old) refers to the Setup value current at the time of calculation.

Result proposals for Entry type = Volume or Fixed volume

Result	Unit	Formula R=	Constant C=
Concentration (Std. in mg/g)	mg/ml	CONC=CONT*(m*d)/(VEQ-(DRIFT/CONC(old))*TIME/1000) [1)]	1
Concentration (Std. in mg/ml)	mg/ml	CONC=CONT*m/(VEQ-(DRIFT/CONC(old))*TIME/1000) [1)]	1
Concentration (Std. in %)	mg/ml	CONC=CONT*(m*d)*10/(VEQ-(DRIFT/CONC(old))*TIME/1000) [1)]	1
Concentration (Std. in ppm)	mg/ml	CONC=CONT*(m*d)/(1000*VEQ-(DRIFT/CONC(old))*TIME) [1)]	1

[1)]CONC(old) refers to the Setup value current at the time of calculation.

Result proposals for Entry type = Weight or Fixed weight

Result	Unit	Formula R=	Constant C=
Concentration (Std. in mg/pc) [1]	mg/ml	CONC=CONT*m/(VEQ-(DRIFT/CONC(old))*TIME/1000) [2]	1

[1] For standard Riedel de Haën FASTrate tablets (CONT in mg/pc , m=pieces)
[2]CONC(old) refers to the Setup value current at the time of calculation.

Blank determination

The result proposals depend on the setting of the following parameters:

- **Entry type** in the **Sample (KF)** method function.
- **Source for drift** in the **Titration stand** method function

Result proposals for Entry type = Weight or Fixed weight and Source for drift = Request, Online or Fix value

Result	Unit	Formula R=	Constant C=
Blank	%	(VEQ*CONC-TIME*DRIFT/1,000)*C/m	0.1
	ppm		1,000

Result proposals for Entry type = Weight or Fixed weight and Source for drift = Determination

Result	Unit	Formula R=	Constant C=
Blank	%	(VEQ*CONC-TIME*DRIFTV*CONC/1,000)*C/m	0.1
	ppm		1,000

Result proposals for Entry type = Volume or Fixed volume and Source for drift = Request, Online or Fix value

Result	Unit	Formula R=	Constant C=
Blank	%	(VEQ*CONC-TIME*DRIFT/1,000)*C/(m*d)	0.1
	ppm		1,000

Result proposals for Entry type = Volume or Fixed volume and Source for drift = Determination

Result	Unit	Formula R=	Constant C=
Blank	%	(VEQ*CONC-TIME*DRIFTV*CONC/1,000)*C/(m*d)	0.1
	ppm		1,000

Miscellaneous internal calculations

Result	Unit	Formula R=	Constant C=
Drift	µg/min	DRIFT=DRIFTV*CONC	1
CW	µg	CW=VEQ*CONC*1,000	1

14.3 Mathematical functions and operators

The following mathematical functions and operators can be used in formulas:

Functions		Comparison operators	
Logarithm to the base 10	lg(x)	equal to	=
Logarithm to the base e	ln(x)	larger than	>
Exponential to base 10	pw(x) or scientific notation	larger than or equal to	> =
Exponential to base e	ex(x)	smaller than	<
Square	sq(x)	smaller than or equal to	<=
Square root	sr(x)	x in the range of	… < x < …
		not equal to	< >
		approximately	~

Mathematical operators	
Addition	+
Subtraction	-
Multiplication	*
Division	/

Logical operators	
and	AND
or	OR

Logical operators are only permitted within the formulas of "Condition" subfunctions (or parameters).

14.4 Naming conventions for using analysis data in calculations

In calculations (**Calculation** method function), you can access analysis data (raw results, results, resource data, and sample data) using symbols or generate further results. The following chapters contain tables with the analysis data that is available for the different types of titrations.

The analysis data is represented by symbols. The symbols consist of basic symbols and symbol extensions. The basic symbols define the type of data (volume, substance quantity) and the corresponding unit. The symbol extensions specify the data more precisely. The symbol extensions are listed in the table below.

Note that the entry of symbols in formulas is case-sensitive.

Extension	Explanation
EQ	Equivalence point
ext	Extraction
s	Sample
sol	Solvent
USE	Use of the symbol in the **Calculation** method function.

14.4.1 Sample data

Basic symbol	Unit	Possible symbol extensions			Symbol	Meaning
d	[g/mL]	--	--	--	**d**	The density of a sample or a standard.
f	--	--	--	--	**f**	A correction factor as defined in the sample method function.
m	[mL] [g] [pcs]	--	--	--	**m**	The sample size.
	[g]	--	--	sol	**msol**	Solvent weight for titrations of type Ext. Extr. (External extraction).
	[g]	--	--	ext	**mext**	Extracted sample quantity for titrations of type Ext. Extr. (External extraction)
n	--	--	--	--	**n**	The sample number.
					nTOT	Total number of samples in the loop.
T	[°C], [K], [°F]	s	--	--	**Ts**	The temperature of the sample, standard or buffer solutions as defined in the sample method function.
wp	[g/pcs]	--	--	--	**wp**	The weight per item.

14.4.2 Resource data

Basic symbol	Unit	Possible symbol extensions			Symbol	Meaning
B	[µg] [mmol]	--	--	--	**B[Name]**	A blank.
c	[mol/L]	--	--	--	**c**	Specifies the nominal concentration of a titrant used for a titration method function.
CONC	[mg/mL]	--	--	--	**CONC**	Represents the actual titrant concentration.
CONT	[mg/g] [mg/mL] [mg/pc] [%] [ppm]	--	--	--	**CONT**	The concentration of a liquid KF standard.
d	[g/mL]	--	--	--	**d**	The density of a sample or a standard.

Basic symbol	Unit	Possible symbol extensions			Symbol	Meaning
H	--	--	--	--	**H[Name]**	An auxiliary value.
M	[g/mol]	--	--	--	**M**	The molar weight of a substance. As defined in the setup.
z	--	--	--	--	**z**	The equivalent number of a substance. As defined in the setup.

14.4.3 Raw results

Basic symbol	Unit	Possible symbol extensions			Symbol	Meaning
C	--	--	--	--	**C**	A constant that uniquely belongs to the result Rx. It cannot be used in this form for the calculations of other results.
CONC	[mg/mL]	--	--	--	**CONC**	Represents the actual titrant concentration.
CW	[µg]	--	--	--	**CW**	Volume of water titrated up to the end point (without drift or blank value correction).
DRIFT	[µg(H_2O)/min]	--	--	--	**DRIFT**	Consumption (mass) per minute for the titration method function (water quantity per time unit that penetrates the titration stand).
DRIFTV	[µL/min]	--	--	--	**DRIFTV**	Volume of titrant consumption per minute for the drift determination.
E	[mV]	EQ	--	--	**EEQ**	Potential at the end point of the titration method function.
EST	[mV]	--	--	--	**EST**	Measured potential at the start of the titration method function.
t	[min:s]	--	--	--	**t**	Duration of a sample analysis.
		USE			**tUSE**	Duration of an analysis of a sample from the start of the loop to the usage of the symbol in the Calculation method function. The symbol cannot be used for conditions.
T	[°C], [°F], [K]	EQ	--	--	**TEQ**	Temperature at the equivalence point of a Titration (KF Vol) method function.
TIME	[min:s]	--	--	--	**TIME**	Duration of a sample analysis from the end of Standby mode to the end of the titration method function or a scan method function (incl. waiting for sample addition)
V	[mL]	EQ	--	--	**VEQ (=V)**	Titrant consumed up to the end point of the titration method function.

14.4.4 Results

Basic symbol	Unit	Possible symbol extensions			Symbol	Meaning
Mean	Unit of Rx	Rx	--	--	**Mean[Rx]**	The mean value of a result Rx.
		yRx			**Meany[Rx]**	The mean value of a result Rx over y samples
Rx	Arbitrary	--	--	--	**Rx**	A result x.
Rx[yy]	Arbitrary	--	--	--	**Rx[yy]**	Uses the value in the Result Buffer list for the corresponding sample for Result x from the method with ID yy.
s	Unit of Rx	Rx	--	--	**s[Rx]**	The standard deviation of a result Rx
		yRx			**sy[Rx]**	The standard deviation of a result Rx over y samples
srel	[%]	Rx	--	--	**srel[Rx]**	The relative standard deviation of the result Rx.
		yRx			**srely[Rx]**	The relative standard deviation of a result Rx over y samples

15 Transporting the titrator

If you transport the titrator over long distances, use the original packaging.

1 Empty all tubes.
2 Empty the titration vessel.
3 Shut down the titrator.
4 Unplug the titrator.
5 Remove all cable connections.
6 Remove the titration vessel from the titration stand.
7 Remove all tubes.
8 Remove all burettes.
9 Move the titrator to the new location.

16 Care and maintenance

16.1 Cleaning

Housing of the titrator

1 Unplug the titrator.
2 Clean the housing of the titrator using a cloth moistened with alcohol.

Titration stand

1 Dismantle the titration stand.
2 Clean the parts of the titration stand.
3 Reassemble the titration stand.

16.2 Maintenance

Mettler Toledo recommends that a preventive maintenance and calibration certification is done at least once a year through your local Mettler Toledo Service Organization.

NOTICE

Danger of damage to the titrator through leaking burettes!

Substances leaking out of burettes can enter the housing and damage parts of the installed boards.

– Check the burettes for leaks and replace leaking burettes.

Daily

- Remove the burettes from the titrator.
- If you work with corrosive substances, rinse the burettes.
- If you work with corrosive substances, check the burettes for leaks and replace leaking burettes.

Weekly

- If you use the burettes daily, check the burettes for leaks and replace leaking burettes.

Before periods of inactivity

1 Rinse the burettes.
2 Empty all tubes.
3 Empty the titration vessel.
4 Shut down the titrator.
5 Unplug the titrator.
6 Remove the titration vessel from the titration stand.
7 Remove all tubes.
8 Remove all burettes.

17 Disposal

In conformance with the European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

18 Technical data

See also

Optional accessories ▶ Page 124

18.1 Titrator

Power supply	Input voltage	100–240 V~ ±10 %
	Input frequency	50–60 Hz
	Primary connection socket	3 pin, IEC C14
	Power consumption	24 VA
	Connected load	24 V DC ⎓, 1.25 A
	Secondary connection plug	2 pin, DC plug
CPU	Processor	Arm Cortex
	SDRAM	512 MB
	Flash memory	1 GB (industrial SD card)
Dimensions	Width	210 mm
	Depth	333 mm
	Height	308 mm (with titration stand)
		320 mm (ready-to-operate device)
	weight	4.2 kg
Materials	Titrator housing	Crastin® PBT
	Cover sheet	PET
	Protective cover	Copolymer
	Chassis	Stainless steel
	Titration stand	Crastin® PBT
	Lid (titration beaker)	Polypropylene
	Threaded ring	Polypropylene
	Three hole adapter	Polypropylene
	Dispensing tube / extraction tube	FEP
	Air tubes	Silicone
	O-ring (screw top)	EPDM
	O-ring (threaded ring)	FEP / silicone
	Sealing ring (bottle)	PTFE / silicone
	Seal (dispensing tube / extraction tube)	PTFE
	Connecting piece	Polypropylene
Ambient conditions	Ambient temperature	+5 °C – 40 °C
	Relative humidity	Max. 80 % (non-condensing) at 31 °C, linear fall to 50 % at 40 °C
	Use	In interior spaces
	Overvoltage category	II
	Pollution degree	2

COM	Socket	9-pin male D-sub
	Configuration	Full-duplex
	Baud rate	1200…19200
	Handshake	X-On / X-Off
	Galvanic isolation	No
	ESD stability	Min. 1000 V
	Short-circuit protection	Yes
USB1 / USB2	USB host	USB full speed
	Max. power load	700 mA max. for each port
PC	USB client	USB 2.0
Ethernet	Socket	RJ45
	Speed	10/100 MBit/s
TTL-I/O	Socket	9-pin female D-sub
	Inputs	2
	Outputs	4
	Galvanic isolation	No
CAN OUT	Socket	RJ12
	Speed	500 kBit/s
	Voltage	24 V⎓ ±10%
	Current	Max. 500 mA
Stirrer / pump	Socket	5-pin mini-DIN
	Pump detection	Yes
	Stirrer detection	Yes
	Pump voltage	24 V⎓ ±5 %, 400 mA maximal current for normal operation
	Stirrer voltage range	0 to 18 V⎓ ±10 % 300 mA maximal current for normal operation
SENSOR	Socket	LEMO triaxial, 9 mm
	Current range	0 to 24 µA~
	Steps	0.1 µA
	Limits of error	1 µA
	Measuring range	± 2000 mV
	Resolution	0.1 mV
	Limits of error	2 mV

Burette drive	Drive	Stepping motor
	Resolution	1/20000 of the burette volume
	Limits of error	At 10% 15 µm
		At 30% 15 µm
		At 50% 25 µm
		At 100% 50 µm
	Filling time	Minimum 20 sec at 100% filling rate
	Discharge time	Minimum 20 sec
	Burette detection	Yes
	Thread length	50 mm
	Thread pitch	1 mm
	Resolver (magnetic)	32 pulse/360°
	Pulse / full stroke	1600
	Monitoring resolution	1/1600 = 0.06%
Interchangeable burettes	Volume	1, 5, 10 and 20 mL
	Drive and burette limits of error	According to ISO 8655-3
	Materials that come into contact with titrants	Fluoroplastic, borsilicate glass, ceramic
Internal magnetic stirrer	Drive	Stepping motor
	Max. speed	1050 rpm
Display	Technology	Color TFT
	Size	5.7"
	Resolution	VGA 640 x 480 pixels
	Backlighting	LED
	Brightness control	Per software 50–100%
Input	Technology	Full-coverage resistive touchscreen

Power Management

The devices have a power management system which prevents the titrator from switching off unexpectedly in the event of a power overload. Tasks which would cause a power overload, because a number of pumps, stirrers and burette drives are already in use, cannot be started at all. A notification brings the start attempt to the attention of the user. It is advisable, if possible, to connect pumps and stirrers directly to sample changers or other devices which have their own power supply, such as a TBox, instead of to the titrator itself.

18.2 Supported devices (periphery)

Balances

Balances can connect to the COM interface of the titrator. METTLER TOLEDO balances must be equipped with an RS-232 interface or an appropriate adapter. For a list of connection cables, see Optional accessories.

Manufacturer	Type	RS	LocalCAN	Note

METTLER TOLEDO	AB / PB	•	•	COM ports
	AB-S / PB-S	•		COM ports
	AG / PG / PR		•	COM ports
	AT / MT / UMT	•		COM ports
	AX / MX / UMX	•	o	COM ports
	PG-S	•	o	COM ports
	XPE / XP	•	o	COM ports
	XSE / XS	•	o	COM ports
	MS-TS / MLT / MET	•	o	COM ports
	MS / MS-S / ML / ME	•	o	COM ports
Sartorius	Various	•		COM ports

• Standard o Option

Printer

Printers can be connected to the USB1 or USB2 interface of the titrator. PCL-compatible printers from various manufacturers are supported. The METTLER TOLEDO USB-P25 is a robust and easy-to-operate matrix printer which prints onto standard quality paper. A current list of supported printers can be found on the Internet at: http://www.mt.com/titration-printers.

Manufacturer	Type	Note
Various	Generic PCL printers	Connection via USB1 or USB2
METTLER TOLEDO	USB-P25	Connection via USB1 or USB2
METTLER TOLEDO	P-56RUE	Connection via USB1 or USB2
METTLER TOLEDO	P-58RUE	Connection via USB1 or USB2

Note

A standard USB hub can be used if more than two devices are to be connected to the USB connections of the titrator.

Sample changer

Manufacturer	Type	Note
METTLER TOLEDO	Stromboli oven sample changer	Connection via TTL-I/O

Barcode reader

Sample data can be read in via an appropriate barcode. The barcode reader can also be used to enter text in open input fields. Barcode readers can be connected to the USB1 or USB2 interface of the titrator.

Note

A standard USB hub can be used if more than two devices are to be connected to the USB connections of the titrator.

19 Optional accessories

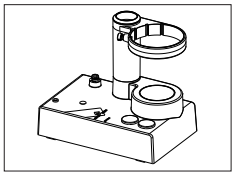
All items that are optionally available for your compact titrator are listed below. Compatibility of optional accessories depends on the titrator type. Check with your local sales representative.

All parts are specified with their ordering code and quantity in cases where more than one part is included. When ordering, some parts are only available in a minimum order quantity. In such cases, the corresponding minimum order quantity is quoted.

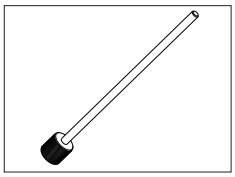
The standard equipment and optional accessories for auxiliary equipment, are listed in the Operating Instructions of the auxiliary equipment.

If you have any questions, contact your authorized METTLER TOLEDO (Ref.) dealer.

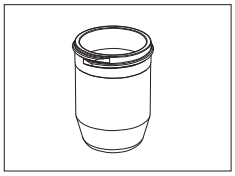
19.1 Titration stands



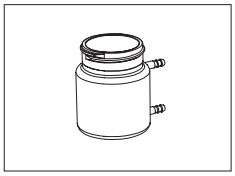
DV704 External titration stand with magnetic stirrer **51109259**



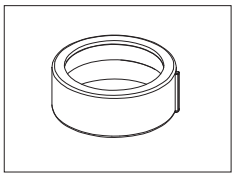
Stand rod **51107495**



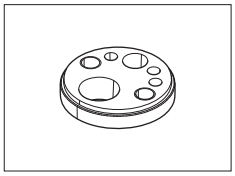
Titration vessel **51107463**



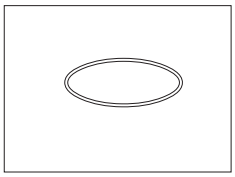
Tempering beaker **51107497**



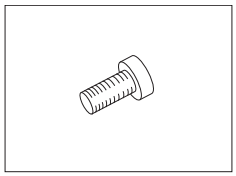
Threaded ring **51107459**



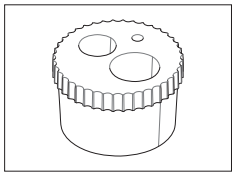
Cover plate for volumetric titration vessel **51107462**



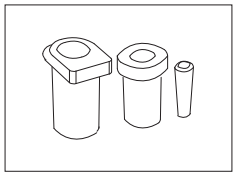
O-ring **51190366**



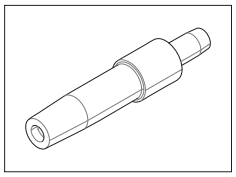
Fastening screw (for measuring cell) **51107474**



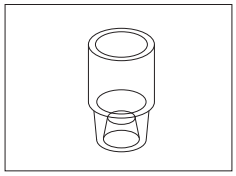
Three-hole adapter **23943**



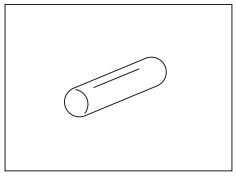
Stopper for three hole adapter **25883**
(1 set: 1 NS 10, 1 NS 7.5, 6 pin hole stopper)



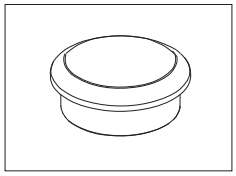
Connector KF Titrators **23957**



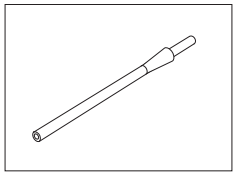
Septum stopper (10 pcs.)
NS 10 **23949**
NS 24 **23950**



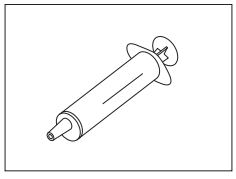
Magnetic stirrer bar **51191159**



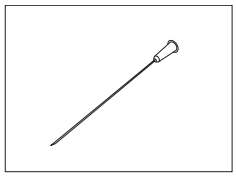
Seal (titration stand drying tube) **51107492**



Gas inlet for Volumetric KF **25971**

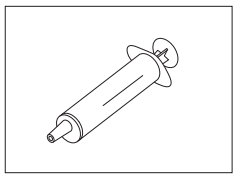


Syringes (100 pcs.) **71482**
10 mL



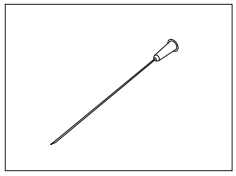
Injection needle (12 pcs)
80 × 1.2 mm

71483



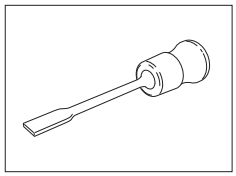
Syringe (120 pcs)
1 mL

30315987



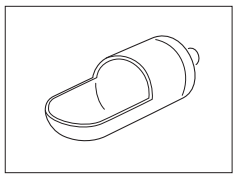
Injection needle (100 pcs)
80 × 0.8 mm

71484



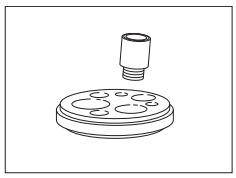
Visco-Spoon™

51107668



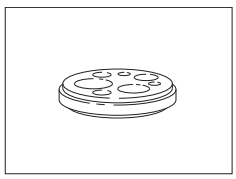
Weighing boats (5 pieces.)
Glass dia. 20 x 60 **23951**
Glass dia. 30 x 80 **23952**
PE dia. 38 x 100 **23954**

19.2 Homogenizer sets



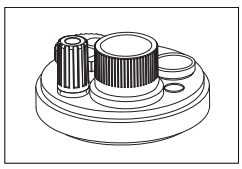
Homogenizer adapter set 12
(for kinematica)

51107534



Homogenizer adapter set 18
(for IKA)

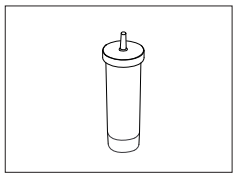
51107409



Homogenizer adapter set 19
(for IKA)

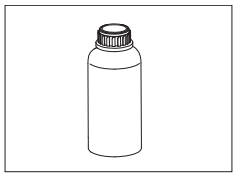
30030848

19.3 Drying tubes

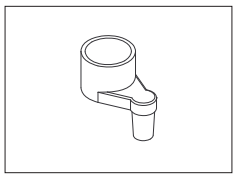


Drying tube with cover

23961

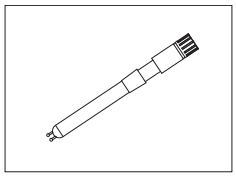


Molecular sieve **71478**
250 g

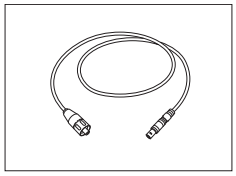


Drying tube holder **23915**

19.4 Sensors

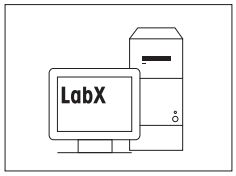


Dual platinum pin electrode **51107699**
DM143-SC

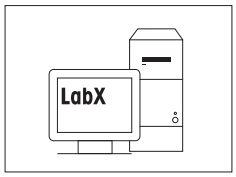


Triaxial SC Lemo (Classic)
Length: 72 cm **51109183**
Length: 100 cm **51109184**
Length: 160 cm **51109185**
(For classic titration electrodes, especially for amperometric and voltametric titrations with DM143-SC)

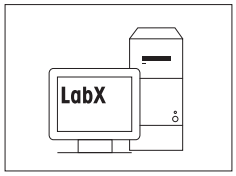
19.5 Software



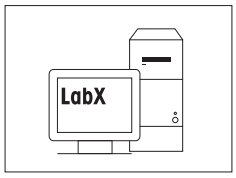
LabX Titration Server **30097755**
- Network installation for up to 30 total instrument licenses
- LabX Titration Server
- User Management and Auot Import/Export



LabX Titration Express **30097754**
- Single PC installation for up to 3 total instrument licenses
- One titrator and balance instrument license

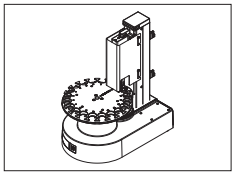


LabX Titration Instrument License (1 pc) **30097756**

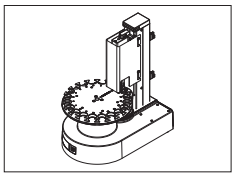


LabX Titration Instrument License (3 pcs) **30097757**

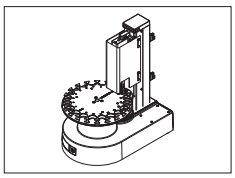
19.6 Sample changers and ovens



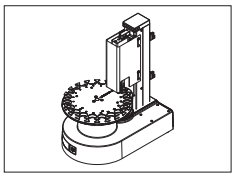
InMotion KF Flex
Rack 10 mL, 23 sample positions, 1 drift position
30407500



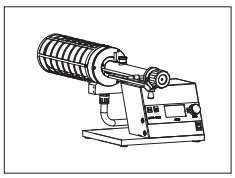
InMotion KF Pro
Rack 20 mL, 19 sample positions, 1 drift position
30407501



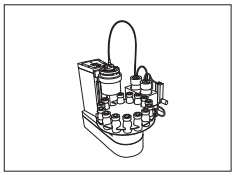
InMotion KF Pro
Rack 10 mL, 23 sample positions, 1 drift position
30407502



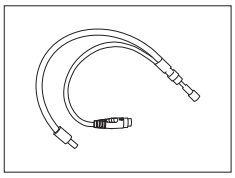
InMotion KF Pro
Rack 5 mL, 25 sample positions, 1 drift position
30407503



DO308 drying oven
51371200

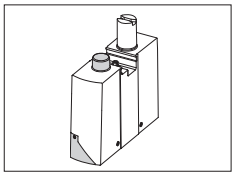


Stromboli oven sample changer
51105200

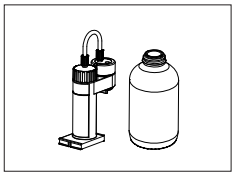


Tube (heatable) with cable
51108836

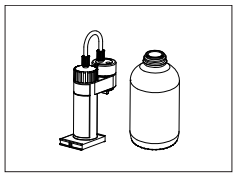
19.7 Dosing and pumps



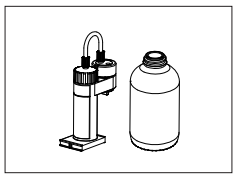
Dosing unit with CAN cable
51109030



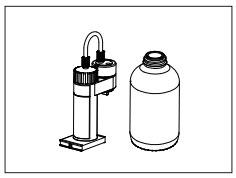
Interchangeable burette DV1005
5 ml
51107500



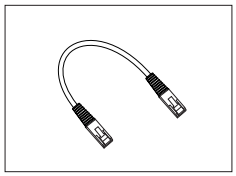
Interchangeable burette DV1010
10 mL **51107501**



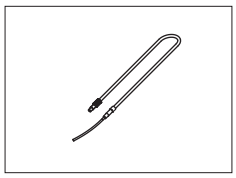
Interchangeable burette DV1020
20 mL **51107502**



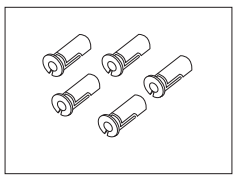
Interchangeable burette DV1001
1 ml **51107503**



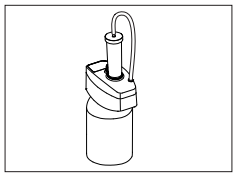
6-pole CAN cable
Length: 20 cm **51109874**
Length: 60 cm **51109886**



Dispensing tube with siphon tip 100 cm **25961**

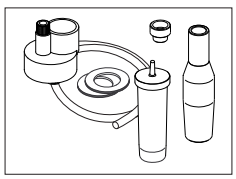


Siphon tips (5 pcs.) **23240**



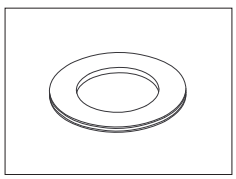
Solvent manager kit **51105652**

- Solvent manager set
- Clear glass bottle, 1L
- Pump tubing
- Y-cables

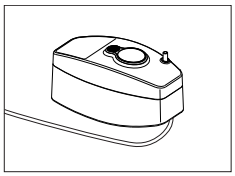


Reagent changing set with: **51105606**

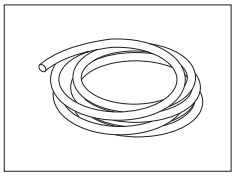
- Extraction adapter for Coulometer cell
- Park sleeve
- PTFE extraction tube 800 mm (23936)
- Screw top (23937)
- Drying tube with cover (23961)
- 2 flat seals (23981) (minimum order quantity 5 pcs)



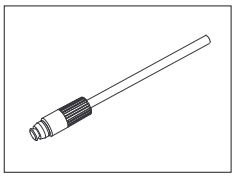
Flat seal (minimum order quantity 5 pcs.) **23981**



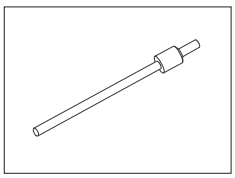
Solvent Manager set with: **51105600**
- Silicone tube 850 mm
- Silicone tube 170 mm
- Drying tube with cover
- 2 flat seals



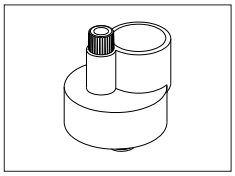
Silicone tube (pressure tube to solvent manager) **51105581**
850 mm



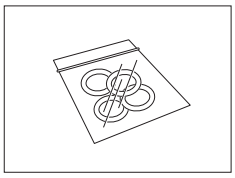
Draining tube / Dispensing tube **51107481**



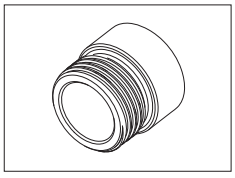
Adapter for immediate draining **51105594**



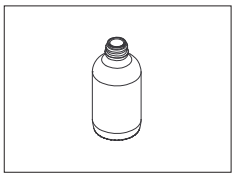
Screw top (for bottles) **23937**



O-ring (4 pcs.) **51107496**
for screw tops

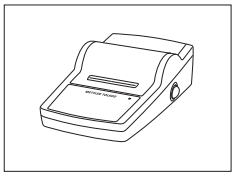


Bottle adapter
Merck, Germany **23774**
Fisher, USA **23787**

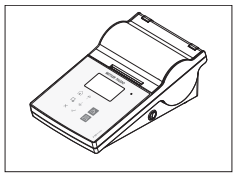


Clear glass bottle **30079610**
1 l

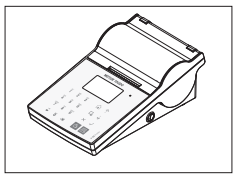
19.8 Printers



Lab equip access. data writer USB-P25/01 **11124301**

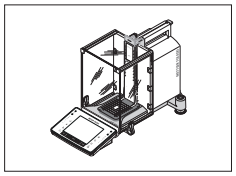


Lab equip access. data writer P-56RUE **30094673**

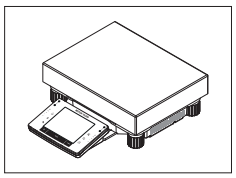


Lab equip access. data writer P-58RUE **30094674**

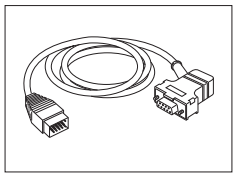
19.9 Balances



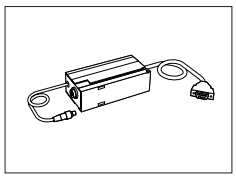
Analytical balances –
- XPE, XSE, XS
- MS, ML, ME-T, ME



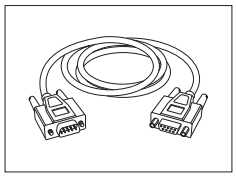
Precision balances –
- XPE, XS
- MS, ML, ME-T, ME



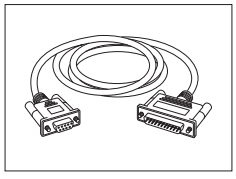
Connection cable for METTLER TOLEDO balance (MiniMettler) **229029**



Connection cable for METTLER TOLEDO balance (LC interface) **229065**

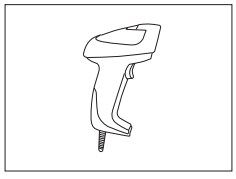


Connection cable for METTLER TOLEDO balance (RS9 interface) **11101051**

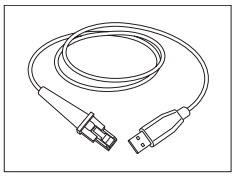


Connection cable for SARTORIUS balances (RS9-RS25) **51190363**

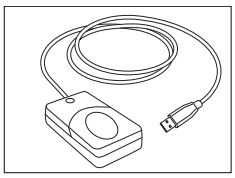
19.10 Miscellaneous peripherals



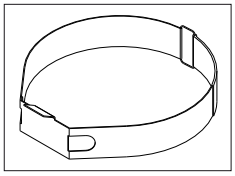
Barcode reader with USB interface **21901297**



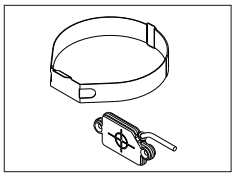
USB Cable 412 **21901309**



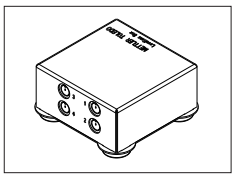
Fingerprint reader with USB interface **51191880**



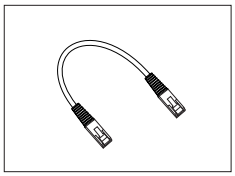
LevelSens holder **51109852**



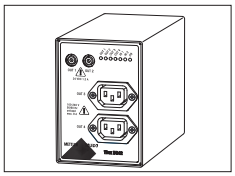
LevelSens (capacitive level sensor)
complete incl. sensor holder
- LevelSens Non-Aqueous **51109853**
- LevelSens Aqueous **51109854**



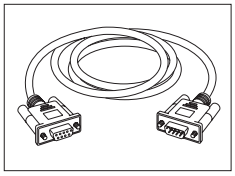
LevelSens box (connection option for four LevelSens) **51109210**



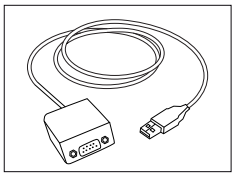
6-pole CAN cable (for LevelSens) **51109874**
(20cm)



DR42 TBox **51107420**
For activating external devices via TTL-I/O

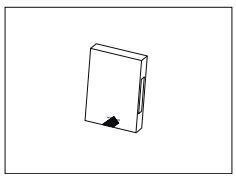


Connection cable for Rondolino **51190589**
(RS9-RS9)

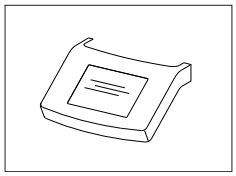


USB data export box **51105855**

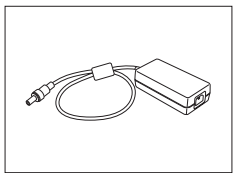
19.11 Miscellaneous accessories



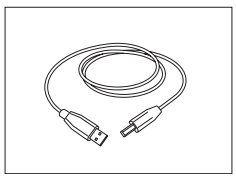
CD Titration User Documentation **30297239**



Protective cover for touchscreen **51105567**



External power supply (100 – 240 V) **51105795**



USB cable A-B (for PC or printer) **51191926**
180 cm

20 Appendix

20.1 System validation

The products / systems were tested in respect of functionality and specification prior to shipment. In order to support GLP and validation requirements, we will make the following documents available to authorized persons for inspection:

- Performance specifications
- Market and technical requirements
- Quality plan
- Project management system
- Plan and Test results
- Review reports

METTLER TOLEDO, Analytical will retain possession of all documents and their reproductions and may wish to conclude a nondisclosure agreement with those requesting access to these documents.

Index

A

accessories 124
Account policies
  Defining 85
Action When Exceeding Usable Life 89
Add Result 66
Adjustment
  Touch screen 93
All Results 66
Analysis and Resources Behavior
  Action When Exceeding Life Span 89
  Action When Exceeding Usable Life 89
  Analysis Sequence Settings 88
  Resource Behavior 89
Analysis data 115
  Using 109
Analysis Data in Formulas 109
Analysis flow diagram 103
Analysis Records 106
Auxiliary values 57, 95

B

Balance 73
Barcode reader 74
Beep 82
Blank value 58
  Dialog 95
  Starting determination 17, 150
Board data 94
Board firmware 93
Burette
  Manual operation 98
Burettes 94

C

Cancel determination
  Online dialog 17, 150
Chemicals
  Concentration standards 71
  Titrants 71
Concentration determination 105
  Titrant 16, 149
Configure barcode reader 74
Configure USB stick 75
Configuring a balance 73
Control
  Titration KF(Vol) 54, 56

D

Date and time 83
Determination types
  Sample, Concentration, and Blank 66
  Switching 106
Dispensing
  Manual 99
Disposal 119, 168
Dosing rate
  Control 54, 56
Drift determination 16, 104, 149, 149
Drives 94

E

Emergency
  Shut down 31, 160
End of sample 63
End series 15, 148
Evaluation and calculation 108
Exceeding Usable Life 89
Experts 85
Expired Resources 70
External Extraction 106
  Analysis Sequence 106

F

Fingerprint reader 78
  Registration 79
Firmware History 93
Formulas 109

G

Global settings
  Analysis and Resources Behavior 87
  System 83
  User Management 84

H

Hardware
- Balance 73
- Barcode reader 74
- Fingerprint reader 78
- LevelSens 79
- Network settings 77
- Network storage 78
- PC settings 77
- Peripherals 73
- Printer 75
- Sensors 72
- Titration stands 80
- USB-Stick 75

Hidden method functions 63
Homogenizer 81

I

Identification, titrator 83
Import/Export, data 92
Indexing of method functions 110
InMotion KF
- Setting up 80

Instruction 58
Internal calculations
- Blank determinations 113
- Concentration determination 113

K

Karl Fischer stand
- Setting up 80

Karl Fischer titration 53
- Measurement principle 19

Keyboard layout
- Define 83

KF Stand 81

L

Language, setting 82
Level sensor 79
LevelSens 79
- Activate 79

Life span 38, 166
Life span monitoring 38, 167

M

Managing groups 85
Manual operations
- Burette 98
- Pump 99
- Sensor 97
- Solvent manager 99
- Stirrer 97

Mathematical functions and operators 114
Measured Values 17, 150
Method
- Delete 36, 164
- Start 36, 164

Method editor 40
Method functions
- Hidden method functions 63
- Overview 45

Method functions, hidden
- Pretitration 63
- Standby 63

Method functions, Parameters
- Auxiliary value 57
- Blank value 58
- Calculation 59
- Drift determination 46
- End of sample 63
- Instruction 58
- Mix time 53
- Record 62
- Sample (KF) 47
- Title 46
- Titration (KF Vol) 53
- Titration Stand 50

Method ID 40
Method syntax 42
Method Templates 40
Method types 40
Methods
- Creating 35, 163
- Modify 35, 164

Mettler methods 41
METTLER TOLEDO balances 74
Mix time 53
Monitoring
- Usable life and life span 38, 166

N

Naming conventions for calculations 115
Network printer
- Parameter 76

Network settings 77
Network storage 78

O

Online Dialog 15, 148
Open series 102
Outlier test 67

P

parts 124
PC settings 77
PDF file writer
  Parameter 77
Peripherals 73
  Balance 73
  Balances 74
  Barcode reader 74
  Fingerprint reader 78
  Printer 75
  USB data export 75
  USB stick 75
Polarized sensors 72
Predefined methods 40
Pretitration
  Automatic switch 16, 149
  Online dialog 16, 149
Printer 75
  PDF file writer 75
  Setup 75
  USB data export 75
  XML file writer 75
Printouts
  Per Series 106
Pump
  Manual operations 99
Pump and Stirrer Detection 89
Pumps 73

R

Recalculation 68
Record 62
Registration
  Fingerprint reader 79
Reset to factory settings 93
Results
  Deleting 69
  Display 15, 148
  raw 66
Results proposals 67
Rinse burette 98
Routine 85

S

Safety Information
  Signal words 8, 141
  Warning Symbols 8, 141
Sample (KF) 47
Sample analysis 16, 149
Sample data
  Change 15, 148
Sample Results 69
Sample series
  Sample parameters 64
Sample size 16, 149
  Standby 17, 150
Screen, setting 82
Sensor
  Polarized 98
Sensors
  Configure 72
Series Analysis 105
Series data
  Save 16, 149
Series templates 64
Service & Maintenance
  Board data 94
  Board firmware 93
  Burettes 94
  Data Import/Export 92
  Drives 94
  Reset to factory settings 93
  Titrator Firmware History 93
  Update 94
Settings
  global 83
Setup menu 70
Shortcuts
  Manage 82
Shut down
  Emergency 31, 160
Signal words 8, 141
Single-component reagent 19
Solvent manager
  Manual operations 99
Standby 16, 149
  Automatic switch 16, 149
  Online dialog 16, 149
Start analysis dialog 14, 147
Starting an Analysis 101
Starting analysis 102
Statistics 67

Stirrer 97
Stop analysis
Online dialog 17, 150
Stop method 15, 148
Stromboli 81
Analysis Sequence 105
Stromboli TTL
Setting up 80
System settings 83

T

Time and date 83
Title
Parameter 46
Titrant
Replacement 106
Titrant Replacement 106
Titrants 71
Titration
Network settings 77
Network storage 78
PC settings 77
Titration (KF Vol) 53
Titration stand
Setting up 80
Titrator identification 83
Touch screen adjustment 93
Two-component reagent 19

U

Undo all 69
Undo Changes 69
Updating 94
Usable life 38, 166
Usable life and life span
Monitoring 38, 166
USB compact printer 75
Parameter 76
USB data export 75
Parameter 76
USB data export box 76
USB printer
Parameter 76
USB-Stick 75
User management
Managing groups 85
User rights
Experts 85
Routine 85
User settings
Keyboards 83
Language 82
Screen 82
Shortcuts 82

V

Values
Auxiliary 95
Blank 95

W

Warning Symbols 8, 141

X

XML file writer
Parameter 77

21

User Manual

21.1	Introduction	140
21.2	Safety information	141
21.2.1	Definition of signal words and warning symbols	141
21.2.2	Product-specific safety notes	141
21.3	Design and Function	143
21.3.1	Instrument	143
21.3.2	User interface	145
21.4	Installation	151
21.4.1	Standard equipment	151
21.4.2	Optional equipment	157
21.5	Operating the instrument	160
21.5.1	Start up the titrator and shut down the titrator	160
21.5.2	Running a coulometric Karl Fischer titration	160
21.5.3	Creating and handling Shortcuts	162
21.5.4	Creating Methods	163
21.5.5	Modifying or Deleting Methods	164
21.5.6	Starting Methods	164
21.5.7	Stopping an analysis	165
21.5.8	Customizing touch screen and signals	165
21.5.9	Monitoring the expiry date and life span of Resources	166
21.6	Transporting the titrator	167
21.7	Care and maintenance	167
21.7.1	Cleaning	167
21.7.2	Maintenance	168
21.8	Disposal	168
21.9	Technical data	168

21 User Manual

21.1 Introduction

Thank you for choosing a METTLER TOLEDO Volumetric KF Titrator. The Volumetric KF Titrator is an easy-to-operate instrument for volumetric Karl Fischer titrations.

About this document

The instructions in this document refer to titrators running firmware version 5.2.0 or higher.

For third party licenses and open source attribution files, see the following link:

▶ www.mt.com/licenses

If you have any additional questions, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

Conventions and symbols

Refers to an external document.

Note for useful information about the product.

Elements of instructions

- Prerequisites

1 Steps

2 …

   ⇨ Intermediate results

⇨ Results

21.2 Safety information

- Read and understand the information in these Operating Instructions before you use the instrument.
- Keep these Operating Instructions for future reference.
- Include these Operating Instructions if you pass on the instrument to other parties.

If the instrument is not used according to the information in these Operating Instructions or if it is modified, the safety of the instrument may be impaired and Mettler-Toledo GmbH assumes no liability.

21.2.1 Definition of signal words and warning symbols

Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results.

Signal words

WARNING	for a hazardous situation with medium risk, possibly resulting in death or severe injury if not avoided.
NOTICE	for a hazardous situation with low risk, resulting in damage to the instrument, other material damage, malfunctions and erroneous results, or loss of data.

Warning symbols

Electrical shock

21.2.2 Product-specific safety notes

Intended use

This instrument is designed to be used in laboratories by trained staff. The instrument is suitable for the processing of reagents and solvents.

Any other type of use and operation beyond the limits of technical specifications without written consent from Mettler-Toledo GmbH is considered as not intended.

Responsibilities of the instrument owner

The instrument owner is the person that uses the instrument for commercial use or places the instrument at the disposal of the staff. The instrument owner is responsible for product safety and the safety of staff, users and third parties.

METTLER TOLEDO assume that the instrument owner provides the necessary protective gear, appropriate training for the daily work and for dealing with potential hazards in their laboratory.

Safety notes

⚠ WARNING

Danger of death or serious injury due to electric shock!

Contact with parts that contain a live current can lead to injury and death.

1 Only use a METTLER TOLEDO power cable and AC adapter designed for your instrument.
2 Connect the power cable to a grounded power outlet.
3 Keep all electrical cables and connections away from liquids.
4 Replace damaged power cables and AC adapters immediately.

NOTICE

Danger of damaging the touch screen with pointed or sharp objects!

Pressing on the touch screen with pointed or sharp objects may damage it.

– Operate the touch screen by applying gentle pressure with the pad of your finger.

NOTICE

Danger of damage to the instrument due to incorrect parts!

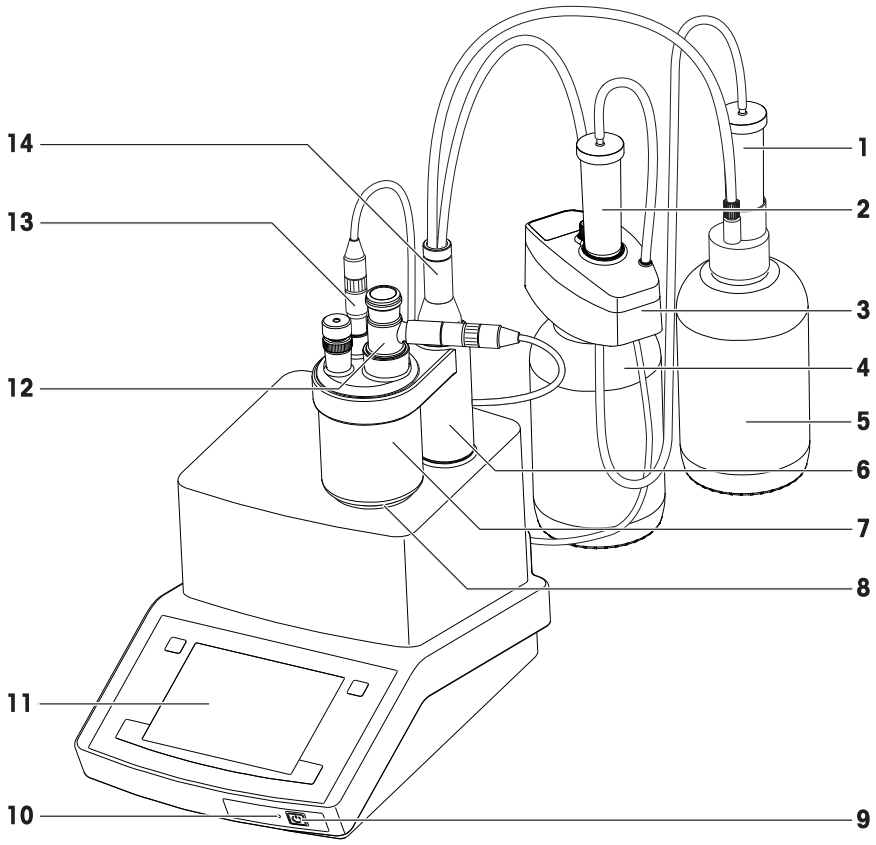
Using incorrect parts with the instrument can damage the Instrument or cause the instrument to malfunction.

– Only use parts supplied with the instrument, listed accessories and spare parts from METTLER TOLEDO.

21.3 Design and Function

21.3.1 Instrument

21.3.1.1 Overview



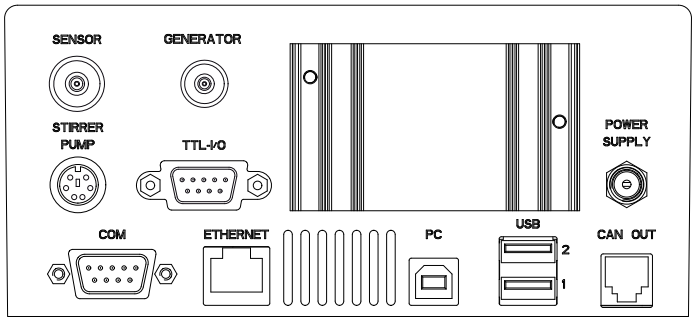
1	Solvent bottle drying tube[1)]	**8**	Internal magnetic stirrer
2	Waste bottle drying tube	**9**	Power button
3	Solvent manager [2)]	**10**	Indicator light (LED)
4	Waste bottle [2)]	**11**	Touch screen
5	Solvent bottle [3)]	**12**	Generator electrode
6	Titration arm	**13**	Double platinum pin electrode
7	Measuring cell	**14**	Extraction adapter and park sleeve [1)]

[1)] Component of the optionally available reagent changing set

[2)] Not available with standard equipment of C10SD and C10SX

[3)] Not available with standard equipment

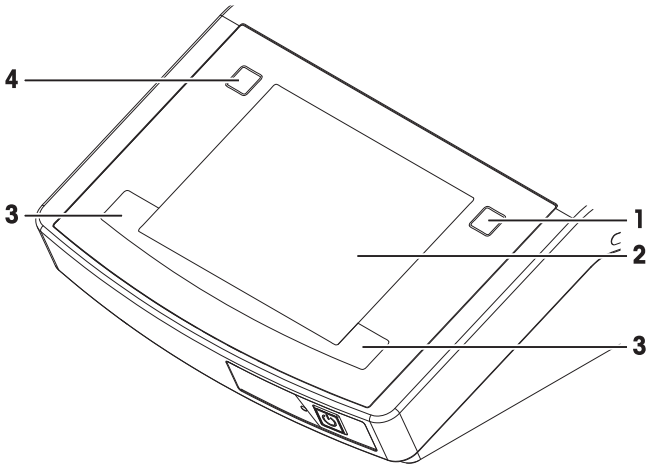
21.3.1.2 Rear panel connections



Socket	Use	Example
SENSOR	Measuring electrode	DM143-SC

Socket	Use	Example
GENERATOR	Generator electrode	Generator electrode with diaphragm
STIRRER PUMP	Stirrer/pump	Solvent manager/stirrer
TTL-I/O	Sample changer/homogenizer	Stromboli/homogenizer via TBox
POWER SUPPLY	AC adapter	AC adapter
COM	Balance	XS analytical balance
ETHERNET	Network	Link to LabX PC software via USB interface
PC	PC connection via USB	Link to LabX PC software via USB interface
USB 1	Printer/barcode reader/memory stick/USB hub/sample changer	USB-P25 compact printer/InMotion KF
USB 2	Printer/barcode reader/memory stick/USB hub/sample changer	Barcode reader/InMotion KF
CAN OUT	CAN connection	For service use

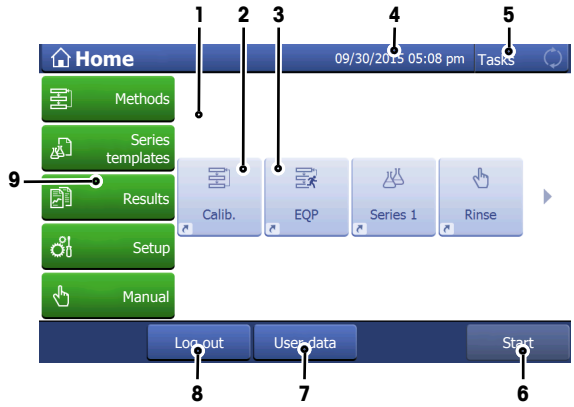
21.3.1.3 Terminal



Nr.	Name	Function
1	Info button	Accesses the interactive online help for the content of the current dialog.
2	Touch screen	Displays information and can be used to enter information.
3	Home button	Returns you to the home screen from any menu position.
4	**Reset** button	Ends all tasks that are currently running.

21.3.2 User interface

21.3.2.1 Home screen



	Name	Explanation
1	**Shortcut area**	Shows indirect and direct shortcuts for frequently used methods. Shortcuts are saved in the user profile and can be defined, changed and deleted by the user.
2	**Indirect shortcut**	An indirect shortcut opens the window **Start analysis** of the method.
3	**Direct shortcut**	A direct shortcut starts the method without opening the window **Start analysis**.
4	**Status bar**	The status bar contains the current menu item, user name as well as date and time.
5	**Instrument status**	Shows the current working status of the instrument. **Blue** No measurement running **Green** Measurement running
6	**Start**	Switch to direct measurement (quick start for the defined standard measurement of this instrument).
7	**User data**	Opens a window with information about the currently logged in user.
8	**Log out**	Directly log out the current user. The window **Login** opens after logging out.
9	**Menus**	**Methods** Create and handle methods for every measurement type.
		Series templates Open the menu for series templates for every method available on the instrument.
		Results Display all measurement results, print out or export them. Visit detail information about every single result.
		Setup Define all system settings in this menu, e.g,, hardware settings, user management or user preferences. These settings are usually made during installation of the instrument.
		Manual Display the manual operations available on the instrument.

21.3.2.2 Footer buttons

Depending on the selected submenu there are specific buttons in the footer.

AddToHome Create a shortcut of a quick analysis.

Axes Opens the **Axes selection**.

Back Go back one step in the menu structure.

Cancel Cancel the current input without saving.

Calculate	Performs the calculation of an additional result and adds the result to the results of the analysis.
Continue	Continues a suspended analysis.
Columns	Opens the **Column selection**.
Delete	Deletes the selected item.
Delete all results	Deletes all results of the selected series.
Delete method	Delete the selected method. Shortcuts which reference to this method will also be deleted.
Expired resources	Shows the expired resources connected to this instrument.
Graphic	Shows the measured values as graphic.
Insert	Insert a method function in an existing method.
Log out	Log out the current user.
Measured values	Shows the measured values as table.
New	Create a new method.
OK	Confirm the entered settings.
Outlier test	Performs an outlier test.
Overview	Goes back one step in the menu structure.
Password login	Opens the menu **Password login**.
Preview	When entering a text with an alphanumeric keypad, you can preview your input.
Print	Print out the currently shown screen in tabular form. A printer must be connected to the instrument.
Results	Shows the current results of the running measurement (only during a running method).
Result proposals	Opens a list with predefined results.
Samples	Open the list with your defined samples.
Select Series	Opens a list with the results of the last series.
Shut down	Shut down the titrator.
Start	Start a quick analysis directly from the homescreen.
Statistics	Shows statistics for results within a sample loop.
Stop	Stops a manual operation.
Stop definitely	Stops the analsysis
Suspend	Suspends the analysis.
Test	Testing your current audio-signal settings.
Update	Command button for updating your board firmware.
User data	Information about the logged user.

21.3.2.3 Input field types

Various fields and lists allow you to enter or view data. Buttons on the right side show the type of the field or list.

Text input field

Any text comprised of letters (up tp 30 characters), numbers and symbols can be entered into these fields.

Text input field (extended)

Any text comprised of letters (up to 500 characters), numbers and symbols can be entered into these fields.

Number input field

Numbers, formulas and auxiliary values can be entered into these fields.

Drop-down list

A drop-down list opens from which you can select an entry.

Shortlist

A shortlist opens from which you can select an entry.

Formula field

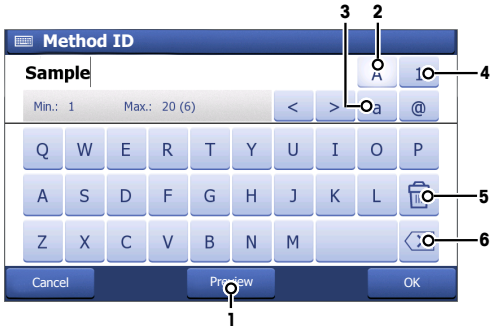
A formula must be entered in these fields.

Info field

The displayed content is only for information (read only).

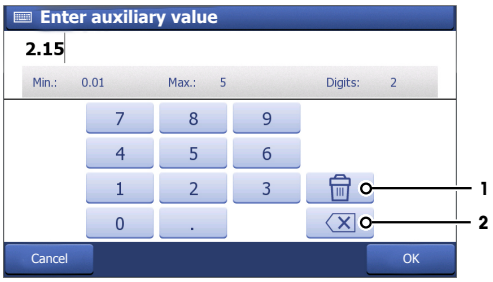
21.3.2.4 Keypads

Alphabetic keypad



- Tap (1) to see how your input looks like.
- Tap (2) for capital letters.
- Tap (3) for lowercase letters.
- Tap (4) to switch to a numeric keypad and (2) to turn back to alphanumeric.
- Tap (5) to delete all entered letters or numbers.
- Tap (6) to delete the last entered letter or number.

Numeric keypad



- Tap (1) to delete all entered numbers.
- Tap (2) to delete the last entered number.

21.3.2.5 Specific user dialogues

21.3.2.5.1 Start analysis

There are several different ways to start an analysis on the titrator:

- By choosing **Start** from the Method editor.
- By choosing **Start** from the **Home** dialog.
- By using a shortcut (or direct shortcut) from the **Home** dialog.
- By choosing **Start** from the **Series** dialog.

The **Start analysis** dialog is always the first dialog that appears after you choose "**Start**" or the relevant shortcut.

When a direct shortcut is activated, the **Start analysis** dialog does not appear and the respective method starts immediately, provided that the other settings allow this.

The parameters for the previously used method or series appear in the **Start analysis** dialog so that the same method can immediately be restarted.

Of course, all of the settings can also be adjusted prior to pressing "**Start**" The type and number of settings displayed in the **Start analysis** dialog depends on the type of analysis to be started and the resources used.

21.3.2.5.2 Online screen KF titrations

The Online screen is displayed when an analysis or manual operation is being performed.

The method ID of the current method or the type of manual operation is displayed in the title bar. In the navigation bar below, the sample index, e.g. displayed as "Sample 2/5" (second of a total of five samples) and loop index, displayed as "Loop 1/3" (first of three loops) are shown. (The Loop index is only displayed if the method actually contains more than one loop). The navigation path is displayed in the navigation bar while a manual operation is being performed. The remainder of the online dialog is divided into a graphical area (left) and a data area (right). During a titration or measurement, the graphical area displays the measurement curve.

Pretitration

Immediately following the start of a Karl Fischer titration, the online window for pretitration appears. In this window, the following buttons are available:

Results

Tap **Results** to display the results and statistics for the samples to be analyzed following the analysis. The system displays the results of the active determination type (sample, blank value). Furthermore, the dialog **Results** also contains the following buttons:

- **Add result**
- **Recalculate**
- **Undo all**
- **Outlier test**

Samples

You can change sample and series data. However, the number of samples cannot be changed while a blank determination is in progress. For changes to the sample data, refer to the analysis sequences:Starting an analysis

More

The **More** button provides you with additional functions. Using the More button in **Pretitration** mode, you can perform the following:

End series

You can end a series if all predefined samples have been processed. Any changes made in the **Start analysis** dialog or later are no longer taken into account. After the series has ended, you return to the pretitration or standby mode and the series can be restarted again. A new series is entered in the results. The system then uses the original sample parameters.

Note

- The **End series** function triggers printouts defined **Per series**.

Stop method

The current method is stopped immediately. No printout is generated.

Note

- Before actually stopping the process, the system displays a system message asking you to confirm the action.

Save series data

The analysis of a series is saved in its entirety under a name freely chosen by the titrator in the form "SeriesXY". Only sample data is included in the series. Blank value data is not included in the generated series. If the maximum number of permitted series has already been reached, the series is not saved.

Axes

You can select the units for the horizontal and vertical axes from a list.

Drift determination (only KF vol)

You have to add at least one titrant increment for a drift determination. When the determination has been completed successfully, the determined drift value is entered in the setup of the titration stand. The system then generates an automatic printout containing the sample data, raw results, and resource data.

Note

- The message **No titrant added / generated. Drift not determined.** can be confirmed, or the message disappears after a certain period of time (60s).
- If the drift falls below a defined value, the system automatically switches to **Standby** mode.

Sample size calculation

The optimum sample size can be calculated from the standby of an analysis.
The determined limits for the sample size do not have any impact on the lower and upper limits in the method or for the sample data memory.

You can determine the following parameters:

Parameters	Description	Values
Content	Expected water content of the sample.	0 .. 10^6
Unit	Unit for the content.	[%] I [ppm]

Use the **Calculate** button to obtain the upper and lower sample size limits for optimum titration.

Concentration determination (only KF vol)

You use this button to determine the concentration of the titrant. No predispensing is performed. The determined concentration or the mean value for a series of concentration determinations is entered in the Setup for the relevant titrant, if this falls within the limits. If the mean value falls outside the specified limits, this is not transferred to the Setup, but the system still switches to Standby. After the concentration has been determined successfully, the user receives a printout. If the value is not transferred to Setup, the system issues a message to inform you of this.

Tapping the **Start conc.** button opens the **Concentration sample** window. You can enter a comment and the temperature. When you tap **OK**, an **Info** dialog is displayed as a prompt to add the standard.

See also

Starting an Analysis ▶ Page 101

Standby

If the drift drops below a predefined value, the system automatically switches from **Pretitration** to **Standby** mode (see "Analysis flows: Analysis flow diagram").

In **Standby** mode, you can start the drift determination or sample analysis, or conduct a blank determination for the "external extraction" method type. The following buttons are available for this:

Start drift

For a drift determination, at least one increment of titrant must be generated.When the determination has been completed successfully, the determined drift value is entered in the setup of the titration stand. The system then generates an automatic printout containing the sample data, raw results, and resource data.

Start sample

This button is used to perform a sample analysis. When you press this button, an **Info** dialog is displayed prompting you to add the sample.

Once a sample has been added and the analysis started, you can use the **Samples** button to enter the sample size (see Method Function: **Sample (KF)** > **Sample**.

Start blank determination

Blank value determination can be performed for the method type **Ext. Extr.**. No predispensing is performed. The determined blank value or the mean value for a series of blank determinations is entered in the Setup for the relevant titrant, if this falls within the limits. If the mean value falls outside the specified limits, this is not transferred to the **Setup**, but the system still switches to **Standby**. After the blank value has been determined successfully,you receive a printout. If the value is not transferred to **Setup**, the system issues a message to inform you of this. When you tap this button, an **Info** dialog is displayed prompting you to add the sample.

Measured values

You can use the **More** and **Measured values** buttons to display a table of measured values during an analysis as an alternative to the online dialog.

Samples

You can use this button to change the sample size of the sample currently being processed or to define the sample size for a new sample.

Stop analysis

You can use this button to cancel the measurement immediately during a sample or blank determination.

Before actually terminating the process, the system displays a system message asking you to confirm the termination.

21.3.2.6 Menu Structure

Methods

The menu **Methods** has no submenus.

Series templates

The menu **Series templates** has no submenus.

Results

The menu **Results** has the following submenus.

- **All results**
  Statistics
- **Samples**
- **Add result**
- **Recalculate**
- **Undo all**

Setup

The menu **Setup** has the following submenus.

Menu level 2	Menu level 3
User settings	**Language**
	Screen
	Audio signal
	Shortcuts
	Keyboard
Values (only C30S)	**Blanks** (only C30S)
	Auxiliary values (only C30S)
Hardware	**Sensors**
	Pumps
	Peripherals
	Titration Stands

Menu level 2	Menu level 3
Global settings	**System**
	User management
	Analysis and resources behavior
	Reagent Control (only C30S)
Mainten. & Service	**MT-Service**
	Import / Export
	Reset to factory settings
	Titrator firmware history
	Board firmware
	Terminal
	Board data
	Update
	Delete Mettler method template (only C30S)

Manual

The menu **Manual** has the following submenus.

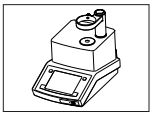
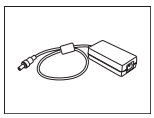
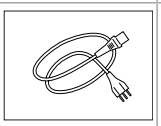
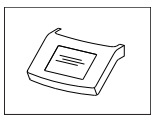
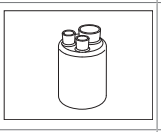
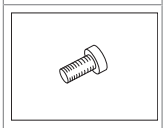
- **Stirrer**
- **Sensor**
- **Pump**

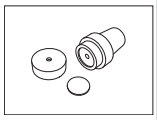
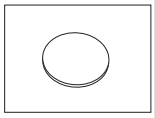
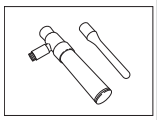
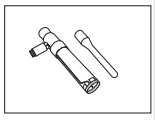
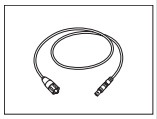
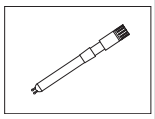
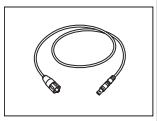
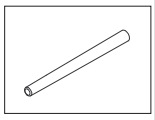
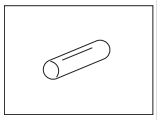
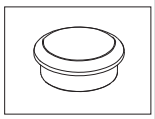
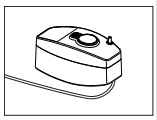
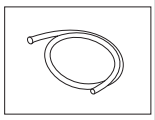
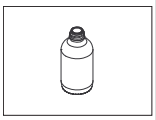
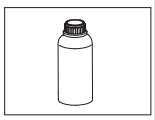
21.4 Installation

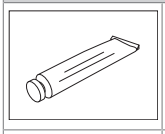
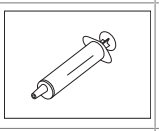
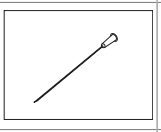
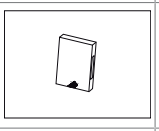
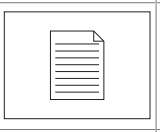
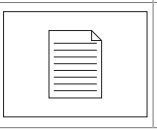
Standard equipment for the titrator types varies. For this reason, installation steps may vary.

21.4.1 Standard equipment

21.4.1.1 Scope of delivery

Description		Order number	C10S D	C10S X	C20S D	C20S X	C30S D	C30S X
	Coulometric KF Titrator	–	•	•	•	•	•	•
	External power supply (100...240 Volt)	–	•	•	•	•	•	•
	Power cable (country-specific)	–	•	•	•	•	•	•
	Protective cover for touchscreen	51105567	•	•	•	•	•	•
	Coulometer measuring cell	51108732	•	•	•	•	•	•
	Mounting bolt (for titration beakers / measuring cell)	51108752	•	•	•	•	•	•

Description		Order number	C10S D	C10S X	C20S D	C20S X	C30S D	C30S X
	Stopper (PTFE) with septum	51108741	•	•	•	•	•	•
	Septum (12 pcs)	51108740	•	•	•	•	•	•
	Generator electrode **with** diaphragm incorporating straight drying tube	51108751	•	–	•	–	•	–
	Generator electrode **without** diaphragm incorporating straight drying tube	51108753	–	•	–	•	–	•
	Cable for generator electrode	51107830	•	•	•	•	•	•
	Dual platinum pin electrode, DM143-SC	51107699	•	•	•	•	•	•
	Triaxial SC LEMO cable, 72 cm	51109183	•	•	•	•	•	•
	Holder	23960	•	•	•	•	•	•
	Magnetic stirrer bar	51191159	•	•	•	•	•	•
	Seal (titration stand drying tube)	51107492	•	•	•	•	•	•
	Solvent Manager set with: • Silicone tube, 850 mm • Silicone tube, 170 mm • Drying tube with cover • 2 flat seals	51105600	–	–	•	•	•	•
	Draining tube	23936	•	•	•	•	•	•
	Clear glass bottle, 1 L	30079610	–	–	•	•	•	•
	Molecular sieve, 250 g	71478	•	•	•	•	•	•

Description		Order number	C10S D	C10S X	C20S D	C20S X	C30S D	C30S X
	Silicone grease	71300	•	•	•	•	•	•
	Syringe, 1 mL	–	•	•	•	•	•	•
	Injection needle, 80 x 0.8 mm	–	•	•	•	•	•	•
	CD Titration User Documentation	30297239	•	•	•	•	•	•
	User Manual	–	•	•	•	•	•	•
	Memo Card	–	•	•	•	•	•	•
	Test report	–	•	•	•	•		
	EC declaration of conformity	–	•	•	•	•	•	•

21.4.1.2 Unpack the titrator

1 Remove the titrator (and accessories) from the protective packing material.
2 Store the packing material for later transport over long distances.
3 Check if you received all parts listed in the scope of delivery.
4 Inspect the parts visually for flaws or damage.
5 If parts are missing or damaged, report it immediately and file a freight claim if needed.

21.4.1.3 Position the titrator

The instrument has been developed for indoor operation in a well-ventilated area. The following site requirements apply:

- The ambient conditions are within the limits specified in the technical data.
- No powerful vibrations
- No direct sunlight
- No corrosive gas atmosphere
- No explosive atmosphere
- No powerful electric or magnetic fields

21.4.1.4 Connect the titrator to the power supply

⚠ WARNING

Danger of death or serious injury due to electric shock!

Contact with parts that contain a live current can lead to injury and death.

1 Only use a METTLER TOLEDO power cable and AC adapter designed for your instrument.
2 Connect the power cable to a grounded power outlet.
3 Keep all electrical cables and connections away from liquids.
4 Replace damaged power cables and AC adapters immediately.

NOTICE

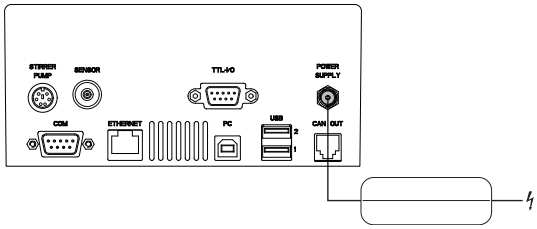
Danger of damage to the AC adapter due to overheating!

If the AC adapter is covered or in a container, it is not sufficiently cooled and overheats.

1 Do not cover the AC adapter.
2 Do not put the AC adapter in a container.

The titrator is operated using an AC adapter. The AC adapter is suitable for all supply line voltages ranging from 100...240 V AC ±10 % and 50-60 Hz.

1 Install the cables in such a way that they cannot be damaged or interfere with operation.
2 Insert the plug of the power cable in the socket of the AC adapter.
3 Insert the plug of the AC adapter in the **POWER SUPPLY** socket at the back of the titrator.
4 To secure the connection at the titrator, screw the plug connector firmly into place.
5 Insert the plug of the power cable in a grounded power outlet that is easily accessible.



21.4.1.5 Disconnect the titrator from the power supply

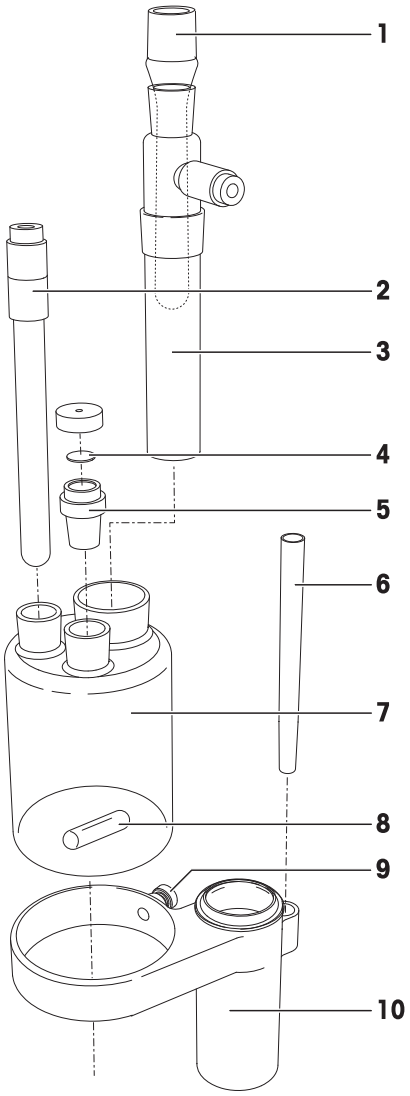
- The titrator has shut down.

1 Pull the plug of the power cable out of the power outlet.
2 Pull the plug of the AC adapter out of the **POWER SUPPLY** socket at the back of the titrator.

21.4.1.6 Assemble titration stand and measuring cell

The titration arm can be pivoted in both directions.

1 Slide the magnetic stirring rod (8) carefully into the measuring cell (7).
2 Place the measuring cell (7) in the titration stand (10) and fasten it with the mounting bolt (9).
3 Lightly grease microsections with the silicone grease supplied.
4 Place the stopper (5) with septum (4) in one of the openings of the measuring cell (7).
5 Place the measuring electrode (2) in one of the openings of the measuring cell (7).
6 Place the generator electrode (3) in the biggest opening of the measuring cell (7).
7 Fill the drying tube (1) with molecular sieve and place it in the generator electrode (3).
8 Place the holder (6) for the tip of the suction tube in the opening of the titration stand (10).



21.4.1.7 Connect the electrodes

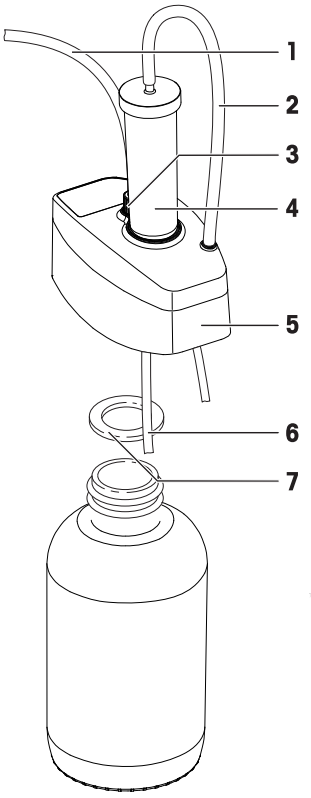
The connection cables for the measuring and generator electrodes have different sized plug connectors on the device side. The cable for the generator electrode has a blue plug for the purposes of differentiation.

- No task is running on the titrator

– To connect the generator electrode, plug the triaxial cable with the blue plug connector into the **GENERATOR** socket on the rear of the titrator.

21.4.1.8 Assemble the waste bottle

1 Place the flat seal (7) on the opening of the bottle.
2 Screw the solvent manager (5) onto the bottle.
3 Loosen the threaded sleeve (3) on the solvent manager (5).
4 Push the thin end of the suction tube (1) through the threaded sleeve (3), so that it is just below the screw top.
5 Tighten the threaded sleeve (3).
6 Fill a drying tube (4) with molecular sieve.
7 Press the drying tube (4) into the appropriate opening of the solvent manager.
8 With a silicone tube (167 mm) (2), connect the drying tube (4) of the bottle to the appropriate adapter of the solvent manager.
9 To ensure that the system has no leaks, check all tubes and closing points for firm seating.



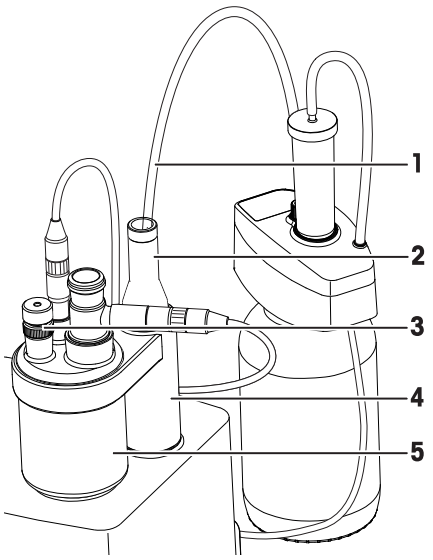
21.4.1.9 Connect the solvent manager to the titrator

1 Shut down the titrator.
2 Plug the cable supplied with the solvent manager into the **STIRRER PUMP** socket on the rear of the titrator.
3 Start up the titrator.
⇨ The titrator automatically detects the solvent manager.

21.4.1.10 Exchange the solvent manually

- The solvent manager is installed on the waste bottle.

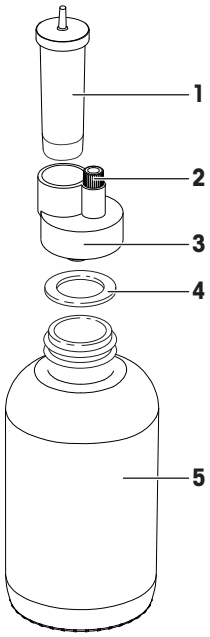
1 To extract exhausted solvent, remove the stopper (3) and push the free end of the suction tube (1) through the available opening and down to the bottom of the measuring cell (5).
2 To park the suction tube (1), place the free end of the suction tube (1) in the park sleeve (2) on the titration stand (4).
3 Add fresh solvent manually.



21.4.2 Optional equipment

21.4.2.1 Assemble the solvent bottle

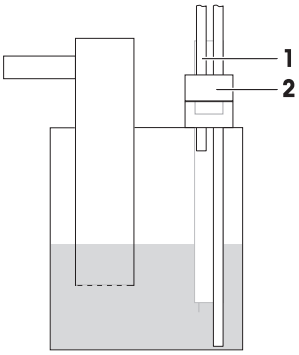
1 Place the flat seal (4) on the opening of the bottle (5) and screw the screw top (3) onto the bottle.
2 Loosen the threaded sleeve (2) on the screw top (3).
3 Push the dispensing tube through the threaded sleeve (2) and the screw top (3) and down to the bottom of the bottle.
4 Tighten the threaded sleeve (2).
5 Fill a drying tube (1) with a molecular sieve and press the drying tube (1) into the screw top (3) of the bottle (5).
6 Connect the drying tube of the screw top to the appropriate connection of the solvent manager.
7 Press the park sleeve into the opening on the titration stand.
8 To ensure that the system has no leaks, check all tubes and closing points for firm seating.

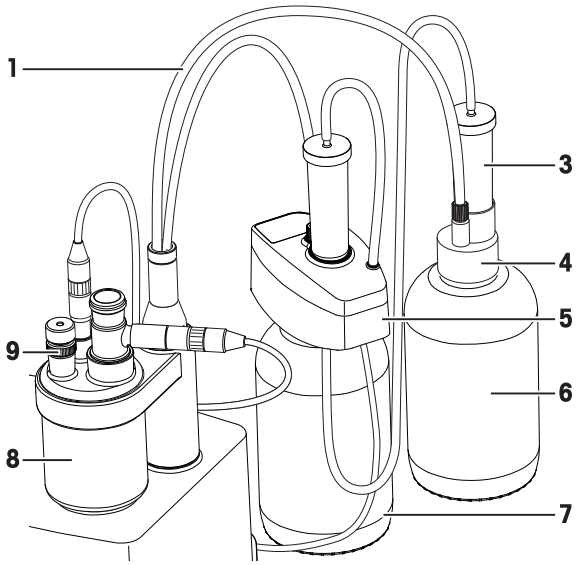


21.4.2.2 Connect the solvent bottle

- The solvent manager (5) is installed on the waste bottle (7).
- The optional reagent exchange set (3, 4) is installed on the solvent bottle (6).

1 Connect the drying tube (3) to the solvent manager (5).
2 Remove the stopper (9) from the measuring cell (8).
3 Place the draining adapter (2) in the available opening of the measuring cell (8).
4 Push the free end of the dispensing tube (1) through one of the openings of the draining adapter (2) into the measuring cell (8).





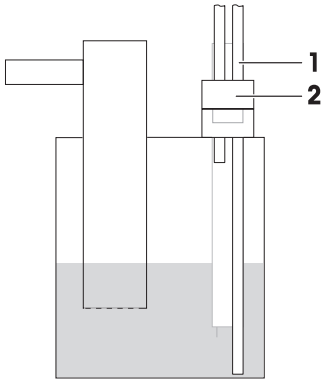
See also

- Assemble the waste bottle ▸ Page 156
- Assemble the solvent bottle ▸ Page 157

21.4.2.3 Exchange the solvent automatically

- The solvent manager is installed on the waste bottle.
- The optional reagent exchange set is installed on the solvent bottle.

1 Remove the stopper from the measuring cell.
2 Place the draining adapter (2) in the available opening of the measuring cell.
3 Push the free end of the suction tube (1) through one of the openings of the draining adapter (2) and down to the bottom of the measuring cell.

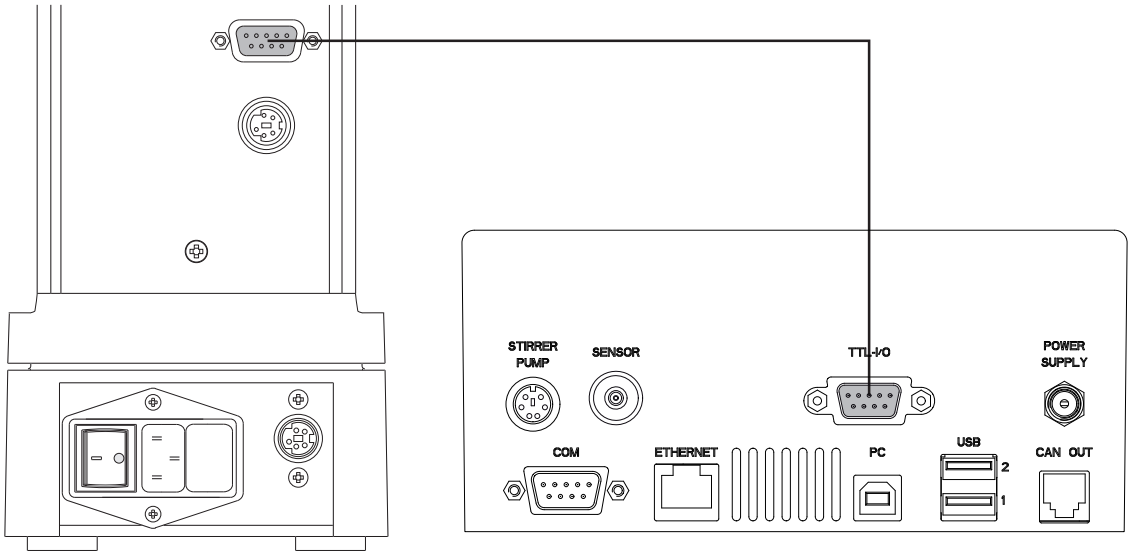


21.4.2.4 Connect the Stromboli oven sample changer

The Stromboli oven sample changer is controlled by TTL signals from the titrator. The flow of gas is led from the gas drying unit through the sample in the oven and from here to the measuring cell of the titrator via the transfer tube.

Further information can be found in the operating instructions for the Stromboli oven sample changer.

- The sample changer is switched off.



1 Shut down the titrator.
2 Plug the cable supplied with the sample changer into the **TTL-I/O** socket of the oven sample changer.
3 Plug the cable into the **TTL-I/O** socket on the rear of the titrator.

21.4.2.5 Set up an InMotion KF

The installation of the sample changer is described in the separate InMotion KF Operating Instructions.

21.4.2.5.1 Connect the sample changer to the titrator

- The sample changer is installed and shut down.

1 Plug the cable supplied with the sample changer into the **INSTRUMENT** socket on the sample changer.
2 Plug the cable into the **USB 1** or **USB 2** socket on the rear panel of the titrator.

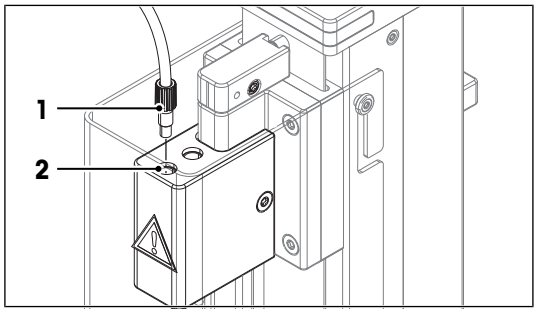
3 Start up the sample changer.

⇨ The titrator automatically detects the sample changer.

21.4.2.5.2 Connect the KF head to a volumetric titration vessel

- The sample changer is shut down.
- The titrator is set up for a volumetric Karl Fischer titration.

1 Screw the M8 connector (1) of the transfer tube into the gas outlet (2) of the KF head.

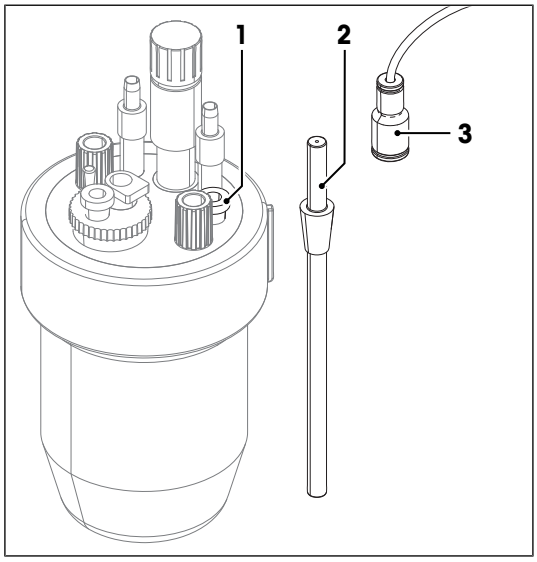


2 Remove the NS stopper (1) from the cover plate.

3 Insert the gas inlet for volumetric KF (2) in the opening.

4 Push the gas inlet as far as you can into the coupling (3) of the transfer tube.

⇨ You can no longer pull the gas inlet out without using force.



21.4.2.5.3 Configure the vial height

Set the vial height

- The sample changer is installed and connected to the titrator.
- The sample changer is running.

1 Make sure the screw cap sits tightly on the vial.

2 Measure the vial height including the screw cap.

3 Go to **Home** > **Setup** > **Hardware** > **Titration Stands**.

4 Select the **InMotion KF** titration stand that is connected to the titrator.

5 Set **Vial height** to the height you have measured.

6 Tap **Save**.

Test the vial height setting

1 Place the vial in the drift position of the sample changer.

2 Go to **Home** > **Methods** > **New** > **Standard method templates**.

3 Select the method **InMotion KF Vol.**

4 Tap **Save**.

5 Tap **Start**.

⇨ The sample changer moves the drift position to the oven position.

⇨ If the drift determination starts, the setting is correct.

6 If the error message **No vial detected. Check vial height or height setting.** opens, increase the setting for **Vial height** by 1 mm.

7 If the error message **Tower lift blocked. Check vial cap or needle. Use vial with appropriate height or remove obstacle. Check height setting.** opens, decrease the setting for **Vial height** by 1 mm.

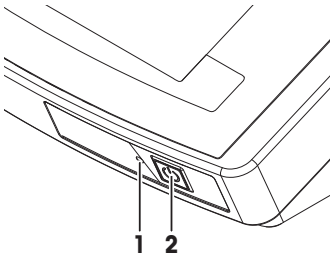
21.5 Operating the instrument

21.5.1 Start up the titrator and shut down the titrator

The power button is fitted with an LED and mounted on the front of the titrator. The LED indicates the operating status.

Start up the titrator

– Press the power button (2).
  ⇨ The titrator starts up and detects connected devices.
  ⇨ The LED (1) flashes as the system starts up.
  ⇨ The titrator is ready for use when the LED (1) remains permanently lit.



Shut down the titrator from the touch screen

– Tap **Home** > **Log out** > **Shut down**.
  ⇨ The titrator stops running tasks and shuts down.
  ⇨ The LED (1) flashes as the system shuts down, which can take up to 60 seconds.

⇨ When the LED goes out, the titrator has shut down. The built in AC adapter and the control circuit for the power button are energized. The rest of the titrator is no longer energized.

Shut down the instrument using the power button

– Press the power button for less than 1 second.
  ⇨ The titrator stops running tasks and shuts down.
  ⇨ The LED (1) flashes as the system shuts down, which can take up to 60 seconds.

⇨ When the LED goes out, the titrator has shut down. The built in AC adapter and the control circuit for the power button are energized. The rest of the titrator is no longer energized.

Shut down of the instrument in emergency situations

– Pull the plug of the power cable out of the power outlet.

21.5.2 Running a coulometric Karl Fischer titration

The following chapters show how to perform a simple coulometric Karl Fischer titration. You need the optional reagent exchange set to fill the measuring cell as it is described in this example.

Chemicals

For this titration you need the chemicals listed below.

- 1% KF standard solution (sample)
- Karl-Fischer reagent

21.5.2.1 Preparation

- The titrator is installed.
- The titration stand is installed and the measuring cell is assembled.
- The measuring electrode and generator electrode are connected.
- The solvent manager is installed on the waste bottle and connected to the titrator and the measuring cell.
- The optional reagent exchange set is installed and the solvent bottle is connected to the measuring cell.
- A USB printer is connected to port "USB1" or "USB2" of the titrator and configured.

1 Pivot the titration arm so the measuring cell is positioned over the internal magnetic stirrer.

2 To ensure that the system has no leaks, check all tubes and closing points for firm seating.
3 Tap **Setup** > **Hardware** > **Titration Stands** > **KF stand**.
⇨ The dialog **Titration stand parameters** opens.
4 Set **Stirrer output** to **Internal stirrer** and tap **Save**.
5 Tap **Manual** > **Pump**.
⇨ The dialog **Pump** opens.
6 Set **Action** to **Fill**.
7 Make sure **Reset counter** is activated.
8 Tap **Start**.
⇨ Reagent is pumped into the measuring cell.
9 To prevent the reagent from overflowing, watch the amount of reagent and tap **Stop** if too much reagent is added.
⇨ The measuring cell is filled with reagent.

21.5.2.2 Performing the coulometric KF titration

The following is a brief description of the sequence involved in a coulometric KF titration. The analysis process is described as an example for the following sequence steps:

- Pretitration
- Standby
- Sample analysis.

21.5.2.2.1 Configure the method

- The titrator is prepared as described in [Preparation ▸ Page 160].

1 Tap **Methods** > **New** > **Standard method template** > **KF Coul**.
⇨ A list of method functions appears.
2 Tap **Sample**.
⇨ The dialog **Sample (KF)** is opens.
3 Tap **Sample**.
4 Set **Entry type** to **Weight** and tap **OK**.
5 Tap **OK**.
⇨ A list with of method functions appears.
6 Tap **Save**.

21.5.2.2.2 Create a direct shortcut

1 Tap **Start**.
⇨ The **Start analysis** window opens.
2 Tap **AddToHome**.
⇨ The **Shortcut parameters** window opens.
3 Enter a name for the shortcut in **Description**.
4 Activate **Immediate start**.
5 Tap **Save**.
⇨ The home screen with the new shortcut opens.

21.5.2.2.3 Start the pretitration

1 To ensure that the system has no leaks, check all tubes and closing points for firm seating.
2 Select the shortcut on the home screen.
⇨ The system performs the pretitration to remove any water from the reagent.
⇨ As soon as the continually determined drift value falls below a defined value, the system automatically switches to **Standby** mode and the **Start sample** button is active.

21.5.2.2.4 Perform the analysis

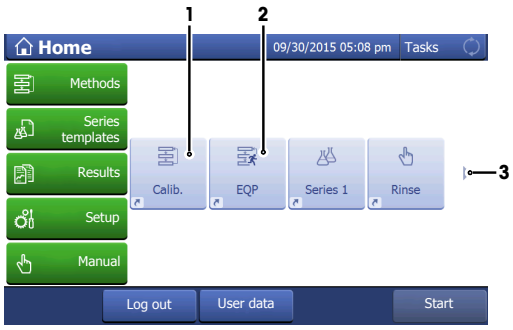
- The system is in **Standby** mode.

1 Fill a syring with 1% KF standard solution, place it on a balance and tare the balance.
2 Tap **Start sample**.
   ⇨ You are prompted to add the sample.
3 Inject approx. 0.5 to 1.0 mL of the 1% KF standard solution into the measuring cell.
4 Place the syring on the balance and note the sample weight.
5 Enter the sample weight on the touch screen and tap **OK**.
   ⇨ The analysis starts.

⇨ Once the titration is complete, the **Results** dialog is displayed. The dialog shows **R1**, the water content.

21.5.3 Creating and handling Shortcuts

- Shortcuts (1, 2) can be created for methods, series templates and manual operations.
- With a shortcut (1) it is possible to access the dialog **Start analysis** with one tap on the homescreen.
- With a shortcut (2) it is possible to start a method, series or manual operation with one tap on the homescreen.
- The number of shortcuts depends on the type of titrator. If more than 12 shortcuts can be created, they can be placed on two screens. Tap (3) to switch between these two screens.
- Each user can manage the shortcuts that he has created in the instrument setup.



Types of shortcuts

Method

Sample Series

Manual operation

Creating a shortcut

1 Select **Methods** and choose your method category.
2 Create a new method or choose an existing method in the list.
3 Tap **Start**.
   ⇨ The **Start analysis** dialog opens. You can change some parameters or add some information to this method.
4 Tap **AddToHome** to create a shortcut.
5 Define the shortcut parameters.
6 Tap **Save**.

⇨ The shortcut is now set on the homescreen.

Deleting a shortcut

1 Select **Setup** > **User settings** > **Shortcuts**.
2 Select the shortcut which you want to delete in the list.
3 Tap **Delete**.
⇨ The shortcut is deleted.

Changing an existing shortcut

- At least one shortcuts has been created.

1 Tap **Setup** > **User settings** > **Shortcuts**.
⇨ A list of existing shortcuts opens.
2 Tap the shortcut you want to change.
3 If needed, change the settings for **Description** and **Immediate start**.
4 To change the position of the shortcut on the homescreen, tap .
⇨ A dialog opens that shows the free positions and the occupied positions on the homescreen.
5 Tap on the free position, where the shortcut should be placed.
⇨ The dialog closes.
6 To save the settings, tap **Save**.

Parameters	Description	Values
Type	Shows the type of action the shortcut stands for.	Method I Series I Manual operation
Description	Any name for the shortcut.	Arbitrary
Immediate start	The method, series, or manual operation can be started immediately. This enables you to start the analysis without any interfering dialog.	Activ I Inactive
Homescreen position	Defines the position of the shortcut on the homescreen.	-
Created by	Shows the name of the user who created the shortcut.	-

21.5.4 Creating Methods

You create a new method by changing the parameters of a delivered method template and saving it under a new method ID.

Navigation: **Home** > **Methods**

1 Tap **New** to create a new method on the basis of a template.
2 From the available templates, in **Mettler method templates** or **Standard method templates**, choose the one that is most similar to the method you wish to create.
⇨ You can now modify this method in line with your requirements by inserting or removing method functions or modifying its parameters.
3 In the method function **Title**, enter a new method ID. Afterwards, a new method will be stored under this method ID.
4 Assign a title to your new method.
5 Select available method functions to modify their parameters in line with your requirements.
6 Tap **Insert** to add additional method functions to the template.
7 Now use the arrow-shaped button to select the required position for the new method function in the method. (You will only be able to insert the method functions that are allowed in the corresponding location based on the method syntax.)
8 From the list, select the method function that you want to insert.
9 Modify the individual parameters of the method function in line with the resources.
⇨ The new method function appears in the method.
10 To delete a method function, select the function in question and then tap **Delete**.
⇨ The method function disappears from the method.
11 After inserting all required method functions, tap **Save**.
⇨ The method is saved under the method ID and appears in the list of available methods.

Note

- When establishing a new method, follow the rules specified by the instrument.

21.5.5 Modifying or Deleting Methods

You can change user methods or Mettler methods and store them under new method IDs.

Note

- Once a Mettler method has been modified, you will only be able to save it as a copy (or as a user method) with a new method ID.

Navigation: **Home** > **Methods**

1 From the displayed list of methods, select the method that you want to modify.
2 As soon as the methods functions of the selected method appear on the screen, you can modify the method.
3 In the method function **Title**, enter a new method ID. Afterwards, a new method will be stored under this method ID. You can enter up to twenty alphanumeric characters.
4 Select available method functions to modify their parameters in line with your requirements.
5 Choose **Insert** to add additional method functions to the template.
6 Now use the arrow-shaped **Insert** button to select the required position for the new method function in the method. (You will only be able to insert the method functions that are allowed in the corresponding location based on the method syntax.)
7 From the list, select the method function that you want to insert.
8 Modify the individual parameters of the method function.
⇨ The new method function appears in the method.
1 To delete a method function, select the function in question and then choose **Delete**.
2 After you have made all of the necessary adjustments, you can store the method in the titrator by choosing **Save**.

Deleting Methods

You can easily delete user-defined methods from the titrator. Select:

Navigation: **Home** > **Methods**

1 Select the method that you want to delete.
2 Choose **Delete method** to delete the method from the titrator's memory.

21.5.6 Starting Methods

The titrator offers various ways of starting a method:

- From the method editor
- By choosing **Start** from the Home dialog
- By using a shortcut on the Home screen
- Via the **Series** dialog
- By using the **Setup** dialog (to perform a calibration or titer determination)

You can use the method editor to start any method stored in the titrator.

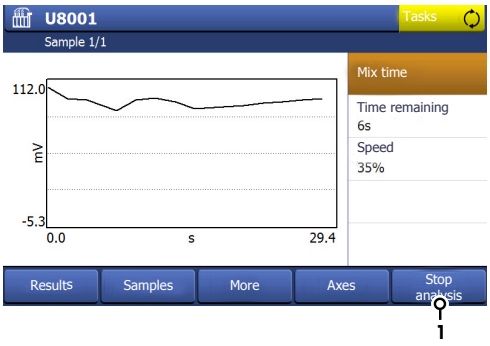
1 From the displayed list in the **Methods** dialog, select the method that you wish to start (Home > Methods).
2 As soon as the method functions of the selected method appear on the screen, you can open the **Start analysis** screen by choosing **Start**.
3 Choose **Start** again to reach an overview screen on the resources required for the method. (Only if this was defined in the analysis sequence settings.)
4 To execute the method, confirm the screen by choosing **OK**.

21.5.7 Stopping an analysis

Stop method directly on the measurement screen

1 Tap **Stop analysis** (1) to stop the current analysis.

⇨ A dialog opens where you have to confirm the stop.



Stop method in the dialog More KF functions

2 Tap **More** (1) to enter the dialog **More KF functions**.

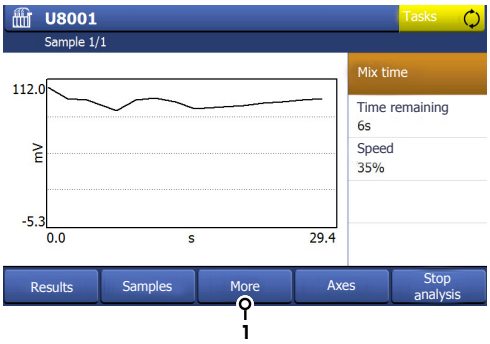
⇨ Depending on the measurement status, you will find different opportunities in this dialog.

3 Tap **End series** to end the current series.

4 Tap **Stop method** to stop the current method.

⇨ A dialog opens where you have to confirm the stop.

5 Tap **Back** to exit the dialog **More KF functions**.



21.5.8 Customizing touch screen and signals

Navigation: **Setup** > **User settings**

21.5.8.1 Changing the language

In the menu **Language** you can set the language of the touch screen and the language for printing.

1 Tap **Setup** > **User settings** > **Language**.

2 Customize the settings.

3 To save the settings, tap **Save**.

Parameters	Description	Values
Touchscreen	Defines the language for operation of the terminal.	German I English I French I Italian I Spanish I Portuguese I Chinese I Russian I Polish I Korean
Record	Defines the language in which the reports are to be printed out.	German I English I French I Italian I Spanish I Portuguese I Chinese I Russian I Polish I Korean

21.5.8.2 Changing the screen settings

In the menu **Screen** you can customize following features.

- The color of the status bar, the borders and the buttons.
- The brightness of the touch screen.
- Activate or deactivate the screen saver and set the time before the screen saver is activated.

1 Tap **Setup** > **User settings** > **Screen**.

2 Customize the settings.

3 To save the settings, type **Save**.

Parameters	Description	Values
Primary color	Here various color schemes for the user interface can be selected.	Gray I Blue I Green I Red
Brightness	Specifies the display brightness in [%].	50 I 60 I 70 I 80 I 90 I 100 [%]
Screen saver	Here you can define whether the screen saver should be used.	Activ I Inactive
Wait time	Defines how long in [min] the system should wait after the user's last action on the terminal before activating the screen saver.	1…1000

21.5.8.3 Configuring the audio-signals

In the menu **Audio signal** you can define if a tap on a button is confirmed by a beep.

1 Tap **Setup** > **User settings** > **Audio signal** .

2 Customize the settings.

3 To save the settings, type **Save**.

Parameters	Description	Values
At push of a button	Enables a beep when tapping on the touch screen.	Activ I Inactive

21.5.8.4 Configuring the keyboards

In the menu **Keyboards** you can set the layout of the alphanumeric and the numeric keyboards.

1 Tap **Setup** > **User settings** > **Keyboards**.

2 Customize the settings.

3 To save the settings, type **Save**.

Parameters	Description	Values
ABC keyboard	Determines the layout of the alphanumeric input field.	English I French I German
123 keyboard	Defines the organization of the keys for the numeric input field.	Calculator I Phone

21.5.9 Monitoring the expiry date and life span of Resources

For certain resources, the titrator provides automatic monitoring of the usable life/life span.

Monitoring the expiry date and life span of resources is only available on C30S.

Monitoring the expiry date of a resource

The expiration date is the period after which the values for a specific resource should be remeasured. These values depend on the nature of the resource:

- The numerical value of an auxiliary value.
- The numerical value of a blank.

Whether the expiration dates should be monitored can be defined in the setup for each individual resource.

If monitoring is activated then additional parameters become available in the respective resource with which the duration of the expiration dates can be determined. In addition a reminder may optionally be issued by the titrator before the expiration dates expire.

You can define the following parameters:

Parameters	Description	Values
Time period	Specifies the time range. Only if **Monitoring usable life** = **Active**.	Days I Hours
Usable life	Defines the time span of the expiration dates either in days or hours (depending on: **Time period**). Only if **Monitoring usable life** = **Active**.	Days: 1…1000 Hours: 1…10^4

Reminder	Determines whether the titrator should issue a warning before the usable life of a resource or a value elapses. Only if **Monitoring usable life** = **Active**.	Activ I Inactive
Days before expirat.	Determines the number of days before the service life of the resource that the titrator should issue a warning. The value entered must be less than the value in **Usable life**. Only if **Monitoring usable life** = **Active**, **Time period** = **Days** and **Reminder** = **Active**.	0…1000

Note

If a resource is updated, the Date/Time field in Setup of the affected resource is automatically adjusted and the expiration date (or time) is recalculated.

In the "Global settings" under "Analysis and resources behavior", you can define how the titrator deals with the relevant resource if the expiration dates have been exceeded at the start of the analysis (see "[Action when exceeding usable life ▶ Page 89]").

Monitoring the life span of a resource

The life span describes the period of time after which a resource is consumed and should be replaced. In the sensor Setup (accessible via the Hardware button), you can determine whether or not the titrator should monitor the life span.

If monitoring is activated then additional parameters become available in the respective resource with which the date of initial operation of the resource and the duration of its life span can be defined.

You can define the following additional parameters:

Parameters	Description	Values
Initial operation	Here you can enter the date of initial activation of the resource.	Date
Life span	Defines the life span of the resource in months.	0…100

In the "Global settings" under "Analysis and resources behavior", you can define how the titrator deals with the relevant resource if the life span has been exceeded at the start of the analysis (see "[Action when exceeding life span ▶ Page 89]").

21.6 Transporting the titrator

If you transport the titrator over long distances, use the original packaging.

1 Empty all tubes.
2 Empty the measuring cell.
3 Shut down the titrator.
4 Unplug the titrator.
5 Remove all cable connections.
6 Remove the measuring cell from the titration stand.
7 Remove all tubes
8 Move the titrator to the new location.

21.7 Care and maintenance

21.7.1 Cleaning

Housing of the titrator

1 Unplug the titrator.
2 Clean the housing of the titrator using a cloth moistened with alcohol.

Titration stand

1 Remove the measuring cell.
2 If installed, remove the park sleeve and clean it.
3 Clean the titration stand.
4 Reinstall measuring cell and park sleeve.

Measuring cell

1 Empty the measuring cell.
2 Remove stopper, measuring electrode and generator electrode.
3 Rinse the measuring cell thoroughly with methanol.
4 If needed, remove remaining depositions with a laboratory washing liquid.
5 Dry the measuring cell with a lint-free cloth.
6 Leave the measuring cell to dry for several hours at 70…80 °C in a drying oven.
7 Lightly grease microsections with the silicone grease supplied.

Generator electrode

1 Empty the generator electrode.
2 Rinse the generator electrode thoroughly with methanol.
3 Dry the generator electrode with a lint-free cloth.
4 Leave the generator electrode to dry for several hours at 70…80 °C in a drying oven.

Dirty diaphragm

1 Place the generator electrode in a suitable solvent (ideally methanol) for several hours.
2 Dry the generator electrode with a lint-free cloth.
3 Leave the generator electrode to dry for several hours at 70…80 °C in a drying oven.

21.7.2 Maintenance

Mettler Toledo recommends that a preventive maintenance and calibration certification is done at least once a year through your local Mettler Toledo Service Organization.

Weekly

- Check if the pins of the dual platinum pin electrode are bent. If the pins are bent, gently straighten them.
- Check if the pins of the dual platinum pin electrode are black. If the pins are black, clean them.

Before periods of inactivity

- Unplug the titrator.
- Empty the measuring cell.
- Empty all tubes.
- Remove the measuring cell from the titration stand.

21.8 Disposal

In conformance with the European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

21.9 Technical data

Power supply	Input voltage	100–240 V~ ±10 %
	Input frequency	50–60 Hz
	Primary connection socket	3 pin, IEC C14
	Power consumption	36 VA
	Connected load	24 V DC ⎓ 1.25 A
	Secondary connection plug	2 pin, DC plug

Dimensions	Width	210 mm
	Depth	340 mm
	Height	291 mm (with titration stand)
		312 mm (ready-to-operate device)
	weight	3.3 kg
Materials	Titrator housing	Crastin® PBT
	Cover sheet	PET
	Protective cover	Copolymer
	Chassis	Stainless steel
	Titration stand	Crastin® PBT
	Dispensing tube / extraction tube	FEP
	Air tubes	Silicone
	O-ring (screw top)	EPDM
	O-ring (threaded ring)	FEP / silicone
	Sealing ring (bottle)	PTFE / silicone
	Seal (dispensing tube / extraction tube)	PTFE
	Connecting piece	Polypropylene
Ambient conditions	Ambient temperature	+5 °C – 40 °C
	Relative humidity	Max. 80 % (non-condensing) at 31 °C, linear fall to 50 % at 40 °C
	Use	In interior spaces
	Overvoltage category	II
	Pollution degree	2

Power Management

The devices have a power management system which prevents the titrator from switching off unexpectedly in the event of a power overload. Tasks which would cause a power overload, because a number of pumps, stirrers and burette drives are already in use, cannot be started at all. A notification brings the start attempt to the attention of the user. It is advisable, if possible, to connect pumps and stirrers directly to sample changers or other devices which have their own power supply, such as a TBox, instead of to the titrator itself.

To protect your product's future:
METTLER TOLEDO Service assures the quality, measuring accuracy and preservation of value of this product for years to come.

Please request full details about our attractive terms of service.

www.mt.com/titration
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