

900 Touch Control



Manual

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900 Touch Control

Program version 5.900.0046

Manual

Technical Communication
Metrohm AG
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Table of contents

1	Introduction	1
1.1	Instrument description	1
1.2	Titration and measuring modes	1
1.3	About the documentation	3
1.3.1	Symbols and conventions	3
2	Safety	5
2.1	Intended use	5
2.2	Responsibility of the operator	5
2.3	Requirements for operating personnel	6
2.4	Safety instructions	6
2.4.1	General notes on safety	6
2.4.2	Electrical safety	6
2.4.3	Tubing and capillary connections	7
2.4.4	Flammable solvents and chemicals	8
2.4.5	Recycling and disposal	8
3	Overview of the instrument	9
4	Installation	11
4.1	Setting up the instrument	11
4.1.1	Packaging	11
4.1.2	Checks	11
4.1.3	Location	11
5	Titration	12
5.1	Dynamic equivalence point titration (DET)	12
5.2	Monotonic equivalence point titration (MET)	12
5.3	Endpoint titration (SET)	13
5.4	Water determination according to Karl Fischer (KFT)	13
5.5	Titration with constant maintenance of the measured value (STAT)	14
5.6	Manual titration (MAT)	15
5.7	Coulometric water content determination according to Karl Fischer (KFC)	16
5.8	Bromine index determination (BRC)	16



6	Operation	17
6.1	Switching the instrument on and off	17
6.2	Fundamentals of operation	18
6.2.1	Touch-sensitive screen	18
6.2.2	Display elements and controls	19
6.2.3	Status display	20
6.2.4	Entering text and numbers	21
7	System settings	24
7.1	General system settings	24
7.1.1	Selecting the dialog language	24
7.1.2	Setting the date, time and local time	25
7.2	System-specific dialog options	26
7.3	User administration	30
7.3.1	Editing the user configuration	31
7.3.2	Creating an identification profile	35
7.3.3	Defining login options	35
7.3.4	Password options	37
7.3.5	Modification options	39
7.3.6	Reasons	40
7.3.7	Audit Trail	41
7.4	Measured value display	42
7.5	Acoustic signals	42
8	Titrants	43
8.1	Adding a new titrant	44
8.2	Editing titrant data	45
8.3	Monitoring the working life	47
8.4	Dosing unit	48
8.4.1	Parameters for preparing (PREP) and emptying (EMPTY)	49
8.4.2	Tubing parameters	51
8.4.3	Shift direction of the valve disk	54
8.5	Exchange unit	54
8.5.1	Parameters for the preparation (PREP)	56
8.5.2	Tubing parameters	57
8.6	GLP test for exchange unit and dosing unit	58
8.7	Titer determination options and data	60
8.7.1	Titer validity	60
8.7.2	Properties of the previous titer determinations	61
9	Reagents	63
9.1	Editing reagent data	64

9.2	Reagent monitoring	64
10	Sensors	68
10.1	Adding a new sensor	69
10.2	Editing the sensor data	70
10.3	Monitoring the working life	71
10.4	Calibration data (for pH- and ISE electrodes and conductivity measuring cells only)	72
10.4.1	Properties of the previous calibrations	74
10.5	Limit values for the calibration data	77
10.6	Monitoring the calibration interval (only for pH and ion-selective electrodes and conductivity measuring cells)	79
11	Device manager	81
11.1	Adding a new device	82
11.2	Configuring the device	82
11.3	Touch Control	83
11.3.1	E-mail	84
11.3.2	PC/LIMS report	85
11.3.3	Shared memory	87
11.3.4	TCP/IP settings	88
11.4	Metrohm control instruments	89
11.4.1	Properties – Control instrument	90
11.4.2	Properties – Measuring input	91
11.4.3	Properties – MSB connector	92
11.4.4	Properties – Peripheral devices	93
11.5	Sample Processor	94
11.5.1	Properties – Sample Processor	95
11.5.2	Properties – Tower	95
11.5.3	Properties – Swing Head	97
11.6	Sample racks	102
11.6.1	Editing rack data	104
11.6.2	Rack adjustment	110
11.7	885 Compact Oven SC	111
11.7.1	Properties - 885 Compact Oven SC	111
11.7.2	Properties - Tower	112
11.7.3	Properties - Oven module	113
11.8	Printer	114
11.8.1	PDF settings	115
11.8.2	Network printer	116
11.8.3	More options	118
11.9	Balance	118

11.10 USB/RS-232 adapter	120
11.11 PC keyboard	122
11.12 Barcode reader	123
12 File manager	126
12.1 Managing files	126
12.1.1 Copying a file	128
12.1.2 Renaming a file	128
12.1.3 File properties	129
12.2 External storage medium	130
12.3 Creating backups / Restoring data	132
12.3.1 Restoring data	132
13 GLP manager	134
13.1 Automatic system test	135
13.2 Test tools	135
13.3 GLP tests for measurement and titration	136
13.3.1 Parameter description	137
13.4 System validation	140
13.4.1 Parameter description	141
13.5 System monitoring	144
13.5.1 Service interval	144
13.5.2 Backup interval	144
14 Common variables	146
14.1 Editing common variables	147
14.2 Properties of common variables	148
14.3 Monitoring validity	149
14.4 Assigning a result automatically to a common variable	150
15 Templates	152
15.1 Sample data	152
15.1.1 Sample identification list	153
15.1.2 Sample assignment table	154
15.2 Custom result templates	156
15.2.1 Editing result templates	157
15.3 Input lines	160
15.3.1 Editing the input signal	161
15.4 Output lines	162
15.4.1 Editing the output signal	164

15.5 Custom calibration buffers	165
15.5.1 Defining calibration buffers	166
15.6 Report header	167
15.7 Custom electrode type	168
15.7.1 Limit values for the electrode rating	169
16 Methods	172
16.1 Creating a new method	172
16.2 Saving a method	173
16.3 Loading a method	174
16.4 Editing a method	175
16.4.1 Inserting a command	176
16.5 Method options	177
16.5.1 Start options	178
16.5.2 Stop options	180
16.5.3 Sample data	181
16.5.4 Method properties	185
16.5.5 Note	187
16.5.6 Saving a determination automatically	187
17 Electronic signatures	189
17.1 Signing methods/determinations electronically	189
17.2 Deleting electronic signatures	190
18 Control	191
19 Favorites	195
19.1 Creating favorites	196
19.1.1 Editing favorites	196
20 Sample data	199
20.1 Entering sample data in the main dialog	199
20.2 Requesting sample data at the start of the determination	200
21 Sample table	202
21.1 General	202
21.2 Editing sample data	205
21.3 Properties	207
22 Determination run	210
22.1 Carrying out a single determination	210

22.2	Performing a sample series	211
22.3	Canceling determinations manually	212
23	Live modifications	213
23.1	Editing the sample data of the running determination	213
23.2	Editing the sample table while a determination is running	214
23.3	Live display	215
23.4	Live parameters	217
24	Results and more determination data	219
24.1	More determination data	220
24.1.1	Details	221
24.2	Messages	223
24.3	Local common variables	224
24.4	Determination properties	224
24.5	Loading a determination	227
24.5.1	Determination list	228
24.6	Saving a determination	232
24.7	Curves	232
24.8	Recalculation and reevaluation	234
25	Statistics	236
25.1	Displaying details for a result	238
25.2	Deleting statistical data	239
25.3	Adding a determination to a determination series	239
26	Result table	241
26.1	Properties	242
26.2	Saving the result table	246
26.3	Loading the result table	246
27	Printing	247
27.1	General report options	249
27.2	Settings of the individual reports	250
27.3	List of all printable reports	251
28	Manual control	255
28.1	Opening and closing the manual control	256

28.2 Measuring	257
28.2.1 Parameter description	258
28.3 Dosing	261
28.3.1 Continuous dosing	263
28.3.2 Dosing fixed volumes	265
28.3.3 Preparing	267
28.3.4 Emptying	268
28.3.5 Filling	269
28.3.6 Replacing reagent	269
28.4 Stirring	270
28.5 Conditioning a titration cell	271
28.5.1 Parameter description	272
28.6 Remote	272
28.7 Sample Processor	273
28.7.1 Moving the lift	275
28.7.2 Moving to a rack position	277
28.7.3 External positions	279
28.8 885 Compact Oven SC	282
28.8.1 Controlling the heating/gas flow	284
29 Parameters	286
29.1 Dynamic equivalence point titrations (DET)	286
29.1.1 Start conditions	286
29.1.2 Titration parameters	289
29.1.3 Stop conditions	293
29.1.4 Potentiometric evaluation	294
29.1.5 Control instrument	299
29.1.6 Sensor	299
29.1.7 Dosing device	301
29.1.8 Stirrer	302
29.2 Monotonic equivalence point titrations (MET)	302
29.2.1 Start conditions	302
29.2.2 Titration parameters	305
29.2.3 Stop conditions	309
29.2.4 Potentiometric evaluation	310
29.2.5 Control instrument	315
29.2.6 Sensor	315
29.2.7 Dosing device	317
29.2.8 Stirrer	318
29.3 Endpoint titrations (SET)	318
29.3.1 Start conditions	318
29.3.2 Control parameters	320
29.3.3 Titration parameters	324
29.3.4 Stop conditions	325
29.3.5 Conditioning	325
29.3.6 Cell	327



29.3.7	Control instrument	328
29.3.8	Sensor	328
29.3.9	Dosing device	330
29.3.10	Stirrer	330
29.4	Volumetric Karl Fischer titrations (KFT)	331
29.4.1	Start conditions	331
29.4.2	Control parameters	333
29.4.3	Titration parameters	336
29.4.4	Stop conditions	337
29.4.5	Conditioning	338
29.4.6	Cell	340
29.4.7	Control instrument	340
29.4.8	Sensor	341
29.4.9	Dosing device	342
29.4.10	Stirrer	343
29.5	Coulometric Karl Fischer titrations (KFC)	344
29.5.1	Control parameters	344
29.5.2	Titration parameters	346
29.5.3	Stop conditions	347
29.5.4	Conditioning	347
29.5.5	Cell	350
29.5.6	Control instrument	351
29.5.7	Sensor	351
29.5.8	Stirrer	352
29.6	Bromine index determination (BRC)	353
29.6.1	Control parameters	353
29.6.2	Titration parameters	356
29.6.3	Stop conditions	357
29.6.4	Conditioning	357
29.6.5	Cell	359
29.6.6	Control instrument	360
29.6.7	Sensor	360
29.6.8	Stirrer	361
29.7	STAT titrations (STAT)	362
29.7.1	Start conditions	362
29.7.2	Control parameters	364
29.7.3	Titration parameters	366
29.7.4	Stop conditions	368
29.7.5	Monitoring	369
29.7.6	Control instrument	376
29.7.7	Sensor	376
29.7.8	Dosing device	377
29.7.9	Stirrer	380
29.8	Manual titrations (MAT)	381
29.8.1	Dosing parameters	382
29.8.2	Control instrument	383
29.8.3	Sensor	383
29.8.4	Dosing device	384

29.8.5	Stirrer	387
29.9	Measurements (MEAS)	387
29.9.1	Measuring parameters	387
29.9.2	Standard addition	392
29.9.3	Control instrument	396
29.9.4	Sensor	396
29.9.5	Stirrer	398
29.10	Calibration of sensors (CAL)	399
29.10.1	Calibration parameters (CAL pH)	399
29.10.2	Calibration parameters (CAL Conc)	402
29.10.3	Calibration parameters (CAL Cond)	405
29.10.4	Control instrument	408
29.10.5	Sensor	408
29.10.6	Stirrer	409
29.11	Electrode test for pH electrodes (ELT)	410
29.11.1	Electrode test parameters	411
29.11.2	Control instrument	412
29.11.3	Sensor	413
29.11.4	Stirrer	413
29.11.5	Additional information	414
29.12	Evaluations (EVAL)	416
29.12.1	Fixed endpoint evaluation (EVAL FIX-EP)	418
29.12.2	pK value and half neutralization potential evaluation (EVAL pK/HNP)	420
29.12.3	Minimum and maximum evaluation (EVAL MIN/MAX)	421
29.12.4	Break point evaluation (EVAL BREAK)	422
29.12.5	Rate evaluation (EVAL RATE)	425
29.13	Calculations	426
29.13.1	Calculations (CALC)	426
29.13.2	Calculations (CALC LIVE)	433
29.13.3	Formula editor	435
29.14	Reports (REPORT)	441
29.14.1	General report options	442
29.14.2	Settings of the individual reports	443
29.14.3	List of reports	443
29.15	Dosing and Liquid Handling	446
29.15.1	Preparing an exchange or dosing unit (PREP)	446
29.15.2	Emptying a dosing unit (EMPTY)	447
29.15.3	Dosing a specified volume (ADD)	448
29.15.4	Liquid Handling (LQH)	453
29.15.5	Monitored dosing (DOS)	456
29.16	Communication	473
29.16.1	Scanning remote lines (SCAN)	473
29.16.2	Setting remote lines (CTRL)	475
29.16.3	Scanning the RS-232 interface (SCAN RS)	476
29.16.4	Defining RS-232 commands (CONTROL RS)	477



29.17 Automation	478
29.17.1 Rotating sample rack (MOVE)	478
29.17.2 Moving the lift (LIFT)	481
29.17.3 Controlling pumps (PUMP)	482
29.17.4 Resetting the rack (RACK)	483
29.17.5 Defining the sample variable (SAMPLE)	483
29.17.6 Creating a subsequence (SUBSEQ)	484
29.17.7 Controlling the heating (HEATER)	487
29.17.8 Controlling the gas flow (FLOW)	487
29.17.9 Starting the measurement for temperature and gas flow (MEAS T/F ON)	488
29.17.10 Exiting the measurement for temperature and gas flow (MEAS T/F OFF)	488
29.18 Miscellaneous commands	489
29.18.1 Controlling a stirrer (STIR)	489
29.18.2 Pausing the method run (WAIT)	490
29.18.3 Scan data (REQUEST)	490
29.18.4 Defining an acoustic signal (BEEP)	491
29.18.5 Signing a determination (SIGN)	491
29.18.6 Canceling the method run (END)	492
30 Operation and maintenance	493
30.1 System initialization	493
31 Troubleshooting	494
31.1 Editing methods	494
31.2 Sample table	495
31.3 Results/Statistics	495
31.4 Printing	496
31.5 Manual control	496
31.6 Miscellaneous	496
31.7 SET titration	496
31.8 Volumetric Karl Fischer Titration	497
31.9 Coulometric Karl Fischer titration	499
31.10 STAT titration	501
32 Appendix	503
32.1 Manual Dosing Controller, optional accessory for man- ual titration	503
32.2 Dosing unit	504
32.2.1 Maximum dosing and filling rate	504
32.2.2 Default parameters for preparing (PREP) and emptying (EMPTY)	504

32.3	Exchange unit	505
32.3.1	Maximum dosing and filling rate	505
32.3.2	Default parameters for preparing (PREP)	505
32.4	Stirring rate	505
32.5	Balance	506
32.6	Result variables as parameter setting	507
32.7	Electrode calibration with Sample Processors	508
32.8	Stored buffer series for pH calibration	510
32.8.1	Metrohm	510
32.8.2	NIST (according to DIN standard 19266, 2015)	511
32.8.3	DIN (according to DIN standard 19267, 2012)	512
32.8.4	Fisher	513
32.8.5	Honeywell Fluka	515
32.8.6	Mettler Toledo	516
32.8.7	Beckmann	517
32.8.8	Radiometer Analytical	518
32.8.9	Baker	520
32.8.10	Hamilton DURACAL	521
32.8.11	Precisa	522
32.8.12	Merck CertiPUR 20 / Titrisol	523
32.8.13	Merck CertiPUR 25	524
32.9	Using AuditTrailViewer	526
32.9.1	Installing AuditTrailViewer	526
32.9.2	Opening the Audit Trail	527
32.9.3	Contents of the Audit Trail	528
32.9.4	Filtering the Audit Trail	529
32.9.5	Exporting the Audit Trail	530
32.10	Diagnosis	530
32.10.1	LCD test	531
32.10.2	Temperature monitoring	532
32.10.3	Formatting an external storage medium	532
32.10.4	Removing an external storage medium	532
32.10.5	Adjusting the touch screen	532
32.10.6	Testing the touch screen	533
32.10.7	Software update (loading program versions and language files)	534
32.10.8	Simulating titration curves	538
32.10.9	Service	540
32.11	Arithmetic algorithms in the Titrand	540
33	Technical specifications	542
33.1	Touch screen	542
33.2	Interfaces	543
33.3	Energy supply	543



- 33.4 **Declarations of Conformity** 543
- 33.5 **Ambient conditions** 544
- 33.6 **Dimensions** 544
- 33.7 **Storage capacity** 544
- 34 Displaying accessories** 545
- Index** 546

Table of figures

Figure 1	Front 900 Touch Control	9
Figure 2	Rear 900 Touch Control	10
Figure 3	Reagent dosing for DET	12
Figure 4	Reagent dosing for MET	12
Figure 5	Reagent dosing for SET	13
Figure 6	Reagent dosing for KFT	14
Figure 7	Reagent dosing for STAT	15
Figure 8	Dosing unit – port assignment	53
Figure 9	Exchange unit – tubing connections	58
Figure 10	Directory structure on the external storage medium	131
Figure 11	Live display "Preparing the dosing unit"	268
Figure 12	Live display "Preparing the exchange unit"	268
Figure 13	Equivalence point recognition and equivalence point numbering within windows	298
Figure 14	Tubbs method for determining the equivalence point	298
Figure 15	Equivalence point recognition and equivalence point numbering within windows	314
Figure 16	Action "Exit method" or "Cancel command"	373
Figure 17	Action "Pause"	373
Figure 18	Action "Wait"	373
Figure 19	Evaluation of pK value / half neutralization potential	420
Figure 20	Evaluation of minimum and maximum	421
Figure 21	Evaluation of a break point	422
Figure 22	Dosing criterion "Volume/Dosing rate"	457
Figure 23	Dosing criterion "Volume/Dosing time"	457
Figure 24	Dosing criterion "Dosing rate/Dosing time"	458
Figure 25	Action "Exit method" or "Cancel command"	466
Figure 26	Action "Pause"	466
Figure 27	Action "Wait"	466
Figure 28	Manual Dosing Controller 6.2107.120 – Overview	503
Figure 29	Rotational speed depending on the stirring rate	506

1 Introduction

1.1 Instrument description

The 900 Touch Control is an operating unit with a touch-sensitive screen. You can operate the following control instruments with the 900 Touch Control:

- Titrandos
- Sample Processors
- 846 Dosing Interface
- 867 pH Module
- 856 Conductivity Module

With the 900 Touch Control, you can conveniently manage all of your titrants, sensors, methods, etc. For example, you can connect a USB flash drive to the USB connector as an external storage medium. You can use this additional memory not only to store your methods and determinations, but also to create a backup together with all of the data and settings of your system. Thanks to the integrated Ethernet connector, the device can be connected to your network, thus offering you the following options, among others:

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

1.2 Titration and measuring modes

The 900 Touch Control supports the following titration and measuring modes. Whether a particular mode is available or not depends on the type of the control instrument connected.

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



- **MET**
Monotonic equivalence point titration. The reagent is added in constant volume steps.
Measuring modes:
 - **pH** (pH measurement)
 - **U** (potentiometric voltage measurement)
 - **Ip_{ol}** (voltametric measurement with selectable polarization current)
 - **Up_{ol}** (amperometric measurement with selectable polarization voltage)
- **SET**
Endpoint titration at one or two specified endpoints.
Measuring modes:
 - **pH** (pH measurement)
 - **U** (potentiometric voltage measurement)
 - **Ip_{ol}** (voltametric measurement with selectable polarization current)
 - **Up_{ol}** (amperometric measurement with selectable polarization voltage)
- **STAT**
Titration with constant maintenance of the measured value.
Measuring modes:
 - **pH** (pH measurement)
 - **U** (potentiometric voltage measurement)
- **MAT**
Manual titration with manual dosing and manual ending.
Measuring modes (optional):
 - **pH** (pH measurement)
 - **U** (potentiometric voltage measurement)
- **KFT**
Volumetric water content determination according to Karl Fischer.
Measuring modes:
 - **Ip_{ol}** (voltametric measurement with selectable polarization current)
 - **Up_{ol}** (amperometric measurement with selectable polarization voltage)
- **KFC**
Coulometric water content determination according to Karl Fischer.
Measuring mode:
 - **Ip_{ol}** (voltametric measurement with selectable polarization current)

- **BRC**
Coulometric bromine index determination. Determining the amount of double bonds in e.g. mineral oils.
Measuring mode:
 - **Ipol** (voltametric measurement with selectable polarization current)
- **MEAS**
Measuring modes:
 - **pH** (pH measurement)
 - **U** (potentiometric voltage measurement)
 - **Ipol** (voltametric measurement with selectable polarization current)
 - **Upol** (amperometric measurement with selectable polarization voltage)
 - **T** (temperature measurement)
 - **Conc** (concentration measurement with or without standard addition)
 - **Cond** (conductivity measurement)
- **CAL**
Electrode calibration.
Measuring mode:
 - **pH** (calibration of pH electrodes)
 - **Conc** (calibration of ion-selective electrodes)
 - **Cond** (calibration of conductivity measuring cells)
 - **ELT** (Electrode test for pH electrodes)

1.3 About the documentation



CAUTION

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








1.3.1 Symbols and conventions

The following symbols and formatting may appear in this documentation:

(5-12)

Cross-reference to figure legend

The first number refers to the figure number, the second to the instrument part in the figure.

1	Instruction step Perform the steps one after the other.
Method	Dialog text, parameter in the software
File ► New	Menu or menu item
[Continue]	Button or key
	WARNING This symbol draws attention to a possible life-threatening hazard or risk of injury.
	WARNING This symbol draws attention to a possible hazard due to electrical current.
	WARNING This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	WARNING This symbol draws attention to a possible biological hazard.
	WARNING Warning of optical radiation
	CAUTION This symbol draws attention to possible damage to instruments or instrument parts.
	NOTICE This symbol highlights additional information and tips.

2 Safety

2.1 Intended use

This 900 Touch Control is designed for use as an operating unit for the Titrandos, USB Sample Processors, 856 Conductivity Module, 867 pH Module, and 946 Dosing Interface. Its main area of use is the operation of titrators.

This device is suitable for processing chemicals and flammable samples. Therefore, the use of the device requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge of the application of the fire prevention measures prescribed for laboratories is also mandatory.

2.2 Responsibility of the operator

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

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

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

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

2.3 Requirements for operating personnel

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

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

2.4 Safety instructions

2.4.1 General notes on safety



WARNING

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

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

2.4.2 Electrical safety

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



WARNING

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



WARNING

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

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

Supply voltage



WARNING

An incorrect supply voltage can damage the instrument.

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

Protection against electrostatic charges



WARNING

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

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

2.4.3 Tubing and capillary connections



CAUTION

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

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



2.4.4 Flammable solvents and chemicals

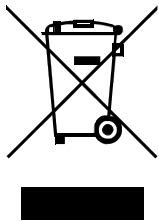


WARNING

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

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

2.4.5 Recycling and disposal



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

3 Overview of the instrument

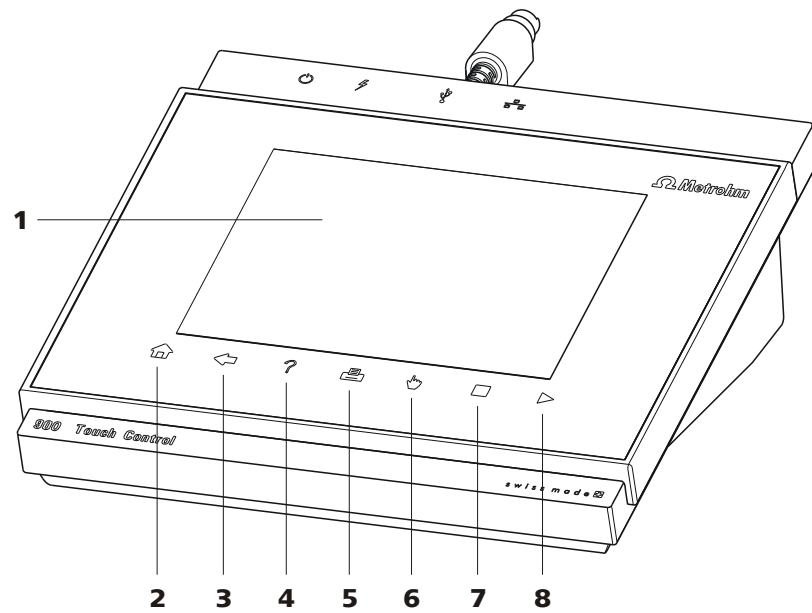


Figure 1 Front 900 Touch Control

<p>1 Display Touch screen.</p>	<p>2 Fixed key [Home] Opens the main dialog.</p>
<p>3 Fixed key [Back] Opens the next-higher dialog page.</p>	<p>4 Fixed key [Help] Opens the online help for the dialog displayed.</p>
<p>5 Fixed key [Print] Opens the print dialog.</p>	<p>6 Fixed key [Manual] Opens the manual control.</p>
<p>7 Fixed key [STOP] Cancels the running determination.</p>	<p>8 Fixed key [START] Starts a determination.</p>

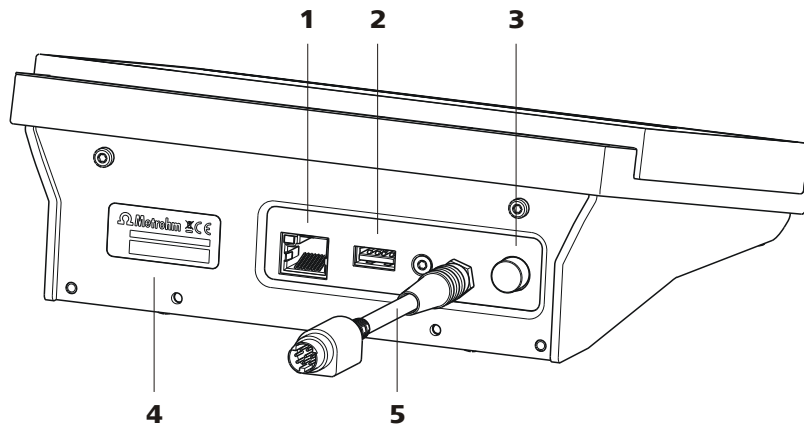


Figure 2 Rear 900 Touch Control

1 Ethernet connector (RJ-45)

For connecting to a network.

2 USB connector (type A)

For connecting printers, USB flash drives, USB hubs, 885 Compact Oven SC, etc.

3 Power switch

Switches the instrument on/off.

4 Type plate

Contains the serial number.

5 Connection cable

For the connection of the Touch Control to a control instrument (socket "Controller").

4 Installation

The connection between the Touch Control and the control instrument (Titrande, etc.) is described in the respective manual, as is the configuration of the titration system with its peripheral devices, e.g. stirrers and dosing devices.

4.1 Setting up the instrument

4.1.1 Packaging

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

4.1.2 Checks

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

4.1.3 Location

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

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

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

5 Titrations

5.1 Dynamic equivalence point titration (DET)

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

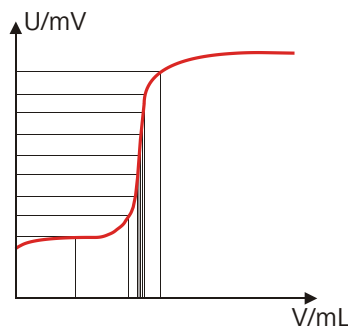


Figure 3 Reagent dosing for DET

5.2 Monotonic equivalence point titration (MET)

Monotonic equivalence point titration is a robust titration mode for titrations with any curve shape and for slow titrations or slow-response electrodes. The reagent is added in constant volume steps. Measured value acceptance is measured value drift-controlled (equilibrium titration) or after a waiting time. Equivalence points are evaluated automatically.

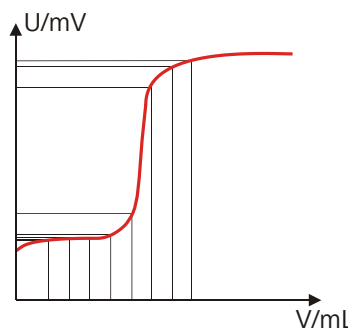


Figure 4 Reagent dosing for MET

5.3 Endpoint titration (SET)

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

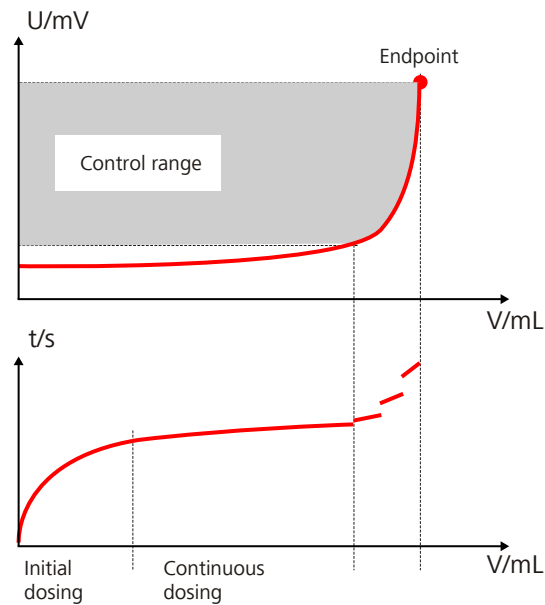


Figure 5 Reagent dosing for SET

5.4 Water determination according to Karl Fischer (KFT)

Karl Fischer Titration is a method for volumetric water determination. Conditioning is carried out automatically both before and after the actual titration. The reagent dosing is controlled in such a way that a predefined endpoint is reached as quickly and as accurately as possible. The volume steps and the rate of reagent dosing are regulated by the difference between the current measured value and the predefined endpoint. This means that titration is performed more slowly in the control range and that smaller volumes are added. The titration is stopped at the endpoint either drift-controlled or after a waiting time. The volume dosed until the endpoint is used to calculate the water content of the sample.

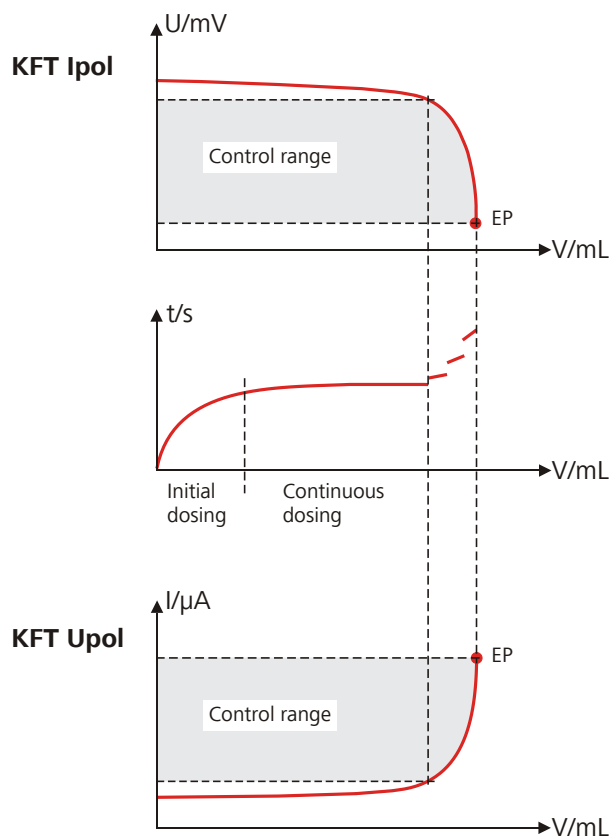


Figure 6 Reagent dosing for KFT

5.5 Titration with constant maintenance of the measured value (STAT)

In STAT titrations, reagent is added until a preset measured value (control point) has been reached, which is then maintained at a constant level. Because the substance that is released as a result of the reaction is immediately titrated off with the titrant, the STAT controller has to be able to maintain a preset control point at a constant level until the preset stop condition has been reached, i.e. without oscillating around the control point.

STAT titrations are used, for example, in enzyme analysis where the enzyme activity can be determined from the resulting dosing rate (in mL/min).

Reagent dosing takes place in two phases during the titration:

- **Dosing outside the control range**

The dosing rate increases continuously during this phase. It starts with the Min. rate and increases to the Max. rate. The dosing continues to be carried out at the Max. rate until the Control range is reached. In this range, STAT mode and SET mode control equally.

- **Dosing inside the control range**

The STAT controller compensates minimal measured value deviations from the control point quickly by dosing in the control range faster than for the SET controller.

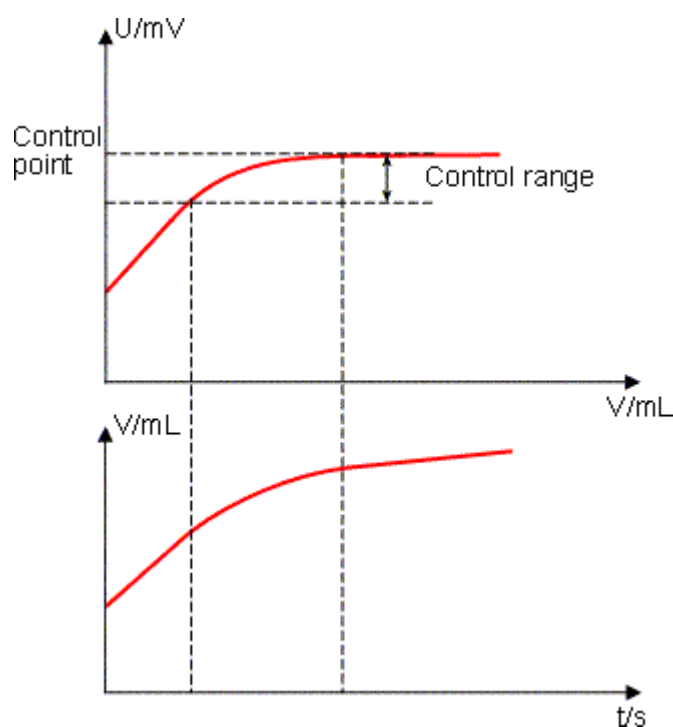


Figure 7 Reagent dosing for STAT

5.6 Manual titration (MAT)

Manual titration is a titration mode that is suitable in particular for titrations that are carried out conventionally manually with a Schellbach buret or a Dosimat.

The reagent is added by manual dosing. The endpoint is detected by a color change or with an electrode connected over a measuring signal. The command always has to be canceled manually with the **Cancel command** button or with the **[FILL]** key on the Manual Dosing Controller.

An advantage of the MAT titration mode is that the manual reagent addition as well as the measuring signal can be recorded optionally. These data points (time, volume, measured value) can be evaluated after the titration, e.g. to assess the titration quality, especially the accuracy of reaching the transition point.

In addition, the method can be equipped with further commands, e.g. calculating a result, creating a report or scanning sample data.

The system is FDA compliant and enables a manual titration according to the FDA guidelines with this mode.



5.7 Coulometric water content determination according to Karl Fischer (KFC)

The coulometric Karl Fischer titration is a variation of the classic water content determination method according to Karl Fischer.

The conventional method works with a methanolic solution of iodine, sulfur dioxide and a base as buffer substance. When titrating a sample containing water several reactions take place, which can be summarized by the following equation:



According to the equation above, the I_2 reacts quantitatively with H_2O . This chemical relation is the base for the water content determination.

With the coulometric Karl Fischer titration, the necessary iodine is directly and electrochemically generated in the submitted electrolyte ("electronic buret"). Between the amount of electric charge and the amount of generated iodine, there is a strictly quantitative relationship, which is used for high-precision dosing of the iodine. No titer needs to be determined as the coulometric Karl Fischer method is an absolute determination. It must only be ensured that the reaction generating the iodine runs with a 100% current efficiency. This is the case with all the reagents available at present.

The endpoint indication is effected voltametrically by modulating an alternating current of constant strength to a double Pt electrode. This produces a voltage difference between the Pt wires, which significantly declines when lowest amounts of free iodine are present. This circumstance is used for detecting the endpoint of the titration.

5.8 Bromine index determination (BRC)

The bromine index is a measure for the content of olefins in a sample.

The basis for the bromine index determination is the addition of bromine to the double bond of olefins. A bromine molecule is used for every carbon-carbon double bond.

With the bromine index determination, the necessary bromine is directly and electrochemically generated in the submitted electrolyte ("electronic buret"). Between the amount of electric charge and the amount of generated bromine, there is a strictly quantitative relationship, which is used for high-precision dosing of the bromine. No titer needs to be determined as the bromine index determination is an absolute determination.

The bromine index is usually indicated in mg bromine per 100 g sample.

6 Operation

6.1 Switching the instrument on and off

Switching on the instrument



CAUTION

Peripheral devices (e.g., printers, 885 Compact Oven SC, etc) must be connected and switched on before you switch on the 900 Touch Control.



NOTE

English is set as the default dialog language when the instrument is switched on for the first time.

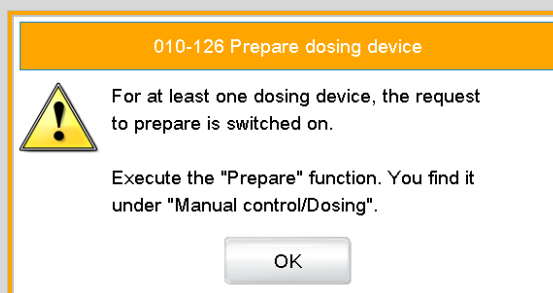
Proceed as follows:

- 1 ▪ Press the power switch on the left-hand side of the back panel of the 900 Touch Control.
The 900 Touch Control and the control instrument are initialized and a system test is carried out. This process takes some time.



NOTE

If a buret unit is connected, then a request appears to carry out the **Prepare** function:



All tubings and the cylinder are rinsed with the **Prepare** function. The preparing of the buret unit is described in *chapter 28.3.3, page 267*.

- Confirm the message with **[OK]**.

The main dialog is displayed:

Switching off the instrument



CAUTION

The 900 Touch Control must be switched off by pressing the power switch on the rear of the instrument before the electricity supply is interrupted. If this is not done, then there is a danger of data loss. Because the power supply for the Touch Control is provided through the control instrument (Titrande, etc.) you must never disconnect the control instrument from the mains (e.g., by switching off with a connector strip) before you have switched off the Touch Control.


Proceed as follows:

- 1 Press the power switch on the left-hand side of the back panel of the 900 Touch Control.

The current data is saved and the system is shut down. This process takes just a short time. At the same time, all other instruments connected to the 900 Touch Control via a USB cable are also being switched off (except the 885 Compact Oven SC).

6.2 Fundamentals of operation

6.2.1 Touch-sensitive screen

The entire 900 Touch Control user interface is touch-sensitive. Simply touch a few of the buttons on the interface to learn how a touch-sensitive screen reacts. You can always return to the main dialog by touching [].

In order to enable an element on the 900 Touch Control user interface, just touch the screen with your fingertip, the eraser of a pencil or a stylus (special tool for operating instruments with touch-sensitive screens).



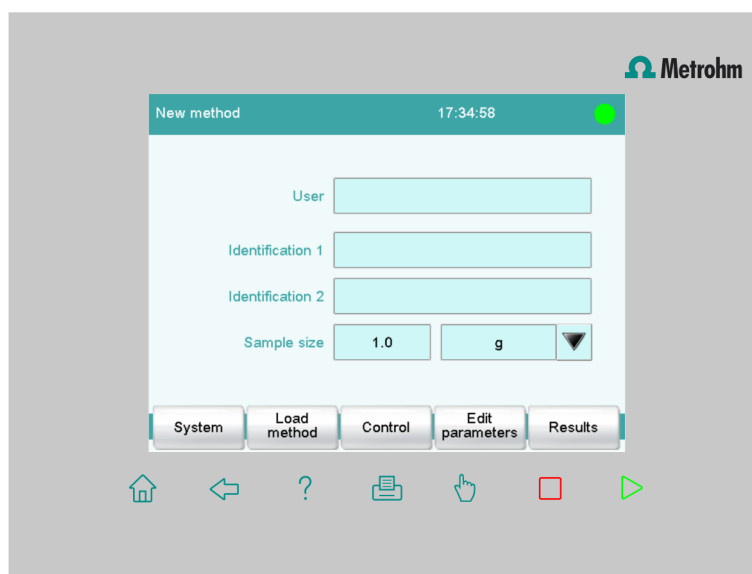
CAUTION

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

In the default setting, the software is configured in such a way that an acoustic signal will be generated every time an active control is touched.








This setting can be deactivated in the system settings (see chapter 7.5, page 42).

6.2.2 Display elements and controls



The following display elements and controls are available:



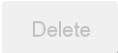
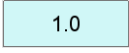


Table 1 Fixed keys which are always available

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

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

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






Table 2 Screen elements

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

6.2.3 Status display

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

Table 3 Status displays

	The instrument is in normal status.
	The working medium is being conditioned.
	Conditioning has been paused.
	The working medium is conditioned.
	A method has been started.



A method has been paused.



An action has been started in manual control.

6.2.4 Entering text and numbers

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

Text editor



Table 4 Editing functions

Editing function	Description
[OK]	The modification is applied and the editing dialog is exited.
[Cancel]	The editing dialog is exited without applying the modification.
[Delete entry]	The content of the input field is deleted completely.
[□]	The character in front of the cursor is deleted.
[←]	The cursor within the input field is shifted to the left by one character.
[⇒]	The cursor within the input field is shifted to the right by one character.



Editing function	Description
[a...z]	The lower-case letters are displayed. The label changes to [A...Z] . The upper-case letters are displayed again by tapping.
[0–9]	Numbers and mathematical characters are displayed.
[Special characters]	Special characters are displayed. You can use the button [More] to navigate through all available characters.

Number editor

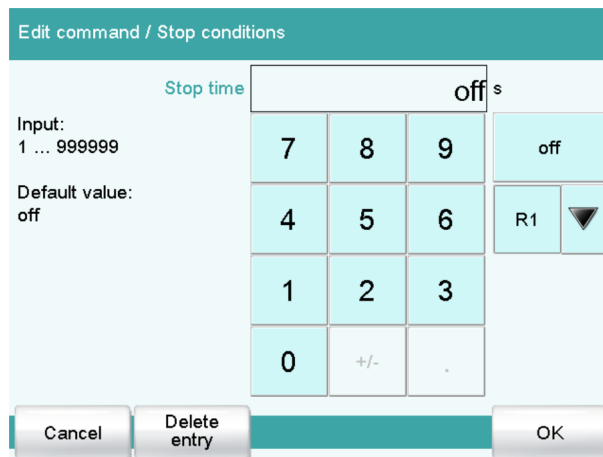


Table 5 Editing functions

Editing function	Description
[OK]	The modification is applied and the editing dialog is exited.
[Cancel]	The editing dialog is exited without applying the modification.
[Delete entry]	The content of the input field is deleted completely.
[off]	If not only numbers but also special values (e.g., off) can be entered, then the corresponding buttons will be shown to the right of the numerical keypad.
[R1]	For many parameters, a result previously defined in the method can also be entered in place of a number (see chapter 32.6, page 507). You can select the result variable by touching [R1] .

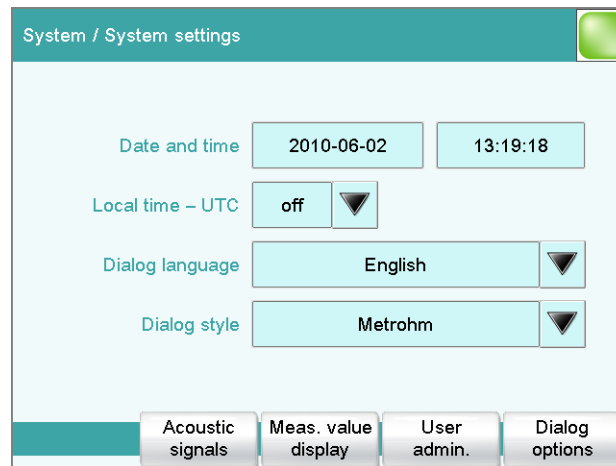
**NOTE**

A commercially available USB keyboard can be connected to make text and numerical input easier. The key assignment is described in *chapter 11.11, page 122*.

7 System settings

Main dialog: **System ► System settings**

This chapter describes the various system settings and configurations.



- Selecting the dialog language (see chapter 7.1.1, page 24).
- Setting the date and time (see chapter 7.1.2, page 25).
- Defining system-specific dialog options (see chapter 7.2, page 26).
- User administration (see chapter 7.3, page 30).
- Defining settings for the measured value display (see chapter 7.4, page 42).
- Configuring settings for acoustic signals (see chapter 7.5, page 42).

7.1 General system settings

7.1.1 Selecting the dialog language

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

Proceed as follows to select the dialog language:

1 Opening the system settings

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

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

2 Selecting the dialog language

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

3 Saving the settings

Tap on the fixed keys [] or [.

The main dialog is displayed in the respective dialog language.

7.1.2 Setting the date, time and local time

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



Proceed as follows to set the date and time:

1 Opening the system settings

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



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

2 Entering the date

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

The input is saved and the editor is closed.

3 Entering the time

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

The input is saved and the editor is closed.

4 Enter the local time

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

5 Saving the settings

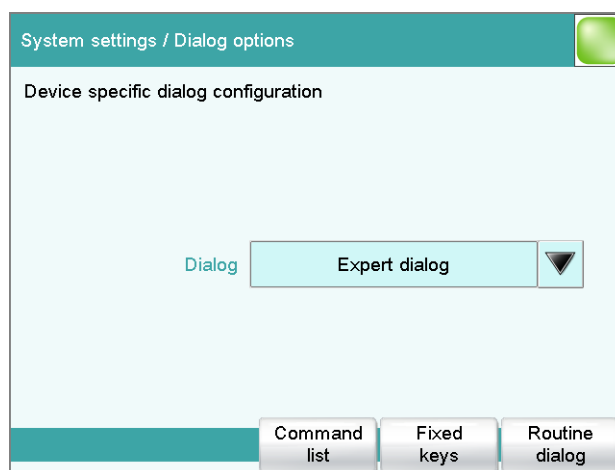
Tap on the fixed keys [↩] or [🏠].

The time settings are saved.

7.2 System-specific dialog options

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

A wide array of different titration systems can be operated with Touch Control. Accordingly, the Touch Control displays far more functions than are required for any particular system.



If you work without a login function, in this dialog you can define whether the system should generally be operated in expert mode or in routine mode. If you work with the login function activated, you must define this setting separately for each user (see chapter 7.3.1, page 31).

Dialog

Dialog mode in which the user may operate the system.

Selection	Expert dialog | Routine dialog
Expert dialog	All functions that are supported by the connected system are available.

Routine dialog

The user dialog can be limited for routine operations. Only selected functions are available (see *Configuring the routine dialog*, page 28).

[Command list]

Block unneeded method commands (see *Blocking unneeded commands and fixed keys*, page 27).

[Fixed keys]

Block unneeded fixed keys (see *Blocking unneeded commands and fixed keys*, page 27).

[Routine dialog]

Configure functions for the routine dialog (see *Configuring the routine dialog*, page 28).

Selecting the dialog mode

Proceed as follows to change the dialog mode:

1 Select the dialog mode

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

2 Saving the settings

Tap on the fixed keys [] or [].

The setting will apply to all dialogs.

**NOTE**

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

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

Blocking unneeded commands and fixed keys

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



Blocking commands

Proceed as follows to block unneeded commands:

1 Display the command list


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

The list of all command groups is displayed.

2 Deactivate command groups

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

3 Saving the settings

Tap on the fixed keys [] or [].

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

Blocking fixed keys

Proceed as follows to block unneeded fixed keys:

1 Display fixed keys which can be blocked

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

All fixed keys which can be blocked are displayed.

2 Deactivate fixed keys

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

3 Saving the settings

Tap on the fixed keys [] or [].

Deactivated fixed keys cannot be used.

Configuring the routine dialog

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

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

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

**NOTE**

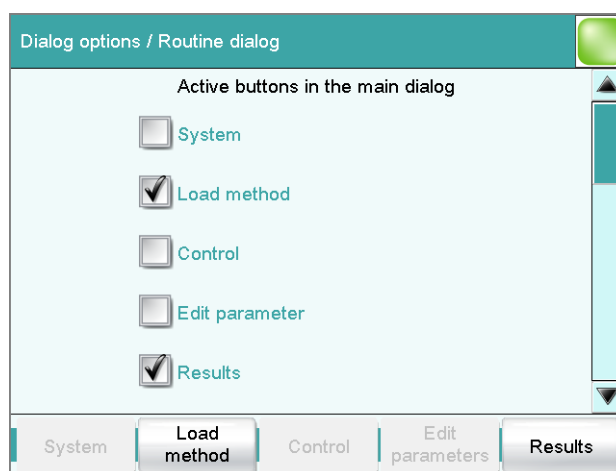
The configuration of the routine dialog applies for all routine users. You also have the option of defining user-specific routine settings. To do this, you must work with the login function activated and create an identification profile for each user (see chapter 7.3.2, page 35).

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

1 Opening the dialog

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

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

**2 Deactivate buttons**

Deactivate those buttons which are not permitted to be used.

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

3 Deactivate other functions

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

4 Saving the settings

Tap on the fixed keys **[↔]** or **[🏠]**.

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

7.3 User administration


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

All of the functions of the user administration are described in this chapter. No user administration is mandatory for the simple operation of a titration system. If, however, you wish to be in compliance with *FDA Guidance 21 CFR Part 11*, then you must use the functions of the user administration. Additional information regarding the requirements of the FDA Guidance can be found in the document *Compliance Guide Touch Control*.



NOTE

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

System settings / User administration 		
User	Dialog	Status
Administrator	Expert dialog	active
ak	Routine dialog	active
ga	Routine dialog	active
jb	Expert dialog	active
wl	Expert dialog	active

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

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

You can use the user list two different ways:

- Operation with login function:
If you work with the login function activated, i.e. if each user must log into the system before starting work, then only those users entered in the list can log in. The user who is currently logged in is shown in the main dialog.
- Operation without login function:
If you work without the login function, the users whose names are entered in the list can be selected in the main dialog or a user name can be entered. This makes it possible to document who has operated the titration system.

[Login options]

Define the settings for the login, Audit Trail, etc. (see chapter 7.3.3, page 35).

[Create ID profile]

Create an identification profile for the selected user on a storage medium (see chapter 7.3.2, page 35).

[New]

Adding a new user to the list (see chapter 7.3.1, page 31).

[Delete]

Delete the selected user from the list.

**NOTE**

Once users have worked with the login function and password protection, they can no longer be deleted, even if the password protection is disabled again. The status of these users must be set to **inactive** (requirement of FDA Guidance 21 CFR Part 11).

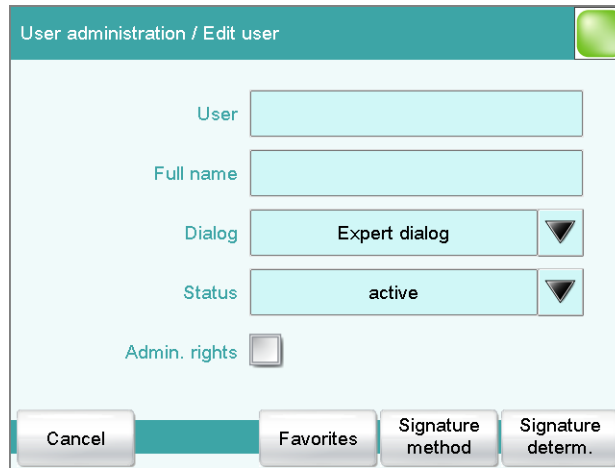
The last user with administrator rights cannot be deleted.

[Edit]

Editing the data of the selected user (see chapter 7.3.1, page 31).

7.3.1 Editing the user configuration

User list: **User ► New / Edit**



User

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

Entry	24 characters maximum
Default value	empty

Full name

Complete name of the user.

Entry	24 characters maximum
Default value	empty

Dialog

Dialog mode in which the user may operate the system.

Selection	Expert dialog | Routine dialog
-----------	---------------------------------------

Expert dialog

All functions that are supported by the connected system are available.

Routine dialog

The user dialog can be limited for routine operations. Only selected functions are available (*see Configuring the routine dialog, page 28*).

Status

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

Selection	active | inactive
Default value	active

active

The user is authorized to operate the system.

inactive

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

Admin. rights

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

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

**NOTE**

The last user with administrator rights cannot be deleted anymore.

[Favorites]

Saving methods and sample tables as user-specific favorites (see *chapter 19, page 195*).

[Signature method]

Assign the permission to use and sign methods (see *"Edit user / Signature method" dialog, page 33*).

[Signature determ.]

Assign the permission to use and sign determinations (see *"Edit user / Signature determination" dialog, page 34*).

"Edit user / Signature method" dialog

User: **Edit ► Signature method**

Authorizations for using and signing methods can be defined in this dialog. These settings are only effective if you are working with the login function enabled and password protection.

Use only released methods

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

If this option is activated, then the user may only start methods that have been released.

Review methods (signature level 1)

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

If this option is activated, then the user may only sign methods which have the status **saved**. The method is assigned the status **reviewed**.

Release methods (signature level 2)

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

If this option is activated, then the user may only sign methods which have the status **reviewed**. The method is assigned the status **released**.



NOTE

If the two options **Review methods** and **Release methods** are selected for a user, then this user can sign different methods at either level 1 or level 2, but not the same method at both level 1 and level 2.

Delete signatures

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

If this option is activated, then the user may delete the signatures of a method which has been released. The method is assigned the status **saved**. The signatures of a method can only be deleted if it has the status **released**.

"Edit user / Signature determination" dialog

User: **Edit ► Signature determ.**

Authorizations for signing determinations can be defined in this dialog. These settings are only effective if you are working with the login function enabled and password protection.

Review determinations (signature level 1)

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

If this option is activated, then the user may only sign determinations at the first level. The determination is assigned the status **reviewed**.

Release determinations (signature level 2)

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

If this option is activated, then the user may only sign determinations at the second level. The determination is assigned the status **released**.

Delete signatures

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

If this option is activated, then the user may delete the signatures of a determination which has been released. The signatures of a determination can only be deleted if it has the status **released**.

7.3.2 Creating an identification profile

User list: **User ► Create ID profile**

If you plan to carry out the login with an identification profile (see chapter 7.3.3, page 35), then you must first create an identification profile on a storage medium for each user. A check can then be made at the time of login as to whether or not the user does exist and whether or not he or she is working in the expert dialog or in the routine dialog. After a successful login the routine dialog settings stored on the card are loaded.



NOTE

In addition to the user name, the current routine dialog settings are also stored in this identification profile. This means you can define user-specific routine dialog settings for each user. However, you must configure them (see "Configuring the routine dialog", page 28), **before** you create the identification profile.

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

1 Plug in a storage medium

Plug in the USB storage medium.

2 Select a user

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

3 Create the identification profile

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

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

7.3.3 Defining login options

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

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

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

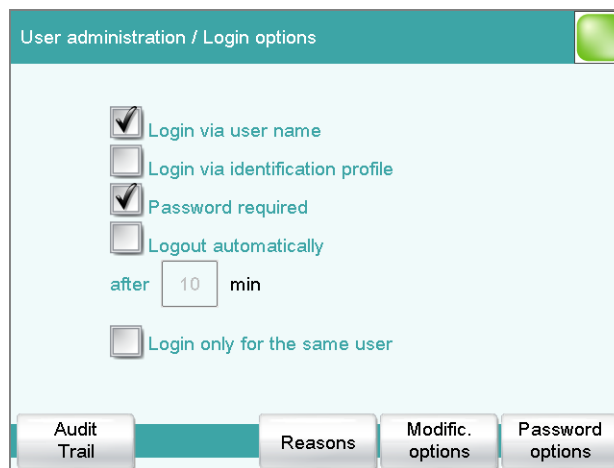
**NOTE**

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

**NOTE**

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

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

**Login via user name**

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

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

Login via identification profile

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

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

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

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

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

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

Input range	1 to 60 min
-------------	--------------------

Login only for the same user**on | off** (Default value: **off**)

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

[Audit Trail]

Define the settings for recording an Audit Trail (*see chapter 7.3.7, page 41*).

[Reasons]

Predefining a list of reasons which can be selected for the modification/signature of a method or determination (*see chapter 7.3.6, page 40*).

[Modific. options]

Defining the modifications for which a reason is required (*see chapter 7.3.5, page 39*).

[Password options]

Define the settings for the password, see following chapter.

7.3.4 Password options

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

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



Minimum password length

Minimum number of characters of the passwords.

Input range	1 to 10
Default value	1

No. of entry attempts

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

Input range	2 to 5
Selection	off
Default value	off

Special characters required

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

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

Password expires

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

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

Input range	1 to 999 days
Default value	365 days

Forgotten password



CAUTION

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

Proceed as follows:

1 Create a backup

Create a backup (*see chapter 12.3, page 132*).

2 Executing a system initialization

Switch off the Touch Control and execute a system initialization (*see chapter 30.1, page 493*).

3 Restore backed-up data

Use the function **Restore** to reload the data from the backup into your system (*see chapter 12.3.1, page 132*).

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

4 Switch on the Touch Control

Switch the Touch Control back on again after a few seconds.

5 Restore the user list

Create the user list again and redefine the login options.

7.3.5 Modification options

Main dialog: **System ► System settings ► User admin. ► Login options ► Modific. options**

In the dialog **Login options / Modification options**, you can define for which actions a reason must be entered. These reasons are documented in the Audit Trail (*see chapter 7.3.7, page 41*) together with the modification. The reason for the last modification is shown in the properties of the method or determination.

**NOTE**

The reasons are only requested when working with activated login function and password.

Saving modified method

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

If this option is activated, then a reason must be given when saving a method modification.

Recalculating determination

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

If this option is activated, then a reason must be given when determinations are being recalculated.

7.3.6 Reasons

Main dialog: **System ► System settings ► User admin. ► Login options ► Reasons**

In the dialog **Login options / Reasons**, you can create a selection list containing reasons from which a selection can be made when signing and modifying methods and determinations. Some reasons have already been provided.

**[New]**

Add a new reason to the list.

[Delete]

Delete the selected reason from the list.

[Edit]

Change the designation of the selected reason.

7.3.7 Audit Trail

Main dialog: **System ► System settings ► User admin. ► Login options ► Audit Trail**

An Audit Trail is an automatically generated log of all user activities. An Audit Trail contains precise logs of user actions (date, time, user, action, etc.). Recording an Audit Trail is important for compliance with *FDA Guidance 21 CFR Part 11* when using PC programs. A step-by-step description of how you must proceed to remain in compliance with the FDA Guidance is included in the document *Compliance Guide Touch Control*. The Audit Trail is saved to the internal memory.

You can also use the Audit Trail function specifically to record the data which are of interest to you.

You can view, filter and export the Audit Trail on a PC with the supplied software program *AuditTrailViewer*. Details concerning utilization of the *AuditTrailViewer* can be found in the Appendix (*chapter 32.9, page 526*).

If necessary, you can delete all of the entries in the Audit Trail with **[Delete Audit Trail]**. Do not fail to create a backup before doing so, however.

Security log

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

If this option is activated, then the following events will be recorded: user login/logout, password changes, automatic deactivation of users and messages displayed during the login procedure.

User administration log

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

If this option is activated, then all changes with respect to user administration will be recorded (modifying user list/user data, changing login options, etc.).

Method log

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

If this option is activated, then all changes with respect to methods and determinations will be recorded (saving, deleting, renaming, copying and loading methods; editing method parameters; starting, stopping, pausing determinations).

Data log



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

If this option is activated, then the following events will be recorded: changing sample data; settings in the **Control** dialog, recalculating determinations, changing statistics data, changing the titer/concentration of a titrant, changing the calibration data of a sensor, changing the value of a common variable.

System log

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

If this option is activated, then the program start and the displayed messages of the following types will be recorded:

- : General warning messages
- : Error messages

7.4 Measured value display

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

The number of decimal places can be defined for pH values and voltages.

This setting refers exclusively to the display of the measured values in the live display and in the manual control. The values will, however, always be stored with their full accuracy.

7.5 Acoustic signals

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

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

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

8 Titrants

Main dialog: **System ► Titrants**

This chapter describes how you can create a list of titrants used in the system. Titrants can be used in intelligent buret units or in nonintelligent buret units. Intelligent buret units have a built-in data chip on which the data for the titrant is stored. This data is automatically read out during attachment and entered in the titrant list.

System / Titrants			
Titrant	Cyl.	Type	Dos.device
c(AgNO ₃) = 0.1 mol/L	20 mL	DU	
c(HCl) = 0.1 mol/L	5 mL	IEU	D1/Titrando 2
c(I ₂) = 0.05 mol/L	50 mL	IDU	
c(NaOH) = 0.1 mol/L	5 mL	IEU	D1/Titrando 1

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

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

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

The following titrant data is stored in the titrant list:

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



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

**NOTE**

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

[New]

Adding a new titrant to the list (see chapter 8.1, page 44).

[Delete]

Delete the selected titrant from the list.

[Edit]

Editing the data of the selected titrant (see chapter 8.2, page 45).

8.1 Adding a new titrant

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

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

8.2 Editing titrant data

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

The screenshot shows a dialog box titled 'Titrants / Edit'. It contains the following fields and controls:

- Titrant:** A dropdown menu showing 'c(HCl) = 0.1 mol/L'.
- Concentration:** A text input field with '0.1000' and a unit dropdown menu showing 'mol/L'.
- Comment:** An empty text input field.
- Titer:** A text input field with '1.004' and a dropdown menu.
- Date titer det.:** A label with the value '2010-06-02 16:14:09'.
- Buttons:** Three buttons at the bottom: 'Working life', 'Exchange unit', and 'Titer options'.

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

Titrant

The designation of the titrant is used for unambiguous identification.

Entry	24 characters maximum
Selection	Selection of frequently used titrants

Concentration

Concentration of the titrant.

Input range	-999999999 to 999999999
Default value	1.000

Unit of the concentration.

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

Comment

Entry	24 characters maximum
-------	------------------------------

Titer

Titer of the titrant.

Input range	-999999999 to 999999999
Default value	1.000

Unit of the titer.

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



NOTE

If you modify the titer or the concentration of the titrant in a loaded determination at a later date and would then like to recalculate the determination with the corrected value, then you must modify the value in the determination data under **View data / Titrant data** (see "Calibration and titrant data", page 223).

Date titer det.

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

[Working life]

Defining the working life of the titrant (see chapter 8.3, page 47).

[Dosing unit]

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

Defining the properties of the dosing unit used (see chapter 8.4, page 48).

[Exchange unit]

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

Defining the properties of the exchange unit used (see chapter 8.5, page 54).

[Titer options]

Displaying the properties for titer determination (see chapter 8.7, page 60).

8.3 Monitoring the working life

Titration: **Edit ► Working life**

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

Preparation date

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

Format: YYYY:MM:DD

Monitoring

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

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

Working life

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

Input range	1 to 999 days
Default value	999 days

Expiry date

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

Format: YYYY:MM:DD

Action

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

Selection	Display message | Document message | Cancel determination
Default value	Display message

For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.



Display message

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

Document message

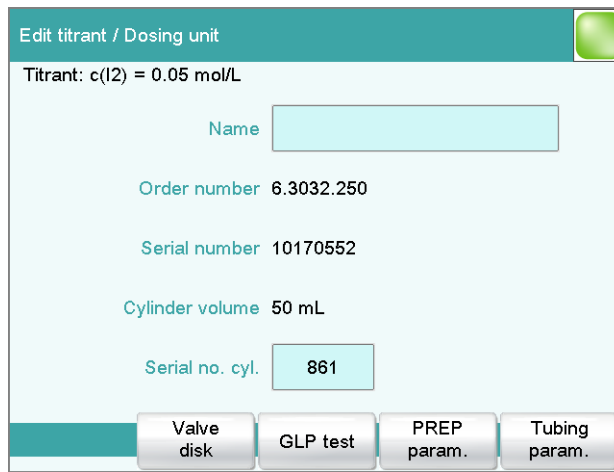
In the determination data it will be documented, that the time interval has been expired.

Cancel determination

The determination is stopped.

8.4 Dosing unit

Titrant: **Edit ▶ Dosing unit**



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

Name

Designation of the exchange or dosing unit.

Entry	24 characters maximum
Default value	empty

Order number

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

Entry	24 characters maximum
Default value	empty

Serial number

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

Entry	8 digits maximum
-------	-------------------------

Cylinder volume

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

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

Serial no. cyl.

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

Entry	8 digits maximum
-------	-------------------------

[Valve disk]

Specifying the shift direction of the valve disk (*see chapter 8.4.3, page 54*).

[GLP test]

Defining the time interval for the GLP test (*see chapter 8.6, page 58*).

[PREP param.]

Entering the parameters for the preparation (*see chapter 8.4.1, page 49*).

[Tubing param.]

Entering the parameters for the connected tubing (*see chapter 8.4.2, page 51*).

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

Titration: **Edit ► Dosing unit ► PREP param.**

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

Dosing port PREP/EMPTY

Dosing port through which the cylinder contents are ejected.

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



Dosing rate Dos. port 1

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

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32.2, page 504*).

Dosing rate Dos. port 2

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

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32.2, page 504*).

Dosing rate Fill port

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

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32.2, page 504*).

Dosing rate Spec.port

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

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32.2, page 504*).

8.4.2 Tubing parameters

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

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



NOTE

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

Dosing port 1

Port

Port to be used as dosing port 1 for the **PREP** and **EMPTY** (see figure 8, page 53) functions.

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

Length

Length of the tubing.

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

Diameter

Diameter of the tubing.

Input range	0.0 to 9.9 mm
Default value	2.0 mm

Dosing port 2

Port

Port to be used as dosing port 2 for the **PREP** and **EMPTY** functions (see figure 8, page 53).

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



Length

Length of the tubing.

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

Diameter

Diameter of the tubing.

Input range	0.0 to 9.9 mm
Default value	2.0 mm

Fill port

Port

Port to be used as fill port for the **PREP** and **EMPTY** functions (*see figure 8, page 53*).

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

Length

Length of the tubing.

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

Diameter

Diameter of the tubing.

Input range	0.0 to 9.9 mm
Default value	2.0 mm

Special port

Port

Port to be used as special port for the **PREP** and **EMPTY** functions (*see figure 8, page 53*).

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

Length

Length of the tubing.

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

Diameter

Diameter of the tubing.

Input range	0.0 to 9.9 mm
Default value	2.0 mm

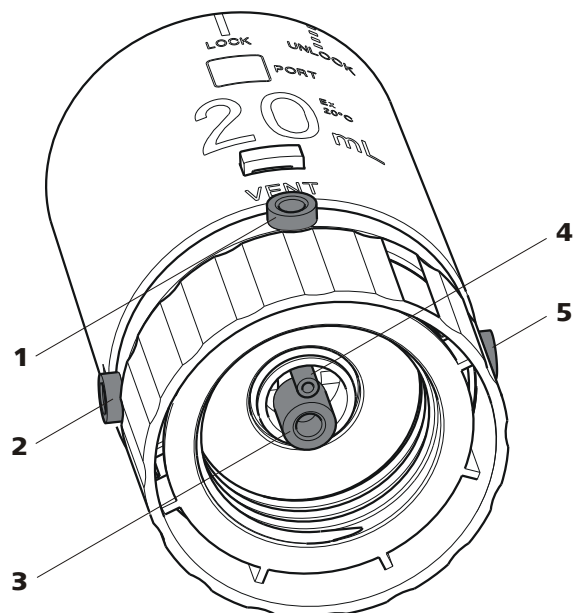


Figure 8 Dosing unit – port assignment

1 VENT

This port is set up for the deaeration of the reagent bottle. An adsorber tube (filled with desiccant) is usually mounted here.

3 Port 2

The default definition of this port is the filling port. A riser tube is usually mounted to it.

5 Port 3

The default definition of this port is dosing port 2.

2 Port 1

The default definition of this port is dosing port 1.

4 Port 4

Air is suctioned through this port during the **Emptying** function.

8.4.3 Shift direction of the valve disk

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

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

Direction

Shift direction of the valve disc.

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

descending

The ports are moved to in descending order.

ascending

The ports are moved to in ascending order.

automatic

The ports are moved to by the shortest path.

not over

Define a protected port.

Not over port

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

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

Selection	1 | 2 | 3 | 4
Default value	4

8.5 Exchange unit

Titrant: **Edit ► Exchange unit**

Edit titrant / Exchange unit ▶
 Titrant: c(HCl) = 0.1 mol/L
 Name
 Order number 6.3026.150
 Serial number 10950001
 Cylinder volume 5 mL
 Serial no. cyl.
 GLP test PREP param. Tubing param.

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

Name

Designation of the exchange or dosing unit.

Entry	24 characters maximum
Default value	empty

Order number

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

Entry	24 characters maximum
Default value	empty

Serial number

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

Entry	8 digits maximum
-------	-------------------------

Cylinder volume

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

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

Serial no. cyl.

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

Entry	8 digits maximum
-------	-------------------------

[GLP test]

Defining the time interval for the GLP test (*see chapter 8.6, page 58*).

[PREP param.]

Entering the parameters for the preparation (*see chapter 8.5.1, page 56*).

[Tubing param.]

Entering the parameters for the connected tubing (*see chapter 8.5.2, page 57*).

8.5.1 Parameters for the preparation (PREP)

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

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

Volume

Volume of titrant dosed during a rinsing cycle.

Input range	0.00000 to 99999.9 mL
Selection	Cylinder volume
Default value	Cylinder volume

Cylinder volume

The entire cylinder volume is being dosed.

Cycles

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

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

Dosing rate

The rate at which dosing takes place.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

8.5.2 Tubing parameters

Titration: **Edit ▶ Exchange unit ▶ Tubing param.**

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

Dosing tip

Tubing to the dosing tip (9-2).

Length

Length of the tubing.

Input range	0.0 to 999.9 cm
Default value	40.0 cm

Diameter

Diameter of the tubing.

Input range	0.0 to 9.9 mm
Default value	2.0 mm

Dosing cylinder

Tubing to the dosing cylinder (9-3).

Length

Length of the tubing.

Input range	0.0 to 999.9 cm
Default value	13.0 cm

Diameter

Diameter of the tubing.

Input range	0.0 to 9.9 mm
Default value	2.0 mm

Reagent bottle

Tubing to the reagent bottle (9-1).

Length

Length of the tubing.

Input range	0.0 to 999.9 cm
Default value	25.0 cm



Diameter

Diameter of the tubing.

Input range	0.0 to 9.9 mm
Default value	2.0 mm

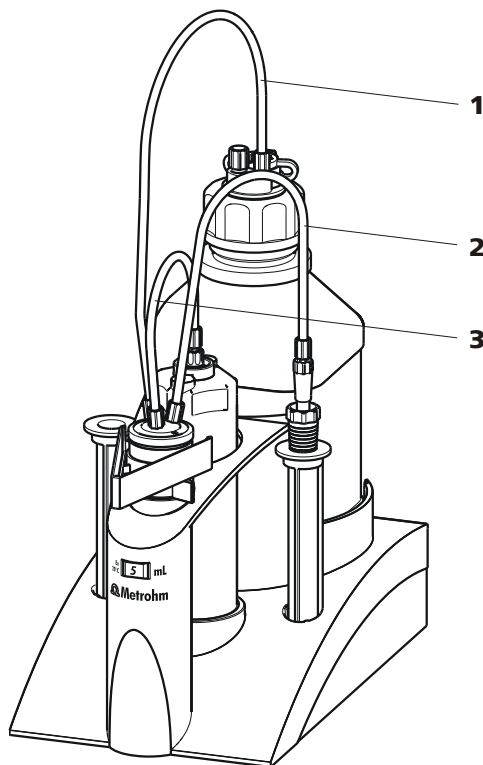


Figure 9 Exchange unit – tubing connections

- | | |
|--|-----------------------------------|
| 1 Tubing to the reagent bottle | 2 Tubing to the dosing tip |
| 3 Tubing to the dosing cylinder | |

8.6 GLP test for exchange unit and dosing unit

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

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

GLP test date

Date on which the last GLP test was carried out.

Format: YYYY:MM:DD

Monitoring

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

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

GLP test interval

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

Input range	1 to 999 days
Default value	999 days

Next GLP test

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

Format: YYYY:MM:DD

Action

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

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

Display message

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

Document message

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

Cancel determination

The determination is stopped.



8.7 Titer determination options and data

Titration: **Edit ► Titer options**

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

- **Titer method**
Method by which the titer was determined. If the titer was entered manually, then **manual** will be displayed.
- **User**
User who carried out the titer determination.
- **Statistical data**
The following information is also displayed for automatically assigned titers if the mean value of the results has been saved as the titer (*see "Save as titer", page 158*):
 - **n (titer det.)**
Number of titer determinations.
 - **s abs**
Absolute standard deviation
 - **s rel**
Relative standard deviation

[Validity]

Defining the time interval for the titer validity (*see chapter 8.7.1, page 60*).

[History]

Displaying information about the last ten titer determinations (*see chapter 8.7.2, page 61*).

8.7.1 Titer validity

Titration: **Edit ► Titer options ► Validity**

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

Date titer det.

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

Monitoring

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

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

Titer validity

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

Input range	1 to 999 days
Default value	999 days

Next titer determ.

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

Format: YYYY:MM:DD

Action

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

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

Display message

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

Document message

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

Cancel determination

The determination is stopped.

8.7.2 Properties of the previous titer determinations

Dialog "Titer options / History"

Titrant: **Edit ► Titer options ► History**

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

**NOTE**

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

[Delete History]

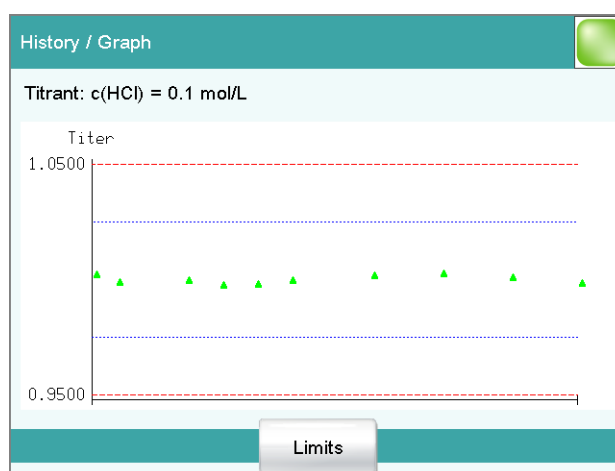
Delete the entire history.

[Graph]

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

Dialog "History / Graph"

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



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

[Limits]

Define warning and intervention limits.

9 Reagents

Main dialog: **System ► Reagents**

This chapter describes how you can create a list of the reagents used in the system. Depending on the usage a distinction is made between two types of reagents:

- Reagent for volumetric determinations
- Reagents for coulometric determinations

System / Reagents	
Reagent	Type
Reagent A	Coulometric
Reagent B	Coulometric
Reagent C	Volumetric

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

[New]

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

[Delete]

Delete the selected reagent from the list.

[Edit]

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

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

- at the start of the determination.
- at the end of the determination.

Number of determ.

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

Input range	1 to 999
Selection	off
Default value	off

Working life

Working life of the reagent.

Input range	1 to 999 days
Selection	off
Default value	off

Volume

This parameter is only visible for volumetric reagents.

Volume of titrant dosed.

Input range	1.0 to 999.9 mL
Selection	off
Default value	off

Reagent capacity

This parameter is only visible with coulometric reagents.

Water capacity of the reagent.

Input range	1 to 9999 mg
-------------	---------------------



Selection	off
Default value	off

Drift

This parameter is only visible with coulometric reagents.
 During conditioning the measured drift has to be in the following range for 2 min: '**specified drift value + 50 µg/min**'.

Input range	1 to 999 µg/min
Selection	off
Default value	off

[Status]

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

[Reagent replacement]

Edit the parameters for the reagent exchange.

"Reagent monitoring / Status" dialog

The current reagent monitoring values are displayed in this dialog.

[Reset]

Reset the values to zero.

Dialog "Reagent monitoring / Reagent replacement"

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

Reagent replacement

The reagent can either be exchanged manually or automatically.

Selection	manual | auto
Default value	manual

manual

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

auto

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

Memory

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

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

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

Shared memory

Shared directory in the network.

Method

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

Method used for emptying the titration cell.



NOTE

Make sure that the memory is accessible.

Entry	32 characters maximum
Selection	Selection of stored methods

10 Sensors

Main dialog: **System ► Sensors**

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

System / Sensors		
Sensor	Sensor type	Meas. input
Ecotrode Plus	pH	
iUnitrode with Pt1000	pH IS	I1/Titrando 1
pH electrode	pH	
Ag Titrode	Metal	
Metal electrode	Metal	
Fluoride electrode	ISE	
Temperature sensor	Temp.	
Conductivity sensor	Cond.	

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

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

- Designation
- Type
 - **pH**: pH electrode
 - **Metal**: Metal electrode
 - **ISE**: Ion-selective electrode
 - **Temp.**: Temperature sensor
 - **Cond.**: Conductivity measuring cell
 - **Other**: Other sensor type
- Measuring input/control instrument (only for intelligent sensors if they are connected)

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

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

- Name
Each sensor in the system is identified by its unambiguous name.
- Calibration data (for pH electrodes, ISE electrodes and conductivity measuring cells only)

- Calibration interval (for pH electrodes, ISE electrodes and conductivity measuring cells only)
- Working life
- etc.

**NOTE**

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

[New]

Adding a new sensor to the list (*see chapter 10.1, page 69*).

[Delete]

Delete the selected sensor from the list.

[Edit]

Editing the data of the selected sensor (*see chapter 10.2, page 70*).

10.1 Adding a new sensor

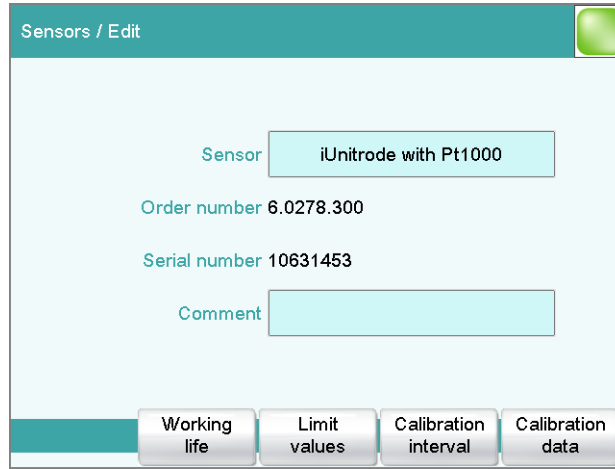
Before you can use a sensor, you must add it to the sensor list. To do this, use the button **[New]**.

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



10.2 Editing the sensor data

Sensor list: **Sensor ▶ New / Edit**



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

Sensor

The designation of the sensor is used for unambiguous identification.

Entry	24 characters maximum
-------	------------------------------

Ion

This parameter is only visible for electrodes of the type **ISE**.

Display of the ion and its charge.

Order number

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

Entry	24 characters maximum
Default value	empty

Serial number

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

Entry	8 digits maximum
-------	-------------------------

Comment

Entry	24 characters maximum
-------	------------------------------

[Working life]

Defining the working life of the sensor (*see chapter 10.3, page 71*).

[Limit values]

This button is displayed only for pH and ISE electrodes and conductivity measuring cells.

Define the limit values for monitoring the slope, the electrode zero point or the cell constant (*see chapter 10.5, page 77*).

[Calibration interval]

This button is displayed only for pH and ISE electrodes and conductivity measuring cells.

Define the time interval for the next calibration (*see chapter 10.6, page 79*).

[Calibration data]

This button is displayed only for pH and ISE electrodes and conductivity measuring cells.

Display the properties for titer determination (*see chapter 10.4, page 72*).

10.3 Monitoring the working life

Sensor: **Edit ► Working life**

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

Start-up

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

Format: YYYY:MM:DD

Monitoring

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

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

Working life

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

Input range	1 to 999 days
Default value	999 days



Expiry date

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

Format: YYYY:MM:DD

Action

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

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

Display message

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

Document message

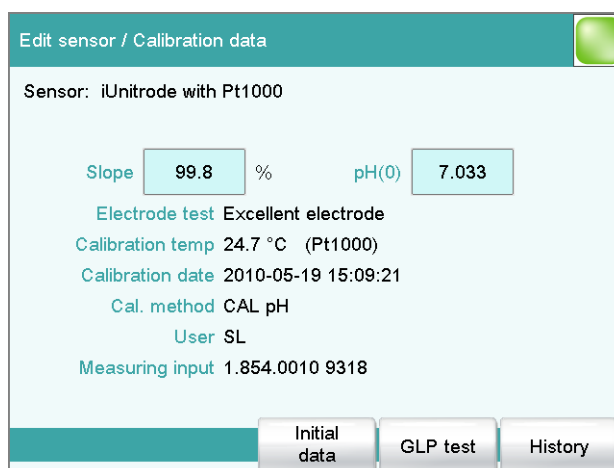
In the determination data it will be documented, that the time interval has been expired.

Cancel determination

The determination is stopped.

10.4 Calibration data (for pH- and ISE electrodes and conductivity measuring cells only)

Sensor: **Edit ► Calibration data**



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

Slope

Slope of the electrode.

pH electrodes:

Input range	-999.9 to 999.9 %
-------------	--------------------------

Default value	100.0 %
---------------	----------------

ISE electrodes:

Input range	-999.9 to 999.9 mV
-------------	---------------------------

The default value depends on the charge of the ion.

pH(0)

This parameter is only visible with pH electrodes.

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

Input range	-20.000 to 20.000
-------------	--------------------------

Default value	7.000
---------------	--------------

E(0)

This parameter is only visible with ISE electrodes.

Electrode zero point. Apart from the slope, E(0) is the second characteristic of the calibration curve.

Input range	-2000.0 to 2000.0 mV
-------------	-----------------------------

Default value	0.0 mV
---------------	---------------

c(blank)

This parameter is only visible with ISE electrodes.

Blank value concentration.

Input range	-999999999 to 999999999
-------------	--------------------------------

Default value	0.00
---------------	-------------

Variance

This parameter is only visible with ISE electrodes.

The variance is only calculated, if the calibration has been carried out with at least three standards.

Cell constant

This parameter is only visible for conductivity measuring cells.

Cell constant.

ually entered calibration data will be displayed in black with the designation **(m)**.

[Delete History]

Delete the entire history.

[Graph slope]

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

[Graph pH(0)]

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

[Graph E(0)]

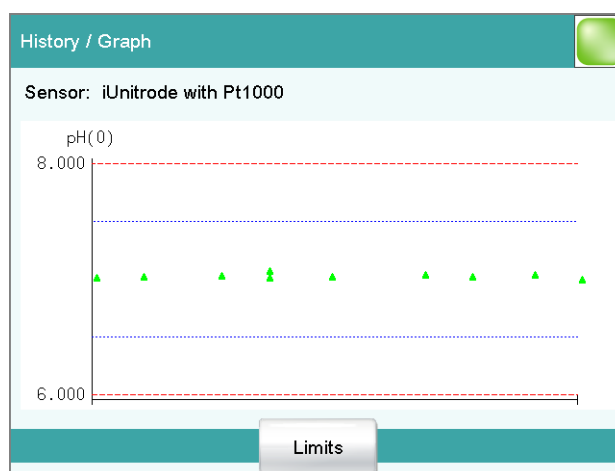
Open the diagram of the electrode zero points, see following chapter.

[Graph cell const.]

Open the diagram of the cell constants, see following chapter.

Dialog "History / Graph"

Sensor: **Edit ▶ Calibration data ▶ History ▶ Graph Slope / pH(0) / E(0) / Cell const.**



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

[Limits]

Define warning and intervention limits.

Dialog "Calibration data / GLP test"

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

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



GLP test date

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

Format: YYYY:MM:DD

Monitoring

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

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

GLP test interval

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

Input range	1 to 999 days
Default value	999 days

Next GLP test

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

Format: YYYY:MM:DD

Action

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

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

Display message

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

Document message

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

Cancel determination

The determination is stopped.

10.5 Limit values for the calibration data

Sensor: **Edit ▶ Limit values**

Dialog box content:

Edit sensor / Limit values

Sensor: iUnitrode with Pt1000

Monitoring slope

Lower limit %

Upper limit %

Monitoring pH(0)

Lower limit

Upper limit

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

- Slope (pH and ion-selective electrodes)
- Electrode zero point (pH and ion-selective electrodes)
- Cell constant (conductivity measuring cells)

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

Monitoring slope

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

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

Lower limit

pH electrodes:

Input range	-999.9 to 999.9 %
Default value	96.0 %

ISE electrodes:

Input range	-999.9 to 999.9 mV
	The default value depends on the charge of the ion: -25.0 mV (-2), -55.0 mV (-1), 55.0 mV (+1), 25.0 mV (+2).



Upper limit

pH electrodes:

Input range	-999.9 to 999.9 %
Default value	101.0 %

ISE electrodes:

Input range	-999.9 to 999.9 mV
	The default value depends on the charge of the ion: -31.0 mV (-2), -61.0 mV (-1), 61.0 mV (+1), 31.0 mV (+2).

Monitoring pH(0)

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

This parameter is only available with pH electrodes.

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

Lower limit

Input range	-20.000 to 20.000
Default value	6.750

Upper limit

Input range	-20.000 to 20.000
Default value	7.250

Monitoring E(0)

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

This parameter is only available with ISE electrodes.

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

Lower limit

Input range	-2000.0 to 2000.0 mV
Default value	-2000.0 mV

Upper limit

Input range	-2000.0 to 2000.0 mV
Default value	2000.0 mV

Monitoring cell constant

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

This parameter is only available for conductivity measuring cells.

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

Lower limit

Input range	0.001 to 500.000 /cm
Default value	0.850 /cm

Upper limit

Input range	0.001 to 500.000 /cm
Default value	1.150 /cm

10.6 Monitoring the calibration interval (only for pH and ion-selective electrodes and conductivity measuring cells)

Sensor: **Edit ► Calibration interval**

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

Calibration date

Date of the last calibration.

Monitoring

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

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

Calibration interval

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

Input range	1 to 999 days
Default value	7 days

Next calibration

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

Format: YYYY:MM:DD

Action

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

11 Device manager

Main dialog: **System ► Device manager**

This chapter describes how you can configure the Touch Control, the control instruments (Titrande, Sample Processor etc.) and the connected peripheral devices. A detailed description of the hardware installation can be found in the installation manual for the control instrument.

System / Device manager	
Device name	Device type
900 Touch Control	900 Touch Control
Titrande 1	906 Titrande
Sample Processor	815 Sample Processor
Printer	Printer
Balance	Balance
USB/RS-232 adapter	USB/RS-232 adapter

The instrument list gives the name and type of every instrument. Connected control instruments (Titrande, Dosing Interface, Sample Processor, etc.) with the peripheral devices (dosing devices, stirrers, etc.) connected to the MSB connector are entered in the list automatically. A USB/RS-232 adapter will also be automatically recognized and entered in the instrument list with default settings. A printer is entered in the instrument list in the default settings. You must enter a PC keyboard, a barcode reader or a balance in the instrument list yourself.

[New]

Add a new device to the list (*see chapter 11.1, page 82*).

[Delete]

Delete the selected device from the list.



NOTE

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

[Edit]

Configure the selected device (*see chapter 11.2, page 82*).



11.1 Adding a new device

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

- Titrande (3 instruments maximum)
- Sample Processor
- Balance
- Barcode reader
- USB/RS-232 adapter
- PC keyboard

Proceed as follows:

1 Displaying the device selection

Tap on **[New]**.

2 Selecting the instrument

Tap on the button for the desired device.

The new device is entered in the list.

11.2 Configuring the device

Instrument list: **Instrument ► Edit**

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

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

- Touch Control *(see chapter 11.3, page 83)*
- Metrohm control instruments *(see chapter 11.4, page 89)*
- Sample Processor *(see chapter 11.5, page 94)*
- Printer *(see chapter 11.8, page 114)*
- Balance *(see chapter 11.9, page 118)*
- PC keyboard *(see chapter 11.11, page 122)*
- USB/RS-232 adapter *(see chapter 11.10, page 120)*
- Barcode reader *(see chapter 11.12, page 123)*

11.3 Touch Control

Instrument list: **900 Touch Control** ► **Edit**

Device manager / Edit

Device type: 900 Touch Control

Device name: 900 Touch Control

Comment:

Switch off display: off min

Program version: 5.900.0011

Serial number: 395612

Control Remote Box: Not available

E-mail PC/LIMS report Shared memory TCP/IP settings More information

Device name

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

Entry **24 characters maximum**

Comment

Entry **24 characters maximum**

Switch off display

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

The function is no longer available with program version 5.900.0046 or higher.

Input range	1 to 999 min
Selection	off
Default value	off

Program version

Program version of the software.

Serial number

Shows the serial number of the device.



Control Remote Box

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



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

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

11.3.1 E-mail

900 Touch Control: **Edit ► E-mail**

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

- : general warning messages
- : error messages

Configuring e-mail dispatch

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

1 Activating the option

- In the instrument properties of the 900 Touch Control, tap on the **[E-mail]** button.
- In the **Edit device / E-mail** dialog, activate the **Send the following messages as e-mail:** option.

2 Configuring e-mail addresses


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

Parameter description

Send the following messages as e-mail:

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

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

- : General warning messages

-  Error messages

Send only during running determination

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

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

Mail server

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

Entry	50 characters maximum
Default value	empty

Sender

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

Entry	50 characters maximum
Default value	empty

Recipient


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

Entry	50 characters maximum
Default value	empty

11.3.2 PC/LIMS report

900 Touch Control: **Edit ► PC/LIMS report**

You can generate a machine-readable report with all of the important data concerning a determination, which is referred to as a PC/LIMS report. This report can be saved as a TXT file (according to ISO/IEC 8859-1) or as a UTF-8 file or sent to a terminal program or a LIMS via an RS-232 interface:

- manually with the  fixed key (see chapter 27, page 247).
- automatically at the end of a determination (see chapter 16.5.6, page 187).

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



Memory

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

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

off

The report will not be saved as a file.

Shared memory

The report will be saved in a shared directory on the network. The shared directory is selected in the **Edit device / Shared memory** dialog (see chapter 11.3.3, page 87).

RS-232

The RS-232 interface via which the PC/LIMS report is sent. The interface parameters are adjusted in the **Edit device / Port parameters** dialog (see chapter 11.10, page 120).

Selection	off | COM 1 | COM 2
Default value	off

off

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

COM 2

This interface is inactive.

Coding

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

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

ISO 8859-1

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

UTF-8

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

11.3.3 Shared memory

900 Touch Control: **Edit ► Shared memory**

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



CAUTION

If the computer on which you share a memory location does not have the same subnet as the Touch Control, then a WINS server must be present. The computer must be entered in this server. In order for the communication to work, the SMB protocol version 1 (SMBv1) must be activated. Since this function is not standard anymore in Windows 10, it has to be activated manually. From firmware version 5.900.0044, the SMB protocol version 2 and 3 is also supported.

Computer

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

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

Entry	max. 32 characters
Default value	empty

Share name

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

Entry	max. 32 characters
Default value	empty

Domain

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



Entry	max. 32 characters
Default value	empty

User

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

Entry	max. 32 characters
Default value	empty

Password

Password of the user configured on the computer.

Entry	max. 32 characters
Default value	empty

[Connect]

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

11.3.4 TCP/IP settings

900 Touch Control: **Edit ► TCP/IP settings**

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

Get IP address automatically (DHCP)

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

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

IP address

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

Entry	x.x.x.x
Default value	192.168.10.11
	"x" is a decimal between 0 and 255.

Subnet mask

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

Entry	x.x.x.x
Default value	255.255.255.0

Default gateway

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

Entry	x.x.x.x
Default value	192.168.10.10

MAC address

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

NetBIOS name

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

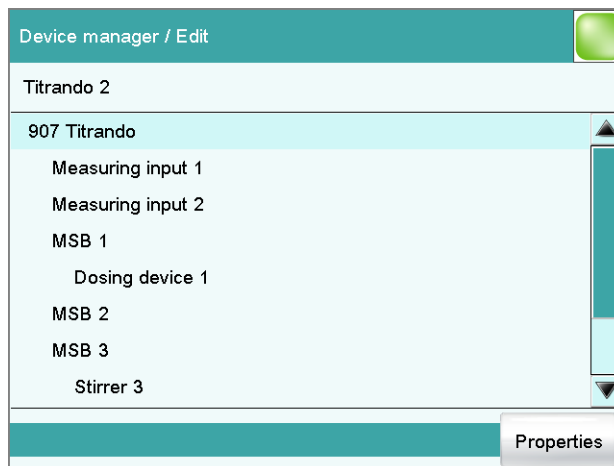
11.4 Metrohm control instruments

The following Metrohm devices can be used as control instruments:

- Titrandos
- Sample Processors
- 846 Dosing Interface
- 867 pH Module
- 856 Conductivity Module

The following specifications apply for all of the control instruments mentioned above.

Additional device configurations for the Sample Processor are described in a separate chapter (*see chapter 11.5, page 94*).



The dialog shows the control instrument with its measuring inputs, the MSB connectors and connected peripheral devices (dosing device, stirrer, Remote Box). If the control instrument is not connected, then the properties dialog of the control instrument will be displayed directly (see chapter 11.4.1, page 90).

[Properties]

Open the properties dialog of the highlighted entry.

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

- Properties of the control instrument (see chapter 11.4.1, page 90)
- Properties of the measuring inputs (see chapter 11.4.2, page 91)
This dialog is available only for devices which have a built-in measuring input.
- Properties of the MSB connectors (see chapter 11.4.3, page 92)
- Properties of the peripheral devices on the MSB connector (see chapter 11.4.4, page 93)

11.4.1 Properties – Control instrument

Instrument list: **Control instrument ▶ Edit ▶ Properties**

Device name

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

Entry **24 characters maximum**

Comment

Entry **24 characters maximum**

Program version

Program version of the instrument software.

Serial number

Shows the serial number of the device.

11.4.2 Properties – Measuring input

Instrument list: **Control instrument** ▶ **Edit** ▶ **Measuring input**
1/2 ▶ **Properties**

Device manager / Edit

Titrande 1 / Measuring input 1

ADC type 3.848.1210

Serial number 46180

Thick film type 3.680.0743

Temperature sensor

Type **Pt1000** ▼ R (25 °C) 30000

B value 4100 K

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

ADC type

Type of analog-digital converter.

Serial number

Serial number of the measuring interface.

Thick film type

Type of the thick film.

Temperature sensor

Type

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

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

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

Selection	Pt1000 | NTC
Default value	Pt1000

R (25 °C)

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

Nominal resistance of the NTC sensor at 25 °C.

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

B value

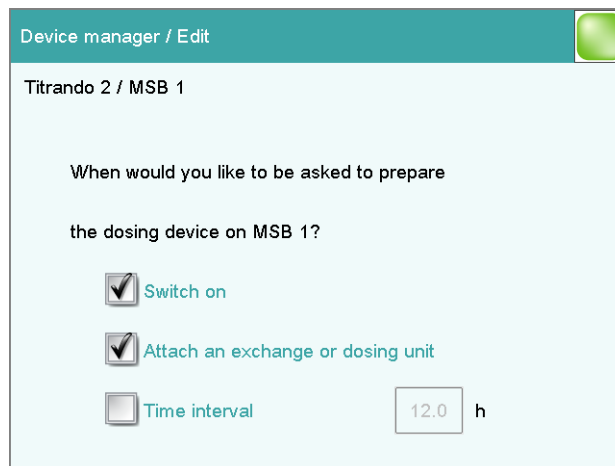
This parameter can only be edited with **Type = NTC**.

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

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

11.4.3 Properties – MSB connector

Instrument list: **Control instrument ▶ Edit ▶ MSB connector 1... 4 ▶ Properties**



In this dialog, you can define when the request to carry out the **Prepare** function for connected dosing devices is to be displayed. This setting applies for all dosing devices of the selected MSB connector. The manual control contains a description of how to prepare the exchange unit and/or the dosing unit (*see chapter 28.3.3, page 267*).

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

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

Attach an exchange or dosing unit**on | off** (Default value: **on**)

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

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

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

Input range	0.1 to 999.9 h
Default value	12.0 h

11.4.4 Properties – Peripheral devices

Instrument list: **Control instrument ► Edit ► Peripheral device ► Properties**

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

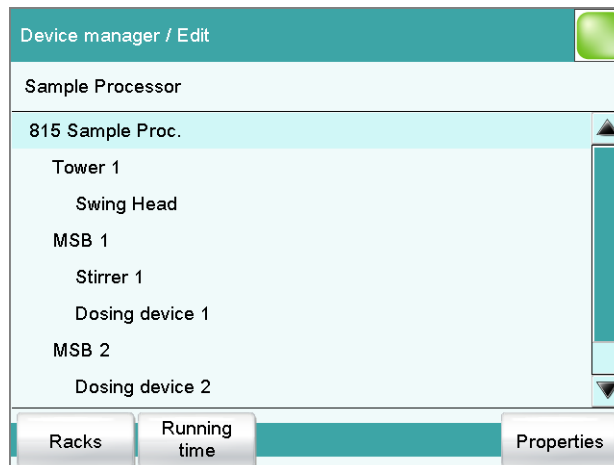
- Type
The display includes the device number, e.g. "800" (Dosino) or "804" (Ti Stand)
- Serial number
In the case of the 700 Dosino and the 685 Dosimat, the serial number cannot be read out.

11.5 Sample Processor



NOTE

The following settings apply to all Sample Processors.



The dialog shows the Sample Processor with its tower (or towers), the MSB connectors and connected peripheral devices (dosing device, stirrer, Remote Box). If the control instrument is not connected, then the properties dialog of the control instrument will be displayed directly (see chapter 11.5.1, page 95).

The settings of the MSB connectors and the connected peripheral devices are described in Chapter "Properties – MSB connector", page 92.

[Racks]

Configure sample racks (see chapter 11.6, page 102).

[Running time]

Configure the running time meter.

The running time meter adds together the time while the Sample Processor is "busy" i.e. when an action is being carried out. A message with the prompt to service the device is displayed after expiry of the time limit set here. We recommend to carry out a service after 1,000 operating hours. A reset of the running time meter can only be carried out by a Metrohm service engineer.

[Properties]

Open the properties dialog of the highlighted entry.

11.5.1 Properties – Sample Processor

Instrument list: **Sample Processor** ► **Edit** ► **Properties**

Device name

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

Entry **24 characters maximum**

Comment

Entry **24 characters maximum**

Program version

Program version of the instrument software.

Serial number

Shows the serial number of the device.

Rack name

Name of the currently attached sample rack.

[Adjustment data]

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

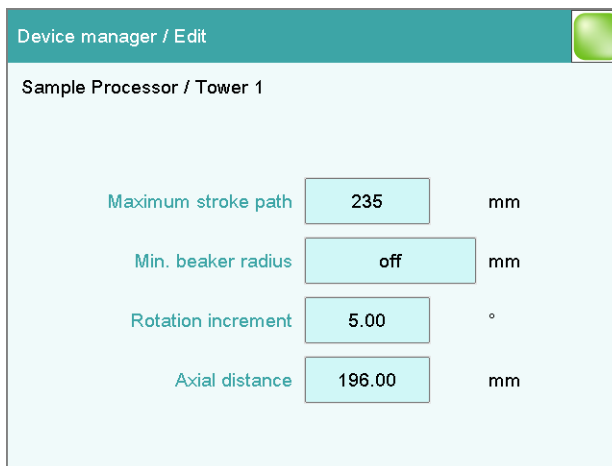


CAUTION

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

11.5.2 Properties – Tower

Instrument list: **Sample Processor** ► **Edit** ► **Tower 1/2** ► **Properties**



NOTE

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

Maximum stroke path

Lowest permissible lift position for automatic and manual operation.

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

Input range	1 to 235 mm
Default value	235 mm

Min. beaker radius

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

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

Input range	1.0 to 100.0 mm (Increment: 0.1) If the lift is to be moved to the work position, a check is made to see whether the beaker radius defined for the attached rack (see "Beaker radius samples", page 104) is less than this value.
-------------	---

Selection	off
Default value	off

off
No check takes place.

Rotation increment

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

Input range	0 to 353.99 °
Default value	5.00 °

Axial distance

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

for 814 USB Sample Processor:

Input range	100.0 to 300.0 mm
Default value	166.0 mm

for 815 Robotic USB Sample Processor XL, 855 Robotic Titrosampler:

Input range	100.0 to 300.0 mm
Default value	196.0 mm

11.5.3 Properties – Swing Head

Instrument list: **Sample Processor ▶ Edit ▶ Swing Head ▶ Properties**

Edit device / Properties		
Sample Processor / Tower 1 / Swing Head 786		
Serial number 01108		
Ext. pos.	Angle [°]	Work [mm]
1	60.00	100
2	60.00	0
3	60.00	0
4	60.00	0
Ext. pos. 1-4	Robotic arm	Adjustment data
Edit		

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

[Ext. pos. 1-4]

Edit the settings that apply for all external positions (see "Properties – External positions 1-4", page 98).

[Robotic arm]

Edit the robotic arm settings (see "Properties – Robotic arm", page 99).



[Adjustment data]

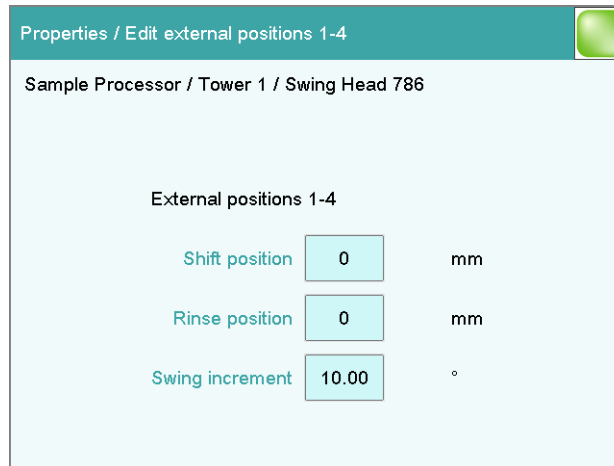
Display the overview of the EEPROM data of the Swing Head. This dialog cannot be edited.

[Edit]

Edit specific settings of the selected external position (see "Properties – External position", page 100).

Properties – External positions 1-4

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



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

Shift position

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

Input range	0 to 'Maximum stroke path' mm
Default value	0 mm A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (see "Maximum stroke path", page 96).

Rinse position

Lift position used for rinsing.

Input range	0 to 'Maximum stroke path' mm
Default value	0 mm
	A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (see " <i>Maximum stroke path</i> ", page 96).

Swing increment

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

Input range	0.00 to 180.00 °
Default value	10.00 °

Properties – Robotic arm

Swing Head: **Properties ► Robotic arm**

Properties / Robotic arm

Robotic arm Tower 1

Swing offset: 0.00 °

Maximum swing angle: 84.00 °

Swing radius: 110.00 mm

Rotation offset: 0.00 °

Swing direction: - ▼

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

Swing offset

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

Input range	-270.00 to 270.00 °
Default value	0.00 °

Maximum swing angle

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



Input range	0.00 to 330.00 °
Default value	60.00 °

Swing radius

Maximum swing radius of the robotic arm. The swing radius is dependent on the length of the robotic arm and is, together with the axial distance (see "Axial distance," page 97), the most important variable for precise movement to a rack position. You will find the required values in the leaflet for the robotic arm.

Input range	30.00 to 300.00 mm
Default value	110.00 mm

Rotation offset

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

Input range	-270.00 to 270.00 °
Default value	0.00 °

Swing direction

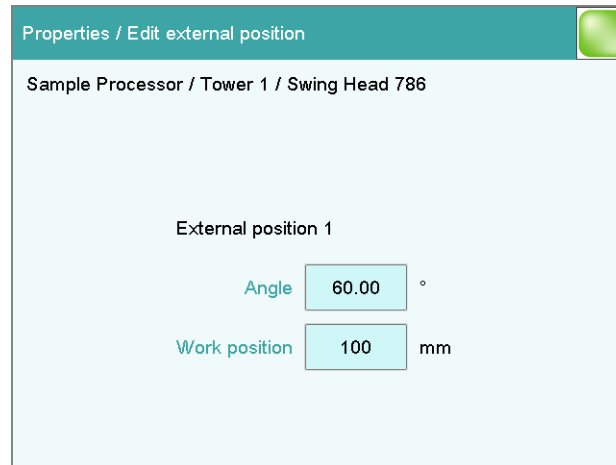
The swing direction of the robotic arm depends on its type. For a 2-tower model, the robotic arm must be defined as right-swinging on Tower 1 and as left-swinging on Tower 2.

Selection	+ | -
Default value	-

- +**
Left-swinging.
- Right-swinging.

Properties – External position

Swing Head: **Properties ► Edit**



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

Angle

Swing angle for the selected external position.

Input range	(Offset) to (Offset + max. swing range) °
Default value	60.00 °
	The offset is made up of a design-dependent angle (approx. 8...9°) together with the robotic arm offset from the robotic arm properties. The maximum swing range is also defined under the robotic arm properties (see "Properties – Robotic arm", page 99).

Work position

Work position for the selected external position.

Input range	0 to 'maximum stroke path' mm
	A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (see "Maximum stroke path", page 96).

11.6 Sample racks

Instrument list: **Sample Processor** ► **Edit** ► **Racks**

Edit device / Sample racks		
Rack	Positions	Code
6.2041.310	12	000001
6.2041.320	16	000010
6.2041.340	24	001000
6.2041.350	48	010000
6.2041.360	12	100000
6.2041.370	14	000011
6.2041.380	14	000101
6.2041.390	16	100001

Buttons: Load, Copy, Delete, Edit

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

The following data is displayed in the list:

- **Rack**
Name of the sample rack. Metrohm standard racks are designated by their order numbers.
- **Positions**
Number of positions on the rack.
- **Code**
The rack code corresponds to the arrangement of magnets on the base of the rack and is read in by the Sample Processor in order to recognize the rack.

[Load]

Load a new sample rack (see "Loading the sample rack", page 103).

[Copy]

Create a new sample rack by copying an existing rack (see "Creating a new sample rack", page 104).

[Delete]

Delete the selected sample rack from the list.

[Edit]

Edit the data of the selected sample rack (see chapter 11.6.1, page 104).

Loading the sample rack

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

1 Copying the file to an external storage medium

- Copy the file to a subdirectory of "Files".



If this structure is not maintained, the new rack will not be found because the software directly accesses subdirectories of "Files".

- Plug in the external storage medium at the Touch Control.

2 Display the list of saved sample racks

- In the **Edit device / Sample racks** dialog, tap on the **[Load]** button.

The selection of file groups on the external storage medium is displayed. If only one group is available, then the list of the saved sample rack files will be displayed directly.

- Select the group with the desired sample rack.
- Tap on **[Show files]**.

The list with the saved sample rack files is opened.

3 Load the sample rack file

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

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

Creating a new sample rack

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

1 Copy the existing rack

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

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

2 Enter the rack name and rack code

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

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

11.6.1 Editing rack data

Sample rack list: **Rack ▶ Edit**

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

Beaker radius samples

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

This beaker radius may not be less than the minimum beaker radius defined in the tower properties (see "Min. beaker radius," page 96). If the

lift is to be moved to the work position, then these two values will be compared with one another.

Input range	1.0 to 100.0 mm
Selection	off
Default value	off

off

No check takes place.

Beaker sensor

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

Selection	Tower | Robotic arm | off
Default value	off

Robotic arm

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

off

No check takes place.

1. Calibration pos.

Position of the first calibration solution for automatic calibration with a Sample Processor(see *"Definition of the calibration positions"*, page 509) .

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

Special beaker 1...n

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

Rack offset

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

Input range	-10.00 to 10.00 °
Default value	0.00 °

[Adjust rack]

Adjust the rack (see chapter 11.6.2, page 110).

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


Define rack specific lift positions (see "Lift positions Tower 1/2", page 106).

[Special beakers]

Define rack positions as special beakers (see "Editing special beakers", page 107).

Lift positions Tower 1/2

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

Edit rack data / Lift positions tower 1 
 Rack 6.2041.410, Code 001010, 142 Positions
 Work position mm
 Rinse position mm
 Shift position mm
 Special position mm

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

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

**NOTE**

These lift positions can also be assigned directly in manual control after moving to the desired lift height (see chapter 28.7.1, page 275).

Work position

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

Input range	0 to 'maximum stroke path' mm A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (<i>see "Maximum stroke path", page 96</i>).
-------------	--

Rinse position

Lift position used for rinsing.

Input range	0 to 'Maximum stroke path' mm
Default value	0 mm A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (<i>see "Maximum stroke path", page 96</i>).

Shift position

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

Input range	0 to 'maximum stroke path' mm A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (<i>see "Maximum stroke path", page 96</i>).
-------------	--

Special position

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

Input range	0 to 'maximum stroke path' mm A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (<i>see "Maximum stroke path", page 96</i>).
-------------	--

Editing special beakers

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



Edit rack data / Special beakers	
Rack 6.2041.410, Code 001010, 142 Positions	
Special beaker	Rack position
Special beaker 1	142
Special beaker 2	0
Special beaker 3	0
Special beaker 4	0
Special beaker 5	0
Special beaker 6	0
Special beaker 7	0

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

[Edit]

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

Special beaker / Edit	
Special beaker 1	
Rack position	142
Work pos. tower 1	100 mm
Work pos. tower 2	0 mm
Beaker radius	off mm
Beaker sensor	Tower

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

Rack position

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

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

Work pos. tower 1/2

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

Input range	0 to 'maximum stroke path' mm A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (see " <i>Maximum stroke path</i> ", page 96).
-------------	--

Beaker radius

Actual radius of the selected special beaker.

This beaker radius may not be less than the minimum beaker radius defined in the tower properties (see "*Min. beaker radius*," page 96). If the lift is to be moved to the work position, then these two values will be compared with one another.

Input range	1.0 to 100.0 mm
Selection	off
Default value	off

off

No check takes place.

Beaker sensor

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

Selection	Tower | Robotic arm | off
Default value	off

Robotic arm

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

off

No check takes place.

11.6.2 Rack adjustment

Instrument list: **Sample Processor ▶ Edit ▶ Racks ▶ Edit ▶ Adjust rack**

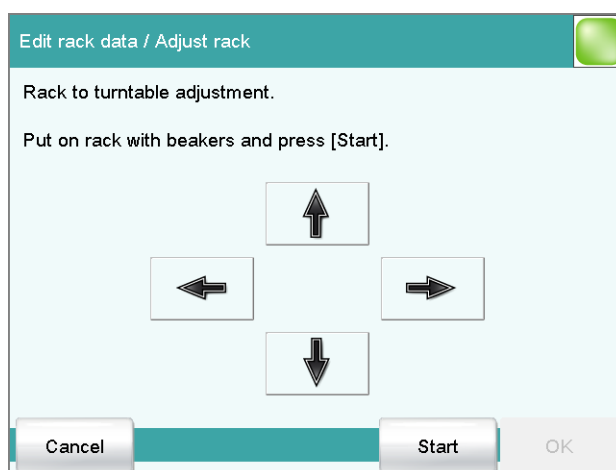
If necessary, each sample rack can be finely adjusted, i.e. the rack offset is determined in the direction of rotation. The adjustment of a rack is usually not necessary. However, if the exact positioning of a robotic arm is necessary for a high degree of accuracy (e.g. for very small sample beakers),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

Proceed as follows:

1 Open the dialog for rack adjustment

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

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



2 Carry out the adjustment

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

The lift is moved to the uppermost stop.

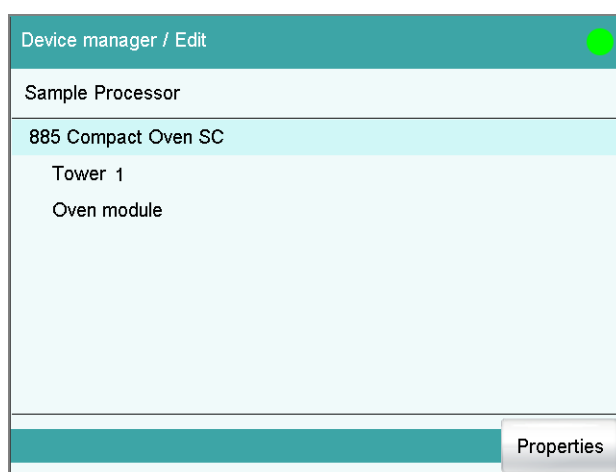
11.7 885 Compact Oven SC



NOTE

In order for the 885 Compact Oven SC to be controlled with the 900 Touch Control, at least the following firmware versions must be installed on the instruments:

- 900 Touch Control 5.900.0045
- 885 Compact Oven SC 5.885.0013



The dialog displays the 885 Compact Oven SC with its tower and the oven module. If the control instrument is not connected, then the properties dialog of the control instrument will be displayed directly (*see chapter 11.7.1, page 111*).

Properties

Open the Properties dialog of the highlighted entry.

11.7.1 Properties - 885 Compact Oven SC

Instrument list: **885 Compact Oven SC** ► **Edit** ► **Properties**

Device name

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

Entry	24 characters maximum
-------	------------------------------

Comment

Entry	24 characters maximum
-------	------------------------------

Program version

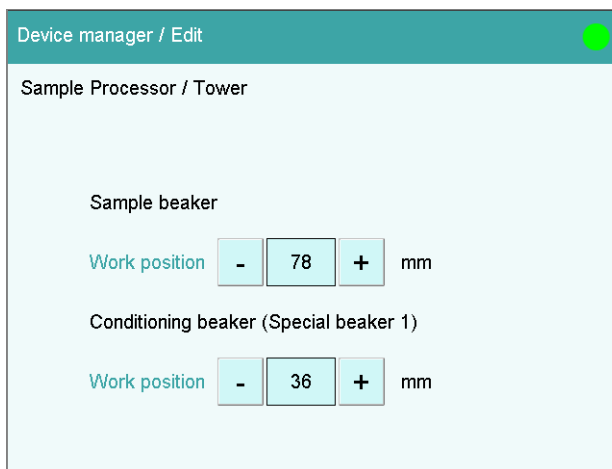
Program version of the device software.

Serial number

Display of the serial number of the device.

11.7.2 Properties - Tower

Instrument list: **885 Compact Oven SC ▶ Edit ▶ Tower ▶ Properties**



Sample beaker

Work position

At this lift position, the sample beaker is optimally placed in the oven and the needle has completely pierced the septum.

Input range	0 to 96 mm (Increment: 6)
Default value	78 mm

A lift height of 0 mm corresponds to the "home position". The lift is located at the upper stop position.

Conditioning beaker (special beaker 1)

Work position

At this lift position, the needle has completely pierced the septum of the conditioning beaker at the conditioning position. In the method run, the **[MOVE]** command is used to move the conditioning bucket with the **Objective** Special beaker 1.

Input range	0 to 96 mm (Increment: 6)
Default value	36 mm

A lift height of 0 mm corresponds to the "home position". The lift is located at the upper stop position.

11.7.3 Properties - Oven module

Instrument list: **885 Compact Oven SC** ▶ **Edit** ▶ **Oven module** ▶ **Properties**

Program version

Program version of the oven module.

Serial number

Display of the serial number of the oven module.

Initial temperature

Entering an initial temperature means that the oven will heat up to the set temperature when the 900 Touch Control is switched on.

Input range	50 to 250 °C (Increment: 1)
Default value	110 °C
Selection	off

off

The oven is not switched on.

Action when switching off the touch device.

Switch off heater

Setting for the behavior of the heater of the oven module when the Touch Control is switched off.

Selection	on | off
Default value	on

Switch off the gas flow

Setting for the behavior of the gas flow of the oven module when the Touch Control is switched off.

Selection	on | off
Default value	on

11.8 Printer

Instrument list: **Printer ▶ Edit**

The screenshot shows a dialog box titled 'Device manager / Edit'. It has a teal header bar with a green close button. Below the header, it says 'Device type: Printer'. There are four input fields: 'Device name' with the value 'Printer', 'Comment' (empty), 'Printer' with a dropdown menu showing 'PCL Inkjet', and 'Connector' with a dropdown menu showing 'USB'. At the bottom, there are three buttons: 'PDF settings', 'Network printer', and 'More parameters'.

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

Device name

Here you can enter a device name of your choice.

Entry	24 characters maximum
-------	------------------------------

Comment

Entry	24 characters maximum
-------	------------------------------

Printer

Selection of the printer type.

Selection	PCL Inkjet | PCL Laser | HP | Epson | Epson new | Canon | CUSTOM NEOS | off
-----------	--

PCL Inkjet

for HP DeskJet printers.

PCL Laser

for HP LaserJet printers.

CUSTOM NEOS

Due to the narrow paper size, only reports marked with # in the "List of all printable reports" (see chapter 27.3, page 251) can be printed.

off

The reports will not be printed out on paper.

Connector

Selection of the connection type for the printer.

Selection	USB | Ethernet
Default value	USB

USB

Local printer at a USB interface.

Ethernet

Network printer.

**NOTE**

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

11.8.1 PDF settings

Printer: **Edit ► PDF settings**

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

Memory

Memory location where the PDF file will be saved. The report will be saved in the directory *PDF_Report*. This directory is created when a PDF file is generated. The file name is appended with the date and time when the determination was started and the date and time when the PDF was generated (e.g.: **Identification 1-20130320-141044-20130320-141220**). The first date and time set indicates the start of the determination, the second date and time set indicates the generation of the PDF file. This prevents previously created PDF files from being overwritten each time a new file is created, e.g. when a result is recalculated and the report is generated again.

All three memory locations are listed as possible selections, even if they cannot be accessed at the moment.

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

off

The report will not be saved as a PDF file.

Shared memory

The report will be saved in a shared directory on the network. The shared directory is selected in the **Edit device / Shared memory** dialog (see chapter 11.3.3, page 87).

Copy or extract content allowed

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

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

Printing allowed

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

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

Change the document allowed

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

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

Add or change comments allowed

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

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

11.8.2 Network printer

Printer: **Edit ► Network printer**

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

**NOTE**

If you have shared a memory location on a PC within your network and if you have configured the Touch Control accordingly (see chapter 11.3.3, page 87), then the settings for the parameters **Domain**, **User** and **Password** will be applied and can then no longer be modified in this dialog.

**CAUTION**

If the computer on which the network printer is configured does not have the same subnet as the Touch Control, then a WINS server must be present. The computer must be entered in this server. In order for the communication to work, the SMB protocol version 1 (SMBv1) must be activated. Since this function is not standard anymore in Windows 10, it has to be activated manually. From firmware version 5.900.0044, the SMB protocol version 2 and 3 is also supported.

Print server

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

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

Entry	max. 32 characters
Default value	empty

Share name

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

Entry	max. 32 characters
Default value	empty

Domain

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

Entry	max. 32 characters
Default value	empty

User

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

Entry	max. 32 characters
Default value	empty

Password

Password of the user configured on the computer.

Entry	max. 32 characters
Default value	empty

11.8.3 More options

Paper size

Selection of the paper size.



NOTE

The paper size selected will be ignored when the report is printed on a **CUSTOM NEOS** printer.

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

Color

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

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

Spooler

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

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

11.9 Balance

List of devices: **Balance ► Edit**

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

Device name

Here you can enter a device name of your choice.

Entry	24 characters maximum
-------	------------------------------

Comment

Entry	24 characters maximum
-------	------------------------------

Balance type

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

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

RS-232

RS-232 interface to which the balance is connected. The interface parameters are adjusted in the **Edit device / Port parameters** dialog (see chapter 11.10, page 120).

Selection	COM 1 | COM 2
Default value	COM 1

COM 2

The interface is disabled.

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



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

11.10 USB/RS-232 adapter

Instrument list: **USB/RS-232 adapter** ► **Edit** ► **COM interface** ► **Edit**

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



NOTE

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

Edit device / Port parameters

Baud rate ▼

Data bits ▼

Parity ▼

Stop bits ▼

Handshake ▼

Baud rate

Transfer rate in characters per second.

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

Data bits

Number of data bits.

Selection	7 | 8
Default value	8

Parity

Type of parity testing.

Selection	even | odd | none
Default value	none

Stop bits

Number of stop bits.

Selection	1 | 2
Default value	1

Handshake

Type of data transfer protocol.

**NOTE**

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

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

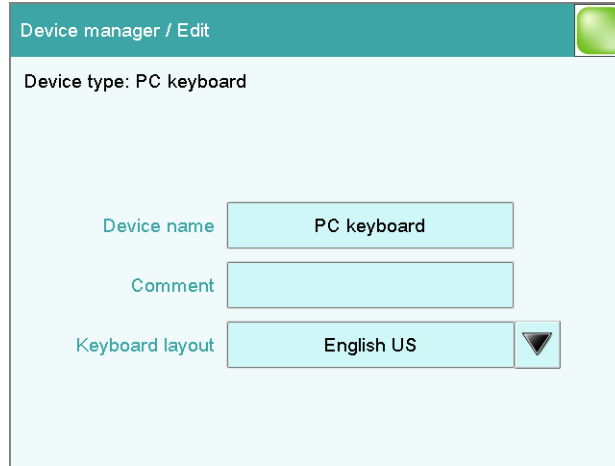
Software (XON/XOFF)

Use the software handshake when you send a PC/LIMS report via an RS-232 interface.

11.11 PC keyboard

Instrument list: **PC keyboard ▶ Edit**

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



Device name

Here you can enter a device name of your choice.

Entry **24 characters maximum**

Comment

Entry **24 characters maximum**

Keyboard layout








Define the country-specific keyboard layout here.

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

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

Table 6 Key assignment

Function in the editing dialog	PC keyboard key
[Cancel]	[Esc]

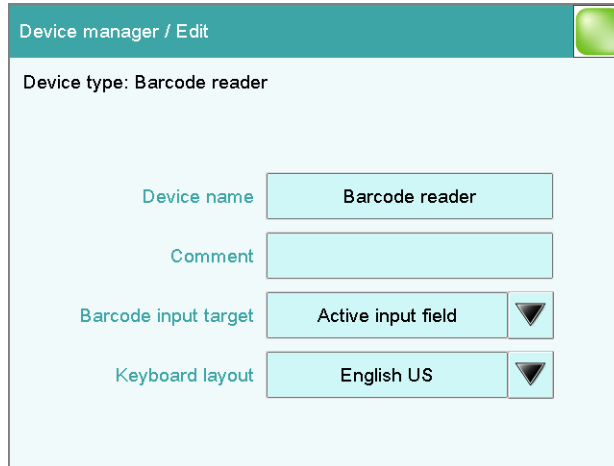
Function in the editing dialog	PC keyboard key
Enter respective character	Numbers, letters and special characters + Shift
[OK]	[Enter] / [↵]
[□]	[←] (backspace)
Line break (for multi-line text input)	[Enter] / [↵]
The cursor is moved up or down by one character.	[↑] [↓]
The cursor is moved to the left or to the right by one character.	[←] [→]
	[F1]
	[F2]
	[F3]
	[F4]
	[F5]
	[F6]
	[F7]

**NOTE**

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

11.12 Barcode reader

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



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

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



NOTE

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

Device name

Here you can enter a device name of your choice.

Entry	24 characters maximum
-------	------------------------------

Comment

Entry	24 characters maximum
-------	------------------------------

Barcode input target

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

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

Active input field

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

Method

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

Identification 1

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

Identification 2

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

Sample size

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

Keyboard layout

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

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

12 File manager

Main dialog: **System ► File manager**

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

The file memory is organized as follows:

- **Internal memory**

The following files can be stored in the internal memory:

- Methods

- **External memory**

You can use a USB flash drive as an auxiliary storage medium, for instance. The following files can be stored on an external memory:

- Backup
- Methods
- Determinations
- Sample tables
- Result tables
- Reports as *.pdf
- PC/LIMS report

12.1 Managing files

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

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

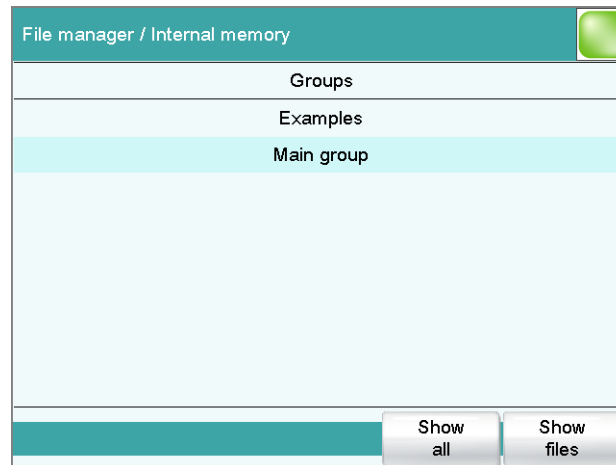


NOTE

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

**NOTE**

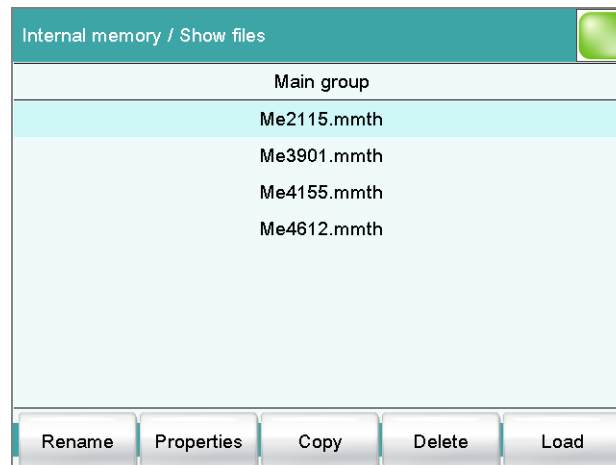
If you use an external storage medium with the FAT or FAT32 file system, then you can save a maximum of 999 files per group. If you find it necessary to store more than 999 files in a single group, then you must reformat the storage medium with the file system **ExFAT** (see chapter 32.10.3, page 532).

**[Show all]**

Display the list of all the files in the selected memory location.

[Show files]

Display the list of all the files in the selected group.

**[Rename]**

Rename the selected file (see chapter 12.1.2, page 128).

[Properties]

Display the file properties (see chapter 12.1.3, page 129).

**[Copy]**

Copy the selected file to a different memory location (*see chapter 12.1.1, page 128*).

[Delete]

Delete the selected file.

[Load]

Load the selected file.

12.1.1 Copying a file

Proceed as follows to copy a file:

1 Selecting the file

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

The selection of memory locations is displayed.

2 Copy the file

- Tap on the desired memory location.
Only memory locations currently being accessible are active.

The file is copied. The file group is retained, i.e. the group will be created again in the new memory location if it does not already exist there.

12.1.2 Renaming a file

Proceed as follows to rename a file:

1 Selecting the file

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

The **Show files / Rename** dialog is displayed.

2 Change the file name

- Tap on the input field **File name**.
The text editor opens.
- Enter a new file name (max. 32 characters) and confirm with **[OK]**.
- Tap on **[OK]**.

The file is saved under the new name.

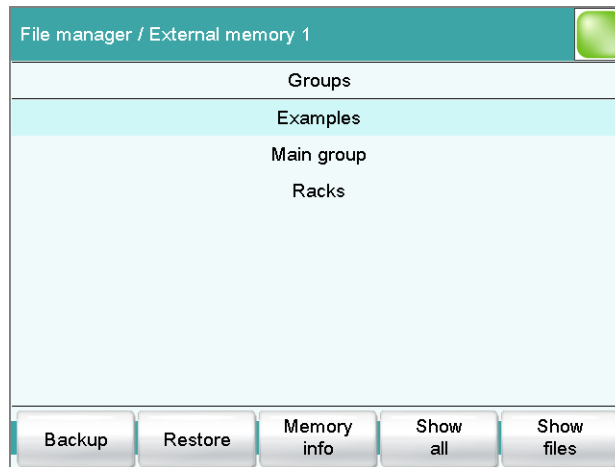
12.1.3 File properties

File manager: **Internal memory / External memory 1 / External memory 2 ► Show all / Show files ► Properties**

Detailed information concerning the file is displayed in the **Show files / Properties** dialog. They can be edited to a certain extent.

- **File name**
Name of the file.
- **File group**
Entry or selection of the group in which the file will be saved. If you enter a new name, then the file will be moved into the new group.
- **Write protection**
If this option is activated, then the file cannot be saved, deleted, moved or renamed. This is only an internal write protection feature and is independent of the write protection of the operating system on your computer.
- **Created by**
User who saved the file initially.
- **Created on**
Date and time at which the file was saved for the first time.
- **Last saved by**
User who saved the file most recently.
- **Last saved on**
Date and time at which the file has been saved most recently. Additionally, the version of the file is displayed. The version number will be increased by one each time the file is saved.
- **Size**
File size.
- **Program version**
Program version of the software with which the file was last saved.

12.2 External storage medium



[Backup]

Creating a backup of all data and settings on this storage medium (see chapter 12.3, page 132).

[Restore]

Load the backup. This function is active only if a backup is available (see chapter 12.3, page 132).

[Memory info]

Display information on the storage medium, see following chapter.

Storage medium – Information

Detailed information about the storage medium is displayed in the dialog **External memory 1/2 / Memory info**:

- **Name**
Designation of the storage medium.
- **Write protection**
If this option is activated, then the file cannot be saved, deleted, moved or renamed. This is only an internal write protection feature and is independent of the write protection of the operating system on your computer.
- **Storage capacity**
Total capacity of the storage medium.
- **Used memory**
Storage capacity used on the storage medium.
- **Free memory**
Free storage capacity on the storage medium.

Directory structure

The directory structure appears as follows on the external storage medium:

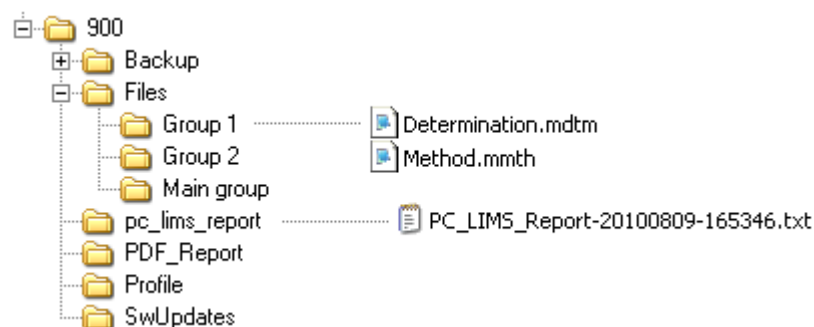


Figure 10 Directory structure on the external storage medium

Backup

All of the files of the backup are stored in this directory. The directory will be created the first time a backup is created.

Files

This directory contains all of the groups as well as the files contained in them (methods, determinations, etc.).

pc_lims_report

PC/LIMS reports are stored in this directory as TXT files. The directory will be created the first time a PC/LIMS report is printed out.

PDF_Report

PDF reports are stored in this directory. The directory will be created the first time a report is saved as a PDF file.

Profiles

The identification profile is stored in this directory. The directory will be created the first time an identification profile is generated.

SwUpdates

Files for software updates must be saved in this directory.

12.3 Creating backups / Restoring data

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

You can use the **[Backup]** function to easily create a backup containing all the data and settings of your system. You should make a backup at regular intervals in order to avoid data loss.



NOTE

Only **one** backup can be created on a storage medium.

If a backup has already been stored on the medium, then it will be overwritten when this function is carried out again.

12.3.1 Restoring data

You can use the function **[Restore]** to restore either a complete backup or only certain data.



CAUTION

All of the methods in the internal memory will be deleted.

Backups are not backward compatible, i.e. backups of the latest version cannot be restored using earlier versions.

Proceed as follows to restore backed-up data:

1 Select the storage medium

- Connect the storage medium on which the backup is located.
- Select the storage medium under **System ► File manager**.

2 Select data

- Tap on **[Backup]**.
The selection of the data that can be restored separately is displayed (see the following).
- Deselect the data sets which are not to be restored.
- Tap on **[Load data]**.

The selected data blocks are restored.

3 Complete the restoration

- Switch the Touch Control off and on again.

Restorable data blocks

The following data blocks can be loaded individually:

- **Methods**
All of the methods stored in the internal memory.
- **Sample table**
Current sample table.
- **Result table**
Current result table.
- **Current determination data**
All the data for the current determination (including the method with which the determination was carried out).
- **Control**
Settings in the control dialog.
- **User list**
Settings for each user under **System settings / User administration**.
- **System settings / User admin.**
All of the system settings, including device-specific dialog configuration and dialog options for the command list and fixed keys, device-specific settings for the user administration (login options, password options and Audit Trail).
- **Titration**
All titration with all their data.
- **Sensors**
All sensors with all their data.
- **Device data**
All of the devices configured in the device manager, with all of the data.
- **GLP data**
All data from the GLP manager.
Deactivate if the backup is to be loaded onto a different system.
- **Common variables**
All common variables.
- **Templates**
All templates for sample data, result calculations, calibration buffers, etc.
- **Routine dialog settings**
Current routine dialog settings (see **Dialog options / Routine dialog**).
- **Sample racks**
The sample racks present in the properties of the USB sample processor.
- **Own subsequences**
All subsequences created and stored by the user.

13 GLP manager

Main dialog: **System ► GLP manager**

In the GLP manager you can document data for various GLP tests. The results of the automatic system tests carried out after switching on are also documented.


The following tests can be documented:

- GLP test "Measurement" (see chapter 13.3, page 136)
- GLP test "Titration" (see chapter 13.3, page 136)
- System validation (see chapter 13.4, page 140)

In addition, you can also:

- Create a list with your test tools (see chapter 13.2, page 135).
- Define a service interval for having routine maintenance carried out by a Metrohm service technician (see chapter 13.5, page 144).
- Define an interval for the regular performance of backups (see chapter 13.5, page 144).

Further information about quality management and validation is also given in the documentation series **Quality Management with Metrohm** and **Application Bulletin AB 252** (Validation of Metrohm titrators (potentiometric) in accordance with GLP/ISO 9001).

System / GLP manager 		
Test	Last test	Next test
Automatic system test	2010-08-30	Power on
System validation	2010-08-02	2011-01-04
GLP test "Measurement"	2010-07-01	2011-01-03
GLP test "Titration"	2010-07-02	2011-01-04

Test tools
GLP tests HW/SW
System validation
Monitoring
View test data

The table shows the last time that each test was carried out and when the next test is to be carried out. A test is entered in the list the first time that it is documented.

[Test tools]

Configuring the test tools for GLP tests (see chapter 13.2, page 135).

[GLP tests HW/SW]

Document the GLP tests "Measurement" and "Titration" (*see chapter 13.3, page 136*).

[System validation]

Document the system validation (*see chapter 13.4, page 140*).

[Monitoring]

Defining the time intervals for system maintenance and backups (*see chapter 13.5, page 144*).

[View test data]

Display the data of the selected test.

13.1 Automatic system test

The system test is carried out automatically when the Touch Control is switched on. The result of each individual test is shown in green if no error has occurred. If a result is shown in red, then an error occurred when the respective test was carried out. Switch the Touch Control off and back on again. If the error still occurs please notify Metrohm Service.

Print report at system start

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

If this parameter is activated, then the result of the system test will be printed out automatically when the Touch Control is switched on.

13.2 Test tools

Main dialog: **System ► GLP manager ► Test tools**

You can create a list of test tools to be used in the tests in the GLP manager.

The following test tools have already been defined:

- **767 Calibrated Reference:** Device for checking measuring inputs and electrode cable.
- **822 Titr.Curve Simulator:** Curve simulator for checking the hardware and software.
- **773 pH/mV Simulator:** Device for checking measuring inputs and electrode cable.
- **868 UR Generator:** Device for checking measuring inputs and electrode cable.

[New]

Add a new test tool to the list.

[Delete]

Delete the selected test tool from the list.

[Edit]

Change the designation of the selected test tool.

13.3 GLP tests for measurement and titration

Main dialog: **System ► GLP manager ► GLP tests HW/SW ► GLP test "Measurement" / GLP test "Titration"**

You can document the GLP tests for measurements and titrations in the dialog **GLP manager / GLP tests Hardware/Software** and its subdialogs. The following procedure describes the GLP test "Measurement," but also applies for the GLP test "Titration".

Proceed as follows:

1 Open the properties dialog

- In the **System / GLP manager** dialog, tap on the **[GLP tests HW/SW]** button and then on the **[GLP test "Measurement"]** button.

2 Edit data

- Define the test method, the test results, etc. (see "Dialogs "GLP tests HW/SW / GLP test "Measurement"" and "GLP tests HW/SW / GLP test "Titration""", page 137).

3 Define the hardware used

- Tap on **[Hardware]**.

- Select the hardware used for the test (see "Dialogs "GLP test "Measurement" / Hardware" and "GLP test "Titration" / Hardware"", page 139).
- Tap on the fixed key [↩].

The dialog **GLP tests HW/SW / GLP test "Measurement"** appears again.

4 Define the test interval

- Tap on **[GLP test interval]**.
- Enter the time interval or the date for the next GLP test (see "Dialogs "GLP test "Measurement" / Test interval" and "GLP test "Titration" / Test interval"", page 138).
- Tap on the fixed key [↩].

13.3.1 Parameter description

Dialogs "GLP tests HW/SW / GLP test "Measurement"" and "GLP tests HW/SW / GLP test "Titration""

Method

Method the GLP test has been carried out with.

Entry	32 characters maximum
Selection	Selection of methods stored in the internal memory

User

User who carried out the GLP test.

Entry	24 characters maximum
Selection	Selection of configured users

Test date

Date on which the GLP was carried out.

Format: YYYY:MM:DD

Test result

Result of the test.

Selection	Test OK | Test not OK
Default value	Test OK

Comment

Entry	24 characters maximum
-------	------------------------------



[GLP test interval]

Defining the time interval for the GLP test (see "Dialogs "GLP test "Measurement" / Test interval" and "GLP test "Titration" / Test interval", page 138).

[Hardware]

Documenting the hardware with which the GLP test was carried out (see "Dialogs "GLP test "Measurement" / Hardware" and "GLP test "Titration" / Hardware", page 139).

Dialogs "GLP test "Measurement" / Test interval" and "GLP test "Titration" / Test interval"

Test date

Date on which the GLP was carried out.

Format: YYYY:MM:DD

Monitoring

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

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

GLP test interval

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

Input range	1 to 999 days
Default value	999 days

Next GLP test

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

Format: YYYY:MM:DD

Action

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

Selection	Display message | Document message | Cancel determination
Default value	Display message

For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message

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

Document message

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

Cancel determination

The determination is stopped.

Dialogs "GLP test "Measurement" / Hardware" and "GLP test "Titration" / Hardware"**Test tool**

Selection of the test tool. Test tools are defined at **GLP manager ► Test tools**.

Selection	Selection of configured test tools
-----------	---

Control device

Selection of the control device with which the GLP test has been carried out.

Selection	Selection of configured control devices
-----------	--

Measuring input

Selection of the measuring input used for the GLP test. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

13.4 System validation

Main dialog: **System ► GLP manager ► System validation**

In the dialog **GLP manager / System validation** and its subdialogs, you can document the system validation results and define the time interval after which validation must be carried out again.

Proceed as follows:

1 Open the properties dialog

- In the **System / GLP manager** dialog, tap on the **[System validation]** button.

2 Edit data

- Define the method, the result, etc. (see *"GLP manager / System validation" dialog*, page 141).

3 Define the validation interval

- Tap on **[Validation interval]**.
- Enter the time interval or the date for the next system validation (see *"Dialog "System validation / Validation interval"*, page 142).
- Tap on the fixed key [**↩**].

The dialog **GLP manager / System validation** appears again.

4 Enter statistical data

- Tap on **[Test statistics]**.
- Enter the statistical data for the last system validation (see *"System validation / Test statistics" dialog*, page 143).
- Tap on the fixed key [**↩**].

The dialog **GLP manager / System validation** appears again.

5 Insert a note

- Tap on **[Note (SOP)]**.
- Enter a brief description, e.g. a summary of the SOP (standard operating procedure) according to which the system validation was carried out (see "*System validation / Note (SOP) dialog*", page 142).
- Tap on the fixed key [**↩**].

13.4.1 Parameter description

"GLP manager / System validation" dialog

Method

Method with which the system validation has been carried out.

Entry	32 characters maximum
Selection	Selection of methods stored in the internal memory

User

User who carried out the system validation.

Entry	24 characters maximum
Selection	Selection of configured users

Test date

Date on which the system validation was carried out.

Format: YYYY:MM:DD

Test result

Result of the test.

Selection	Test OK | Test not OK
Default value	Test OK

Comment

Entry	24 characters maximum
-------	------------------------------

[Note (SOP)]

Enter a brief description, e.g. a summary of the SOP (standard operating procedure) according to which the system validation has been carried out.

[Validation interval]

Defining the time interval for the system validation (see "*Dialog "System validation / Validation interval"*", page 142).



[Test statistics]

Documenting the statistical data of the system validation (see "*System validation / Test statistics*" dialog, page 143).

"System validation / Note (SOP)" dialog

In this dialog, you can enter a brief text, e.g. a summary of the SOP (standard operating procedure) according to which the system validation was carried out.

Dialog "System validation / Validation interval"

Last validation

Date on which the last system validation was carried out.

Format: YYYY:MM:DD

Monitoring

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

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

Validation interval

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

Input range	1 to 999 days
Default value	999 days

Next validation

If you define a time interval for the next system validation, then the **Validation interval** will be tracked automatically.

Format: YYYY:MM:DD

Action

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

Selection	Display message | Document message | Cancel determination
Default value	Display message

For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message

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

Document message

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

Cancel determination

The determination is stopped.

"System validation / Test statistics" dialog

In the dialog **System validation / Test statistics**, you can document the statistical data for the last system validation.

Number (n)

Number of determinations carried out.

Input range	1 to 999999999
Default value	empty

Mean value

Mean value out of single results.

Input range	-999999999.00000 to 999999999.00000
Default value	empty

s abs

Absolute standard deviation of the results.

Input range	0.00000 to 999999999.00000
Default value	empty

s rel

Relative standard deviation of the results.

Input range	0.00000 to 100.00000 %
Default value	empty %

d rel

Systematic deviation of the results.

Input range	0.00000 to 100.00000 %
Default value	empty %

a sys

Systematic error.

Input range	0.00000 to 999999999.00000
Default value	empty

13.5 System monitoring

13.5.1 Service interval

Main dialog: **System ► GLP manager ► Monitoring ► Service interval**

In the dialog **GLP manager / Service interval**, you can define the time interval for the maintenance of the system by the Metrohm Service department. The service interval is checked each time the system is started.

Last service

Date on which the last servicing was carried out.

Format: YYYY:MM:DD

Monitoring

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

If this parameter is activated, then the time interval after which system maintenance must be carried out again will be monitored.

Service interval

If you define a time interval for the system maintenance, then the date in **Next service** will be tracked automatically.

Input range	1 to 999 days
Default value	999 days

Next service

If you specify a date for the next system maintenance, then the **Service interval** will be tracked automatically.

Format: YYYY:MM:DD

13.5.2 Backup interval

Main dialog: **System ► GLP manager ► Monitoring ► Backup interval**

In the dialog **GLP manager / Backup interval**, you can define the time interval for backups. The backup interval is checked each time the system is started.

Last backup

Date on which the last backup was created.

Format: YYYY:MM:DD

Monitoring

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

If this parameter is activated, then the time interval after which a backup has to be created again will be monitored.

Backup interval

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

Input range	1 to 999 days
Default value	999 days

Next backup

If you specify a date for the next backup, then the **Backup interval** will be tracked automatically.

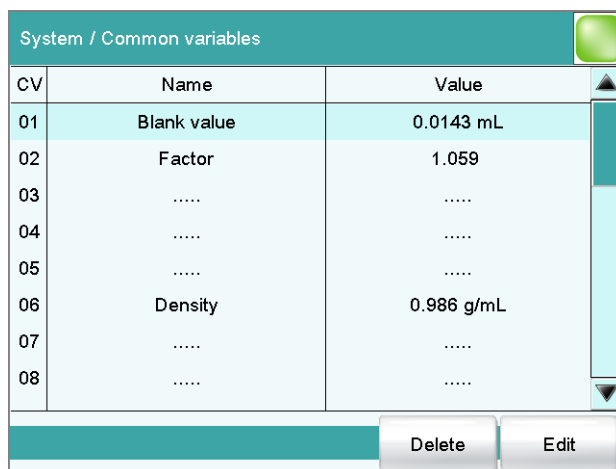
Format: YYYY:MM:DD

14 Common variables

Main dialog: **System ► Common variables**

You can save 25 **method-independent variables**, or common variables. These variables can be used in future calculations (as variables **CV01... CV25**). Common variables are useful, e.g. for the following applications:

- Determination of a blank value which will be taken into account during the content determination of the sample.
- Determination of the content of a standard solution, which will be taken into account during the content determination of the sample.



CV	Name	Value
01	Blank value	0.0143 mL
02	Factor	1.059
03	.....	.....
04	.....	.....
05	.....	.....
06	Density	0.986 g/mL
07	.....	.....
08	.....	.....

The designation and the value (including the unit) are displayed for every common variable in the list.

[Delete]

Delete the selected common variable from the list.

[Edit]

Edit the data of the selected common variable, see following chapter.

14.1 Editing common variables

List of common variables: **Common Variable ► Edit**

The common variables can be modified as follows:

- Edit manually, see the following.
- Automatic assignment from the determination run. A calculation result must be configured accordingly for this purpose (see chapter 14.4, page 150).

Name

Designation of the common variable.

Entry	24 characters maximum
Default value	empty

Value

Value of the common variable.

Input range	-999999999 to 999999999
Default value	empty

Unit of the common variable.

Entry	10 characters maximum
Default value	empty
Selection	% | mol/L | mmol/L | g/L | mg/L | mg/mL | mg/100 g | ppm | g | mg | µg | mL | µL | mg/piece | °C | µg/min | mL/min | µL/min
Default value	%



Next assignment

This parameter is displayed only if a validity has been defined for the common variable.

Date on which the validity of the common variable expires.

Format: YYYY:MM:DD

[Validity]

Defining the time interval for the validity of the common variable (*see chapter 14.3, page 149*).

[Properties]

Display the properties of the common variable, see following chapter.

14.2 Properties of common variables

Common variable: **Edit ► Properties**

Detailed information concerning the common variable is displayed in the **Edit common variables / Properties** dialog:

- **Status**
Status of the common variable. If the time interval for the validity has expired, then **invalid** will be displayed.
- **Method**
Method with which the value has been assigned to the common variable. If the value was entered manually, then **manual** will be displayed.
- **Method status** (only for automatic assignment from the determination run)
- **Determination status** (only for automatic assignment from the determination run)
- **Last assignment**
Date and time of the last assignment.
- **User**
User who assigned the value to the common variable.

14.3 Monitoring validity

Common variable: **Edit ► Validity**

In the dialog **Edit common variables / Validity**, you can define the time interval after which a new value must be assigned to the common variable.

Last assignment

Date on which the common variable was last assigned a value.

Format: YYYY:MM:DD

Monitoring

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

If this parameter is activated, then the time interval after which the common variable must be assigned a new value will be monitored.

Validity

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

Input range	1 to 999 days
Default value	999 days

Next assignment

If you specify a date for the next assignment, then the time interval for the **Validity** will be tracked automatically.

Format: YYYY:MM:DD

Action

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

Selection	Display message | Document message | Cancel determination
Default value	Display message

For all three options it is documented in the determination data (see dialog **More determination data / Messages**), that the time interval has been expired.

Display message

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

Document message

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

Cancel determination

The determination is stopped.

14.4 Assigning a result automatically to a common variable

**NOTE**

This instruction is based on the assumption that the method contains a calculation command with a calculation.

Proceed as follows to assign a result to a common variable:

1 Opening the editing dialog of the result

- In the command list, select the command **CALC**.
- Tap on the **[Edit command]** button.
- Select the result whose value is to be assigned to a common variable and tap on **[Edit]**.

The editing dialog of the result is displayed.

2 Define result options

- Tap on the **[Result options]** button.

- Activate the parameter **Save as common variable**.
- Define **Variable = CV01...CV25**.

3 Saving the settings

Tap on the fixed keys [↩] or [🏠].

In the future, the calculated result will be assigned to the selected common variable (result name, value and unit).

15 Templates

Main dialog: **System ► Templates**

You have the option of defining **system-specific templates**. You can use these templates when editing the respective data.

You can create the following templates:

- **Sample data** (see chapter 15.1, page 152)
Create sample identifications and sample assignments.
- **Custom result templates** (see chapter 15.2, page 156)
Define formulas for result calculations.
- **Input lines** (see chapter 15.3, page 160)
Define input signals on the remote interface.
- **Output lines** (see chapter 15.4, page 162)
Defining output signals on the remote interface.
- **Custom calib. buffers** (see chapter 15.5, page 165)
Define a buffer series for the calibration of pH electrodes.
- **Report header** (see chapter 15.6, page 167)
Create a system-specific report header that contains information concerning the laboratory, for example.
- **Custom electrode type** (see chapter 15.7, page 168)
Define customized limit values for the electrode test of pH electrodes.

15.1 Sample data

Main dialog: **System ► Templates ► Sample data**

The screenshot shows a software dialog box titled "Templates / Sample data". It features a light blue background and a teal header bar. The dialog is organized into several sections:

- Sample identification list:** A light blue rectangular box. Below it is a checked checkbox labeled "Use sample identification list".
- Sample assignment table:** A light blue rectangular box. Below it is a checked checkbox labeled "Use sample assignment table".
- Assignment ident.:** A text label followed by a dropdown menu currently displaying "Identification 1".
- Request assignment identification:** An unchecked checkbox.

You can create the following templates in the dialog **Templates / Sample data**:

- Sample identifications (*see chapter 15.1.1, page 153*)
List with sample identifications. If you must enter the sample identification before starting a determination, then you can select the entries contained in this list.
- Sample assignments (*see chapter 15.1.2, page 154*)
You can assign a particular method to a sample identification.

Use sample identification list

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

Activate this parameter so that the sample identifications defined in the list will be displayed as selections.

Use sample assignment table

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

Activating/deactivating the use of the sample assignment table.



NOTE

If this parameter is activated, the following will no longer be possible:

- Carrying out determinations without their sample identification being defined in the sample assignment table.
- Defining a method in the sample table. Previously defined methods will be ignored.

Assignment ident.

Identification which is used as assignment identification to load the correct method.

Selection	Identification 1 | Identification 2
Default value	Identification 1

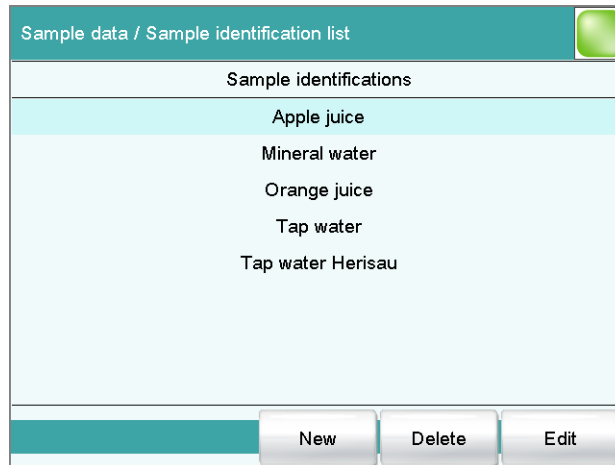
Request assignment identification

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

If this parameter is activated, then the sample identification will be requested automatically at the start of a determination.

15.1.1 Sample identification list

Main dialog: **System ► Templates ► Sample data ► Sample identification list**



You can create a system-specific list with sample identifications in the dialog **Sample data / Sample identification list**. This list makes it easier for you to enter frequently used sample identifications, i.e. this list is available to you for entering them (main dialog, command **REQUEST**, etc.). It may be a good idea to define the unchanging part of the identification as a template and to add the variable part during sample data input.

[New]

Add a new sample identification to the list.

[Delete]

Delete the selected sample identification from the list.

[Edit]

Change the designation of the selected sample identification.

15.1.2 Sample assignment table

Main dialog: **System ► Templates ► Sample data ► Sample assignment table**

Sample ident.	Method
Apple juice	Me2115
Mineral water	Me3901
Orange juice	Me4612
Tap water *	Me4155

In the sample assignment table, a particular method is assigned to a sample identification. In this way, you ensure that your samples will be processed with the correct method; mix-ups are not longer possible. When you start a determination, you need only enter the sample identification; the method is loaded automatically.

[New]

Add a new sample assignment to the list, see following chapter.

[Delete]

Delete the selected sample assignment.

[Edit]

Edit the selected sample assignment, see following chapter.

Editing the sample assignment

Identification

Identification of the sample.



NOTE

You can place an * as a wildcard at the beginning or end of the character string. Doing so allows you to prefix or suffix a sequential number, for example, to the identification, which will be ignored when methods are being assigned.

Entry	24 characters maximum
Selection	Selection of defined identifications in the sample identification list

Memory

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

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

Shared memory

Shared directory in the network.

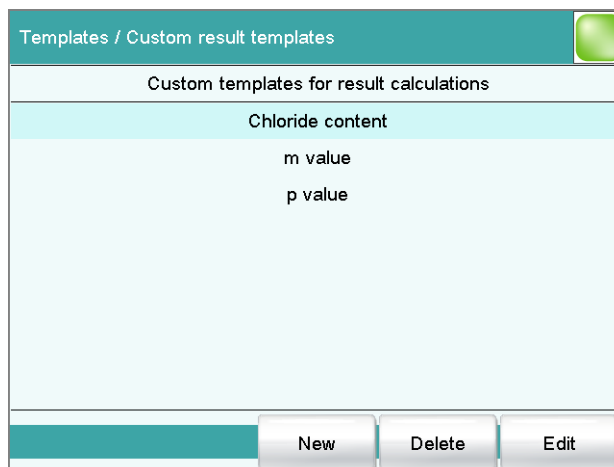
Method

Method that is loaded when a sample with the above-specified identification is processed. You can also enter a method that does not yet exist in the selected memory. When a determination is started there is a check whether the method is available.

Entry	32 characters maximum
Selection	Selection of methods stored in the selected memory

15.2 Custom result templates

Main dialog: **System ► Templates ► Custom result templates**



In the dialog **Templates / Custom result templates**, you can define the result calculations which can be loaded in the calculation command **CALC**. With the exception of the following points, creating a result template is identical to editing a calculation in the command **CALC** (*see chapter 29.13.1.2, page 429*):

- No result variable can be assigned to the template.
- The definition of limit values is not possible.



NOTE

Up to nine **wildcards** can be inserted in the calculation formula, the **Variables F1...F9**. Use these variables, e.g. for the molar mass of your analyte. If you have loaded a result template with these wildcards in the calculation command, then you will automatically be prompted to enter the numerical values.

[New]

Add a new result template to the list, see following chapter.

[Delete]

Delete the selected result template from the list.

[Edit]

Edit the data of the selected result template, see following chapter.

15.2.1 Editing result templates

List of result templates: **Result template ► New / Edit**

Result name

The result name is the text which will be shown in the results display and in the report.

Entry	max. 24 characters
Default value	R

Calculation formula

Shows the calculation formula. A special editor is opened for the definition (see chapter 29.13.3, page 435).

Entry	max. 100 characters
Default value	empty

Decimal places

Number of decimal places used to display the result.

Input range	0 to 5
Default value	2

Result unit

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

Entry	max. 10 characters
Selection	% | mol/L | mmol/L | g/L | mg/L | mg/mL | mg/100 g | ppm | g | mg | µg | mL | µL | mg/piece | °C | µg/min | mL/min | µL/min
Default value	%

[Note]

Entering a note on the calculation.

[Note for wizard]

Enter a note on the calculation. This note is displayed when loading the result template.

[Result options]

Defining additional settings for the calculation.

"Edit result template / Result options" dialog

In the dialog **Edit result template / Result options**, settings for how to process the calculated result are defined.



Variable for mean value

If the statistic calculations have been activated (see method options), the mean value of the single results will be saved as variable SMN1 to SMN9. As default value, always the first free variable is being displayed.

Selection	SMN1 ... SMN9 | off
-----------	----------------------------

off

For the result not statistic calculations are carried out.

Save as titer

The result can be saved as titer for the selected titrant.



NOTE

The titer is assigned to the titrant defined in the last titration command before the calculation. Please note that the CALC command containing the titer assignment is inserted after the titration command with which the titer is determined.

Selection	Single value | Mean value | off
Default value	off

Single value

The result of the current determination is saved as titer.

Mean value

If statistic calculations are carried out for the result, the current mean value of the determination series is saved.

off

The result is not saved as titer.

Save as common variable

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

The calculated result can be saved as a method-independent variable, a so-called common variable. The result is then also available in other methods for calculations. In all cases, only the single value will be saved, even if the statistics function is enabled.

Variable

Selection of the common variable to which the result is being assigned.

Selection	CV01 ... CV25
-----------	----------------------

Display result

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

If you deactivate this parameter, the result is neither displayed in the result dialog nor printed in the result report. This can be advisable for intermediate results.

Save result in result table

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

The calculated result can be saved in the result table. This may be advisable if e.g. the results of all determinations carried out on a particular day are to be displayed clearly. A maximum of nine results from a determination can be saved in the result table.

Precision

Setting, with which accuracy the result is used in additional calculations.

Selection	Round | Truncate | Full precision
Default value	Round

Round

The result is rounded to the defined number of decimal places (commercial rounding, in accordance with the US Pharmacopeia USP). If the digit at the first dropped decimal place is **1, 2, 3 or 4**, then it will be rounded off; if this digit is **5, 6, 7, 8 or 9**, then it will be rounded up. Negative digits will be rounded in accordance with their amount, i.e. away from zero.

Truncate

The result is cut to the number of decimal places defined.

Full precision

The result is used with full accuracy (floating point number either in "single precision" (32 bit) or in "double precision" (64 bit), according to the standard IEEE 754).

Signal name	Input signal	Function
Sample ready	***1***	waits for a stepping pulse, of, for instance, a connected Sample Processor, as soon as it is ready.

[New]

Add a new input signal to the list, see following chapter.

[Delete]

Delete the selected input signal from the list.

[Edit]

Edit the data of the selected input signal, see following chapter.

15.3.1 Editing the input signal

List of input signals: **Input signal ► New / Edit**

Signal name

Designation of the template.

Entry	24 characters maximum
-------	------------------------------

Input signal

Entering the desired bit pattern:

Entering the bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status

The input lines are always numbered from right to left, i.e. with the signal *******1** line 0 is expected to be active.



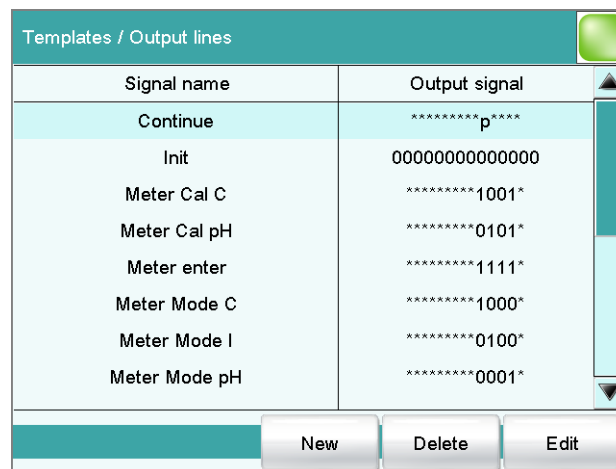
NOTE

We recommend masking lines that are of no interest or for which no defined condition can be predicted with an asterisk (*).

Entry	Bit pattern of exactly 8 characters
Default value	*****

15.4 Output lines

Main dialog: **System ▶ Templates ▶ Output lines**



In the dialog **Templates / Output lines**, you can define the output signals at the remote interface as a template. You can select these templates in the command **CTRL**. The list can contain a maximum of 20 templates.

Table 8 List of predefined output signals

Signal name	Output signal	Function
Continue	*****p****	sends a stepping pulse to the connected Sample Processor.
Init	00000000000000	initializes the remote interface.
Meter Cal C	*****1001*	switches the 781 pH/Ion meter to concentration calibration.
Meter Cal pH	*****0101*	switches the 780/781 pH/Ion meter to pH calibration and starts the calibration.
Meter enter	*****1111*	simulates the [Enter] key of the 780/781 pH/Ion meter; mandatory for pH calibration in order to start the measurement of the second buffer.
Meter Mode C	*****1000*	switches the 781 pH/Ion meter to concentration measurement.
Meter Mode I	*****0100*	switches the 780/781 pH/Ion meter to voltametric measurement with polarization current and starts the measurement.
Meter Mode pH	*****0001*	switches the 780/781 pH/Ion meter to pH measurement and starts the measurement.

Signal name	Output signal	Function
Meter Mode T	*****0010*	switches the 780/781 pH/Ion meter to temperature measurement and starts the measurement.
Meter Mode U	*****0011*	switches the 780/781 pH/Ion meter to voltage measurement and starts the measurement.
Start device*	*****p****p	starts Devices 1 and 2 (e.g. Titrino, Titrand, etc.) * The signal is transmitted as a short pulse of 200 ms.
Start device1	*****p	starts Device 1 (e.g. Titrino, Titrand, etc.) * The signal is transmitted as a short pulse of 200 ms.
Start device2	*****p*****	starts Device 2 (e.g. Titrino, Titrand, etc.) * The signal is transmitted as a short pulse of 200 ms.
Start Dos*	****p*p*****	starts Dosimat at Devices 1 and 2 (Titrino via "activate"). The signal is transmitted as a short pulse of 200 ms.
Start Dos1	*****p*****	starts Dosimat at Device 1 (Titrino via "activate"). The signal is transmitted as a short pulse of 200 ms.
Start Dos2	****p*****	starts Dosimat at Device 2 (Titrino via "activate"). The signal is transmitted as a short pulse of 200 ms.

*¹) In the case of the 780/781 pH/Ion meter, a result report is triggered.

[New]

Add a new output signal to the list, see following chapter.

[Delete]

Delete the selected output signal from the list.

[Edit]

Edit the data of the selected output signal, see following chapter.

15.4.1 Editing the output signal

List of input signals: **Output signal** ► **New / Edit**

Signal name

Designation of the template.

Entry	24 characters maximum
-------	------------------------------

Output signal

Entering the desired bit pattern:

Entering the bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal *******1** line 0 is set.



NOTE

We recommend masking lines that are of no interest or for which no defined condition can be predicted with an asterisk (*).

Entry	Bit pattern of exactly 14 characters
Default value	*****

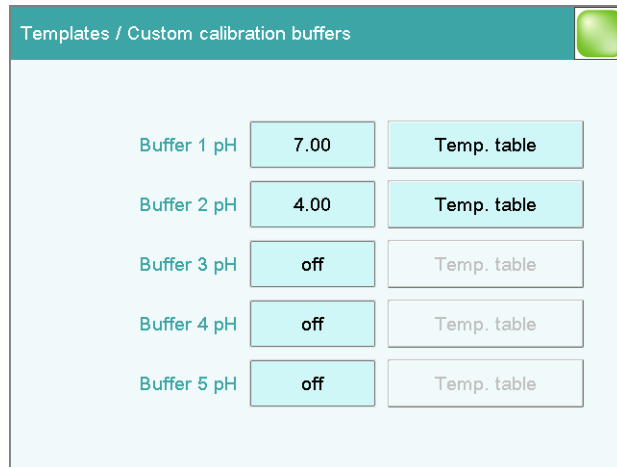
Pulse length

Duration of the sent pulses.

Input range	100 to 1000 ms
Default value	200 ms

15.5 Custom calibration buffers

Main dialog: **System ▶ Templates ▶ Custom calib. buffers**



In the **Templates / Custom calibration buffers** dialog, you can define a buffer series of your own for pH calibrations with a maximum of five calibration buffers. Automatic buffer recognition is active for this buffer.

Buffer 1 pH

pH value of the first calibration buffer.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Input range	-20.000 to 20.000
Selection	off
Default value	off

Buffer 2...5 pH

See **Buffer 1 pH**.

[Temp. table]

Display the temperature table for the selected buffer, see following chapter.

15.5.1 Defining calibration buffers

The **Custom calibration buffers / Temperature table** dialog lists the pH values of the buffer in the temperature range 0 - 95 °C.

Custom calibration buffers / Temperature table	
Temperature in °C	pH value
0.0	off
5.0	off
10.0	7.06
15.0	7.04
20.0	7.02
25.0	7.00
30.0	6.99
35.0	off

Edit
pH value

[Edit pH value]

Enter the pH value for the selected temperature.

"Temperature table / Edit pH value" dialog

In this dialog, the pH values of the buffer are defined at various temperatures. Enter the pH values for the temperature range in which you will carry out your pH calibration and pH measurement. If you do not know the pH values at individual temperatures, they will be calculated automatically by means of linear interpolation.

Temperature in °C

Input range	0.0 to 95.0 °C (Increment: 5.0)
-------------	--

pH value

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Input range	-20.000 to 20.000
Selection	off
Default value	off

15.6 Report header

Main dialog: **System ► Templates ► Report header**

In the dialog **Templates / Report header**, you can create a system-specific report header that contains information concerning the laboratory, for example. The report header can contain a maximum of four lines of 46 characters each and will always be printed out in front of the standard report header. The standard report header contains the instrument type, serial number and program version of the software, instrument name and printing date.

Print logo

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

If this parameter is activated, then the logo defined below will be printed out in the right margin.

Logo

Selection	Metrohm logo | Custom logo
Default value	Metrohm logo

Custom logo

Select this setting if your logo is to be printed out in the report header. How to create a logo is described below.

Applying the custom logo

You can create a graphics file of your own and use it as a logo in the report header in place of the Metrohm logo.



NOTE

Observe the size of the graphics object. The maximum size of your graphics file is 64 kB. We recommend a maximum of 500 × 200 pixels.

Proceed as follows to create your own logo:

1 Creating the logo

- Create a graphics file with the desired logo in an image processing program.
- Save the graph as a JPG file under the file name "CustomImage.jpg".



2 Copying the file to an external storage medium

- Copy the file "CustomImage.jpg" to the directory "900".
If this structure is not maintained, the file will not be found because the software directly accesses the "900" directory.
- Plug in the external storage medium at the Touch Control.

3 Loading the graphics file

- In the **Templates / Report header** dialog, tap on the **[Load]** button.
The file is copied to the internal memory.
- Switch the instrument off and back on again.

4 Applying the custom logo

- In the **Templates / Report header** dialog, activate the **Print logo** option.
- Define **Logo = Custom logo**.

Your logo will now be printed in the report header of all reports in the future.

15.7 Custom electrode type

Main dialog: **System ► Templates ► Custom electrode type**

For the electrode test of pH electrodes, you can define your own values instead of using the limit values that are saved. This can be helpful for special applications, e.g. when other quality requirements are demanded of the pH electrode or when working with a reference electrode that pushes the offset potential U_{off} beyond the required -15 to $+15$ mV (standard electrode).

Limit values can be defined for the following electrode ratings:

- Excellent electrode
- Good electrode
- Usable electrode

Lower limit U_{off}

Lower limit value for the offset voltage, i.e. the voltage at $\text{pH} = 7.0$. The value applies for all ratings.

Input range	-999 to 999 mV
Default value	-15 mV

Upper limit Uoff

Upper limit value for the offset voltage, i.e. the voltage at pH = 7.0. The value applies for all ratings.

Input range	-999 to 999 mV
Default value	15 mV

15.7.1 Limit values for the electrode rating

You can define limit values for the three electrode ratings **Excellent electrode**, **Good electrode** and **Usable electrode**. These values represent maximum values that may not be exceeded (exception: **Min. slope** = minimum value).

Streaming potential

The streaming potential is the difference between the measured voltages in stirred and unstirred solution.

for very good electrodes:

Input range	-999.9 to 999.9 mV
Default value	2.5 mV

for good electrodes:

Input range	-999.9 to 999.9 mV
Default value	3.0 mV

for usable electrodes:

Input range	-999.9 to 999.9 mV
Default value	4.0 mV

Drift

The drift in stirred solution is determined for each buffer. The sum of these values is compared with this value here.

for very good electrodes:

Input range	0.1 to 9.9 mV/min
Default value	2.0 mV/min

for good electrodes:

Input range	0.1 to 9.9 mV/min
Default value	2.5 mV/min

for usable electrodes:

Input range	0.1 to 9.9 mV/min
Default value	3.0 mV/min



Min. slope

Minimum slope of the pH electrode.

for very good electrodes:

Input range	0.1 to 999.9 %
Default value	96.5 %

for good electrodes:

Input range	0.1 to 999.9 %
Default value	96.0 %

for usable electrodes:

Input range	0.1 to 999.9 %
Default value	95.0 %

Max. slope

Maximum slope of the pH electrode.

for very good electrodes:

Input range	0.1 to 999.9 %
Default value	101.0 %

for good electrodes:

Input range	0.1 to 999.9 %
Default value	102.0 %

for usable electrodes:

Input range	0.1 to 999.9 %
Default value	103.0 %

Response time

The voltage measured after three minutes in stirred solution serves as a comparison value for determining the response time. The response time is the time after which the measured voltage is within ± 1 mV of this comparison value.

for very good electrodes:

Input range	0 to 999 s
Default value	45 s

for good electrodes:

Input range	0 to 999 s
Default value	50 s



for usable electrodes:

Input range	0 to 999 s
Default value	60 s

16 Methods

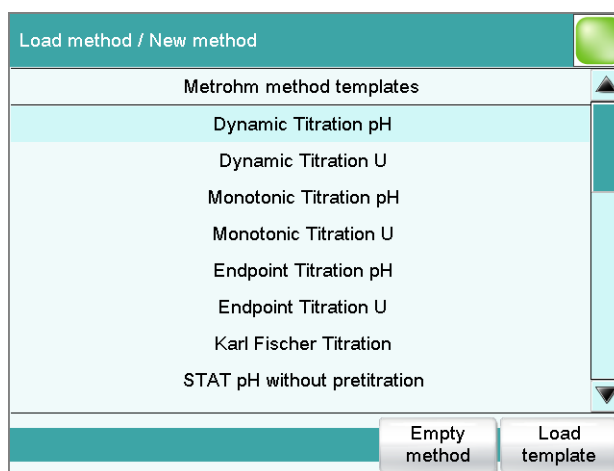
16.1 Creating a new method

Proceed as follows to create a new method:

1 Opening the method table

- In the main dialog, tap on **[Load method]**.
- Tap on **[New method]**.

The method table with the stored templates opens:



2 Loading the method

- Tap on **[Empty method]**.

or

- Select the desired template and tap on **[Load template]**.

The method is now loaded. **New method** is displayed in the main dialog in the title line.

If a new method has been created, then the individual parameters can be modified with **[Edit parameters]**.

16.2 Saving a method

If you modify method parameters, then you can save these as your own method.

To save a method, proceed as follows:

1 Open the command sequence

- In the main dialog, tap on **[Edit parameters]**.

The command sequence of the method is displayed:

Parameters / Sequence		
Current method: New method		
01	MET pH	Monotonic pH titration
02	CALC	Calculation
03	REPORT	Report
04	...	

Save method Method options Insert command Delete command Edit command

2 Modifying/applying the method name

- Tap on **[Save method]**.
A method name will be suggested for new methods. If the method has already been saved once, then the method name will be displayed.

Sequence / Save method	
Memory	Internal memory ▼
Group	Main group ▼
File name	Me2115 ▼

Cancel Save

Applying the name:

- Tap on **[Save]**.

The method will be saved and the command sequence is displayed.

Entering a new name:

- Tap on the input field **File name**.
The text editor opens.
- Enter a new file name (max. 32 characters) and confirm with **[OK]**.
- Tap on **[Save]**.

The method will be saved and the command sequence is displayed.

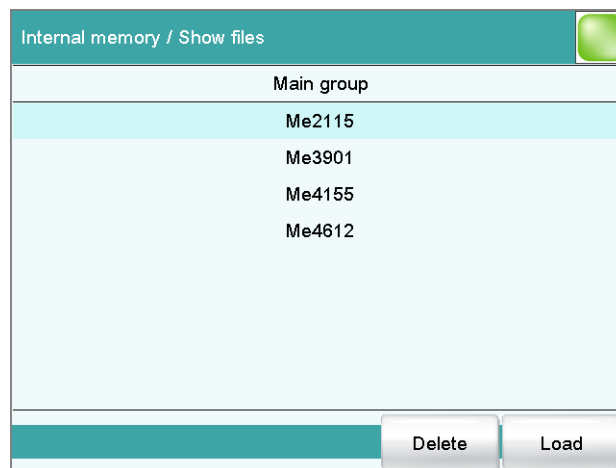
16.3 Loading a method

Proceed as follows to load a method:

1 Opening the method table

- In the main dialog, tap on **[Load method]**.
The selection of memory locations is displayed. This selection will be skipped if only the internal memory is accessible.
- Select the memory location where the desired method is saved.
The selection of file groups is displayed (*see chapter 12.1, page 126*). If only one group is available, then the method table will be displayed directly.
- Select the group with the desired method.
- Tap on **[Show files]**.

The method table with the stored methods opens:



2 Selecting the method

- Select the desired method.

3 Loading the method

- Tap on **[Load]**.

The method is now loaded. The method name is displayed in the main dialog in the title line.



NOTE

The data of the current determination will be deleted when you load a method.

16.4 Editing a method

Main dialog: **Edit parameters**

Parameters / Sequence		
Current method: New method		
01	MET pH	Monotonic pH titration
02	CALC	Calculation
03	REPORT	Report
04	...	
<div style="display: flex; justify-content: space-between; padding: 0;"> Save method Method options Insert command Delete command Edit command </div>		

In the dialog **Parameters / Sequence**, you can define and edit the method commands which are executed successively during a determination.

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

- Line number
- Name
- Comment
You can adjust the comment in accordance with your requirements.

[Save method]

Save the current method (*see chapter 16.2, page 173*).

[Method options]

Define various settings which refer to the entire method, e.g. statistics, automatic saving of determinations, settings for sample data, etc. (*see chapter 16.5, page 177*).

[Insert command]

Insert a new method command. It is inserted before the selected command.

**NOTE**

Not all commands are available for subsequences. Commands which cannot be inserted into subsequences are disabled.

[Delete command]

Delete the selected method command.

[Edit command]

Edit the selected method command.

16.4.1 Inserting a command

A method is comprised of individual commands. When you start a determination, the commands are executed one after the other.

The following constraints apply:

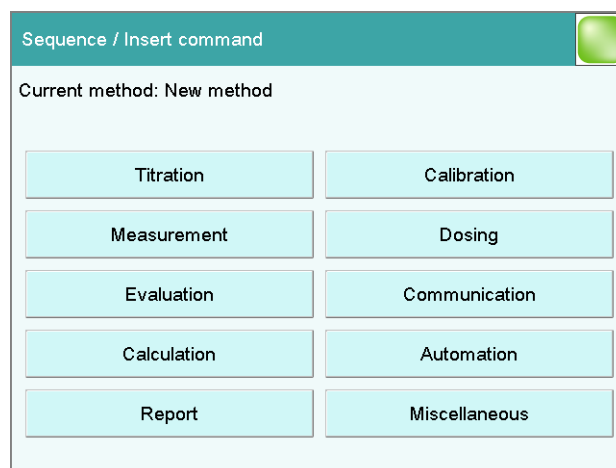
- Maximum of 99 commands
- Maximum of nine commands for titrations, measurements and calibrations

Inserting a command

To insert a command in a method, proceed as follows:

1 Open the command overview

- In the main dialog, tap on **[Edit parameters]**.
- Tap on the **[Insert command]** button.



This dialog contains all of the commands which can be inserted into a method run, organized into thematic groups.

2 Select a command group

- Tap on the desired command group.

In the case of **[Report]**, the command is inserted directly into the command list. For all other command groups, the available commands will be displayed (titration / measuring commands, etc.).

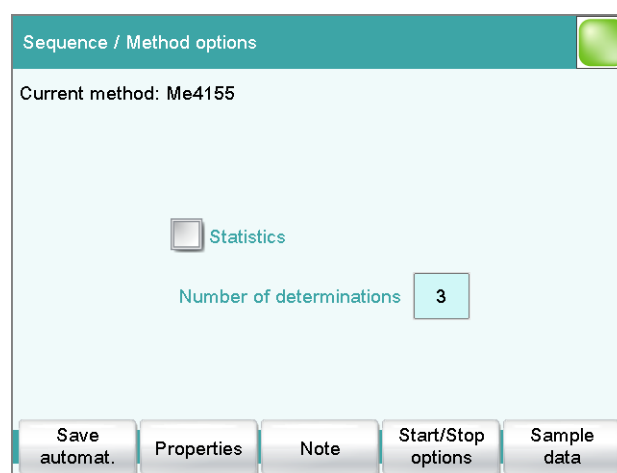
3 Inserting a command

Tap on the desired command.

The dialog is closed and the command is displayed in the command list.

16.5 Method options

Main dialog: **Edit parameters ► Method options**



Method options are settings which apply to the method as a whole and not to an individual command.

The following settings are available:

- Activate/deactivate statistics calculations
- Save determination automatically
- Sign a method electronically
- Check the method when the determination starts
- Define a fixed sample size
- etc.



Statistics

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

If this parameter is activated, then statistics calculations will be carried out for all of the defined results. The prerequisite here, however, is that a variable for the mean value is defined in the result options (see *"Dialog "Edit calculation / Result options"*, page 431).

Number of determinations

The number of determinations that are carried out for the statistics calculations.

If an additional determination has to be added to the determination series, because one determination has been incorrect, for example, then this can be accomplished in the statistical overview (see *chapter 25, page 236*).

Input range	2 to 20
Default value	3

[Save automat.]

Define the settings for automatically saving the determination (see *chapter 16.5.6, page 187*).

[Properties]

Display the properties of the current method and sign electronically (see *chapter 16.5.4, page 185*).

[Note]

Enter a note on the method (see *chapter 16.5.5, page 187*).

[Start/Stop options]

Edit functions which are carried out immediately after the method is started or stopped, see *chapter Start options, page 178* and *chapter Stop options, page 180*.

[Sample data]

Specify method-specific settings for the sample data, e.g. designation of the sample identifications, limits for the sample size (see *chapter 16.5.3, page 181*).

16.5.1 Start options

Main dialog: **Edit parameters ► Method options ► Start/Stop options ► Start options**

In the dialog **Method options / Start options**, you can configure the functions which are carried out when a determination is started.

Method check at start

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

If this option is activated, then the following tests are carried out at the method start.

- Are the required control and peripheral devices connected?
- Are the titrant and the sensor on hand?
- Have the monitoring intervals expired?
- etc.



NOTE

We recommend that the method check only be deactivated if the titration must begin immediately after the start of the determination (e.g. with very rapid reactions such as enzyme-catalyzed reactions). If the method check is deactivated, it could happen that the determination run will be interrupted, e.g. because devices, titrants or sensors are not on hand.

The following settings can be implemented for a connected Sample Processor:

Rack reset

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

If this option is activated, then the sample rack is initialized at the time of the method start. The following actions are carried out:

- The lift is moved upwards.
- The sample rack is rotated to the starting position.
- The rack code of the rack attached is being read out and the corresponding rack data is transferred to the Sample Processor.
- The sample variable is reset to the value 1.

Check rack

Definition of the sample rack which must be attached at the time of the method start. This ensures that the method will be carried out only with this sample rack.



NOTE

The sample rack can, however, only be checked if the **Rack reset** option is activated.

For methods for the 885 Compact Oven SC, this parameter must be set to **no** as it has a fixed rack.

Selection	no | Selection of the configured sample racks
Default value	no

Increase sample variable automatically

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

The sample variable describes the current position of the sample on the rack of the Sample Processor. If this option is activated, then the sample variable is automatically increased by 1 at the end of each determination.

This option must be deactivated if the sample variable is to be altered specifically with a **SAMPLE** command.

Request rack position at start

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

If this option is activated, then the rack position of the first sample to be processed is requested.

16.5.2 Stop options

Main dialog: **Edit parameters** ► **Method options** ► **Start/Stop options** ► **Stop options**

In the dialog **Method options / Stop options**, you can define the actions which are carried out when a method is canceled.

The method can be canceled as follows:

- Manual stop with the fixed key []
- Stop because of an error
- Stop by remote signal via the Control Remote Box

Switch off pumps

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

If this option is activated, then all of the connected pumps will be switched off.

Switch off stirrers

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

If this option is activated, then all of the connected stirrers will be switched off.

**NOTE**

Do not fail to deactivate this option for the currently loaded method if you are conditioning a titration cell at the same time in manual control. Otherwise, the stirrer of the titration cell will also be switched off if the currently loaded method is canceled. This would result in an overtitration of the working medium.

Set remote lines

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System ► Templates ► Output lines**.

**NOTE**

A line set active is not being reset automatically, not even at the end of the determination.

Entering the bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal *******1** line 0 is set. With a pulse, the length is set to 200 ms. If you wish to set pulses with other lengths, you have to define a corresponding template.

Entry	Bit pattern containing exactly 14 characters or a max. of 24 characters for the name of the template
Default value	*****
Selection	Selection of the templates defined

16.5.3 Sample data

Main dialog: **Edit parameters ► Method options ► Sample data**

You can define the following method-specific settings in the dialog **Method options / Sample data**:

- Modify the designation for the sample identifications
- Define a fixed sample size



- Define limits for the sample size
If you define limits, these will be monitored at the start and at the end of the determination.

Below you will find an example demonstrating the effects on the main dialog of the settings in this dialog (see "Modifying sample data", page 183).

Identification 1, Identification 2

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

If this option is activated, then the input field for the sample identification in the main dialog will be displayed.

Designation

A designation of your own choosing can be defined for the input field for each method.

Entry	16 characters maximum
-------	------------------------------

Fixed sample size

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

Activate this parameter if the same sample amount is always to be used for all determinations. If this is case, then you can define the sample size here. It will be displayed in the main dialog, but it can no longer be changed there.

Sample size

This parameter can only be edited when **Fixed sample size** is activated.

Input range	-999999999 to 999999999
Default value	1.0

Unit of sample size.

Selection	g | mg | µg | mL | µL | pieces
Default value	g

**NOTE**

You can also use the parameter **Fixed sample size** if you would like to establish a default for the sample size.

Example: For a particular determination, you require 10 mL of sample. Now and again, however, you have too little sample available and you must perform the determination with 5 mL, for instance. In this case, proceed as follows:

1. Activate the parameter **Fixed sample size**.
2. Define the value and unit for the sample size, in the above example, for instance, **[10 mL]**.
3. Deactivate the parameter **Fixed sample size** again.
4. Save method.

⇒ Each time you load this method, 10 mL is entered as the sample size, but in the example mentioned you can enter the lesser quantity of 5 mL.

[Sample size limits]

This button is accessible only if **Fixed sample size** is deactivated.

Define the limit values for the sample size (see "Defining limit values for the sample size", page 184).

Modifying sample data

This instruction is for the purpose of clarifying the settings which are possible in this dialog. The following settings should be made:

- Change the designation for the input field of the first sample identification.
- Hide the input field for the second sample identification.
- Define a fixed sample size.

Proceed as follows:

1 Change the designation for the input field

- Tap on the input field **Identification 1**.
The text editor opens.
- Change the designation in **Batch** and confirm with **[OK]**.
- Deactivate the parameter **Identification 2**.

2 Define a fixed sample size

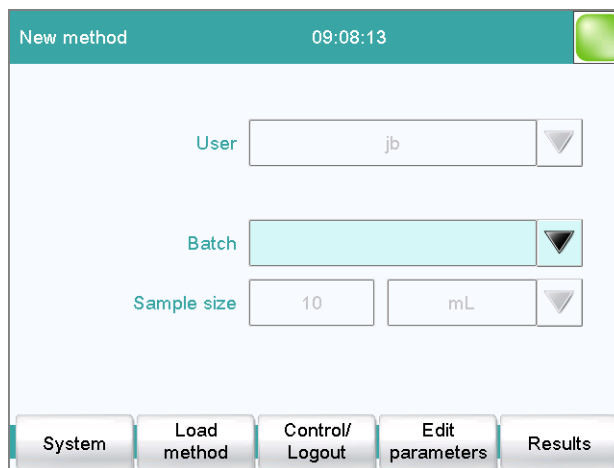
- Activate the parameter **Fixed sample size**.

- Enter the value **10 mL** as **Sample size**.

3 Displaying the main dialog

Tap on the fixed key [].

The data is saved and the adjusted main dialog appears.



Only Identification 1 is shown with the title "Batch." The fixed sample size "10 mL" is shown, but cannot be edited.

Defining limit values for the sample size

In the dialog **Sample data / Sample size limits**, you can define the limit values for the sample size. These values are not monitored during sample data input, but rather:

- when the determination is started.
- when the determination is finished.
- upon automatic sample data query via the command **REQUEST**.
- when the determination is being recalculated.

An entry is made in the message list automatically when these limits are infringed (*see chapter 24.2, page 223*).

Monitoring sample size limits

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

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

Lower limit

Input range	-999999999 to 999999999
Default value	0

Upper limit

Input range	-999999999 to 999999999
Default value	999999999

Display message

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

If this parameter is activated, a message is displayed in case the limits are infringed. You can select whether you want to continue with the determination or cancel the run.

If this parameter is deactivated, then the message will be entered only in the message list of the determination.

Timeout

The message is displayed during this time. Afterwards, the determination is continued automatically.

Input range	0 to 999999 s
Default value	30 s
Selection	off

off

The determination will not be continued until after the message has been confirmed.

16.5.4 Method properties

Main dialog: **Edit parameters ▶ Method options ▶ Properties**

Detailed information concerning the method is displayed in the **Method options / Properties** dialog and the methods can be signed electronically here:

- **Method status**

Current status of the method.

- **new**

The method has been newly created and not yet saved.

- **saved**

The current method has been saved.

- **modified**

The current method has been modified.

- **reviewed**

The current method has been signed at level 1.

- **released**

The current method has been signed at level 2.

- **Created by**

User who created the method.



- **Created on**
Date and time at which the method was created.
- **Last saved by**
User who saved the method most recently.
- **Last saved on**
Date and time at which the method was most recently saved. The version of the method is displayed as well. The version number will be increased by one each time the file is saved.

The following data is displayed only if the option **Saving modified method** under **Login options / Modification options** is activated:

- **Modified by**
User who modified and saved the method most recently.
- **Modified on**
Date and time at which the method was most recently modified and saved.
- **Reason**
Reason for the modification of the method.
- **Comment**
Comment for the modification of the method.

The following information is only shown if the method has been signed at level 1:

- **Reviewed by**
User who signed the method at level 1.
- **Reviewed on**
Date and time at which the method has been signed at level 1.
- **Reason**
Reason for the signing of the method.
- **Comment**
Comment for the signing of the method.

The following information is only shown if the method has been signed at level 2:

- **Released by**
User who signed the method at level 2.
- **Released on**
Date and time at which the method has been signed at level 2.
- **Reason**
Reason for the signing of the method.
- **Comment**
Comment for the signing of the method.

[Delete signature]

Delete all of the signatures for the method or the determination. This button is inactive if level 2 has not yet been signed (*see chapter 17.2, page 190*).

[Sign]

Sign the method or determination. This button is active only when working with activated login function and password (see chapter 17.1, page 189).

16.5.5 Note

Main dialog: **Edit parameters ► Method options ► Note**

In this dialog, you can enter a short text, e.g. important information about carrying out the determination.

[Display options]

Definition when the note is being displayed.

Automatically after loading the method

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

If this parameter is activated, the note is displayed when loading the method. It can otherwise only be read in this dialog.

16.5.6 Saving a determination automatically

Main dialog: **Edit parameters ► Method options ► Save automat.**

In the dialog **Method options / Save automatically**, you can specify whether the determination is to be saved automatically and/or whether a PC/LIMS report is to be created.

Save determination automatically

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

If this parameter is activated, then the determination will be saved automatically.

Memory

Memory location where the determination will be saved.

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

Shared memory

The determination will be saved in a shared directory on the network. The shared directory is selected in the **Edit device / Shared memory** dialog (see chapter 11.3.3, page 87).

Group

Directory where the determination will be saved.

Entry	32 characters maximum
-------	------------------------------

Selection	Selection of available directories | empty
Default value	empty

File name

File name of the determination. The file name is always extended to include the date and the time of day (YYYYMMDD-hhmmss) in order to ensure that the file names are unique for all determinations.

Entry	max. 16 characters
Selection	Identification 1 | Identification 2 | Method
Default value	Identification 1

Identification 1

The first 16 characters of the text which was entered in the main dialog for Identification 1 + YYYYMMDD-hhmmss.

Identification 2

The first 16 characters of the text which was entered in the main dialog for Identification 2 + YYYYMMDD-hhmmss.

Method

The first 16 characters of the text, of the method name + YYYYMMDD-hhmmss.

Write protection

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

If this parameter is activated, then the file cannot be saved, deleted, or renamed. This is only an internal write protection feature and is independent of the write protection of the operating system on your computer. This write protection feature protects the saved determination data against accidental modifications or modifications by unauthorized persons.

Create PC/LIMS report

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

If this parameter is activated, then a machine-readable report with all of the important data for the determination is created, a so-called PC/LIMS report.

The settings are implemented in the device manager (*see chapter 11.3.2, page 85*).

When you save the PC/LIMS report as a file, the file name will be generated automatically as follows: **PC_LIMS_Report**-first 16 characters of the value of the parameter **File name-Date-Time.txt**. If the value of the parameter **File name** contains one or more of the following characters, then these will be automatically converted in the file name into the character "_": / \ : * ? " < > |.

17 Electronic signatures

17.1 Signing methods/determinations electronically

Methods: **Main dialog ▶ Edit parameters ▶ Method options ▶ Properties ▶ Sign**

Determinations: **Results dialog ▶ More data ▶ Properties ▶ Sign**

You can sign methods or determinations in the dialog **Electronic signature**. The following information is saved along with each electronic signature:

- User (complete name)
- Date and time
- Reason
- Comment

Methods can only be signed if they have the status **saved**. The status of a method can be found in the dialog **Method options / Properties**.

Signature

Selection of the level at which the determination should be signed.

Selection	Review (signature level 1) | Release (signature level 2)
	A maximum of three signatures from up to three different users can be given at each level. However, it is not possible for a user to sign at both level 1 and level 2.

Review (signature level 1)

If the method has never been signed before, then only level 1 can be selected.

Release (signature level 2)

If the method has been signed three times at level 1 or already once at level 2 then only level 2 can be selected.

User

Identification of the user who signs.

Password

Password of the user.

**Reason**

Selection of the reasons for the signature. The list with reasons is compiled in the user administration (*see chapter 7.3.6, page 40*).

Selection	Selection of configured reasons
-----------	--

Comment

Entry	24 characters maximum
-------	------------------------------

[Change password]

Change the current password.

[Sign]

Sign the method or determination with the data entered above.

17.2 Deleting electronic signatures

If a released method must be revised, e.g. in order to adapt to altered conditions, then the signatures must be deleted. The method can otherwise not be modified. In the case of released determinations, the signatures can also be deleted. Signatures, however, cannot be deleted until after the method/determination has been signed at Level 2.

Signatures are deleted automatically in the following cases:

- A method signed at Level 1 is being altered.
- A determination signed at Level 1 is being recalculated.

User

Identification of the user who deletes the signatures.

Password

Password of the user.

Reason

Selection of the reasons for the deletion of the signature. The list with reasons is compiled in the user administration (*see chapter 7.3.6, page 40*).

Selection	Selection of configured reasons
-----------	--

Comment

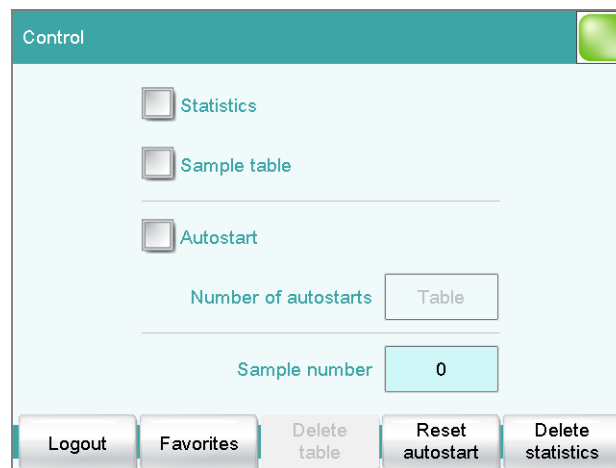
Entry	24 characters maximum
-------	------------------------------

[Delete signature]

Delete all the signatures for the method or the determination. The method is assigned the status **saved**.

18 Control

Main dialog: **Control**



In the dialog **Control**, the settings for the execution of a single determination or of one sample series are defined.

If you work with the login function activated, you can log off the system in this dialog. The login dialog will then be shown immediately.

Statistics

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

With this option, you can enable or disable the statistics calculations for individual determinations (see "Statistics", page 193).



NOTE

The parameter **Statistics** in the method options will not be changed as a result. This setting here will be adjusted automatically to match the one in the method options.

Sample table

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

If this option is activated, the sample data for a sample series can be entered in a table (see chapter 21, page 202).

Autostart

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

If this option is activated, a new determination is started automatically at the end of a determination. This continues until the number specified has been reached (siehe **Number of autostarts**).



NOTE

If you deactivate this option while a determination is running, then that determination will be ended, although the next one will however also not be started. This can be used to cancel a sample series.

Number of autostarts

Number of automatic starts.

Input range	1 to 9999
Selection	Table
Default value	Table

Table

The number of automatic starts corresponds to the number of samples in the sample table.

Sample number

The sample number is primarily used for documentation. Each time a determination is started, it is increased by one. The sample number can, however, also be entered manually. Each time the Touch Control is switched on, the value is reset to zero.

Input range	0 to 9999
Default value	0

[Logout]

User logout (visible only when work is done with activated login function).

[Favorites]

Save methods/sample tables as a favorite (*see chapter 19, page 195*). Depending on whether you are working with or without login function, user-specific or common favorites can be created. On the main dialog, a button is created for each favorite. This way, a method or a sample table can be started with one single mouse click.

[Delete table]

Delete the sample table completely.

[Reset autostart]

Reset the value of the autostart counter to zero.

[Delete statistics]

Delete all statistics data.

The statistics data should be deleted manually if a sample series has been canceled and a new sample series is to be started.

The statistics data is deleted automatically in following cases:

- when all of the determinations of the determination series have been carried out and a new determination has been started afterwards.
- when a new method is loaded.
- when a determination is loaded (the method with which the determination was carried out is loaded simultaneously with the determination).

Statistics

In the dialog **Control**, you can deactivate the statistics calculations for individual determinations. This option is required primarily in order to insert the processing of an "**urgent sample**" during the processing of a sample series when the urgent sample is not to be included in the statistics calculations.

Interrupting a determination series for an "urgent sample"

If the same method is required for the "urgent sample" as is being used for the sample series, then you need only deactivate the option **Statistics** and then reactivate it after the determination is completed. Proceed as follows if you need to process the "urgent sample" with a different method:

1 Deactivate statistics calculation

- Deactivate the option **Statistics**.

2 Saving the determination

- Save the current determination of the sample series (*see chapter 24.6, page 232*).

3 Carrying out the determination

- Load the method for the "urgent sample".
- Carry out the determination.

4 Load the last determination of the sample series

- Reload the previously saved last determination.

The determination, the method used for it and the current statistical data are loaded. The option **Statistics** is activated again and the



value of the statistics counter corresponds to that in effect before the interruption.

5 Continuing the sample series

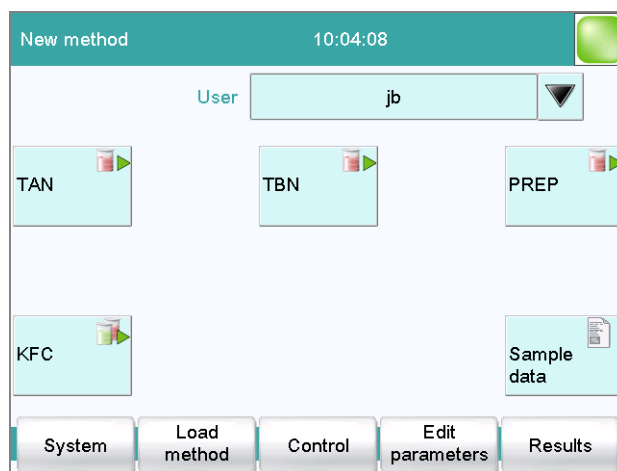
- Carry out the remaining determinations in the sample series.

19 Favorites

Main dialog: **Control ▶ Favorites**

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

This chapter describes how you can create favorites. Favorites are comparable to the favorites/bookmarks in your Internet browser. In the main dialog, a button is created for each favorite. By pressing a single key, you can trigger an action without having to navigate through different dialogs.



The following objects can be saved as favorites:

- Methods
- Sample tables

User-specific or common favorites can be created, depending on whether you are working with or without the login function.

- Operation with login function:
 - If you are working with the login function activated, **user-specific favorites** can be created. These can only be used by a certain user. User-specific favorites are created as follows:
 - in the user administration by a user with administrator rights (**System ▶ System settings ▶ User admin. ▶ Edit**).
 - in the dialog **Control** for the user who is logged in.
- Operation without login function:
 - If you are working without the login function, **common favorites** can be created. These favorites are available for all users. Common favorites are created in the **Control** dialog.



19.1 Creating favorites

Control / Favorites	
Name	Position
TAN	1
TBN	3
PREP	5
KFC	11

The list of favorites gives the designation and position of the button on the main dialog of each favorite configured.

[New]

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

[Delete]

Delete the selected favorite from the list.

[Edit]

Edit the properties of the selected favorite, see following chapter.

19.1.1 Editing favorites

Favorites / Edit	
Position	1 ▼
Name	TAN
Type	Method ▼
Memory	Internal memory ▼
Method / Sample table	TAN ▼



Position

On the main dialog, a button is created for each favorite. These buttons are ordered in three rows at fixed positions. The position 1 can be found top left.

Input range	1 to 14
Default value	1

Name

The designation of the favorite is used for unambiguous identification.

Entry	24 characters maximum
-------	------------------------------

Type

Definition as to whether the favorite represents a single method or a complete sample table.

Selection	Method | Sample table
Default value	Method

Memory

Memory location the method or the sample table is loaded from. Only the currently accessible memory locations are selectable.

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

Shared memory

The favorite will be saved in a shared directory on the network. The shared directory is selected in the **Edit device / Shared memory** dialog (see chapter 11.3.3, page 87).

Method / Sample table

Method or sample table of the favorite.

Selection	Selection of stored methods/sample tables
-----------	--

[More options]

Parameterize the autostart function, see following chapter.

More options

The autostart function is parameterized under **[More options]**.



Autostart

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

If this option is activated, a new determination is started automatically at the end of a determination. This continues until the number specified has been reached (siehe **Number of autostarts**).

Number of autostarts

This option can only be edited when **Autostart** is activated.

Number of automatic starts.

Input range	1 to 9999
Default value	1
Selection	Table

Table

The number of automatic starts corresponds to the number of samples in the sample table.

20 Sample data

You can enter the sample data (identification, sample size, etc.) in a variety of ways:

- Directly in the main dialog.
- Using the sample table. This is particularly useful with sample series. The sample table is a table in which the sample data for up to 999 samples can be entered (*see chapter 21, page 202*).
- Automatic request immediately after the start of the determination (*see chapter 20.2, page 200*).

You can also send the sample size and the unit from a connected balance in any case. With some balances, the sample identification and method can be also sent (*see chapter 32.5, page 506*).

20.1 Entering sample data in the main dialog

For a sample, you can enter the sample data directly in the main dialog, even while the determination is running (*see chapter 23, page 213*).

Identification 1

Sample identification. The sample identification can be used in calculations as the variable **CI1**. If you have defined a sample identification list (*see chapter 15.1.1, page 153*) then the entries can be selected here.

Entry	24 characters maximum
Default value	empty



Identification 2

Sample identification. The sample identification can be used in calculations as the variable **CI2**. If you have defined a sample identification list (see chapter 15.1.1, page 153) then the entries can be selected here.

Entry	24 characters maximum
Default value	empty

Sample size

Sample size. The value of the sample size can be used in calculations as the variable **C00**.

Input range	-99999999 to 999999999
Default value	1.0

Unit of sample size.

Entry	6 characters maximum
Selection	g | mg | µg | mL | µL | pieces
Default value	g

Unit defined in method:

The unit defined in the method is ignored. The unit entered in the sample table is used.

Balance connected and configured:

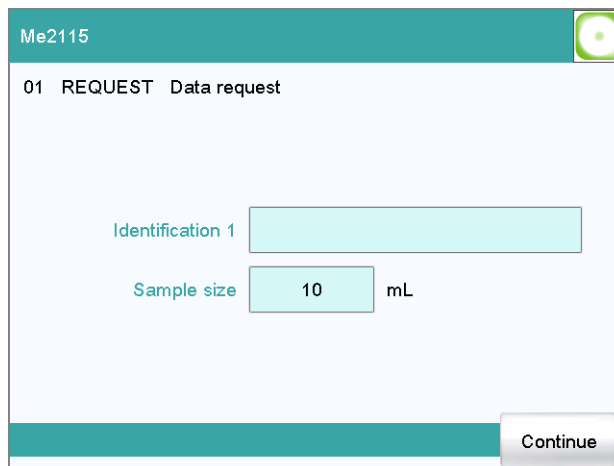
Value from the connected balance.

Fixed sample size defined in method:

The value will be entered in the corresponding line when the method is loaded. The existing entry will be overwritten.

20.2 Requesting sample data at the start of the determination

The sample data can be automatically requested immediately after the start of the determination in order to ensure that the sample data entry is not forgotten. This automatic inquiry is requisite for reweighing.



Me2115

01 REQUEST Data request

Identification 1

Sample size mL

Continue

To accomplish this, you must insert and configure the command **REQUEST** in the method (see chapter 29.18.3, page 490).

If the **Hold sequence** parameter is activated, then the run will be paused and must be continued with **[Continue]** after the sample data has been entered. If the **Hold sequence** parameter is deactivated, then the determination will continue in the background until the measured data is required for further processing. This dialog will be displayed until the entering of the sample data is confirmed with **[Continue]**, even if the titration/measurement is already completed. This ensures that the sample data is available for calculations.

If a fixed sample size has been defined in the method (see chapter 16.5.3, page 181), then it will be displayed at the time of the entry but it will not be editable.

21 Sample table

21.1 General

Main dialog: **Sample table**

The sample table is a table in which the sample data for up to 999 samples can be entered. If you are processing larger-sized sample series, it makes sense to enter the sample data in this table.

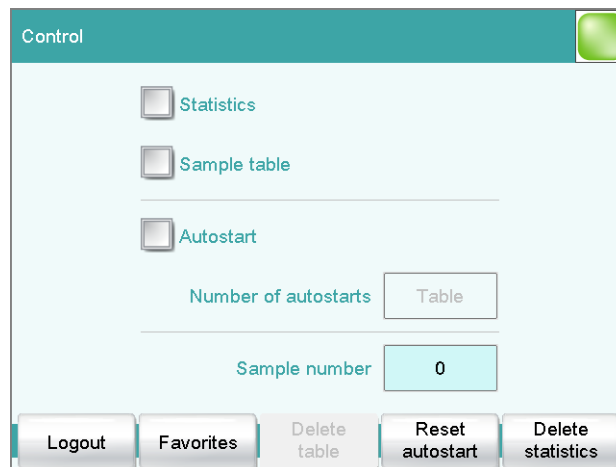
Activating the sample table

Proceed as follows to enable the sample table:

1 Opening the control dialog

- In the main dialog, tap on **[Control]**.

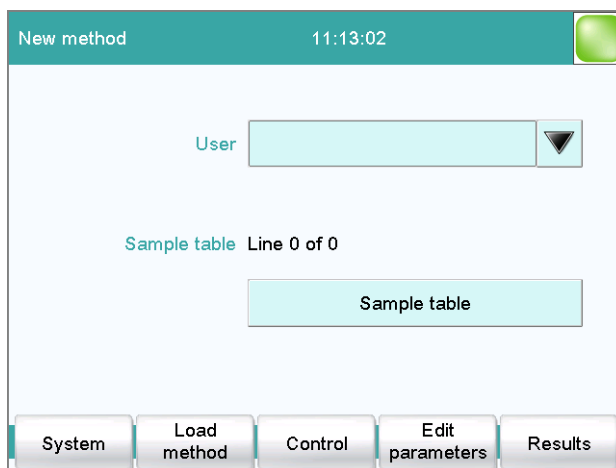
The control dialog is displayed:



2 Activating the sample table

- Activate the **Sample table** option.
- Tap on the fixed key **[🏠]**.

The main dialog is displayed:



The display will show the number of determinations already carried out and the total number of sample lines containing data. The sample table is still empty in this example.

The sample table contains numbered lines; each line represents one determination. In the standard settings, the first sample identification and the sample size of each sample are displayed. In the properties, you define the columns to be displayed (*see chapter 21.3, page 207*).

Sample table		
No.	Identification 1	Sample size
1	#2370015	1.0 g
2	#2370015	1.0 g
3	#2370016	1.0 g
4	#2370016	1.0 g
5	...	

[Load/ Save]

Load a saved sample table (*see "Loading a sample table", page 205*) or save the current sample table (*see "Saving a sample table", page 204*).

[Properties]

Edit the properties of the sample table (*see chapter 21.3, page 207*).

[Insert line]

Insert a new line above the line selected.

[Delete]

Delete the selected line from the sample table.

[Edit]

Edit the data of the selected line (see chapter 21.2, page 205).

Saving a sample table**NOTE**

Sample tables can only be saved on external storage media or on a shared file system.

Proceed as follows to save a sample table:

1 Opening the dialog

- In the **Sample table** dialog, tap on the **[Load/ Save]** button.

The **Sample table / Load/Save** dialog is displayed.

If no external storage medium is plugged in or if no file system is shared, then **[Save]** is disabled.

2 Modify/apply a name

- Tap on **[Save]**.

A name is suggested for new sample tables. If the sample table has already been saved, the previous name will be displayed.

Applying the name:

- Tap on **[Save]**.

The sample table is saved.

Entering a new name:

- Tap on the input field **File name**.
The text editor opens.
- Enter a new file name (max. 32 characters) and confirm with **[OK]**.
- Tap on **[Save]**.

The sample table is saved.

Loading a sample table

Proceed as follows to load a sample table:

1 Display the list of saved sample tables

- In the **Sample table** dialog, tap on the **[Load/ Save]** button. The **Sample table / Load/Save** dialog is displayed. If no external storage medium is plugged in or if no file system is shared, then **[Load]** is disabled.
- Tap on **[Load]**. The selection of memory locations is displayed. This selection will be skipped if only one memory can be accessed.
- Select the memory location where the desired sample table is stored. The selection of file groups is displayed (*see chapter 12.1, page 126*). If only one group is available, then the list of the saved sample tables will be displayed directly.
- Select the group with the desired sample table.
- Tap on **[Show files]**.

The list with the saved sample table is opened.

2 Select the sample table

- Select the desired sample table.

3 Loading a sample table

- Tap on **[Load]**.

The sample table is now loaded.

21.2 Editing sample data

Sample table / Edit

Line number: - 1 +

Method: Me2115

Identification 1: #2370015

Identification 2:

Sample size: 1.0 g



At the very top you will see the line number of the selected line. In this example, the sample data of the first line is displayed. You can scroll between individual data sets with the keys **[-]** and **[+]**.

Method

Method used for processing the sample.

If you use the sample assignment table (*see chapter 15.1.2, page 154*), then the method can no longer be defined here.

Selection	Selection of stored methods | empty
Default value	empty

empty

The currently loaded method is used.

Identification 1

Sample identification. The sample identification can be used in calculations as the variable **CI1**. If you have defined a sample identification list (*see chapter 15.1.1, page 153*) then the entries can be selected here.

Entry	24 characters maximum
Default value	empty

Identification 2

Sample identification. The sample identification can be used in calculations as the variable **CI2**. If you have defined a sample identification list (*see chapter 15.1.1, page 153*) then the entries can be selected here.

Entry	24 characters maximum
Default value	empty

Sample size

Sample size. The value of the sample size can be used in calculations as the variable **C00**.

Input range	-99999999 to 9999999999
Default value	1.0

Unit of sample size.

Entry	6 characters maximum
Selection	g | mg | µg | mL | µL | pieces
Default value	g

Unit defined in method:

The unit defined in the method is ignored. The unit entered in the sample table is used.

Balance connected and configured:

Value from the connected balance.

Fixed sample size defined in method:

The value will be entered in the corresponding line when the method is loaded. The existing entry will be overwritten.



NOTE

The sample size limits defined in the method are not monitored when the sample data is being entered in the sample table.

21.3 Properties

Method memory

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

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

Shared memory

Shared directory in the network.

Display in table

Selection of the columns to be displayed in the sample table.

Selection	Method | Identification 1 | Identification 2
Default value	Identification 1

**Method**

Only the assigned method is displayed for each sample.

Identification 1

The first sample identification and the sample size are displayed for each sample.

Identification 2

The second sample identification and the sample size are displayed for each sample.

Number of lines

Maximum number of lines which can be present in the sample table.

Input range	2 to 999
Default value	99

Lock editing

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

If this option is activated, then the sample data can no longer be altered.

Display options

Configure the sample data to be displayed in the dialog **Sample table / Edit** (see *"Properties / Display options" dialog*, page 208).

Editing options

Specify the settings for the processing of the sample data (see *"Properties / Editing options" dialog*, page 208).

Identifications

Define the designations for the input fields of Identification 1 and Identification 2 (see *"Dialog "Properties / Identifications" "*, page 209).

"Properties / Display options" dialog

Sample table: **Properties ► Display options**

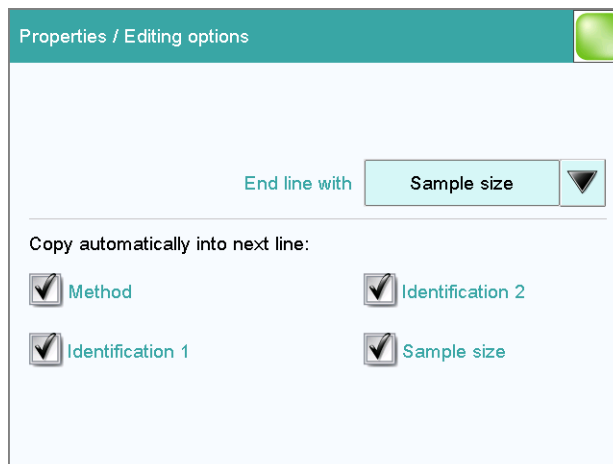
In this dialog, you can configure which of the following sample data can be edited in the sample table:

- **Method**
- **Identification 1**
- **Identification 2**
- **Sample size**

"Properties / Editing options" dialog

Sample table: **Properties ► Editing options**

In this dialog, you can define the settings so that the input of the sample data becomes simpler and faster.



End line with

Selection as to with which input the editing dialog for the next sample is automatically displayed.

Selection	Sample size | Identification 1 | Identification 2 | manual
Default value	Sample size

manual

The editing dialog for the next sample can be displayed with the **[New sample]** button in the editing dialog.

If, for example, you have to enter similar data for each sample, then you can automatically copy the data which is identical for each sample into the next line:

- **Method**
- **Identification 1**
- **Identification 2**
- **Sample size**

Dialog "Properties / Identifications"

Sample table: **Properties ► Identifications**

In the dialog **Properties / Identifications**, you can alter the designations for the sample identifications in accordance with specific methods.

22 Determination run

This chapter provides a description of how to carry out a determination, i.e. how to process a single sample or a sample series. The current sample data is used for calculations.

22.1 Carrying out a single determination

When you carry out a determination, you can enter the sample data in various ways (see chapter 20, page 199). The following instructions describe how to enter the sample data in the main dialog.

To carry out a single determination, proceed as follows:

1 Loading the method

- See Chapter "Loading a method", Page 174.

2 Preparing the sample



NOTE

Calculate the amount of the sample in such a way that a titrant consumption of 10...90% of the cylinder volume will result.

- Weigh in or measure the sample in a sample vessel.
- Add solvent.
- Place the sample vessel on the stirrer.
- Immerse the electrode and buret tip in the solution.

3 Entering the sample size

- Tap on the input field **Sample size** in the dialog. The number editor opens.
- Enter the sample size and confirm with **[OK]**.

4 Starting a determination

- Tap on the fixed key [**▷**].

Sequence of the determination


- After a determination is started, a check is made as to
 - whether all of the devices required are connected and ready for operation.
 - whether all titrants and sensors are present.
 - whether the monitoring intervals for titrants, sensors and common variables are still valid.
 - if a sample assignment table is activated (*see chapter 15.1.2, page 154*):
 - whether the entered sample identification is defined in the sample assignment table. If this is the case, then the assigned method will be loaded automatically and the actual determination will be started.



NOTE

Manual titrations (MAT command):

Start of titration: Because of the technical implementation involved, a few microliters are already dosed at the start of a manual titration. The possibility of deviation from the actual endpoint volume is excluded, however, because the already dosed volume is taken into account.

End of titration: A manual titration must always be ended with the **[Cancel command]** button (NOT with the [] fixed key) or with the **[FILL]** key on the Manual Dosing Controller. This is the only way to ensure that subsequent method commands will be carried out.

22.2 Performing a sample series

You can use the following functions with sample series:


- **Statistics for multiple determinations**
The statistics calculations are enabled in the method options (*see chapter 16.5, page 177*).
- **Sample table**
You can enter the sample data for an entire sample series in the sample table (*see chapter 21, page 202*).



Sequence of the sample series

- After a determination is started, a check is made as to
 - whether all of the devices required are connected and ready for operation.
 - whether all titrants and sensors are present.
 -
 - whether the monitoring intervals for titrants, sensors and common variables are still valid.
 -
 - if a sample assignment table is activated (see chapter 15.1.2, page 154):
whether the entered sample identification appears in the sample assignment table. If this is the case, then the assigned method will be loaded automatically and the actual determination will be started. If a different method has been entered in the sample table, then it will be ignored.
- At the end of the determination,
 - the line in the sample table is deleted.
 - the next determination is started (if you are working with the autostart function enabled (see chapter 18, page 191)).

22.3 Canceling determinations manually

You can cancel a determination at any time with the fixed key []. The command being carried out at that moment is canceled and only calculations and reports are executed or created.

If you are working with the autostart function activated (see chapter 18, page 191), the entire series will be canceled.



NOTE

If you do not wish to cancel the entire determination, but only the current command, use the function **[Cancel command]** in the live display.

The subsequent method commands are carried out normally.


23 Live modifications

23.1 Editing the sample data of the running determination

The sample data can be entered or modified in the main dialog while a determination is running. The sample data entered at the end of the determination is always used in calculations.

Proceed as follows to edit the sample data:

1 Display the main dialog

- Tap on the fixed key [].

The main dialog is displayed. The determination continues to run in the background.

2 Edit the sample data

- Edit the sample data and apply with **[OK]**.

3 Display the live dialog

- Tap on **[Live display]**.

The live dialog is displayed once again.



NOTE

Make sure that the input dialogs are closed before the determination is ended. Otherwise the determination will have to be recalculated.

23.2 Editing the sample table while a determination is running

You can insert new lines or delete existing ones or edit sample data while a determination is running.



NOTE

To ensure that no problems arise during the run and that the current data is always available for the calculation, we recommend that the input dialogs always be closed.

Editing the sample table

Proceed as follows to edit the sample table:

1 Display the main dialog

- Tap on the fixed key [].

The main dialog is displayed. The determination continues to run in the background.

2 Select the sample data

- Tap on **Sample table**.
The sample table is displayed. The first line always contains the sample data of the running determination.
- Select the desired line.
- Tap on the button **[Edit]**.

3 Edit the sample data

- Edit the sample data and apply with **[OK]**.



NOTE

In addition to the sample data, the method can also be modified, except in cases where the determination is running.

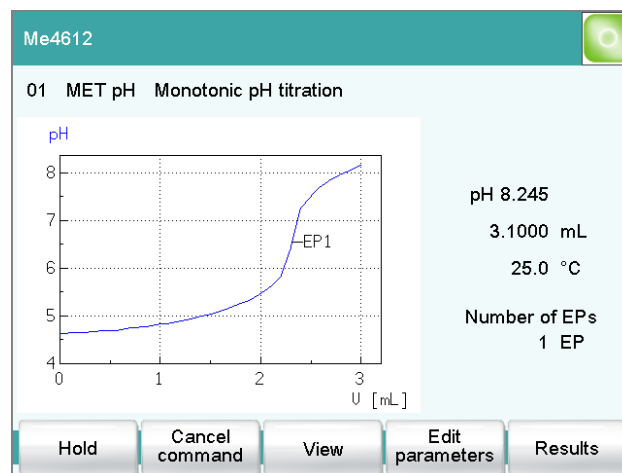
4 Display the live dialog

- Tap on the fixed key [].
The main dialog is displayed.
- Tap on **[Live display]**.

The live dialog is displayed once again.

23.3 Live display

Main dialog: **Live display**



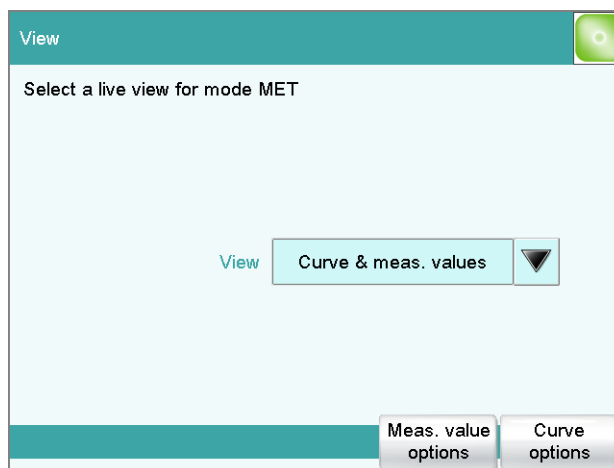
The current method and the system status are displayed in the title line. The currently running command is displayed directly underneath the title line.

The following functions are available to you while a determination is running:

- **[Hold]**
Pause the determination. The label changes to **[Continue]**. This can be used to continue the run.
- **[Cancel command]**
Cancel the current method command. The next command is started.
- **[View]** (only for titrations/measurements)
To modify the settings for the curve and measured value display, see below.
- **[Sample data]** (visible only if a titration or a measurement is not currently running)
Switch to the main dialog in order to edit the sample data.
- **[Edit parameters]**
Edit the method options and live parameters (see chapter 23.4, page 217).
- **[Results]**
Display the results dialog (see chapter 24, page 219).

Dialog "View"

Main dialog: **Live display** ► **View**



View

Type of curve display.

Selection	Curve | Curve & meas. values | Measured values | Curve & sample data
Default value	Curve & meas. values

Curve

Only the curve is displayed.

Curve & meas. values

The measured values are displayed to the right next to the curve.

Measured values

Only the measured values are displayed.

Curve & sample data

The sample data is displayed to the right next to the curve.

[Meas. value options]

Define settings for the display of the measured values.

A maximum of three different values can be displayed at the same time. The selection depends on the titration/measuring mode. The settings are saved separately for each mode.

[Curve options]

Define the settings for the curve display (*see "Curve options", page 233*). The settings are saved separately for each titration/measuring mode and apply not only for the live display but also for the curve display in the results dialog.

23.4 Live parameters

Live display: **Edit parameters**

Certain method parameters can be edited while a determination is being carried out. The modified parameters are taken into account at once. If you modify, for instance, the start conditions after the start volume has been dosed, then these modifications will not be taken into account until the next determination.



NOTE

If the live modifications are also to be used in the future, then the method must be saved after the determination has been completed. The live modifications are discarded as soon as you load a new method. If you are working with the sample table and a different method is used for the next sample, then the live modifications will be discarded.

Proceed as follows to modify method parameters during an ongoing determination:

1 Select the method command

- Tap on **Edit parameters**.
The command sequence is displayed.

Parameters / Sequence		
Current method: Me4612		
01	REQUEST	Data request
02	MET pH	Monotonic pH titration
03	CALC	Calculation
04	REPORT	Report
05	...	
<div style="display: flex; justify-content: space-between; padding: 0;"> Save method Method options Insert command Delete command Edit command </div>		

[Edit command] is enabled only for those commands for which the live parameters can be edited.

All of the functions except for the method properties can be edited with **[Method options]**.


- Select the desired method command.
- Tap on **[Edit command]**.



2 Edit the method parameters

- Change the desired parameters accordingly.

3 Display the live dialog

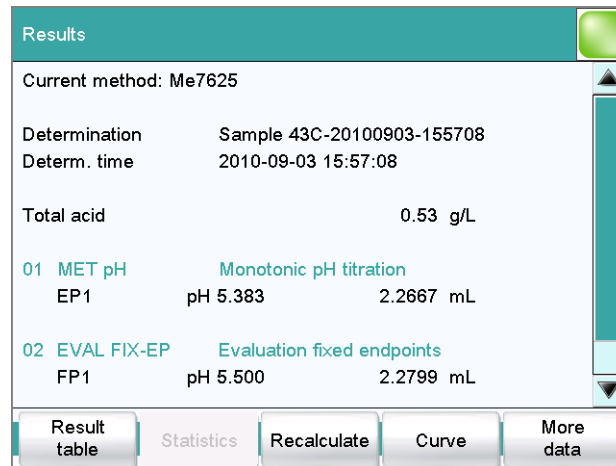
- Tap on the fixed key [].
The main dialog is displayed.
- Tap on **[Live display]**.

The live dialog is displayed once again.

24 Results and more determination data

Main dialog: **Results**

Detailed specifications concerning the current determination are displayed in the **Results** dialog:



- **Current method**
Method with which the determination was carried out.
- **Determination**
Name of the determination. Displayed only if the determination has been saved.
- **Determination time**
Date and time at which the determination was carried out.
- **Results**
Calculated results. If monitoring of the result limits is activated, then the result will be highlighted in color:
 - Green lettering: The result is within the limits
 - Red lettering: The result is outside the limits
- **Commands**
List of the data-generating commands (titrations, measurements, etc.). The most important data is displayed for each command.

[Result table]

Open result table (*see chapter 26, page 241*). The result table is a table in which the results for several determinations can be saved.

[Statistics]

Display the statistical overview of a determination series (*see chapter 25, page 236*).

[Recalculate]

Recalculate the determination. The procedure will be executed immediately. Recalculation cannot be undone (*see chapter 24.8, page 234*).

[Sign]

Sign the current determination.

If the method contains a command **SIGN**, then this button will be displayed instead of **[Recalculate]**. The determination can be signed directly on level 1 (with a second command also on level 2).

[Curve]

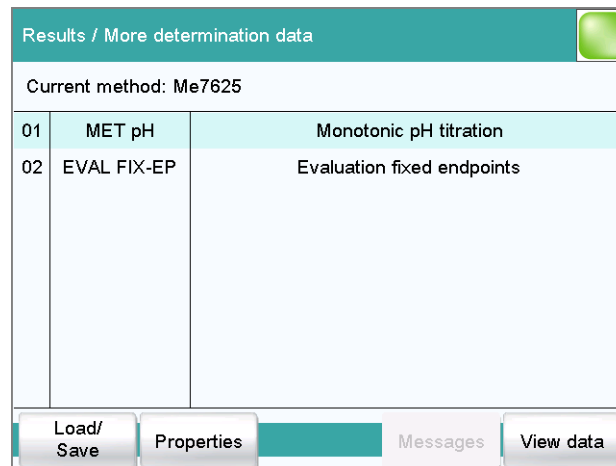
Display the curve of the current determination (*see chapter 24.7, page 232*).

[More data]

Display detailed specifications for the determination (determination properties, measuring point list, endpoint details, etc.), save determination (*see chapter 24.1, page 220*).

24.1 More determination data

Results dialog: **More data**



All of the commands for which you can display other data (titrations, measurements, evaluations, etc.) are listed in the **Results / More determination data** dialog.

[Load/ Save]

Load saved determinations (*see chapter 24.5, page 227*) and save current determination (*see chapter 24.6, page 232*).

[Properties]

Display the properties of the current determination (*see chapter 24.4, page 224*).

[Local com. var.]

(available only with loaded determinations)

Display the list of the common variables defined at the time of the determination (see chapter 24.3, page 224).

[Messages]

Display list with all of the messages which occurred during the determination (see chapter 24.2, page 223).

[View data]

Display all of the details for the selected command.

24.1.1 Details

Results dialog: **More data ► View data**

More determination data / View data		
01 MET pH Monotonic pH titration		1M
Stop criterion	Stop volume reached	MTS
Titration duration	48.9 s	MCD
Start volume	1.0000 mL	MSV
End volume	3.0000 mL	MCV
Temp. measurement	Pt1000	MTM
Initial measured value	3.507	MIM
Initial temperature	27.8 °C	MIT
Start duration	6.5 s	MSD
Start measured value	3.682	MSM
Start temperature	27.8 °C	MST
End measured value	6.812	MCM

All of the variables generated by the determination are listed in the **More determination data / View data** dialog. These can be used in calculations.

[Calibration data]

(available only with loaded determinations)

Display calibration data of the sensor used which was valid at the time of the determination (see "Calibration and titrant data", page 223).

[Titrant data]

(available only with loaded determinations)

Display titrant data which was valid at the time of the determination (see "Calibration and titrant data", page 223).

[Endpoint details]

Display details for each endpoint found (see "Endpoint details", page 222).

[Measuring point list]

Display measuring point list of titrations and measurements (see "Measuring point list", page 222).

Measuring point list

Results dialog: **More data ▶ View data ▶ Measuring point list**

Results dialog: **Curve ▶ Display curve ▶ Measuring point list**

View data / Measuring point list		
01 MET pH Monotonic pH titration		1M
Volume [mL]	Meas.value [pH]	Delta MV [pH]
1.00000	3.682	0.000
1.10000	3.713	0.032
1.20000	3.749	0.036
1.30000	3.790	0.040
1.40000	3.836	0.046
1.50000	3.889	0.053
1.60000	3.950	0.061

View

The individual measured values are listed in the **View data / Measuring point list** dialog. You can configure which columns are displayed ([View] button). These settings are saved separately for each mode (DET, MET, etc.).

Column 1 / Column 2 / Column 3

Quantity displayed in the columns 1, 2 and 3. Both the selection of the quantities and the default setting depend on the mode.

Selection	Volume | Measured value | Water | Bromine | ERC | Delta meas.value | Time | Temperature | Drift | Volume drift | Signal drift | Index | Monitoring
-----------	---

Endpoint details

Results dialog: **More data ▶ View data ▶ Endpoint details**

Results dialog: **Curve ▶ Display curve ▶ Endpoint details**

Detailed information concerning each equivalence point or endpoint determined is displayed in the **View data / Endpoint details** dialog.

The volume, the measured value, the equivalence point criterion ERC (only DET, MET), the time and the temperature are specified for each equivalence point or endpoint determined.

The equivalence point criterion determined (ERC = Equivalence point Recognition Criterion) is a measure for the size of the jump in the titration curve. The ERC determined is compared with the EP criterion defined in the method for the evaluation of the titration curve *see "Evaluation and equivalence point criterion with DET", page 298 and "Evaluation and equivalence point criterion with MET", page 314*). The ERC is thus an important quantity when you need to adjust the parameters for the evaluation of the equivalence points.

Calibration and titrant data

Results dialog: **More data ► View data ► Calibration data**

Results dialog: **More data ► View data ► Titrant data**

The calibration data or titrant data which was current at the time the determination was performed is displayed in the dialogs **View data / Calibration data** and **View data / Titrant data**.



NOTE

Recalculation:

The concentration and titer of the titrant can be modified retroactively. The values displayed here are used for the recalculation of a loaded determination. The values saved in the dialog **System / Titrants** are not changed as a result.

24.2 Messages

Results dialog: **More data ► Messages**

If messages occurred during a determination, they will be displayed in the **More determination data / Messages** dialog. The following data for the message is indicated under **[Details]**:

- **Message number**
Unique identification number.
- **Time**
Moment that the message occurred.
- **Message**
Message text.

24.3 Local common variables

Results dialog: **More data ► Local com. var.**

The list of common variables as it existed at the time of the determination is displayed in the **More determination data / Local common variables** dialog.



NOTE

Recalculation:

The common variables can be modified retroactively. The values displayed here are used for the recalculation of a loaded determination. The list of common variables in the **System / Common variables** dialog is not changed as a result.

24.4 Determination properties

Results dialog: **More data ► Properties**

Detailed information concerning the determination is displayed in the **More determination data / Properties** dialog:

- **User**
User who carried out the determination.
- **Sample number**
Number which was entered in the dialog **Control** at the start of the determination.
- **Start counter**
This value, just like the sample number, is increased by one each time a determination starts. In contrast to the sample number, this value cannot be modified by the user.
- **Duration determ.**
Duration of the entire determination.

- **Method status**
Current status of the method.
 - **new**
The method has been newly created and not yet saved.
 - **saved**
The current method has been saved.
 - **modified**
The current method has been modified but not saved yet (e.g. live modification).
 - **reviewed**
The current method has been signed at level 1.
 - **released**
The current method has been signed at level 2.
- **Determination**
Name of the determination. Displayed only with saved determinations.
- **End of determin.**
Way in which the determination was ended.
 - **Regular without errors**
The determination was automatically ended at the end of the method.
 - **Manual stop**
The determination has been canceled with the fixed key [].
 - **Error**
The determination has been canceled due to an error.
- **Status of deter.**
 - **original**
The determination has not been recalculated.
 - **recalculated**
The determination has been recalculated.
 - **loaded**
The determination has been loaded.
 - **saved**
The determination has been saved. The version number indicates how many times the file has been saved.
 - **reviewed**
The determination has been signed at level 1.
 - **released**
The determination has been signed at level 2.

The following data is displayed only if the option **Recalculating determination** under **Login options / Modification options** is activated:

- **Recalculated by**
User who recalculated the determination.
- **Recalculated on**
Date and time at which the determination was recalculated.



- **Reason**
Reason for the recalculation of the determination.
- **Comment**
Comment for the recalculation of the determination.

The following information is displayed only if the determination has been signed at level 1:

- **Reviewed by**
User who signed the determination at level 1.
- **Reviewed on**
Date and time at which the determination was signed at level 1.
- **Reason**
Reason for the signing of the determination.
- **Comment**
Comment for the signing of the determination.

The following information is displayed only if the determination has been signed at level 2:

- **Released by**
User who signed the determination at level 2.
- **Released on**
Date and time at which the determination was signed at level 2.
- **Reason**
Reason for the signing of the determination.
- **Comment**
Comment for the signing of the determination.
- **Used devices**
Hardware that was used for the determination.
 - Touch Control with program version of the software and the serial number.
 - Control instrument with the program version of the device software and the serial number.
 - Measuring inputs with ADC type und serial number.
 - MSB connector with peripheral devices connected to it (dosing device, stirrer).

[Delete signature]

Delete all of the signatures for the method or the determination. This button is inactive if level 2 has not yet been signed (*see chapter 17.2, page 190*).

[Sign]

Sign the method or determination. This button is active only when working with activated login function and password (*see chapter 17.1, page 189*).

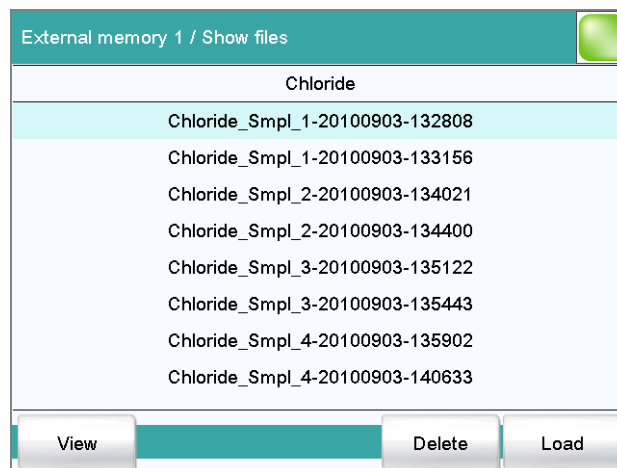
24.5 Loading a determination

Proceed as follows to load a determination:

1 Opening the determination list

- In the results dialog, tap on **[More data]**.
- Tap on **[Load/ Save]**.
- Tap on **[Load]**.
The selection of memory locations is displayed. This selection will be skipped if only one external storage medium is available.
- Select the memory location where the desired determination is saved.
The selection of file groups is displayed (*see chapter 12.1, page 126*). If only one group is available, then the determination list will be displayed directly.
- Select the group with the desired determination.
- Tap on **[Show files]**.

The determination list with the stored determination opens:



2 Selecting a determination

- Select the desired determination.

3 Loading the determination

- Tap on **[Load]**.

The determination is now loaded. The properties are displayed in the results dialog.

**NOTE**

When you load a determination, the method with which the determination was carried out will be loaded automatically.

For this reason, save any modifications which may have been made to the method currently loaded before you load a determination.

24.5.1 Determination list

Results dialog: **More data ► Load/ Save ► Load ► Show files ► View**

Show files / View		
Sorted by Determ. time		10
No.	Identification 1	Result 1
1	Blank methanol	0.01 %
2	Blank methanol	0.02 %
3	Calcium hardness	2.015 mmol/L
4	Calcium hardness	1.981 mmol/L
5	Titer of NaOH	0.99615
6	Titer of NaOH	0.99417
7	Titer of NaOH	0.98729

Previous 100 Next 100 Properties Delete Load

In the **Show files / View** dialog you can depict the individual determinations in greater detail. The sorting criterion and the number of saved determinations are displayed at the very top. The list contains numbered lines; each line represents one determination. In the default settings, the first sample identification and the first calculated result of each determination are displayed. In the properties, you define which data is displayed in the columns and the criteria according to which the determinations are sorted (see "Properties", page 229). In addition, you can define search filters to aid you in finding the desired determinations (see "Filter criteria", page 230).

[Previous 100]

Display the previous 100 determinations.

[Next 100]

Display the next 100 determinations.

[Properties]

Configure the display of the columns and define filter criteria.

[Delete]

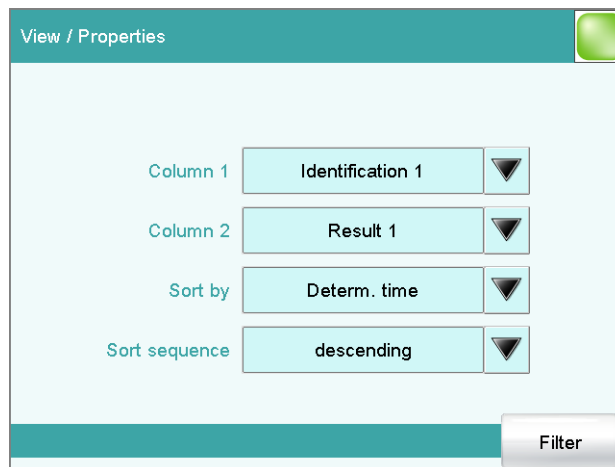
Delete the selected file.

[Load]

Load the selected file.

Properties

Determination list: **Properties**



In the **View / Properties** dialog, you can define which data is displayed in the columns and the criteria according to which the determinations are to be sorted.

Column 1

Selection of what is to be displayed in the first column.

Selection	Identification 1 | Identification 2 | Determ. time | Result name | Method | Sample size | User
Default value	Identification 1

Column 2

Selection of what is to be displayed in the second column.

Selection	Result 1...9 The numbering of the results corresponds to the order in which the results were calculated in the determination run.
-----------	---

Sort by

Selection according to which criterion the list is to be sorted.



Selection	Identification 1 | Identification 2 | Determ. time | Result | Method | Sample size | User
Default value	Determ. time

Identification 1

Sort alphabetically according to the first sample identification.

Identification 2

Sort alphabetically according to the second sample identification.

Determ. time

Sort chronologically according to the determination time.

Result

Sort according to the numerical value of the result.

Method

Sort alphabetically according to the method name.

Sample size

Sort according to the numerical value of the sample size.

User

Sort alphabetically according to the user who carried out the determination.

Sort sequence

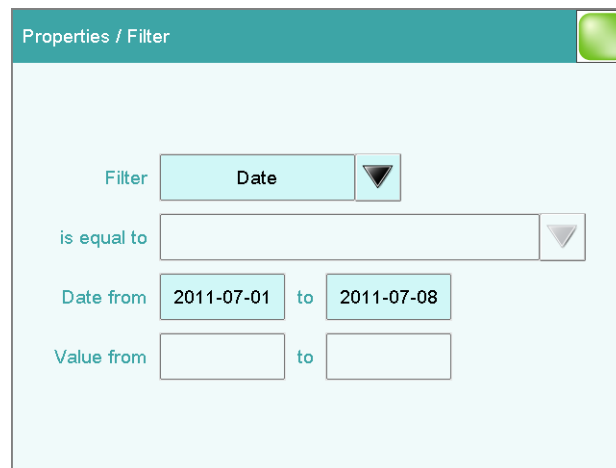
Selection	ascending | descending
Default value	descending

[Filter]

Specify the filter criteria for the list.

Filter criteria

Determination list: **Properties ▶ Filter**



You can set filters in the **Properties / Filter** dialog. A filter is a rule defining what is to be displayed in the determination list. If a filter has been set,

this is indicated with a corresponding symbol in the **Show files / View** dialog.

Filter

Define the criterion according to which the list is to be filtered. The only lines which will be displayed are those which fulfil the filter criterion.

Selection	no filter | Identification 1 | Identification 2 | Date | Result | Method | Sample size | User
Default value	no filter

no filter

The list itself will not be filtered.

Identification 1

In the input field **is equal to**, select or enter the first sample identification according to which filtering is to be carried out.

Identification 2

In the input field **is equal to**, select or enter the second sample identification according to which filtering is to be carried out.

Date

In the input fields **Date from ... to**, specify the period of time according to which filtering is to be carried out.

Result

In the input fields **Value from ... to**, specify the value range according to which filtering is to be carried out.

Method

In the field **is equal to**, select or enter the method name according to which filtering is to be carried out.

Sample size

In the input fields **Value from ... to**, specify the value range according to which filtering is to be carried out.

User

In the field **is equal to**, select or enter the user according to whom filtering is to be carried out.



NOTE

The filter can be applied to empty fields as well, for example, if no sample identification has been entered. In this case, select only the desired filter criterion and leave the fields below empty.

24.6 Saving a determination

Results dialog: **More data ▶ Load/ Save ▶ Save**

Determinations can be saved as follows:

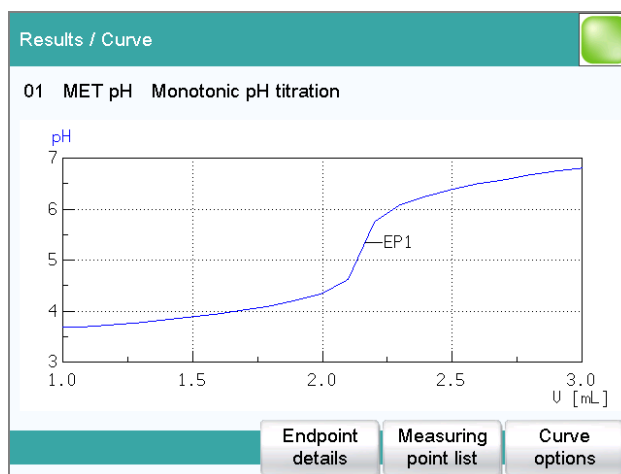
- Manually in this dialog.
The suggested default setting for file names is the first 16 characters of Identification 1, followed by the determination time in the format YYYYMMDD-hhmmss. Extending the file name with the determination time has the advantage that the file names of all determinations are unique.
- Automatically at the end of the determination (*see chapter 16.5.6, page 187*).

The following data is stored for each determination:

- Calculated results
- Measuring point lists, equivalence points, curves and variables which were generated during the determination
- Determination properties
- Statistics (if carried out)
- Method with which the determination was carried out
- Common variables (values and properties of all common variables at the time of the determination)
- Titrant data of the titrant used
- Calibration data of the sensor used

24.7 Curves

Results dialog: **Curve**



The curve of the current determination is displayed in the **Results / Curve** dialog. You can configure the curve display.

[Endpoint details]

Display details for each endpoint found (see "Endpoint details", page 222).

[Measuring point list]

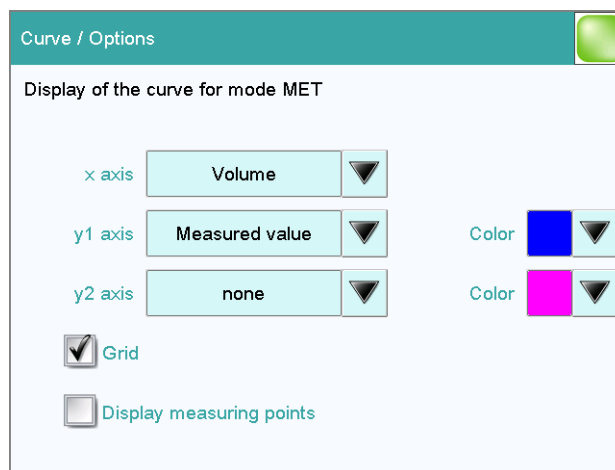
Display measuring point list of titrations and measurements (see "Measuring point list", page 222).

[Curve options]

Define the settings for the curve display (see "Curve options", page 233). The settings are saved separately for each titration/measuring mode and apply not only for the live display but also for the curve display in the results dialog.

Curve options

Results dialog: **Curve ▶ Curve options**



You can make the settings for the curve display in the **Curve / Options** dialog. These settings are saved separately for each mode (DET, MET, etc.) and also apply for the live display. Both the selection of the quantities and the default setting depend on the mode.

x axis

Quantity which is shown on the x axis of the graph.

Selection	Volume | Measured value | ERC | Delta meas.value | Time | Temperature | Volume drift | Signal drift
-----------	--

y1 axis

Quantity which is shown on the y1 axis of the graph.



Selection	Volume | Measured value | ERC | Delta meas.value | Time | Temperature | Volume drift | Signal drift
-----------	--

y2 axis

Quantity which is shown on the y2 axis of the graph.

Selection	none | Volume | Measured value | ERC | Delta meas.value | Time | Temperature | Volume drift | Signal drift
Default value	none

Color

Selection of a color for the curves.

Grid

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

If this parameter is activated, grid lines are shown.

Display measuring points

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

If this parameter is activated, the curve is shown with the single measured values.

24.8 Recalculation and reevaluation

Results dialog: **Recalculate**

You can use the **[Recalculate]** function to recalculate and reevaluate determinations. This is necessary in the following cases:

- If you have modified the evaluation parameters in a way that changes the recognized endpoints or equivalence points.
- If you have modified the calculations.
- If you have modified the variables used in calculations, e.g. sample size, titer or common variables.

**NOTE**

Neither the recalculation nor the reevaluation can be undone.

We therefore recommend that the original determination be saved beforehand (*see chapter 24.6, page 232*). The best way of doing this is to use the **Save determination automatically** function (*see chapter 16.5.6, page 187*).

The following method commands are executed once again with the **[Recalculate]** function:

- DET and MET titrations:
The potentiometric evaluation will be carried out again.
- EVAL commands:
All evaluations are carried out again. You can also insert new evaluations retroactively.
- CALC command:
All calculations are carried out again. You can also define new calculations retroactively.
If you subsequently modify the titrant in a method, then the variables TITER and CONC of the "new" titrant will be used. If a result is assigned to the variable TITER in a calculation, then the titer of the "new" titrant will also be overwritten.



NOTE

If you modify the calibration data of the sensor used in the **System / Sensors** dialog, these modifications will not be taken into account. Changing the sensor in the method also has no influence on the measured data.

If a determination has been recalculated, this will be documented in the determination properties (*see chapter 24.4, page 224*).

Recalculation/reevaluation of loaded determinations

With loaded determinations, it is assumed that they were carried out a long time ago and that the **titrant data** and **common variables** of the system no longer correspond to those of the determination. This is why the most important titrant data of the titrants used and the list of **common variables** are stored with each determination. This data will be used if you recalculate a loaded determination. If you wish to recalculate the result with a corrected **common variable** or with a corrected titer, you must therefore modify the respective values in the **More determination data / Local common variables** or **More determination data / View data** dialog.

If a result is assigned to the variable TITER or to a **common variable**, then the titer or **common variable** which is currently valid in the system will not be overwritten until after a query has been confirmed.

If you modify the titrant retroactively in the method, this will not be taken into account.

The recalculated results of loaded determinations are not saved in the result table.

25 Statistics

Main dialog: **Results ► Statistics**

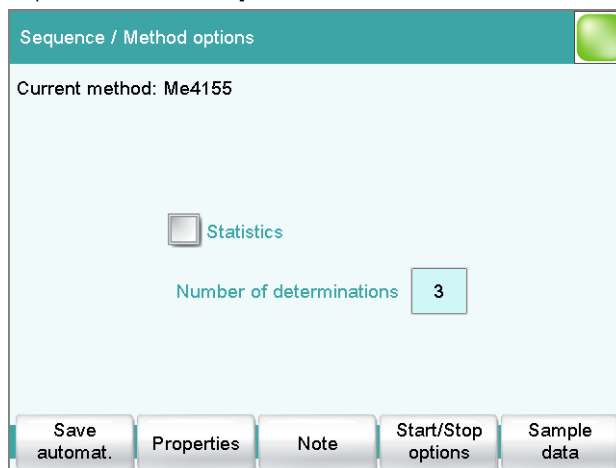
In the dialog **Results**, you can use **[Statistics]** to display the statistical overview of a determination overview. You can statistically evaluate a maximum of nine results calculated in a determination. A statistical series can contain a maximum of 20 determinations.

Activating the statistics function

Proceed as follows to activate the statistics function:


1 Editing the method options

- In the main dialog, tap on **[Edit parameters]**.
- Tap on **[Method options]**.



- Activate the **Statistics** option.
- Under **Number of determinations**, enter the desired number of determinations.

The results for which statistical calculations are performed are defined in the calculation command **CALC** (see "Variable for mean value", page 158).

Results / Statistics 	
Current method: Me3901 3 of 3	
Result name	Mean value
Content (mmol/L)	100.31 mmol/L
Volume of HCl	5.0 mL
<div style="display: flex; justify-content: space-between; align-items: center;"> Add determ. Details </div>	

In this dialog, the method with which the determination was carried out is displayed in the first line. The second line shows how many determinations have already been carried out and the total number of determinations to be carried out. The name of the result and the mean value are shown for each result.

[Add determ.]

Add a further determination to the determination series (*see chapter 25.3, page 239*).

[Details]

Display the statistics results for the selected result and the single results from all determinations, see next chapter.



NOTE

If you recalculate a determination, the statistics for this determination are also recalculated.

25.1 Displaying details for a result

Results dialog: **Statistics ▶ Details**

Statistics / Details		
Result name: Content (mmol/L)		SMN1
Mean value	100.31 mmol/L	n=03
s abs	0.236 mmol/L	
s rel	0.24 %	
No.	Sample size	Result
1	5.0 mL	100.56 mmol/L
2	4.5 mL	100.09 mmol/L
3	5.5 mL	100.28 mmol/L
Sample data		Determ. on/off
		Result on/off

In the dialog **Statistics / Details**, the following details are displayed:

- Result name
- Mean value
On the right-hand side of the dialog the number of single results from which the mean value was calculated is displayed. In this example, it is 3.
- Absolute standard deviation (**s abs**)
- Relative standard deviation (**s rel**)
- Result and sample size of each single determination
Results that could not be calculated are indicated with **invalid** and ignored.

[Sample data]

Display the sample data of the selected determination.

[Determ. on/off]

Remove all of the results of the selected determination from the statistics. All of the entries of this line are marked with an asterisk (*), the statistics will be recalculated automatically.

[Result on/off]

Remove the selected result from the statistics. The result is marked with an asterisk (*), the statistics will be recalculated automatically.

**NOTE**

If the mean value has been assigned to a common variable or to the variable TITER (see command **CALC**), then the determination must be recalculated manually (see chapter 24.8, page 234).

25.2 Deleting statistical data

In the dialog **Control**, you can delete all of the statistics data manually with the function **[Delete statistics]**. The statistics data is deleted automatically in the following cases:

- when all of the determinations of the determination series have been carried out and a new determination has been started afterwards.
- when a new method is loaded (even if it is the same method)
 - If the **sample table** or the **sample assignment table** is used, the statistics data is only deleted when another method is loaded.

25.3 Adding a determination to a determination series

You can use the function **[Add determ.]** to add an additional sample to a determination series, e.g. because a determination was faulty and had to be removed from the statistics.

Results / Statistics	
Current method: Me3901 3 of 3 (+2)	
Result name	Mean value
Content (mmol/L)	100.31 mmol/L
Volume of HCl	5.0 mL
<div style="display: flex; justify-content: space-between;"> Add determ. Details </div>	

The number of determinations by which the set statistics counter has been increased is shown above the list in brackets. This modification is also displayed in the main dialog and in the statistics report.



NOTE

The number of samples defined in the method options does not, however, change as a result.

26 Result table

Main dialog: **Results ► Result table**

Results / Result table		
Sorted by Determ. time		6 of 100
No.	Identification 1	Result 1
1	Content of Ca #32	0.101 mol/L
2	Content of Ca #32	0.092 mol/L
3	Content of Ca #32	0.098 mol/L
4	Titer NaOH	0.9946
5	Titer NaOH	0.9942
6	Titer NaOH	0.9967

Buttons: Load/ Save, Properties, Delete all, Delete, Details

The result table is suitable for displaying in detail the results of all of the determinations performed on a single day, for instance. You can save the results of up to 200 determinations. A maximum of 9 results from a single determination can be saved in the result table. You define which results from this table are to be saved using the **CALC** command. Because the size of the display is not sufficient to display all of the data at the same time, it is practical to print out the result table.

The sorting criterion and the number of determinations from which results are saved in the result table are displayed at the top. The list contains numbered lines; each line represents one determination. In the default settings, the first sample identification and the first calculated result of each determination are displayed. In the properties, you define which data is displayed in the columns and the criteria according to which the determinations are sorted (*see chapter 26.1, page 242*). In addition, you can define search filters to aid you in finding the desired determinations (*see "Filter criteria", page 244*).

[Load/ Save]

Load a saved result table (*see chapter 26.3, page 246*) or save the current result table (*see chapter 26.2, page 246*).

[Properties]

Configure the display of the columns and define filter criteria.

[Delete all]

Delete the result table completely.



[Delete]

Delete the selected line from the result table.

[Details]

Display details concerning the selected determination.

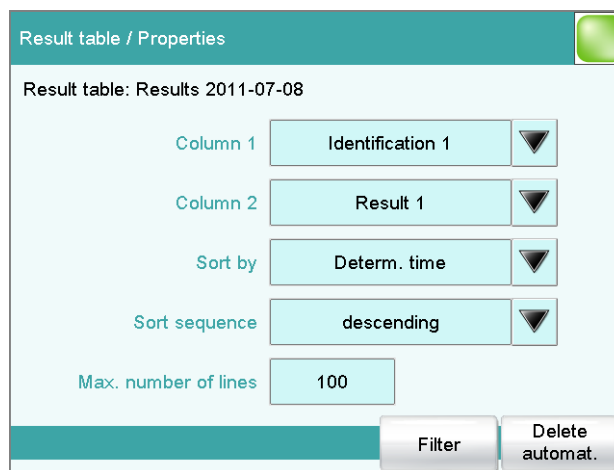
"Result table / Details" dialog

The following determination data is displayed in this dialog:

- **User**
User who carried out the determination.
- **Method**
Method with which the determination was carried out.
- **Determ. time**
Date and time at which the determination was carried out.
- Sample data (Identification 1 and 2 and sample size).
- All of the results of this determination saved in the result table.

26.1 Properties

Result table: **Properties**



In the **Result table / Properties** dialog, you can select the data to be displayed with each determination as well as the sorting criterion for the list.

Column 1

Selection of what is to be displayed in the first column.

Selection	Identification 1 | Identification 2 | Determ. time | Result name | Method | Sample size | User
Default value	Identification 1

Column 2

Selection of what is to be displayed in the second column.

Selection	Result 1...9 The numbering of the results corresponds to the order in which the results were calculated in the determination run.
-----------	---

Sort by

Selection according to which criterion the list is to be sorted.

Selection	Identification 1 | Identification 2 | Determ. time | Result | Method | Sample size | User
Default value	Determ. time

Identification 1

Sort alphabetically according to the first sample identification.

Identification 2

Sort alphabetically according to the second sample identification.

Determ. time

Sort chronologically according to the determination time.

Result

Sort according to the numerical value of the result.

Method

Sort alphabetically according to the method name.

Sample size

Sort according to the numerical value of the sample size.

User

Sort alphabetically according to the user who carried out the determination.

Sort sequence

Selection	ascending | descending
Default value	descending

Max. number of lines

If the result table contains the quantity of lines defined here, then no further results can be saved. If this is the case, save the result table and create a new one.

Input range	10 to 200
Default value	100

[Filter]

Specify the filter criteria for the list.

Result

In the input fields **Value from ... to**, specify the value range according to which filtering is to be carried out.

Method

In the field **is equal to**, select or enter the method name according to which filtering is to be carried out.

Sample size

In the input fields **Value from ... to**, specify the value range according to which filtering is to be carried out.

User

In the field **is equal to**, select or enter the user according to whom filtering is to be carried out.

**NOTE**

The filter can be applied to empty fields as well, for example, if no sample identification has been entered. In this case, select only the desired filter criterion and leave the fields below empty.

Deleting the result table automatically

Result table: **Properties ► Delete automat.**

In the **Properties / Delete automatically** dialog, you define when the contents of the result table is to be automatically deleted.

Delete oldest line only

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

If this option is activated at the same time that the result table is full, the oldest entry will be deleted as soon as the results of a new determination are saved.

Time when result table is deleted:**Switch on**

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

If this option is activated, then the result table will be deleted each time you switch on the Touch Control.

Start a new sample series

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

If this option is activated, then the result table will be deleted when you start a new sample series (with activated autostart function!).

Save result table

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

If this option is activated, the result table will be deleted as soon as you have saved it.

26.2 Saving the result table



NOTE

When you save the result table, the complete determination will not be saved with each entry. If you wish to save the determination data for each determination, use the **Save determination automatically** function (see chapter 16.5.6, page 187).

26.3 Loading the result table

Proceed as follows to load a result table:

1 Opening the current result table

- In the results dialog, tap on **[Result table]**.
- Tap on **[Load/ Save]**.
- Tap on **[Load]**.
The selection of memory locations is displayed. This selection will be skipped if only one external storage medium is available.
- Select the memory location where the desired result table is saved.
The selection of file groups is displayed (see chapter 12.1, page 126). If only one group is available, then the list of the saved result tables will be displayed directly.
- Select the group with the desired result table.
- Tap on **[Show files]**.

The list with the saved result tables opens.

2 Selecting the result table

- Select the desired result table.

3 Loading the result table

- Tap on **[Load]**.

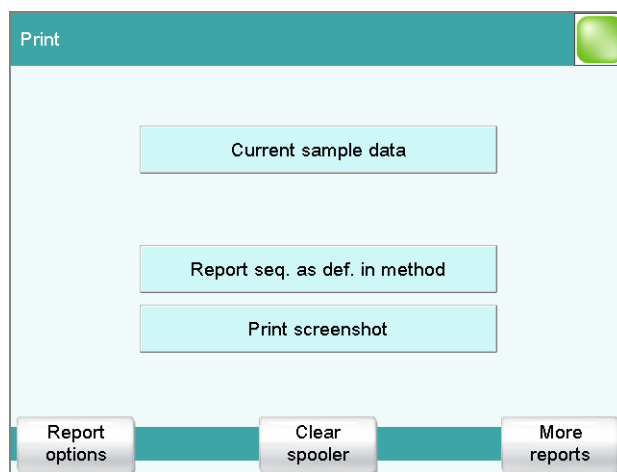
The result table is now loaded and will be displayed immediately.

27 Printing

Reports can be printed out as follows:

- Manually with the **[Print]** fixed key in this dialog. The fixed key is disabled while a determination is running.
- Automatically in the determination run with the command **REPORT** (see chapter 29.14, page 441).

The Titrande manual describes how to connect a printer to a Titrande system. The configuration of the printer is described in *Chapter 11.8, page 114*.



This screenshot shows the printing dialog associated with the main dialog. The sample data is entered in the main dialog, which is why you can print out the sample data from there in a context-sensitive manner with **[Current sample data]**.

The following buttons are also available in the other print dialogs:

[Report seq. as def. in method]

Print out all of the reports which are defined in the loaded method.

[Print screenshot]

Activate the "Print Screen" function. The current screen contents will be printed out the next time the fixed key **[Print]** is tapped on.

[Report options]

Defining the general settings for the report output.

[Clear spooler]

Delete all outstanding printing orders.

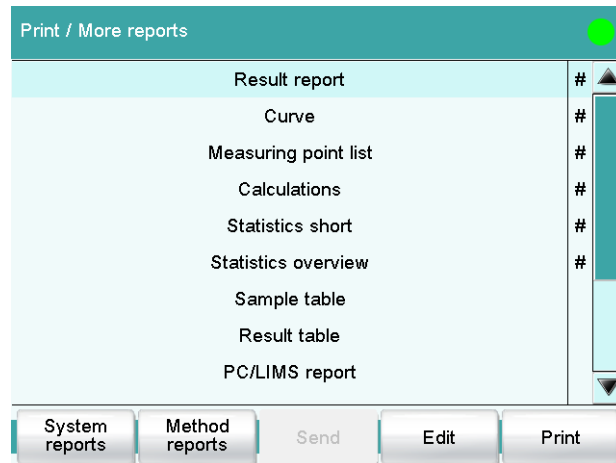
[More reports]

Open the list of available reports.

More reports

Fixed key []: **More reports**

The dialog **Print / More reports** displays a list of all of the available reports.



NOTE

If you are using a **CUSTOM Neos** printer, you can print only the reports marked with a #. The designation on the reports is only visible once the **CUSTOM NEOS** printer is selected (see screenshot above).

[System reports]

Opening the list of reports for the system settings.



NOTE

If you are using a **CUSTOM NEOS** printer, you cannot print system reports.

[Method reports]

Opening the list of reports for the current method.



NOTE

If you are using a **CUSTOM NEOS** printer, you cannot print method reports.

[Send]

Create a PC/LIMS report.

[Edit]

Edit the settings of the selected report.

[Print]

Print the selected report.

27.1 General report options

Fixed key : **Report options**

The settings for the report printout can be adjusted in the dialog **Print / Report options** to indicate, for example, whether a report header, a signature line or a frame is to be printed.

Report header

Defining the output of the report header. The report header contains general information such as device type, serial number, program version and the printing date.



NOTE

You can also define your own report header, which is printed in addition to this report header (**System ► Templates ► Report header**).

Selection	off | once | on each page
Default value	on each page

off

The report header will not be printed.

once

The report header will only be printed on the first page.

on each page

The report header will be printed on every page.

Signature line

Output of a special line for date and signature. This line will be printed at the very bottom of every page.

Selection	off | once | on each page
Default value	off

off

No signature line will be printed.

**once**

The signature line will only be printed on the last page.

on each page

The signature line will be printed on every page.

Frame

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

If this parameter is activated, a frame is printed as lateral marking.

27.2 Settings of the individual reports

Fixed key []: **More reports ► Report ► Edit**

Command REPORT: **Report ► Edit**

Settings can be edited for the following reports (for details, see online help):

- **Result report**
- **Curve**
Definition of the curve size, display of the individual measuring points and grid lines, etc.
- **Measuring point list**
Definition of the method command to which the measuring point list is to be printed.
- **Calculations**
Definition of the accuracy with which the variables used as well as the results calculated are printed.
- **Statistics short**
Definition of the time at which the report is to be printed (with each determination or only at the end of a sample series).
- **Statistics overview**
Definition of the time at which the report is to be printed (with each determination or only at the end of a sample series).
- **Sample table**
- **Result table**
Definition of the time at which the report is to be printed (with each determination, at the end of a sample series or at the end of the sample table).
- **Used devices**
- **Variables**
- **Monitoring**

27.3 List of all printable reports

The following reports can be printed out with the fixed key []:



NOTE

If you have selected a **CUSTOM NEOS** printer, you can print only the reports that are marked with a # on the display.

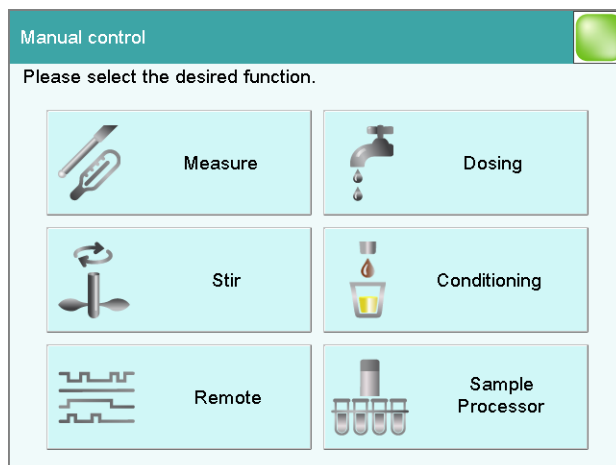
Report	Contents
Result report	# Report with determination properties, sample data, calculated results, etc. If there are multiple determinations, the statistics will also be printed out.
Curve	# Curve report. The settings for the curve print-out are adopted from the curve options of the live display.
Measuring point list	# Measuring point list report.
Calculations	# Details concerning the calculations carried out (parameter settings in accordance with the CALC command and the calculated results).
Used devices	The devices used for the determination, as displayed in the More determination data / Properties dialog.
Variables	All determination variables, as displayed in the results dialog.
Monitoring	Details for the monitored quantities (STAT, DOS only).
Statistics	
Statistics short	# Summary of the statistics calculations. The number of determinations, the mean value, and the absolute and relative standard deviations are printed out for each result.
Statistics overview	# Detailed statistical overview. The sample data and all individual results are printed out for each determination. The number of determinations, the mean value, and the absolute and relative standard deviations are printed out for each result.
PC/LIMS	

Report	Contents
PC/LIMS report	Machine-readable report with all of the important data for a determination. This report can be saved as a TXT or UTF-8 file or sent to a terminal program or a LIMS via an RS-232 interface. The definition is carried out in the device manager (<i>see chapter 11.3.2, page 85</i>).
Sample data	
Current sample data	Sample data of the current determination, <i>context-sensitive only</i> from the main dialog.
Sample table	List of all determinations in the sample table with the respective sample data, as entered in the sample table.
Result table	
Result table	List of all determinations in the result table with results and with the determination data, as saved in the result table.
More reports ► Method reports	
Method sequence	Method properties and the list of all method commands.
Parameters full	Method properties and options, all method commands with all parameters. All parameters which no longer have their default settings will be printed in bold . All parameters which have been modified in comparison to the stored version of the method are indicated by an *.
Titration & measuring param.	Method properties; titration, measurement and calibration commands with all parameters. All parameters which no longer have their default settings will be printed in bold . All parameters which have been modified in comparison to the stored version of the method are indicated by an *.
Modified parameters	Method properties, all method parameters which have been modified in comparison to the stored version of the method.
Non default parameters	Method properties, all method parameters which no longer have any default settings.
More reports ► System reports	
System settings	
System settings	Settings for acoustic signals and accuracy of the measured value display.

Report	Contents
Dialog options	Settings for routine dialog and expert dialog.
User list	List with all of the users configured in the system, together with their data, <i>context-sensitive only</i> from the user list.
Login options	Login options, <i>context-sensitive only</i> from the respective dialog.
Titrants	
Titrant list	List of all the titrants configured in the system.
All titrant data short	The most important titrant data of all titrants (name, concentration, titer, last titer determination).
All titrant data full	All of the titrant data of all of the titrants (working life, titer options, data concerning the exchange unit/dosing unit).
Titrant data short	The most important titrant data of the selected titrant, <i>context-sensitive only</i> from the editing dialog.
Titrant data full	All titrant data of the selected titrant, <i>context-sensitive only</i> from the editing dialog.
Sensors	
Sensor list	List of all the sensors configured in the system.
All sensor data short	The most important sensor data for all sensors (name, calibration data).
All sensor data full	All of the sensor data for all of the sensors (working life, complete calibration data, calibration interval).
Sensor data short	The most important sensor data of the selected sensor, <i>context-sensitive only</i> from the editing dialog.
Sensor data full	All of the sensor data of the selected sensor, <i>context-sensitive only</i> from the editing dialog.
Device manager	
Device list	List of all devices configured in the system.
All device properties	Properties of all the devices configured in the system.
Device properties	Properties of the selected device, <i>context-sensitive only</i> from the editing dialog.
GLP manager	
GLP data	All data stored in the GLP manager.
Common variables	

Report	Contents
Common variable list	List of all the common variables defined in the system, together with their most important data (name, value, status).
All common variable properties	Properties of all common variables (name, value, validity, status).
Common variable properties	Properties of the selected common variable (name, value, validity, status), <i>context-sensitive only</i> from the editing dialog.
Local Common variable list	List with the common variables available at the time of the determination, together with their most important data (name, value, status), <i>context-sensitive only</i> from the dialog "More determination data / Local common variables".
Local common var. properties	Properties of the selected common variable (name, value, validity, status), <i>context-sensitive only</i> from the dialog "More determination data / Local common variables".
Templates	
Templates sample data	Sample identification list and sample assignment table.
Result template list	List with all of the user-generated result templates.
All result templates details	Details of the all of the user-generated result templates (calculation formula, result options, note).
Result template details	Details of the selected result template, <i>context-sensitive only</i> from the editing dialog.
Input/Output lines	List with all of the defined input and output lines at the remote interface (name, bit pattern).
Custom calibration buffers	Temperature tables for all defined custom calibration buffers.
Rack tables	
Sample rack list	List with all of the sample racks configured in the system, together with designation, number of positions and rack code.

28 Manual control



The following functions are available in the manual control:

[Measure]

Carrying out manual measurements (*see chapter 28.2, page 257*).

Measuring modes:

- **pH** (potentiometric pH measurement)
- **U** (potentiometric voltage measurement)
- **Ipol** (voltametric measurement with selectable polarization current)
- **Upol** (amperometric measurement with selectable polarization voltage)
- **T** (temperature measurement)
- **Conc** (concentration measurement)
- **Cond** (conductivity measurement)

[Dosing]



NOTE

Only active if a Dosino or dosing unit is connected.

Manual dosing (*see chapter 28.3, page 261*).

The following dosing functions are available:

- Preparing the exchange unit or dosing unit
- Emptying the dosing unit
- Filling the dosing cylinder of the exchange unit/dosing unit
- Dosing a specified volume
- Dosing continuously

[Conditioning]

Conditioning the volumetric or coulometric titration cell manually (see chapter 28.5, page 271).

[Stir]

Controlling the stirrer manually (see chapter 28.4, page 270).

[Remote]

Scanning the input lines on the remote interface and setting the output lines (see chapter 28.6, page 272).


[Sample Processor]

Controlling the Sample Processor manually (see chapter 28.7, page 273).

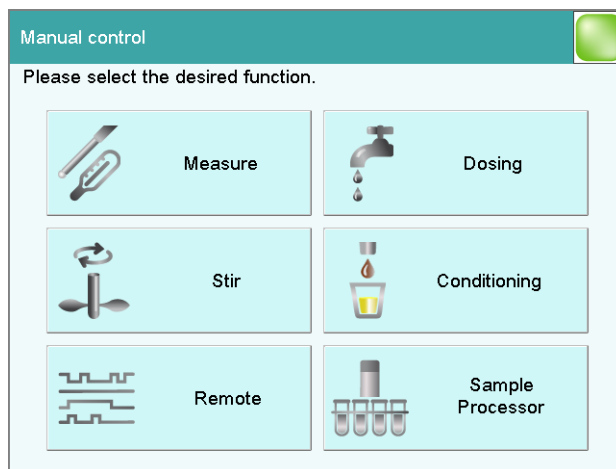
28.1 Opening and closing the manual control

Opening the manual control

1 Opening the dialog window

- Tap on the fixed key [].

Manual control opens:




2 Select the function

- Tap on the button for the desired function.

If the function can be carried out by several devices, a dialog to select the device will appear first; otherwise the dialog for the selected function will appear immediately.

Closing the manual control

- 1 Tap on the fixed key [].

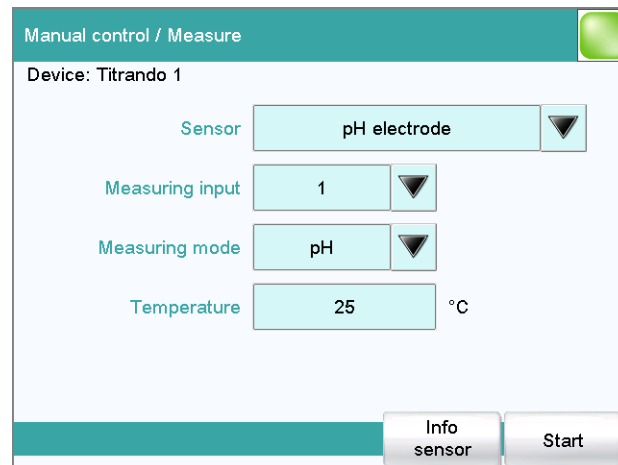


NOTE

Manual control can also be exited when a manual sequence has been started but has not yet ended. The fact that a sequence has been started in manual control can be recognized by the corresponding symbol in the title line (see chapter 6.2.3, page 20).

28.2 Measuring

Manual control ► Measure



Manual control / Measure

Device: Titrand 1

Sensor: pH electrode

Measuring input: 1

Measuring mode: pH

Temperature: 25 °C

Info sensor Start

Manual measurements can be carried out with the function **[Measure]**.

Proceed as follows:

1 Selecting a sensor

- Select the desired sensor from the sensor list.
All of the sensors available in the sensor list are displayed. Sensors are defined under **System ► Sensors**.
- Select the measuring input at which the sensor is connected.

2 Select a measuring mode

- Select the desired measuring mode.
Only those measuring modes are displayed which are advisable for the selected sensor.

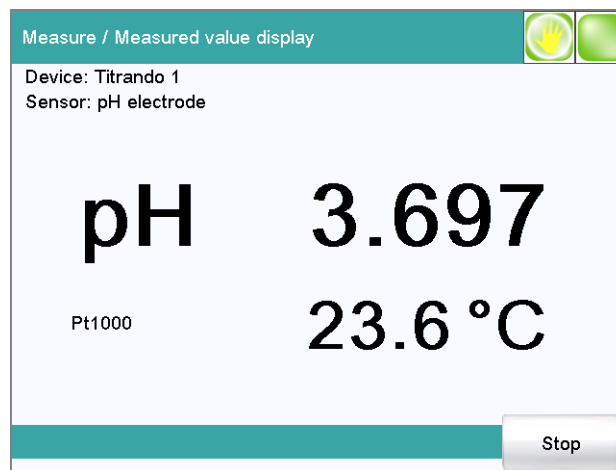
3 Enter a measuring temperature

- Enter the measuring temperature if no temperature sensor is connected. If a temperature sensor is connected, then the temperature will be measured automatically. This temperature is used for automatic temperature compensation with pH measurements.

4 Starting the measurement

- Tap on **[Start]**.

The measured value display is opened:



The ongoing measurement is canceled with **[Stop]**. The label switches once again to **[Start]**.

28.2.1 Parameter description

"Manual control / Measure" dialog

Sensor

Selection of the sensor from the sensor list. Sensors are defined under **System ► Sensors**.

Selection	Selection of configured sensors
-----------	---------------------------------

Measuring input

Selection of the measuring input the sensor is connected to. The selection depends on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Measuring mode

Selection of the measuring mode. Only those measuring modes are displayed which are advisable for the selected sensor.

Selection	pH | U | Ipol | Upol | Conc | Cond | T
pH	potentiometric pH measurement
U	potentiometric voltage measurement
Ipol	voltametric measurement with selectable polarization current
Upol	amperometric measurement with selectable polarization voltage
Conc	concentration measurement as direct measurement
Cond	conductivity measurement
T	temperature measurement

Temperature

This parameter is not available for conductivity measuring cells.

Temperature entered manually. If a temperature sensor is connected, then the temperature will be measured continuously. This value is used for temperature correction in pH and concentration measurements.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Measuring temp.

This parameter is available only with conductivity measurements.

Temperature entered manually. If a temperature sensor is connected then the temperature will be measured continuously.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

[Temp. compens.]

This button is available only with conductivity measurements.

Edit the parameters for converting the measured conductivity to a reference temperature.

[Info sensor]

Display information on the sensor.

"Measure / Temperature compensation" dialog

The parameters for converting the measured conductivity to a reference temperature are defined under **[Temp. compens.]**.

Reference temp.

The measured conductivity is converted to this temperature.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C
Selection	off

off

The temperature compensation is disabled.

Temp. compensation

Type of temperature compensation.

Selection	constant | ISO / DIN
-----------	-----------------------------

constant

The temperature compensation is carried out with the value entered for the temperature coefficient.

ISO / DIN

For ground water, spring water and surface water, the temperature coefficients according to standard ISO 7888:1985 (German version: DIN EN 27888:1993) are stored in the system.

Temp. coefficient

This parameter can only be edited with **Temp. compensation = constant**.

Temperature coefficient belonging to the reference temperature entered above. With this temperature coefficient, the conductivity is converted to the reference temperature.

Input range	0.00 to 9.99 %/°C
Default value	0.00 %/°C

28.3 Dosing

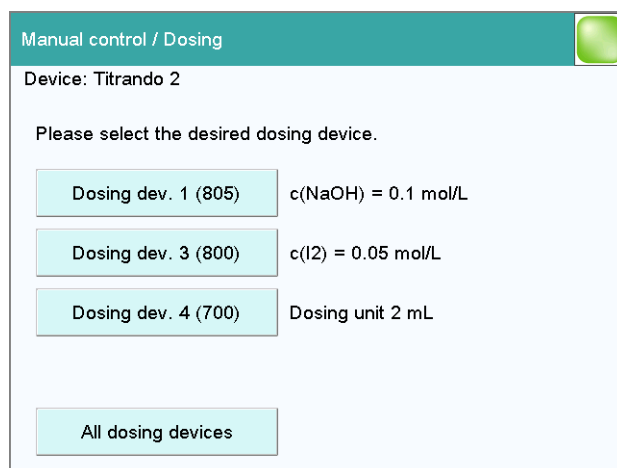
Manual control ► Dosing

The following dosing functions are available:

- Preparing the exchange or dosing unit (*see chapter 28.3.3, page 267*)
- Emptying the dosing unit (*see chapter 28.3.4, page 268*)
- Filling the dosing cylinder of the exchange unit/dosing unit (*see chapter 28.3.5, page 269*)
- Dosing a specified volume (*see chapter 28.3.2, page 265*)
- Dosing continuously (*see chapter 28.3.1, page 263*)

Selecting the dosing device

If several dosing devices are connected to a control instrument, then the dialog for selecting a dosing device will be opened.



[Dosing device X]

Selection of the dosing device. The MSB connector and the type of the connected dosing device are displayed.

Various information is shown next to the button:

- Titrant
For dosing devices of the type 8XX with an intelligent exchange unit or dosing unit the titrant name is read off the data chip.
- Cylinder volume
For dosing devices of the type 6XX or 7XX only the cylinder volume is displayed.
- ---
For exchange or dosing units which are not or not correctly attached.
- Manual busy
When a dosing function is being carried out.

[All dosing devices]

Carrying out the functions **[Prepare]**, **[Empty]** and **[Fill]** at the same time with several dosing devices of the control device.

Selecting the dosing function

If only one dosing device is connected, then the properties of this dosing device will be shown directly. This information varies according to the type of dosing device:

- Type 8XX with integrated data chip:
If an exchange or dosing unit with integrated data chip is attached, the data stored on the data chip is displayed.

- Type 8XX without integrated data chip:
If an exchange unit without integrated data chip is attached, then the titrant can be selected from the titrant list. We recommend always selecting the titrant. This ensures that the parameters defined for the titrant for the preparing are used. Titrants are defined under **System ► Titrants**.

[Empty]

Empty the cylinder and the tubings of the dosing unit (see chapter 28.3.4, page 268).

[Prepare]

Rinse the cylinder and the tubings of the exchange / dosing unit (see chapter 28.3.3, page 267).

[Fill]

Fill the cylinder of the exchange / dosing unit (see chapter 28.3.5, page 269).

[Dosing fixed vol.]

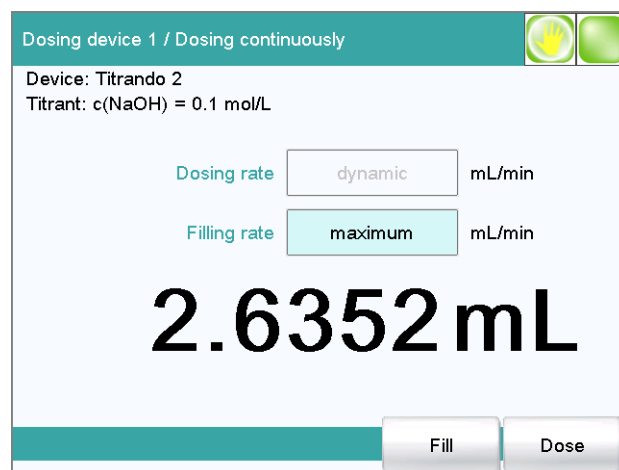
Dose a specified volume (see chapter 28.3.2, page 265).

[Dosing]

Dose continuously (see chapter 28.3.1, page 263).

28.3.1 Continuous dosing

Manual control: **Dosing ► Dosing**



With the function **[Dosing]**, dosing is continuous for as long as you hold the button **[Dose]** pressed down.

Proceed as follows:

1 Configure the dosing function



NOTE

- The dosing and filling rates should be decreased for viscous liquids.
- The maximum dosing and filling rates depend on the cylinder volume (*see chapter 32, page 503*).

- Enter the dosing rate.
- Enter the filling rate.

2 Start dosing

- Tap on **[Dose]**.

The volume dosed is displayed. When the volume of one cylinder has been dosed, the dosing cylinder will be refilled automatically.

3 Fill the cylinder

- Tap on **[Fill]**.

The dosing cylinder is filled. The displayed volume value will be reset to 0.0000 mL.



NOTE

If you exit the dialog with the fixed key [**↵**], the dosing cylinder is filled automatically.

Parameter description

Dosing rate

Rate at which it is dosed.

Input range	0.01 to 166.00 mL/min
Selection	maximum | dynamic
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

dynamic

This setting can only be selected when the dosing cylinder is filled. The dosing is being carried out faster and faster until the maximum dosing rate is reached (starting with 1 mL/min and then doubling the dosing rate every 1.5 s).

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

28.3.2 Dosing fixed volumes

Manual control: **Dosing ► Dosing fixed vol.**

Dosing device 1 / Dosing fixed volume

Device: Titrand 2
Titrant: c(NaOH) = 0.1 mol/L

Volume mL

Dosing rate mL/min

Filling rate mL/min

Fill automatic.

You can dose a particular volume with the **[Dosing fixed vol.]** function.

Proceed as follows:

1 Configure the dosing function**NOTE**

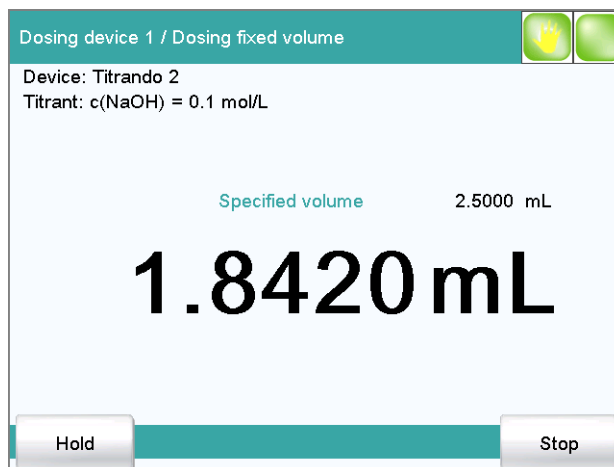
- The dosing and filling rates should be decreased for viscous liquids.
 - The maximum dosing and filling rates depend on the cylinder volume (*see chapter 32, page 503*).
- Enter the desired volume.

- Enter the dosing rate.
- Enter the filling rate.

2 Start dosing

- Tap on **[Start]**.

The volume display is shown. When the volume of one cylinder has been dosed, the dosing cylinder will be refilled automatically.



Continuous dosing is paused with **[Hold]**. The label changes to **[Continue]**. It can be used to resume the run.

3 Fill the cylinder

With the default settings (see "Fill automatic.", page 267) the dosing cylinder is filled automatically.

Otherwise:

- Tap on **[Fill]**.

The dosing cylinder is filled. The displayed volume value will be reset to 0.0000 mL.

Parameter description

Volume

Volume which is dosed.

Input range	0.00000 to 99999.9 mL
Default value	0.10000 mL

Dosing rate

The rate at which dosing takes place.

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

Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

Fill automatic.

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

If this parameter is activated, then the dosing cylinder is being automatically filled at the end of the dosing.

28.3.3 Preparing

Manual control: **Dosing ► Prepare**

The **Prepare** function is used to rinse and fill the cylinder and tubings of the exchange or dosing unit air bubble-free. You should carry out this function before the first determination or once a day.

If the titrant is selected (*see "Selecting the dosing function", page 262*), the parameters defined for the titrant for preparing/emptying and the tubing parameters will be used (dosing unit only). If the titrant is not selected, default parameters will be used (*see Chapter 32.2.2, page 504 and Chapter 32.3.2, page 505*).

The following two figures show the live display of an exchange unit and a dosing unit:

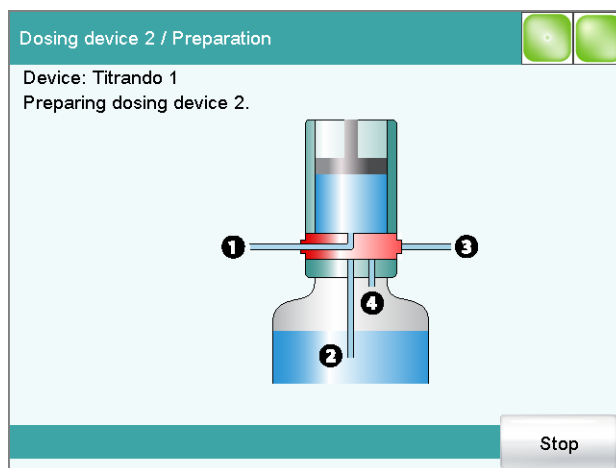


Figure 11 Live display "Preparing the dosing unit"

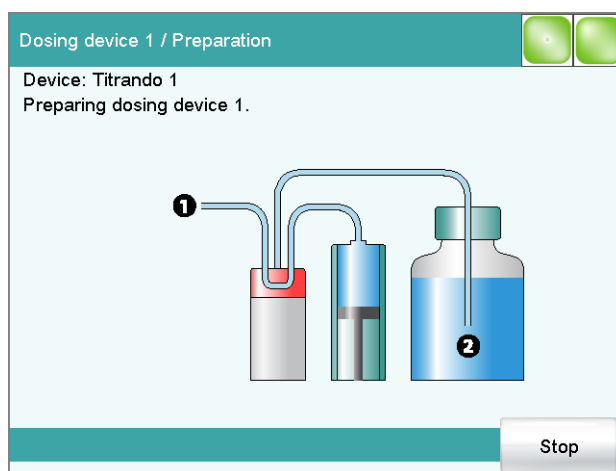


Figure 12 Live display "Preparing the exchange unit"

28.3.4 Emptying

Manual control: **Dosing ► Empty**



NOTE

The function **Empty** is possible only with dosing units.

The cylinders and the tubings of the dosing unit are emptied with this function.

If the titrant is selected (see "Selecting the dosing function", page 262), the parameters defined for the titrant for preparing/emptying and the tubing parameters will be used. If the titrant is not selected, default parameters will be used (see Chapter 32.3.2, page 505 and Chapter 32.2.2, page 504).

28.3.5 Filling

Manual control: **Dosing ► Fill**

You can use the function **[Fill]** to fill the dosing cylinder of the exchange unit/dosing unit manually. The filling rate cannot be configured; the maximum filling rate will be used.

28.3.6 Replacing reagent



NOTE

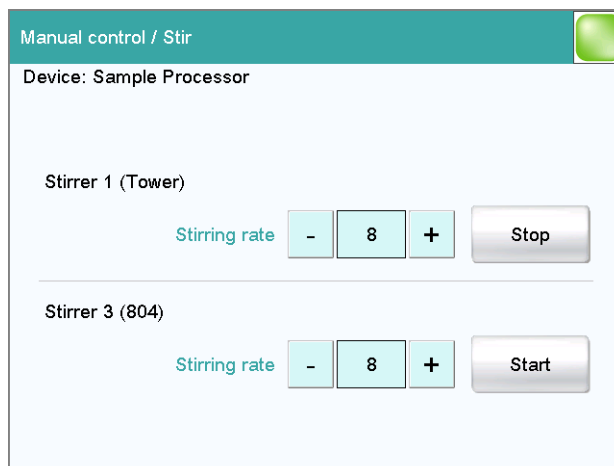
You can easily change the reagent in a dosing unit without no contact with the chemicals using the functions **Prepare** and **Empty**.

Proceed as follows:

- 1** Execute the function **[Empty]**.
- 2** Attach the dosing unit to the bottle with a suitable solvent.
- 3** Execute the function **[Prepare]**.
The last traces of the reagent in the cylinder and tubings are removed with the solvent.
- 4** Execute the function **[Empty]** again.
- 5** Attach the dosing unit to the bottle with the new reagent.
- 6** Execute the function **[Prepare]**.
The dosing unit can now be used.

28.4 Stirring

Manual control ► Stir



The MSB connector and type of stirrer is indicated for each connected stirrer.

You can control a connected stirrer manually with the function **[Stir]**.

Proceed as follows:

1 Setting the stirring rate

- Tap on the **[-]** or **[+]** button.
Each time one of the buttons is tapped, the stirring rate is reduced or increased by one level.

2 Switching on the stirrer

- Tap on **[Start]**.

The stirrer is started.

3 Switching off the stirrer

- Tap on **[Stop]**.

The stirrer is stopped.

Parameter description

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8



NOTE

If a stirrer is used in the determination run, it can still be manually controlled at the same time. For example, you can use the manual control to reduce the stirring rate of a stirrer which has been started in the determination run.

28.5 Conditioning a titration cell

Manual control ► Conditioning

In manual control, you have the option of permanently conditioning one titration cell for Karl Fischer titrations while carrying out a Karl Fischer titration in a second titration cell.

Proceed as follows:

1 Create a method

- Create a Karl Fischer method.
- Save the method.

2 Load the method

- Select the memory location where the desired method is saved.
- Tap on the input field **File name**.
The method table with the saved methods is opened.
- Select the desired method.

3 Start the conditioning

- Tap on **[Start]**.

The working medium is titrated to the endpoint. The status is kept stable.



28.5.1 Parameter description

Memory

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

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

Shared memory

Shared directory in the network.

File name

Selection of the method.

Selection	Selection of stored methods
-----------	------------------------------------

28.6 Remote

Manual control ▶ Remote



With the function **[Remote]**, you can define manual output signals to the remote interface of a connected Remote Box. It is not possible to define input signals; the current status of the input lines is, however, displayed.

Inputs

Current status of the input lines.

Outputs

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System ▶ Templates ▶ Output lines**.

Entering the bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal **00000000000001** line 0 is set. With a pulse, the length is set to 200 ms. If you wish to set pulses with other lengths, you have to define a corresponding template.

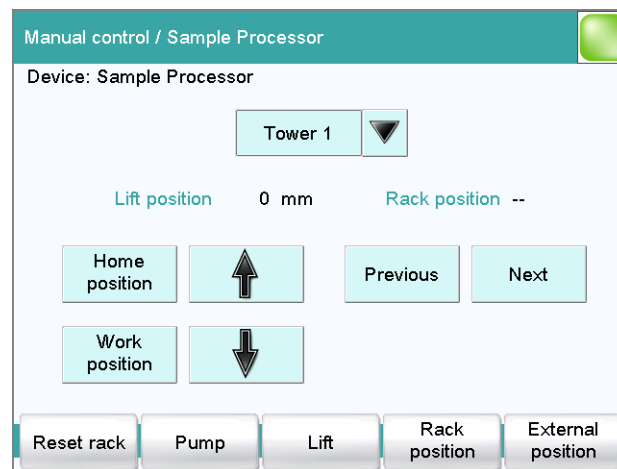
Entry	Bit pattern containing exactly 14 characters or a max. of 24 characters for the name of the template
Default value	00000000000001
Selection	Selection of the templates defined

[Set]

Set a defined output signal.

28.7 Sample Processor

Manual control ► Sample Processor



With the function **[Sample Processor]**, you can control a connected Sample Processor manually. The following functions are available:

- Rotating the sample rack
- Moving the lift
- Defining specific lift positions (work position, rinse position, etc.)
- Switching pumps on and off
- Initializing the rack
- Defining external positions outside of the sample rack (only with Swing Head)

Tower for the manual control.

Selection	Tower 1 | Tower 2
-----------	-------------------

Tower 1

View from the front, the right tower.

Tower 2

View from the front, the left tower. This selection is only available for Sample Processors with two towers.

Lift position

Current lift position.

Rack position

Current rack position. If the rack is not set to a valid position, e.g. after a rack reset, -- is displayed to indicate this.



NOTE

Note that the rack has to be set to a valid position for all lift movements! Otherwise a corresponding error message will be displayed.

Move to a valid rack position with **[Previous]** or **[Next]**. Alternatively, you can carry out a MOVE command.

[Home position]

Move the lift to the home position (corresponds to lift position 0 mm).

[Work position]

Move the lift to the work position of the current rack position or the external position.

The work position can directly be defined here (see "Assigning lift positions", page 276) or in the device manager (see "Lift positions Tower 1/2", page 106).

[↑]

Continuously move the lift upwards as long as the button is pressed down. The lift rate used is defined in the dialog **Sample Processor / Lift**.

[↓]

Continuously move the lift downwards as long as the button is pressed down. The lift rate used is defined in the dialog **Sample Processor / Lift**.

[Previous]

Move to the previous rack position.

[Next]

Move to the next rack position.

[Reset rack]

Initialize the rack. This function is identical with the command **RACK**. The following actions are carried out:

- The lift is moved upwards.
- The sample rack is rotated to the starting position.
- The rack code of the rack attached is being read out and the corresponding rack data is transferred to the Sample Processor.
- The sample variable is being reset to the value 1.

[Pump]

Switch on and off the pumps mounted or connected to the tower.

[Lift]

Move the lift to any or a specific lift position and assigning lift positions (see chapter 28.7.1, page 275).

[Rack position]

Move the rack to any sample position or to defined positions which are defined as special beakers (see chapter 28.7.2, page 277).

[External position]

This button is only enabled when a Swing Head is mounted to the Sample Processor.

Swing the robotic arm to an external position outside the sample rack and assign the swing angle and the lift position (see chapter 28.7.3, page 279).

28.7.1 Moving the lift

Manual control: **Sample Processor ▶ Lift**

Sample Processor / Lift

Tower 1

Current lift pos. 0 mm

Move to lift pos. Work position mm

Lift rate 25 mm/s

Assign lift pos. Start

In the dialog **Sample Processor / Lift**, you can move the lift to any lift position. You can also define frequently used positions (work position, rinse position, etc.) as specific lift positions and then to move to them with



ease (see "Assigning lift positions", page 276). This definition is possible in this dialog for the attached rack, and in the device manager for all of the racks in the list.

Current lift pos.

Current lift position.

Move to lift pos.

Selecting a predefined lift position or enter any lift position.

Input range	0 to 'maximum stroke path' mm A lift position of 0 mm corresponds to the "home position", i.e. the lift is located at the upper stop position. The maximum stroke path is defined in the properties of the tower (see "Maximum stroke path", page 96). If a higher value is entered, an error message will be displayed.
Selection	Work position | Shift position | Rinse position | Special position
Default value	Work position

Lift rate

Rate at which the lift is moved in the manual control.

Input range	5 to 25 mm/s
Default value	25 mm/s

[Assign lift pos.]

Assign the current lift position to a preset lift position.

Assigning lift positions

Specific lift position are stored separately for every sample rack used as well as for tower 1 and tower 2. The following specific lift positions are available:

- **General rack positions**
For general rack positions you can define one work position, one shift position and one rinse position as well as one special position.
- **Special beaker positions**
A specific work position can be defined for each special beaker. The definitions of the general rack positions are used for the shift position, rinse position and special position of the affected tower.

- **External positions** (only with robotic arm and mounted Swing Head, see Chapter 28.7.3, page 279)

For each of the four possible external positions, a specific work position can be defined. Shift position and rinse position can only be defined for all four external positions commonly. A special position is not possible.

Proceed as follows to assign the current lift position to a specific lift position:

1 Move to lift position

- Enter the desired lift position in mm and tap on **[Start]**.

The lift moves to the desired lift position.

2 Assign lift position

- Tap on **[Assign lift pos.]**.

The **Lift / Assign lift position** dialog is displayed:

Lift / Assign lift position	
Current lift pos. 100 mm	
Position name	Position height
Work position	130 mm
Shift position	50 mm
Rinse position	100 mm
Special position	0 mm
Assign	

- Select the desired specific lift position and tap on **[Assign]**.

The current lift position is assigned to the specific lift position.

28.7.2 Moving to a rack position

Manual control: **Sample Processor ► Rack position**

In the dialog **Sample Processor / Rack position**, you can move to any position on the attached rack.

Current rack pos.

Current rack position. If the rack is not set to a valid position, e.g. after a rack reset, -- is displayed to indicate this.

Rack position

Desired rack position.

Input range	1 to Number of positions on the rack attached.
Default value	1
Selection	Special beaker 1...16

Special beaker 1...16

The selection depends on how many rack positions are defined as special beakers (see "Editing special beakers", page 107).

Shift rate

Rate at which the sample rack is moved.

Input range	3 to 20 °/s
Default value	20 °/s

Shift direction

Direction in which the rack is moved.

Selection	auto | + | -
Default value	auto

auto

A shift direction, with which the shorter way has to be passed, is automatically selected.

- +
Counterclockwise rotation.
- Clockwise rotation.

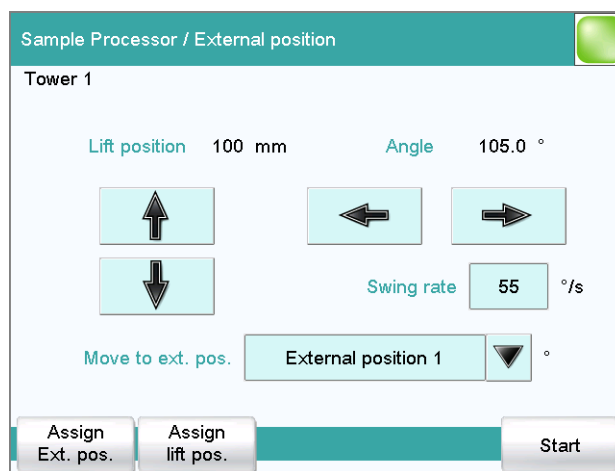
Swing rate

Rate at which the robotic arm is swung in the manual control.

Input range	10 to 55 °/s
Default value	55 °/s

28.7.3 External positions

Manual control: **Sample Processor ▶ External position**



NOTE

This dialog is accessible only if you have a Swing Head with robotic arm attached to the Sample Processor.

In the dialog **Sample Processor / External position**, you can swivel the robotic arm to an external position outside of the sample rack. As with the rack positions, here you can also define up to four frequently used external positions as specific positions. You can assign specific lift positions to these positions, analogous to the rack positions.

External positions are required if you have, for example, a measuring vessel or a titration cell mounted in addition to the rack.

Lift position

Current lift position.

Angle

Current angle position of the robotic arm.



[↑]

Only enabled, when the robotic arm has been moved to a specific external position with **[Start]**.

Continuously move the lift upwards as long as the button is pressed down. The lift rate used is defined in the dialog **Sample Processor / Lift**.

[↓]

Only enabled, when the robotic arm has been moved to a specific external position with **[Start]**.

Continuously move the lift downwards as long as the button is pressed down. The lift rate used is defined in the dialog **Sample Processor / Lift**.

[↻]

Swing the robotic arm in clockwise direction as long as the button is pressed down.

[⇨]

Swing the robotic arm in counterclockwise direction as long as the button is pressed down.

Swing rate

Rate at which the robotic arm is swung in the manual control.

Input range	10 to 55 °/s
Default value	55 °/s

Move to ext. pos.

Selecting a predefined position or entering any swing angle.

Input range	(Offset) to (Offset + max. swing range) ° The offset is made up of a design-dependent angle (approx. 8...9°) together with the robotic arm offset from the robotic arm properties. The maximum swing range is also defined under the robotic arm properties (see " <i>Properties – Robotic arm</i> ", page 99).
Selection	External position 1..4

[Assign Ext. pos.]

Assign the current angle position of the robotic arm to an external position as swing angle.

[Assign lift pos.]

Assign the current lift position to a preset lift position.

Assigning swing angles and lift positions

For each of the four possible external positions, a specific work position can be defined. Shift position and rinse position can only be defined for all four external positions commonly. A special position is not possible.

Proceed as follows to assign a swing angle to an external position and to assign the current lift position to a specific lift position:

1 Move to the external position

- Swing the robotic arm to the desired position with the arrow keys [←] or [→].

2 Assign the external position

- Tap on **[Assign Ext. pos.]**.
The **External position / Assign swing angle** dialog is displayed:

External position / Assign swing angle	
Current robotic arm angle 98.0 °	
External position	Angle
1	105.0 °
2	60.0 °
3	60.0 °
4	60.0 °
Assign	

- Select the desired external position and tap on **[Assign]**.

The current angle position of the robotic arm is assigned to the external position.

3 Move to the external position

- Tap on [↩].
The next higher-level dialog is displayed.
- Select **Move to ext. pos. = External position X** (X = 1...4) and tap on **[Start]**.

The robotic arm swings to the desired position.

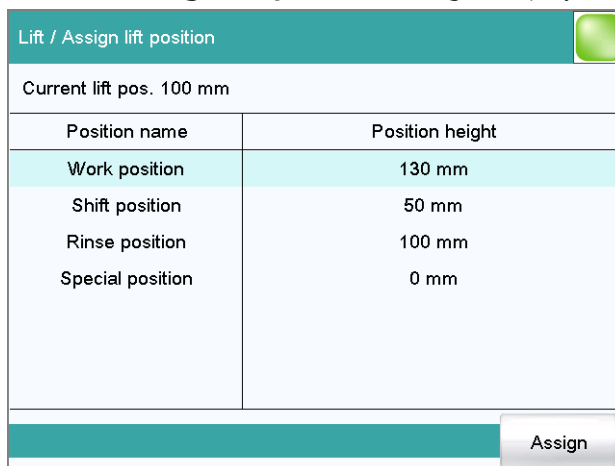
4 Move to lift position

- Move the lift to the desired height with the arrow keys [↑] or [↓].



5 Assign lift position

- Tap on **[Assign lift pos.]**.
The **Lift / Assign lift position** dialog is displayed:

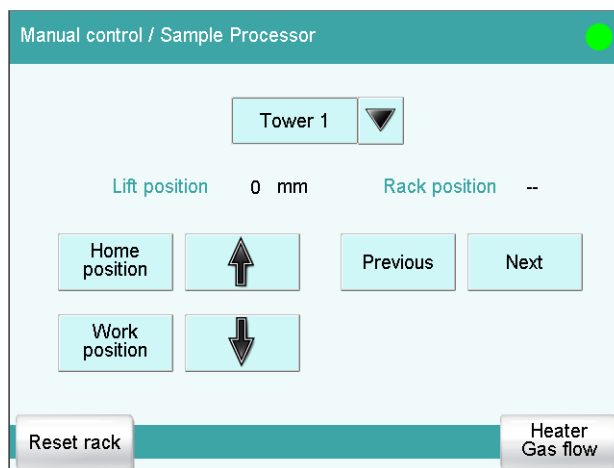


- Select the desired specific lift position.
- Tap on **[Assign]**.

The current lift position is assigned to the specific lift position.

28.8 885 Compact Oven SC

Manual control ► Sample Processor



You can control a connected 885 Compact Oven SC manually with the **[Sample Processor]** function. The following functions are available:

- Initializing the rack
- Settings for the heating and the gas flow

Lift position

Current lift position.

Rack position

Current rack position. If the rack is not set to a valid position, e.g. after a rack reset, -- is displayed to indicate this.



NOTE

Note that the rack has to be set to a valid position for all lift movements! Otherwise a corresponding error message will be displayed.

Move to a valid rack position with **[Previous]** or **[Next]**. Alternatively, you can carry out a MOVE command.

[Home position]

Move the lift to the home position (corresponds to lift position 0 mm).

[Work position]

Move the lift to the work position of the current rack position.

The work position for sample beakers and conditioning beakers is defined in the device manager (*see chapter 11.7.2, page 112*).

[↑]

Move the lift continuously upwards as long as the button is pressed down. The lift moves in 6 mm steps.

[↓]

Move the lift continuously downwards as long as the button is pressed down. The lift moves in 6 mm steps.

[Previous]

Move to the previous rack position.

[Next]

Move to the next rack position.

[Reset rack]

Initialize the rack. This function is identical with the command **RACK**. The following actions are carried out:

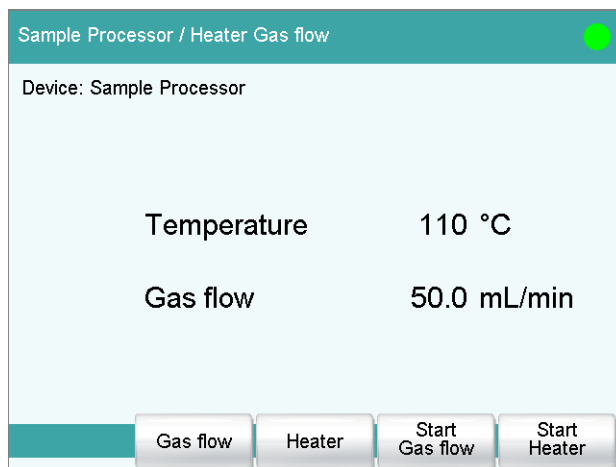
- The lift is moved upwards.
- The sample rack is rotated to the starting position.
- The sample variable is reset to the value 1.

[Heater Gas flow]

Display, control and settings of the current temperature and current gas flow.

28.8.1 Controlling the heating/gas flow

Manual control: **Sample Processor ▶ Heater Gas flow**



You can see, control and set the current temperature and current gas flow in the **Sample Processor / Heater Gas flow** dialog.

[Gas flow]

Edit parameters for the gas flow.

[Heater]

Edit parameters for the heater.

[Start / Stop Gas flow]

Starts or stops the gas flow.

[Start / Stop Heater]

Starts or stops the heater.

Settings for the gas flow

Flow rate

Flow rate for the gas flow.

Input range	10 to 150 mL/min (Increment: 1)
Default value	50 mL/min

Gas supply

Selection of the gas supply.

Selection	pump | valve
Default value	pump

pump

The integrated air pump is used for the gas flow.

valve

The integrated inlet valve is used for the gas flow. The inlet valve in the 885 Compact Oven SC is connected to compressed air or nitrogen.

Gas type

Gas type of the carrier gas used.

Selection	air | nitrogen
Default value	air

Settings for the oven temperature**Temperature**

Temperature to which the oven is heated.

Input range	50 to 250 °C (Increment: 1)
Default value	110 °C

29 Parameters



NOTE

For most of the numerical parameters, the result of a calculation can also be utilized in place of a number. A description of this can be found in the appendix (see chapter 32.6, page 507).

29.1 Dynamic equivalence point titrations (DET)

29.1.1 Start conditions

The parameters that are carried out before the start of titration are defined under **[Start conditions]**. The start conditions are processed in the following sequence:

1. Start volume
2. Start measured value
3. Start slope
4. Pause

Start volume

Volume that is dosed prior to the start of the titration.

Input range	0.00000 to 9999.99 mL
Default value	0.00000 mL

Dosing rate

Rate at which the start volume is dosed.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (see chapter 32, page 503).

Pause

Waiting time, e.g. for the electrode to settle down after the start or a reaction time after the dosing of a start volume. The time entered here is only running when all start conditions have been fulfilled.

Input range	0 to 999999 s
Default value	0 s

More start conditions

Start meas. value

Before starting the titration, it will be dosed until this measured value is reached. If the start measured value is reached by the dosing of a start volume, then the titration starts directly.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measuring mode U, Ipol:

Input range	-2000.0 to 2000.0 mV
Selection	off
Default value	off

Measuring mode Upol:

Input range	-200.0 to 200.0 µA
Selection	off
Default value	off

Start slope

Before starting the titration, it will be dosed until this slope (measured value per volume) is reached. If the start slope is reached by the dosing of a start volume, then the titration starts directly.

Measuring mode pH:

Input range	00.000 to 9,999 pH/mL
Selection	off
Default value	off

Measuring mode U, Ipol:

Input range	0 to 999 mV/mL
Selection	off
Default value	off

Measuring mode Upol:

Input range	0 to 99 µA/mL
Selection	off
Default value	off



Dosing rate

Rate to be dosed with until the start measured value or the start slope is reached.

Input range	0.01 to 166.00 mL/min
Default value	5.00 mL/min
Selection	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Initial measured value

The [**Initial meas. value**] is measured before carrying out the **start conditions**. This value is used for the **titration direction determination**, which is necessary for the **start measured value** and **stop measured value** parameters.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

Measuring mode pH, U and I_{pol}:

Input range	0.1 to 999.0 mV/min
Selection	off
Default value	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Upol:

Input range	0.01 to 99.90 µA/min
Selection	off
Default value	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	0 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	1 s

29.1.2 Titration parameters

Under **[Titration parameters]**, the parameters influencing the run of the entire titration are defined.

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	slow | optimal | fast | user
Default value	optimal

slow

For titrations in which the finest details are also to be visible. This could however also lead to an increase in noise, which could result in unwanted equivalence points.

optimal

For all standard titrations. The parameters have been optimized for the most frequent applications.

fast

For fast and less critical titrations.

user

The individual titration parameters can be modified.



NOTE

Select **optimal** as titration rate when you are developing a new titration method. This parameter is suitable for virtually all titrations and only needs adaptation in special cases.

The settings of the individual titration rates are listed in *table 9, page 292*.

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog



of the command). This value is used for temperature correction in pH measurements.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

User-defined parameters

These parameters are only accessible when **Titration rate = user**.

Meas. point density

A small value means small volume increments, i.e. a high measuring point density. The curve then shows all the finest details which also include noise; this could cause unwanted equivalence points to be found. A larger value, i.e. a smaller measuring point density, permits quicker titrations. If you are using a dosing device with a small cylinder volume then a smaller measuring point density value may be beneficial. However, you should also set a smaller signal drift and a higher EP criterion at the same time.

Input range	0 to 9
Default value	4

Min. increment

This smallest permitted volume increment is added at the start of the titration and with steep curves in the region of the equivalence point. Very small values should only be used if a low titrant consumption is expected; otherwise unwanted equivalence points could be evaluated.

Input range	0.05 to 999.90 µL
Default value	10.00 µL

Max. increment

A maximum volume increment should be selected in the following cases:

- when titration consumption is very low up until the equivalence point is reached.
- when a start volume is dosed up until shortly before the equivalence point is reached.
- when the change of direction in the jumping range is very abrupt, because otherwise it could easily happen that an excessively large volume will be dosed in the region of the equivalence point.

The value should not be less than 1/100 cylinder volume.

Input range	0.1 to 9999.9 µL
Selection	off
Default value	off

**NOTE**

It is not advisable to select similar volumes for the minimum and the maximum increment. Monotonic equivalence point titration (MET) is appropriate for these applications.

Dosing rate

Rate at which the volume increments are dosed.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. This type of titration is often referred to as equilibrium titration. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

**NOTE**

A constant measured value is often only reached after a certain time, as mixing and the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e. reaching a constant measured value takes longer and longer. Drift-controlled measured value acceptance is particularly advisable in such cases, as the measured values are only accepted when equilibrium has almost been reached.

Measuring mode pH, U and Ipol:

Input range	0.1 to 999.0 mV/min
Default value	50.0 mV/min
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed. This can be useful when the titration reaction proceeds slowly or the electrode is slow to respond.

*Measuring mode Upol:*

Input range	0.01 to 99.90 $\mu\text{A}/\text{min}$
Default value	50.00 $\mu\text{A}/\text{min}$
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed. This can be useful when the titration reaction proceeds slowly or the electrode is slow to respond.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	0 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	26 s

Table 9 Default values of the predefined titration rates for DET

	Titration rate		
	slow	optimal	fast
Meas. point density	2	4	6
Min. increment	10.00 μL	10.00 μL	30.00 μL
Max. increment	off	off	off
Dosing rate	maximum	maximum	maximum
Signal drift			
– pH, U and I _{pol}	20.0 mV/min	50.0 mV/min	80.0 mV/min
– U _{pol}	20.0 $\mu\text{A}/\text{min}$	50.0 $\mu\text{A}/\text{min}$	80.0 $\mu\text{A}/\text{min}$
Min. waiting time	0 s	0 s	0 s
Max. waiting time	38 s	26 s	21 s

29.1.3 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**.

Stop volume

The titration is stopped when the specified volume has been dosed since the start of the titration. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	0.0000 to 9999.99 mL
Default value	100,000 mL
Selection	off

Stop meas. value

The titration is canceled when the specified measured value has been reached since the start of the titration.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measuring mode U, Ipol:

Input range	-2000.0 to 2000.0 mV
Selection	off
Default value	off

Measuring mode Upol:

Input range	-200.0 to 200.0 μA
Selection	off
Default value	off

Stop EP

The titration is stopped when the specified number of equivalence points has been found.

Input range	1 to 9
Default value	9
Selection	off



Volume after EP

This volume will be added when the number of equivalence points defined under **Stop EP** has been found. The curve shape after the equivalence point can also be seen this way.

Input range	0.01000 to 9999.99 mL
Selection	off
Default value	off

Stop time

The titration is stopped when the specified time has elapsed since the start of the titration.

Input range	0 to 999999 s
Selection	off
Default value	off

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

29.1.4 Potentiometric evaluation

The parameters for the evaluation of the titration curve are defined under **[Potentiometr. evaluation]**.

EP criterion

The Equivalence point Recognition Criterion (ERC) found is compared with this value. Equivalence points whose ERC is less than the value defined here will be ignored.

Input range	0 to 200
Default value	5

EP recognition

This parameter allows you to filter out only the equivalence points that are being sought.

Selection	all | greatest | last | ascending | descending | off
Default value	all

all

All equivalence points will be recognized.

greatest

Only the equivalence point with the greatest ERC value, i.e. the steepest jump, will be recognized.

last

Only the last equivalence point will be recognized.

ascending

Only equivalence points with a positive slope of the titration curve will be recognized.

descending

Only equivalence points with a negative slope of the titration curve will be recognized.

off

No evaluation takes place.

Set windows

This parameter allows to recognize equivalence points only in a particular range (so-called window) of the curve. Equivalence points outside this window will not be recognized. A maximum of 9 windows can be defined. Setting windows is advisable when interference and unnecessary equivalence points are to be suppressed.

Selection	Measured value | Volume | off
Default value	off

Measured value

The windows are defined on the measured value axis.

Volume

The windows are defined on the volume axis.

off

The entire titration curve is being evaluated.

Setting windows

The list of defined windows is opened with **[Set window]**.

When the list is opened for the first time, a window over the entire measured value range or volume range is already defined. The windows must not overlap, they only may lie next to one another. For each window, own criteria can be defined for the equivalence point recognition.

**NOTE**

When you define a result variable instead of a numerical value as limit value (*see chapter 32.6, page 507*), then just one window can be defined.

[New]

Define a new window. This is only possible when not the entire range is covered yet.

[Delete]

Delete the selected window.

[Edit]

Edit the settings of the selected window.

Lower limit

Measured value or volume for the lower limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measured value (measuring mode pH):

Input range	-20.000 to 20.000
Default value	-20.000

Measured value (measuring mode U, Ipol):

Input range	-2000.0 to 2000.0 mV
Default value	-2000.0 mV

Measured value (measuring mode Upol):

Input range	-200.00 to 200.00 μA
Default value	-200.00 μA

Volume:

Input range	0.00000 to 9999.99 mL
Default value	0.00000 mL

Upper limit

Measured value or volume for the upper limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measured value (measuring mode pH):

Input range	-20.000 to 20.000
Default value	20.000

Measured value (measuring mode U, I_{pol}):

Input range	-2000.0 to 2000.0 mV
Default value	2000.0 mV

Measured value (measuring mode U_{pol}):

Input range	-200.00 to 200.00 µA
Default value	200.00 µA

Volume:

Input range	0.00000 to 9999.99 mL
Default value	9999.99 mL

EP criterion

The Equivalence point Recognition Criterion (ERC) found is compared with this value. Equivalence points whose ERC is less than the value defined here will be ignored.

Input range	0 to 200
Default value	5

EP recognition

This parameter allows you to filter out only the equivalence points that are being sought.

Selection	first | greatest | last | ascending | descending
Default value	first

first

Only the first equivalence point will be recognized.

greatest

Only the equivalence point with the greatest ERC value, i.e. the steepest jump, will be recognized.

last

Only the last equivalence point will be recognized.

ascending

Only equivalence points with a positive slope of the titration curve will be recognized.

descending

Only equivalence points with a negative slope of the titration curve will be recognized.

Only one equivalence point will be recognized in a window. The numbering of the equivalence points (EP) is defined by the numbering of the win-

dows (e.g. EP2 in window 2), so that even if EPs are missing, the calculations will still be carried out with the correctly assigned EP volumes.

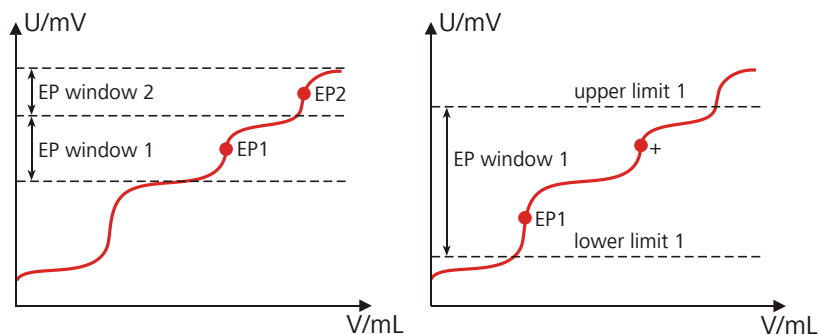


Figure 13 Equivalence point recognition and equivalence point numbering within windows

In the first example in the above figure, two equivalence points are recognized in two different windows (EP1 in window 1 and EP2 in window 2). In the second example, two equivalence points are found in one window, but only the first one is recognized. In order to ensure that the user recognizes that more than one equivalence point was found in the set window, EP1 is marked with a "+" in the result view. In addition, a corresponding message is entered in the message list.

Evaluation and equivalence point criterion with DET

The equivalence points (EP) are localized in a way similar to the Tubbs method [1][2]. The volume value of the equivalence point (V_E) is shifted from the inflection point (see arrow) towards the smaller circle of curvature for real asymmetric titration curves.

[1] C. F. Tubbs, *Anal. Chem.* **1954**, 26, 1670–1671.

[2] E. Bartholomé, E. Biekert, H. Hellmann, H. Ley, M. Weigert, E. Weise, *Ullmanns Encyklopädie der technischen Chemie*, Vol. 5, Verlag Chemie, Weinheim, 1980, p. 659.

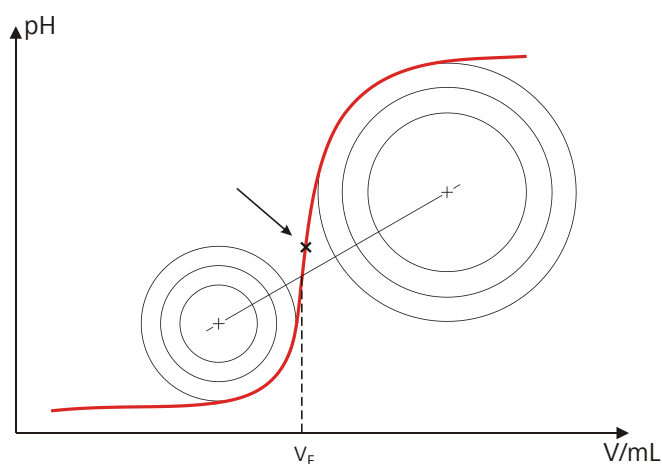


Figure 14 Tubbs method for determining the equivalence point

The figure shows that the evaluation still requires measured values from the measuring point list even after the equivalence point.

For the recognition of the EPs found, the set EP criterion is compared to the ERC (Equivalence point Recognition Criterion) found. The ERC is the first derivative of the titration curve combined with a mathematical function that is more sensitive for flat jumps than for steeper ones. EPs whose ERC is smaller than the defined EP criterion will not be recognized. The ERC is displayed in the results dialog for each discovered and recognized EP. If you adjust the EP criterion later in order to recognize more or fewer EPs, then you can reevaluate the determination (**[Recalculate]** function in the results dialog).

29.1.5 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.1.6 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a



determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

I(pol)

The polarization current is the current that is applied to a polarizable electrode during voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-125.0 to 125.0 µA (Increment: 2.5)
Default value	5.0 µA
Selection	-1.0 µA | 1.0 µA

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-1,250 to 1,250 mV (Increment: 25)
Default value	400 mV

Electrode check

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

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.1.7 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.



29.1.8 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.2 Monotonic equivalence point titrations (MET)

29.2.1 Start conditions

The parameters that are carried out before the start of titration are defined under **[Start conditions]**. The start conditions are processed in the following sequence:

1. Start volume
2. Start measured value
3. Start slope
4. Pause

Start volume

Volume that is dosed prior to the start of the titration.

Input range	0.00000 to 9999.99 mL
Default value	0.00000 mL

Dosing rate

Rate at which the start volume is dosed.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Pause

Waiting time, e.g. for the electrode to settle down after the start or a reaction time after the dosing of a start volume. The time entered here is only running when all start conditions have been fulfilled.

Input range	0 to 999999 s
Default value	0 s

More start conditions

Start meas. value

Before starting the titration, it will be dosed until this measured value is reached. If the start measured value is reached by the dosing of a start volume, then the titration starts directly.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measuring mode U, Ipol:

Input range	-2000.0 to 2000.0 mV
Selection	off
Default value	off

Measuring mode Upol:

Input range	-200.0 to 200.0 µA
Selection	off
Default value	off

Selection	off
Default value	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Upol:

Input range	0.01 to 99.90 μA/min
Selection	off
Default value	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	0 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	1 s

29.2.2 Titration parameters

Under **[Titration parameters]**, the parameters influencing the run of the entire titration are defined.

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	slow | optimal | fast | user
Default value	optimal

slow

For titrations in which the finest details are also to be visible. This could however also lead to an increase in noise, which could result in unwanted equivalence points.

optimal

For all standard titrations. The parameters have been optimized for the most frequent applications.

fast

For fast and less critical titrations.

user

The individual titration parameters can be modified.

**NOTE**

Select **optimal** as titration rate when you are developing a new titration method. This parameter is suitable for a lot of titrations and only needs adaptation in special cases.

The settings of the individual titration rates are listed in *table 10, page 308*.

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

User-defined parameters

These parameters are only accessible when **Titration rate = user**.

Volume increment

The volume that is dosed at each dosing step. High accuracy requires using the correct volume increment.

A good guideline for the volume increment is 0.1 mL. A total of 20 dosing steps is recommended until the equivalence point is reached.

With greater consumption, the titration time can be optimized using the start conditions. Smaller volume increments (smaller than 0.1 mL) are required to determine blank values or to ensure accuracy with highly asymmetric curves. Larger volume increments are advisable for flatter curves.

**NOTE**

The accuracy of the evaluation cannot be increased by using smaller increments as the measured value changes between two measuring points are then of the same order of magnitude as the noise.

Input range	0.00005 to 999.900 mL
Default value	0.10000 mL

Dosing rate

Rate at which the volume increments are dosed.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. This type of titration is often referred to as equilibrium titration. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

**NOTE**

A constant measured value is often only reached after a certain time, as mixing and the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e. reaching a constant measured value takes longer and longer. Drift-controlled measured value acceptance is particularly advisable in such cases, as the measured values are only accepted when equilibrium has almost been reached.

Measuring mode pH, U and Ipol:

Input range	0.1 to 999.0 mV/min
Default value	50.0 mV/min
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed. This can be useful when the titration reaction proceeds slowly or the electrode is slow to respond.

Measuring mode Upol:

Input range	0.01 to 99.90 $\mu\text{A}/\text{min}$
Default value	50.00 $\mu\text{A}/\text{min}$
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed. This can be useful when the titration reaction proceeds slowly or the electrode is slow to respond.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	0 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	26 s

Table 10 Default values of the predefined titration rates for MET

	Titration rate		
	slow	optimal	fast
Volume increment	0.05000 mL	0.10000 mL	0.20000 mL
Dosing rate	maximum	maximum	maximum
Signal drift			
– pH, U and I _{pol}	20.0 mV/min	50.0 mV/min	80.0 mV/min
– U _{pol}	20.0 $\mu\text{A}/\text{min}$	50.0 $\mu\text{A}/\text{min}$	80.0 $\mu\text{A}/\text{min}$
Min. waiting time	0 s	0 s	0 s
Max. waiting time	38 s	26 s	21 s

29.2.3 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**.

Stop volume

The titration is stopped when the specified volume has been dosed since the start of the titration. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	0.0000 to 9999.99 mL
Default value	100,000 mL
Selection	off

Stop meas. value

The titration is canceled when the specified measured value has been reached since the start of the titration.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measuring mode U, Ipol:

Input range	-2000.0 to 2000.0 mV
Selection	off
Default value	off

Measuring mode Upol:

Input range	-200.0 to 200.0 μA
Selection	off
Default value	off

Stop EP

The titration is stopped when the specified number of equivalence points has been found.

Input range	1 to 9
Default value	9
Selection	off



Volume after EP

This volume will be added when the number of equivalence points defined under **Stop EP** has been found. The curve shape after the equivalence point can also be seen this way.

Input range	0.01000 to 9999.99 mL
Selection	off
Default value	off

Stop time

The titration is stopped when the specified time has elapsed since the start of the titration.

Input range	0 to 999999 s
Selection	off
Default value	off

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

29.2.4 Potentiometric evaluation

The parameters for the evaluation of the titration curve are defined under **[Potentiometr. evaluation]**.

EP criterion

The Equivalence point Recognition Criterion (ERC) found is compared with this value. Equivalence points whose ERC is less than the value defined here will be ignored.

Measuring mode pH:

Input range	0.10 to 9.99
Default value	0.50

Measuring mode U, Ipol:

Input range	1 to 999 mV
Default value	30 mV

Measuring mode Upol:

Input range	0.1 to 99.9 μA
Default value	2.0 μA

EP recognition

This parameter allows you to filter out only the equivalence points that are being sought.

Selection	all | greatest | last | ascending | descending | off
Default value	all

all

All equivalence points will be recognized.

greatest

Only the equivalence point with the greatest ERC value, i.e. the steepest jump, will be recognized.

last

Only the last equivalence point will be recognized.

ascending

Only equivalence points with a positive slope of the titration curve will be recognized.

descending

Only equivalence points with a negative slope of the titration curve will be recognized.

off

No evaluation takes place.

Set windows

This parameter allows to recognize equivalence points only in a particular range (so-called window) of the curve. Equivalence points outside this window will not be recognized. A maximum of 9 windows can be defined. Setting windows is advisable when interference and unnecessary equivalence points are to be suppressed.

Selection	Measured value | Volume | off
Default value	off

Measured value

The windows are defined on the measured value axis.

Volume

The windows are defined on the volume axis.

off

The entire titration curve is being evaluated.

Setting windows

The list of defined windows is opened with **[Set window]**.

When the list is opened for the first time, a window over the entire measured value range or volume range is already defined. The windows must not overlap, they only may lie next to one another. For each window, own criteria can be defined for the equivalence point recognition.



NOTE

When you define a result variable instead of a numerical value as limit value (see chapter 32.6, page 507), then just one window can be defined.

[New]

Define a new window. This is only possible when not the entire range is covered yet.

[Delete]

Delete the selected window.

[Edit]

Edit the settings of the selected window.

Lower limit

Measured value or volume for the lower limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measured value (measuring mode pH):

Input range	-20.000 to 20.000
Default value	-20.000

Measured value (measuring mode U, Ipol):

Input range	-2000.0 to 2000.0 mV
Default value	-2000.0 mV

Measured value (measuring mode Upol):

Input range	-200.00 to 200.00 µA
Default value	-200.00 µA

Volume:

Input range	0.00000 to 9999.99 mL
Default value	0.00000 mL

Upper limit

Measured value or volume for the upper limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measured value (measuring mode pH):

Input range	-20.000 to 20.000
Default value	20.000

Measured value (measuring mode U, Ipol):

Input range	-2000.0 to 2000.0 mV
Default value	2000.0 mV

Measured value (measuring mode Upol):

Input range	-200.00 to 200.00 µA
Default value	200.00 µA

Volume:

Input range	0.00000 to 9999.99 mL
Default value	9999.99 mL

EP criterion

The Equivalence point Recognition Criterion (ERC) found is compared with this value. Equivalence points whose ERC is less than the value defined here will be ignored.

Measuring mode pH:

Input range	0.10 to 9.99
Default value	0.50

Measuring mode U, Ipol:

Input range	1 to 999 mV
Default value	30 mV

Measuring mode Upol:

Input range	0.1 to 99.9 µA
Default value	2.0 µA

EP recognition

This parameter allows you to filter out only the equivalence points that are being sought.

Selection	first | greatest | last | ascending | descending
Default value	first

first

Only the first equivalence point will be recognized.

greatest

Only the equivalence point with the greatest ERC value, i.e. the steepest jump, will be recognized.

last

Only the last equivalence point will be recognized.

ascending

Only equivalence points with a positive slope of the titration curve will be recognized.

descending

Only equivalence points with a negative slope of the titration curve will be recognized.

Only one equivalence point will be recognized in a window. The numbering of the equivalence points (EP) is defined by the numbering of the windows (e.g. EP2 in window 2), so that even if EPs are missing, the calculations will still be carried out with the correctly assigned EP volumes.

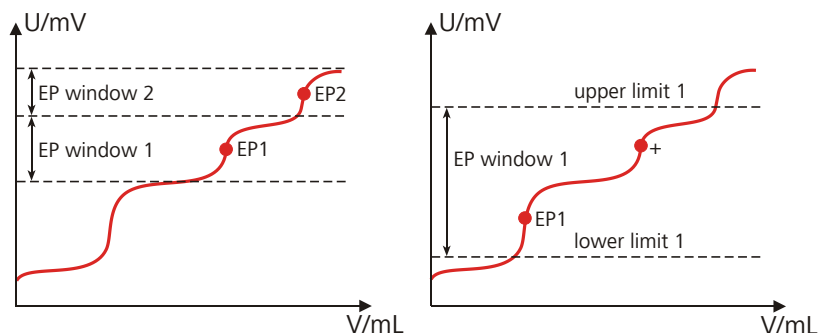


Figure 15 Equivalence point recognition and equivalence point numbering within windows

In the first example in the above figure, two equivalence points are recognized in two different windows (EP1 in window 1 and EP2 in window 2). In the second example, two equivalence points are found in one window, but only the first one is recognized. In order to ensure that the user recognizes that more than one equivalence point was found in the set window, EP1 is marked with a "+" in the result view. In addition, a corresponding message is entered in the message list.

Evaluation and equivalence point criterion with MET

The equivalence points (EPs) are localized by a method based on the Fortuin method which has been adapted by Metrohm for numerical methods. A search is made for the largest measured value change (Δ_n). The exact EP is determined by using an interpolation factor ρ which depends on the Δ values before and after Δ_n .

$$V_{EP} = V_0 + \rho \cdot \Delta V$$

- V_{EP} : EP volume
 V_0 : Dosed total volume before Δ_n
 ΔV : Volume increment
 ρ : Interpolation factor according to Fortuin

For the recognition of the EPs found, the set EP criterion is compared to the ERC (Equivalence point Recognition Criterion) found. The ERC is the sum of the measured value changes before and after the jump:

$$|\Delta_{n-2}| + |\Delta_{n-1}| + |\Delta_n| + |\Delta_{n+1}| + |\Delta_{n+2}|$$

In certain cases only three or only one summand is taken into account.

EPs whose ERC is smaller than the defined EP criterion will not be recognized. The ERC is displayed in the results dialog for each discovered and recognized EP. If you adjust the EP criterion later in order to recognize more or fewer EPs, then you can reevaluate the determination (**[Recalculate]** function in the results dialog).

29.2.5 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	---

29.2.6 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.



Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

I(pol)

The polarization current is the current that is applied to a polarizable electrode during voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-125.0 to 125.0 μA (Increment: 2.5)
Default value	5.0 μA
Selection	-1.0 μA | 1.0 μA

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-1,250 to 1,250 mV (Increment: 25)
Default value	400 mV

Electrode check

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

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.2.7 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.



29.2.8 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.3 Endpoint titrations (SET)

29.3.1 Start conditions

The parameters that are carried out before the start of titration are defined under **[Start conditions]**.

Pause 1

Waiting time, e.g. for the electrode to settle down before a start volume is added.

Input range	0 to 999999 s
Default value	0 s

Start volume

Volume that is dosed prior to the start of the titration.

Input range	0.00000 to 9999.99 mL
Default value	0.00000 mL

Dosing rate

Rate at which the start volume is dosed.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Pause 2

Waiting time, e.g. for the electrode to settle down after the start or a reaction time after the dosing of a start volume.

Input range	0 to 999999 s
Default value	0 s

Initial measured value

The [**Initial meas. value**] is measured before carrying out the **start conditions**. This value is used for the **titration direction determination** when the titration direction is set to **auto** and only 1 EP is defined.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

Measuring mode pH, U and I_{pol}:

Input range	0.1 to 999.0 mV/min
Selection	off
Default value	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Upol:

Input range	0.01 to 99.90 µA/min
Selection	off
Default value	off

**off**

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	0 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	1 s

29.3.2 Control parameters

The control parameters for endpoint 1 and endpoint 2 are defined under **[Control parameters]**.

Endpoint 1 at

Measured value for the first endpoint.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measuring mode U and I_{pol}:

Input range	-2000.0 to 2000.0 mV
Selection	off
Default value	off

Measuring mode U_{pol}:

Input range	-200.00 to 200.00 µA
Selection	off
Default value	off

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	slow | optimal | fast | user
Default value	optimal

slow

For steep titration curves for which dosing must be carried out in small steps at the endpoint.

optimal

For all standard titrations. The parameters have been optimized for the most frequent applications.

fast

For flat titration curves for which the endpoint is reached only slowly.

user

The individual titration parameters can be modified.

The settings of the individual titration rates are listed in *table 11, page 322*.

User-defined parameters

These parameters are only accessible when **Titration rate = user**.

Dynamics

This parameter defines the control range before the specified endpoint. Individual volume steps are dosed in the control range; the dosing is finely controlled. The closer the endpoint, the slower the dosing until the dosing rate defined under **Min. rate** has been reached. The larger the control range, the slower the titration. Outside of the control range, dosing is carried out continuously; the dosing rate is defined under **Max. rate**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	0.001 to 20.000
Default value	2.000
Selection	off

Measuring mode U and I_{pol}:

Input range	0.1 to 2000.0 mV
Default value	100.0 mV
Selection	off

Measuring mode U_{pol}:

Input range	0.01 to 200.00 μA
Default value	10.00 μA
Selection	off

Max. rate

Rate at which dosing is carried out outside of the control range.

Input range	0.01 to 166.00 mL/min
Default value	10.00 mL/min
Selection	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Min. rate

Rate at which dosing is carried out at the very beginning of the titration and in the control range at the end of the titration. This parameter has a decisive influence on the titration rate and thus also on the accuracy. The smaller the selected minimum rate, the slower the titration.

Input range	0.01 to 9999.00 μL/min
Default value	25.00 μL/min

Table 11 Default values of the predefined titration rates for SET

	Titration rate		
	slow	optimal	fast
Dynamics			
– pH	5.000	2.000	0.500
– U und I _{pol}	300.0 mV	100.0 mV	30.0 mV
– U _{pol}	40.00 μ A	10.00 μ A	5.00 μ A
Max. rate	1.00 mL/min	10.00 mL/min	maximum
Min. rate	5.00 μ L/min	25.00 μ L/min	50.00 μ L/min

Stop criterion**Stop criterion**

The titration is stopped when the endpoint has been reached and this stop criterion has been fulfilled. If no stop criterion has been selected then the titration will not be stopped. The stop conditions (*see chapter 29.3.4, page 325*) always lead to a stop, even if the stop criterion has not been reached.

**NOTE**

In older instructions the delay time was usually defined as the stop criterion. The same delay time may however result in different stopping time points – because of different smallest possible volume increments (depending on the cylinder volume). In contrast, if the stop drift is used, the titration will always be stopped at the same curve slope dV/dt .

Selection	drift | time | off
Default value	drift

drift

The titration is stopped when the stop drift has been reached.

time

The titration is stopped when the endpoint has been exceeded during a certain period of time (**Delay time**).

off

The titration will not be stopped until the stop conditions have been fulfilled.

Stop drift

This parameter can only be edited with **Stop criterion = drift**.

The titration is stopped when the endpoint and the stop drift have been reached.

Input range	1 to 999 $\mu\text{L}/\text{min}$
Default value	20 $\mu\text{L}/\text{min}$

Delay time

This parameter can only be edited with **Stop criterion = time**.

When the endpoint has been reached, the specified time is allowed to elapse after the last dosing and the titration is then stopped.

Input range	0 to 999 s
Default value	10 s

Endpoint 2

The control parameters for the second endpoint are defined under **[Endpoint 2]**. The parameters and input ranges are identical with those for the first endpoint.



29.3.3 Titration parameters

Under **[Titration parameters]**, the parameters influencing the run of the entire titration are defined.

Titration direction

With the setting "auto", the titration direction is determined automatically from the initial measured value and the set endpoint. It is recommended that you specify whether the titration direction is positive or negative. If two endpoints have been set, then the titration direction will be defined automatically. In this case, the setting will be ignored.

Selection	+ | - | auto
Default value	auto

+

Positive measured value change by the addition of titrant, i.e. in the direction of a higher pH value, greater voltage or greater current.

-

Negative measured value change by the addition of titrant, i.e. in the direction of a lower pH value, lesser voltage or lesser current.

auto

The titration direction is determined automatically from the initial measured value and the set endpoint.

Extraction time

Minimum duration of the titration. The titration will not be stopped during the extraction time, even if the endpoint has already been reached. The titration is however stopped if a stop condition is fulfilled during this time (see chapter 29.3.4, page 325). The entry of an extraction time may be advisable, e.g. for the titration of sparingly soluble samples.

Input range	0 to 999999 s
Default value	0 s

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	0.1 to 999999.0 s
Default value	2.0 s

29.3.4 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**, if this does not occur automatically. This could be the case when the endpoint set is not reached or if the stop criterion (*see "Stop criterion", page 322*) is not fulfilled.

Stop volume

The titration is stopped when the specified volume has been dosed since the start of the titration. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	0.00000 to 9999.99 mL
Default value	100,000 mL
Selection	off

Stop time

The titration is stopped when the specified time has elapsed following the termination of the start conditions.

Input range	1 to 999999 s
Selection	off
Default value	off

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum


The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

29.3.5 Conditioning

The conditions required for conditioning are defined under **[Conditioning]**.

Conditioning

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

If this parameter is activated, then the first time the titration is started the working medium will be titrated to the endpoint with the specified control parameters. The status is kept stable. The actual method run does not begin until [] has been pressed once more.



Start drift

Conditioning OK will be displayed as soon as this drift has been reached and the titration can be started.

Input range	1 to 999 $\mu\text{L}/\text{min}$
Default value	20 $\mu\text{L}/\text{min}$

Drift correction

The endpoint volume can be corrected by taking the drift value into account. For this, the drift is multiplied with the drift correction time and this value is then subtracted from the endpoint volume. The drift correction time is the time interval between the end of conditioning and the end of the determination.

Selection	auto | manual | off
Default value	off

auto

The value of the current drift is automatically applied at the start of the titration.

manual

If the drift is known throughout a longer period of time, this can be entered manually.

off

No drift correction takes place.

Drift value

This parameter can only be edited with **Drift correction = manual**.

Drift for manual drift correction.

Input range	0.0 to 99.9 $\mu\text{L}/\text{min}$
Default value	0.0 $\mu\text{L}/\text{min}$

Measured value display

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

If this parameter is activated, the currently measured value is displayed during the conditioning.

Conditioning options [Cond. options]

Cond. stop volume

Maximum permissible volume that can be dosed during conditioning. Conditioning is stopped when the specified volume is dosed. If conditioning is continued by pressing [\blacktriangleright] once again, then the titrant volume that has already been dosed will not be taken into account; i.e. the dosing

starts again at zero. The stop volume should be adjusted to the size of the titration cell in order to prevent any overflow.

Input range	0.0000 to 9999.99 mL
Default value	20.0000 mL
Selection	off

Cond. stop time

Maximum permissible time over which conditioning may take place. Conditioning is stopped when the specified time has elapsed.

Input range	1 to 999999 s
Selection	off
Default value	off

Delay reconditioning

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

If this parameter is activated, the conditioning will not start before all the method commands have been processed. Otherwise, the conditioning will immediately start after the titration command.



NOTE

This parameter must be activated if commands follow which must not run simultaneously with the conditioning.

Example: Emptying the titration cell followed by adding new working medium.

29.3.6 Cell

The monitoring of the reagent used is activated or deactivated under **[Cell]**.

Reagent monitoring

Selection of the reagent from the list of reagents. The selection depends on the titration mode. Reagents are defined under **System ► Reagents**.

Selection	Selection of configured reagents | off
Default value	off

off

The reagent monitoring is not active.



29.3.7 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.3.8 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

I(pol)

The polarization current is the current that is applied to a polarizable electrode during voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-125.0 to 125.0 μA (Increment: 2.5)
Default value	5.0 μA
Selection	-1.0 μA} | 1.0 μA

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-1,250 to 1,250 mV (Increment: 25)
Default value	400 mV

Electrode check

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

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.3.9 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **Sys-tem ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

29.3.10 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rota-

tional speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.4 Volumetric Karl Fischer titrations (KFT)

29.4.1 Start conditions

The parameters that are carried out before the start of titration are defined under **[Start conditions]**.

Pause 1

Waiting time, e.g. for the electrode to settle down before a start volume is added.

Input range	0 to 999999 s
Default value	0 s

Start volume

Volume that is dosed prior to the start of the titration.

Input range	0.00000 to 9999.99 mL
Default value	0.00000 mL

Dosing rate

Rate at which the start volume is dosed.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	1 s

29.4.2 Control parameters

The control parameters for the endpoint are defined under **[Control parameters]**.

Endpoint at

Measured value for the endpoint.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Measuring mode Ipol:

Input range	-2,000.0 to 2,000.0 mV
Default value	250.0 mV
Selection	off

Measuring mode Upol:

Input range	-200.00 to 200.00 µA
Default value	25.00 µA
Selection	off

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	slow | optimal | fast | user
Default value	optimal

slow

For samples with a low water content or samples which release their moisture only slowly.

optimal

For all standard titrations. The parameters have been optimized for the most frequent applications.

fast

For uncritical samples with high water content.

user

The individual titration parameters can be modified.

The settings of the individual titration rates are listed in *table 12, page 335*.

User-defined parameters

These parameters are only accessible when **Titration rate = user**.

Dynamics

This parameter defines the control range before the specified endpoint. Individual volume steps are dosed in the control range, the dosing is finely controlled. The closer the endpoint, the slower the dosing until the volume increment defined under **Min. increment** has been reached. The larger the control range, the slower the titration. Outside the control range, dosing is carried out continuously, and the dosing rate is defined under **Max. rate**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Measuring mode Ipol:

Input range	0.1 to 2,000.0 mV
Default value	100.0 mV
Selection	off

Measuring mode Upol:

Input range	0.01 to 200.00 µA
Default value	10.00 µA
Selection	off

Max. rate

Rate at which dosing is carried out outside of the control range.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Min. increment

Minimum volume increment that is dosed at the beginning of the titration and in the control range at the end of the titration. This parameter has a decisive influence on the titration rate and thus also on the accuracy. The smaller the selected minimum increment, the slower the titration.

Input range	0.10 to 99.90 µL
Selection	minimum
Default value	minimum

Table 12 Default values of the predefined titration rates for KFT

	Titration rate		
	slow	optimal	fast
Dynamics			
– I _{pol}	300.0 mV	100.0 mV	30.0 mV
– U _{pol}	40.00 µA	10.00 µA	5.00 µA
Max. rate	1.00 mL/min	maximum	maximum
Min. increment	minimum (= cylinder volume/10,000)	minimum (= cylinder volume/10,000)	5.00 µL

Stop criterion

Stop criterion

The titration is stopped when the endpoint has been reached and this stop criterion has been fulfilled. If no stop criterion has been selected then the titration will not be stopped. The stop conditions (*see chapter 29.4.4, page 337*) always lead to a stop, even if the stop criterion has not been reached.



NOTE

In older instructions the delay time was usually defined as the stop criterion. The same delay time may however result in different stopping time points – because of different smallest possible volume increments (depending on the cylinder volume). In contrast, if the stop drift is used, the titration will always be stopped at the same curve slope dV/dt .

Selection	drift | time | rel. drift | off
Default value	drift

drift

The titration is stopped when the stop drift has been reached.

time

The titration is stopped if the endpoint has been exceeded during a certain time period (**Delay time**).

rel. drift

The titration is stopped when the sum of the drift at the start of the titration and the relative stop drift has been reached.

off

The titration will not be stopped until the stop conditions have been fulfilled.



Stop drift

This parameter can only be edited with **Stop criterion = drift**.

The titration is stopped when the endpoint and the stop drift have been reached.

Input range	1 to 999 $\mu\text{L}/\text{min}$
Default value	20 $\mu\text{L}/\text{min}$

Delay time

This parameter can only be edited with **Stop criterion = time**.

When the endpoint has been reached, the specified time is allowed to elapse after the last dosing and the titration is then stopped.

Input range	0 to 999 s
Default value	10 s

Relative stop drift

This parameter can only be edited with **Stop criterion = rel. drift**.

The titration is stopped when the endpoint and the sum of the drift at the start of the titration and the relative stop drift have been reached.

Input range	1 to 999 $\mu\text{L}/\text{min}$
Default value	10 $\mu\text{L}/\text{min}$

29.4.3 Titration parameters

Under **[Titration parameters]**, the parameters influencing the run of the entire titration are defined.

Titration direction

Selection	+ | - | auto The default value depends on the measuring mode: Ipol = -, Upol = +
-----------	---

+

Positive measured value change by the addition of titrant, i.e. in the direction of a greater voltage or greater current.

-

Negative measured value change by the addition of titrant, i.e. in the direction of a lesser voltage or lesser current.

auto

The titration direction is determined automatically from the initial measured value and the set endpoint.

Extraction time

Minimum duration of the titration. The titration will not be stopped during the extraction time, even if the endpoint has already been reached. The titration is however stopped if a stop condition is fulfilled during this time (see chapter 29.4.4, page 337). The entering of an extraction time is e.g. recommended with samples that release water slowly or if a Karl Fischer oven is used.

Input range	0 to 999999 s
Default value	0 s

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	0.1 to 999999.0 s
Default value	2.0 s

29.4.4 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**, if this does not occur automatically. This could be the case when the endpoint set is not reached or if the stop criterion (see "Stop criterion", page 335) is not fulfilled.

Stop volume

The titration is stopped when the specified volume has been dosed since the start of the titration. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	0.00000 to 9999.99 mL
Default value	100,000 mL
Selection	off

Stop time

The titration is stopped when the specified time has elapsed following the termination of the start conditions.

Input range	1 to 999999 s
-------------	----------------------

off

No drift correction takes place.

Drift value

This parameter can only be edited with **Drift correction = manual**.

Drift for manual drift correction.


Input range	0.0 to 99.9 µL/min
Default value	0.0 µL/min

Measured value display

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

If this parameter is activated, the currently measured value is displayed during the conditioning.

Conditioning options [Cond. options]**Cond. stop volume**

Maximum permissible volume that can be dosed during conditioning. Conditioning is stopped when the specified volume is dosed. If conditioning is continued by pressing [] once again, then the titrant volume that has already been dosed will not be taken into account; i.e. the dosing starts again at zero. The stop volume should be adjusted to the size of the titration cell in order to prevent any overflow.

Input range	0.00000 to 9999.99 mL
Default value	20.0000 mL
Selection	off

Cond. stop time

Maximum permissible time over which conditioning may take place. Conditioning is stopped when the specified time has elapsed.

Input range	1 to 999999 s
Selection	off
Default value	off

Delay reconditioning

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

If this parameter is activated, the conditioning will not start before all the method commands have been processed. Otherwise, the conditioning will immediately start after the titration command.

**NOTE**

This parameter must be activated if commands follow which must not run simultaneously with the conditioning.

Example: Emptying the titration cell followed by adding new working medium.

29.4.6 Cell

The monitoring of the reagent used is activated or deactivated under **[Cell]**.

Reagent monitoring

Selection of the reagent from the list of reagents. The selection depends on the titration mode. Reagents are defined under **System ► Reagents**.

Selection	Selection of configured reagents | off
Default value	off

off

The reagent monitoring is not active.

29.4.7 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.

**NOTE**

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.4.8 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

I(pol)

The polarization current is the current that is applied to a polarizable electrode during voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the "Technical specifications" chapter for the control instrument used.

Input range	-125.0 to 125.0 μA (Increment: 2.5)
Default value	50.0 μA
Selection	-1.0 μA | 1.0 μA

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-1,250 to 1,250 mV (Increment: 25)
Default value	400 mV



Electrode check

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

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.4.9 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

29.4.10 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.5 Coulometric Karl Fischer titrations (KFC)

29.5.1 Control parameters

The control parameters for the endpoint are defined under **[Control parameters]**.

Endpoint at

Measured value for the endpoint.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Input range	-1250.0 to 1250.0 mV
Default value	50.0 mV
Selection	off

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	slow | optimal | fast | user
Default value	optimal

slow

For samples with a low water content or samples which release their moisture only slowly.

optimal

For all standard titrations. The parameters have been optimized for the most frequent applications.

fast

For uncritical samples with high water content.

user

The individual titration parameters can be modified.

The settings of the individual titration rates are listed in *table 13, page 345*.

User-defined parameters

These parameters are only accessible when **Titration rate = user**.

Dynamics

This parameter defines the control range before the specified endpoint. Within the control range, the iodine is generated step by step, the generation is finely controlled. The closer the endpoint, the slower the iodine is generated until the rate defined under **Min. rate** is reached. The larger the control range, the slower the titration. Outside the control range,

iodine is being continuously generated, the rate is defined under **Max. rate**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Input range	0.1 to 1250.0 mV
Default value	70.0 mV
Selection	off

Max. rate

Rate at which iodine is generated outside the control range.

Input range	1.5 to 2241.0 µg/min
Selection	maximum
Default value	maximum

Min. rate

Rate at which iodine is generated at the very beginning of the titration and in the control range at the end of the titration. This parameter has a vital influence on the titration rate and thus also on the accuracy. The smaller the selected minimum rate, the slower the titration.

Input range	0.3 to 999.0 µg/min
Default value	15.0 µg/min

Table 13 Default values of the predefined titration rates for KFC

	Titration rate		
	slow	optimal	fast
Dynamics	120.0 mV	70.0 mV	30.0 mV
Max. rate	1000.0 µg/min	maximum	maximum
Min. rate	0.3 µg/min	15.0 µg/min	30.0 µg/min

Stop criterion

Stop criterion

The titration is stopped when the endpoint has been reached and this stop criterion has been fulfilled. If no stop criterion has been selected then the titration will not be stopped. The stop conditions (*see chapter 29.5.3, page 347*) always lead to a stop, even if the stop criterion has not been reached.

Selection	drift | time | rel. drift | off
Default value	rel. drift

Extraction time

Minimum duration of the titration. The titration will not be stopped during the extraction time, even if the endpoint has already been reached. The titration is however stopped if a stop condition is fulfilled during this time (see chapter 29.5.3, page 347). Entering an extraction time may e.g. be advisable if a Karl Fischer oven is used.

Input range	0 to 999999 s
Default value	0 s

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	0.1 to 999999.0 s
Default value	2.0 s

29.5.3 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**, if this does not occur automatically. This could be the case when the endpoint set is not reached or if the stop criterion (see "Stop criterion", page 345) is not fulfilled.

Stop time

The titration is stopped when the specified time has elapsed since the start of the titration.

Input range	1 to 999999 s
Selection	off
Default value	off


29.5.4 Conditioning

The conditions required for conditioning are defined under **[Conditioning]**.



Conditioning

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

If this parameter is activated, then the first time the titration is started the working medium will be titrated to the endpoint with the specified control parameters. The status is kept stable. The actual method run does not begin until [] has been pressed once more.

Start drift

If the measured drift is smaller than this value for a certain time (so-called stabilizing time), **Conditioning OK** is displayed and the titration can be started. The stabilizing time is defined in the dialog **Conditioning / Conditioning options**.

Input range	1 to 999 µg/min
Default value	20 µg/min

Drift correction

The endpoint amount can be corrected taking the drift value into account. For this, the drift is multiplied with the drift correction time and this value is then subtracted from the endpoint amount. The drift correction time is the time interval between the end of conditioning and the end of the determination.

Selection	auto | manual | off
Default value	auto

auto

The value of the current drift is automatically applied at the start of the titration.

manual

If the drift is known throughout a longer period of time, this can be entered manually.

off

No drift correction takes place.

Drift value

This parameter can only be edited with **Drift correction = manual**.

Drift for manual drift correction.

Input range	0.0 to 99.9 µg/min
Default value	0.0 µg/min

Measured value display

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

If this parameter is activated, the currently measured value is displayed during the conditioning.

Automatic start [Automatic start]**NOTE**

If you use the automatic start function, then we recommend that the start drift be reduced and that a stabilizing time be defined.

Recommendation: start drift $\leq 10 \mu\text{g}/\text{min}$ / stabilizing time $\geq 30 \text{ s}$

Automatic start

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

If this parameter is activated, the determination is automatically started when the measured voltage suddenly changes. This setting will be ignored as long as the working medium has not been conditioned.

Threshold value

If the change in voltage is higher than this value, the determination will automatically be started.

Input range	0 to 999 mV
Default value	50 mV

Conditioning options [Cond. options]**Stabilizing time**

Waiting time, during which the measured drift has to be smaller than the start drift defined until **Conditioning OK** is displayed. The start drift is defined in the dialog **Edit command / Conditioning**.

Input range	0 to 999999 s
Default value	0 s

Cond. stop time

Maximum permissible time over which conditioning may take place. Conditioning is stopped when the specified time has elapsed.

Input range	1 to 999999 s
Selection	off
Default value	off

Delay reconditioning

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

If this parameter is activated, the conditioning will not start before all the method commands have been processed. Otherwise, the conditioning will immediately start after the titration command.

**NOTE**

This parameter must be activated if commands follow which must not run simultaneously with the conditioning.

Example: Emptying the titration cell followed by adding new working medium.

29.5.5 Cell

The parameters for the titration cell are defined under **[Cell]**.

Generator electrode

Type of generator electrode.

Selection	without diaphragm | with diaphragm
Default value	without diaphragm

without diaphragm

Generator electrode without diaphragm.

with diaphragm

Generator electrode with diaphragm.

Generator current

Polarization current at the generator electrode.

Selection	100 mA | 200 mA | 400 mA | auto
-----------	--

400 mA

Default value, when **Generator electrode = without diaphragm**.

auto

The current is adapted to the conductivity of the reagent and automatically reduced near the endpoint. Default value, when **Generator electrode = with diaphragm**.

Reagent monitoring

Selection of the reagent from the list of reagents. The selection depends on the titration mode. Reagents are defined under **System ► Reagents**.

Selection	Selection of configured reagents | off
Default value	off

off

The reagent monitoring is not active.

29.5.6 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.5.7 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

I(pol)

The polarization current is the current that is applied to a polarizable electrode during the voltametric measurement.

Selection	5 μA | 10 μA | 20 μA | 30 μA
Default value	10 μA

Electrode check

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

For polarizable electrodes and the generator electrode, an electrode check can be carried out. The following will be tested:



- Polarizable electrodes
 - Is the electrode connected?
 - Is there a short circuit?

The electrode check is carried out when this command is started.

- Generator electrode:
 - Is the electrode connected?
 - Is the generator system defective?
 - Is the resistance of the sample solution very high?

The electrode check is carried out continuously during the execution of this command.

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.5.8 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.6 Bromine index determination (BRC)

29.6.1 Control parameters

The control parameters for the endpoint are defined under **[Control parameters]**.

Endpoint at

Measured value for the endpoint.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Input range	-1,250.0 to 1,250.0 mV
Default value	200.0 mV
Selection	off

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	slow | optimal | fast | user
Default value	optimal

slow

For samples with slow bromine addition.

optimal

For all standard titrations. The parameters have been optimized for the most frequent applications.

fast

For uncritical samples with fast bromine addition.

user

The individual titration parameters can be modified.

The settings of the individual titration rates are listed in *table 14, page 354*.

User-defined parameters

These parameters are only accessible when **Titration rate = user**.

Dynamics

This parameter defines the control range before the specified endpoint. Within the control range, the bromine is generated step by step, the generation is finely controlled. The closer the endpoint, the slower the bromine is generated until the rate defined under **Min. rate** is reached. The larger the control range, the slower the titration. Outside the control range, bromine is continuously generated, the rate is defined under **Max. rate**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Input range	0.1 to 1250.0 mV
Default value	400.0 mV
Selection	off

Max. rate

Rate at which bromine is generated outside the control range.

Input range	10.0 to 19876.0 µg/min
Default value	1000.0 µg/min
Selection	maximum

Min. rate

Rate at which bromine is generated at the very beginning of the titration and in the control range at the end of the titration. This parameter has a vital influence on the titration rate and thus also on the accuracy. The smaller the selected minimum rate, the slower the titration.

Input range	1.0 to 999.0 µg/min
Default value	25.0 µg/min

Table 14 Default values for the predefined titration rates for BRC

	Titration rate		
	slow	optimal	fast
Dynamics	400.0 mV	400.0 mV	400.0 mV
Max. rate	500.0 µg/min	1000.0 µg/min	2000.0 µg/min
Min. rate	15.0 µg/min	25.0 µg/min	50.0 µg/min

Stop criterion

Stop criterion

The titration is stopped when the endpoint has been reached and this stop criterion has been fulfilled. If no stop criterion has been selected then the titration will not be stopped. The stop conditions (*see chapter 29.6.3, page 357*) always lead to a stop, even if the stop criterion has not been reached.

Selection	drift | time | rel. drift | off | drift & time
Default value	drift & time

drift

The titration is stopped when the stop drift has been reached.

time

The titration is stopped if the endpoint has been exceeded during a certain time period (**Delay time**).

rel. drift

The titration is stopped when the sum of the drift at the start of the titration and the relative stop drift has been reached.

off

The titration will not be stopped until the stop conditions have been fulfilled.

drift & time

The titration is stopped when the stop drift has been exceeded during the time set and the endpoint has been reached.

Stop drift

This parameter can only be edited with **Stop criterion = drift** or **drift & time**.

The titration is stopped when the endpoint and the stop drift have been reached.

Input range	1 to 999 µg/min
Default value	15 µg/min

Delay time

This parameter can only be edited with **Stop criterion = time** or **drift & time**.

When the endpoint has been reached, the specified time is allowed to elapse after the last dosing and the titration is then stopped.

Input range	0 to 999 s
Default value	40 s



Relative stop drift

This parameter can only be edited with **Stop criterion = rel. drift**.

The titration is stopped when the endpoint and the sum of the drift at the start of the titration and the relative stop drift have been reached.

Input range	1 to 999 µg/min
Default value	5 µg/min

29.6.2 Titration parameters

Under **[Titration parameters]**, the parameters influencing the run of the entire titration are defined.

Pause

Waiting time, for example for dissolving the sample. During this time no bromine is generated.

Input range	0 to 999999 s
Default value	0 s

Extraction time

Minimum duration of the titration. The titration will not be stopped during the extraction time, even if the endpoint has already been reached. The titration is however stopped if a stop condition is fulfilled during this time (*see chapter 29.6.3, page 357*).

Input range	0 to 999999 s
Default value	0 s

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	0.1 to 999999.0 s
Default value	2.0 s

29.6.3 Stop conditions

The conditions for canceling the titration are defined under **[Stop conditions]**, if this does not occur automatically. This could be the case when the endpoint set is not reached or if the stop criterion (*see "Stop criterion", page 355*) is not fulfilled.

Stop time

The titration is stopped when the specified time has elapsed since the start of the titration.


Input range	1 to 999999 s
Selection	off
Default value	off

29.6.4 Conditioning

The conditions required for conditioning are defined under **[Conditioning]**.

Conditioning

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

If this parameter is activated, then the first time the titration is started the working medium will be titrated to the endpoint with the specified control parameters. The status is kept stable. The actual method run does not begin until [] has been pressed once more.

Start drift

If the measured drift is smaller than this value for a certain time (so-called stabilizing time), **Conditioning OK** is displayed and the titration can be started. The stabilizing time is defined in the dialog **Conditioning / Conditioning options**.

Input range	1 to 999 µg/min
Default value	20 µg/min

Drift correction

The endpoint amount can be corrected taking the drift value into account. For this, the drift is multiplied with the drift correction time and this value is then subtracted from the endpoint amount. The drift correction time is the time interval between the end of conditioning and the end of the determination.

Selection	auto | manual | off
Default value	off

**NOTE**

This parameter must be activated if commands follow which must not run simultaneously with the conditioning.

Example: Emptying the titration cell followed by adding new working medium.

29.6.5 Cell

The parameters for the titration cell are defined under **[Cell]**.

Generator electrode

Type of generator electrode.

Selection	without diaphragm | with diaphragm
Default value	with diaphragm

without diaphragm

Generator electrode without diaphragm.

with diaphragm

Generator electrode with diaphragm.

Generator current

Polarization current at the generator electrode.

Selection	100 mA | 200 mA | 400 mA | auto
Default value	auto

auto

The current is adapted to the conductivity of the reagent and automatically reduced near the endpoint.

Reagent monitoring

Selection of the reagent from the list of reagents. The selection depends on the titration mode. Reagents are defined under **System ► Reagents**.

Selection	Selection of configured reagents | off
Default value	off

off

The reagent monitoring is not active.

Electrode check

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

For polarizable electrodes and the generator electrode, an electrode check can be carried out. The following will be tested:

- Polarizable electrodes
 - Is the electrode connected?
 - Is there a short circuit?

The electrode check is carried out when this command is started.

- Generator electrode:
 - Is the electrode connected?
 - Is the generator system defective?
 - Is the resistance of the sample solution very high?

The electrode check is carried out continuously during the execution of this command.

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.6.8 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.



Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.7 STAT titrations (STAT)

29.7.1 Start conditions

The parameters that are carried out before the start of titration are defined under **[Start conditions]**.

Pause 1

Waiting time, e.g. for the electrode to settle down before a start volume is added.

Input range	0 to 999999 s
Default value	0 s

Start volume

Volume that is dosed prior to the start of the titration.

Input range	0.00000 to 9999.99 mL
Default value	0.00000 mL

Dosing rate

Rate at which the start volume is dosed.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Pause 2

Waiting time, e.g. for the electrode to settle down after the start or a reaction time after the dosing of a start volume.

Input range	0 to 999999 s
Default value	0 s

Initial measured value

The [**Initial meas. value**] is measured before carrying out the **start conditions**. This value is used for the **titration direction determination** when the titration direction is set to **auto**.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

Input range	0.1 to 999.0 mV/min
Selection	off
Default value	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	0 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	1 s

29.7.2 Control parameters

The parameters for the control point are defined under **[Control parameters]**.

Control point at

Measured value for the control point.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measuring mode U:

Input range	-2000.0 to 2000.0 mV
Selection	off
Default value	off

Titration rate

Three predefined sets of parameters can be selected for the titration rate.

Selection	50 µL/min | 100 µL/min | 500 µL/min | user
Default value	100 µL/min

50 µL/min

For reactions with an expected reaction rate in the range of 50 µL/min.

100 µL/min

For reactions with an expected reaction rate in the range of 100 µL/min.

500 µL/min

For reactions with an expected reaction rate in the range of 500 µL/min.

user

The individual titration parameters can be modified.

The settings of the individual titration rates are listed in *table 15, page 366*.

User-defined parameters

These parameters are only accessible when **Titration rate = user**.

Dynamics

The control range defines the measured value range before the specified control point. This control point has a vital influence on the titration rate and thus also on the measuring accuracy.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	0.001 to 20.000
Default value	1.000
Selection	off

Measuring mode U:

Input range	0.1 to 2,000.0 mV
Default value	60.0 mV
Selection	off

Max. rate

The maximum permissible rate at which dosing takes place.

Rule of thumb for the maximum rate in mL/min:

$0.005 \cdot \text{expected reaction rate in } \mu\text{L/min}$

Input range	0.01 to 166.00 mL/min
Default value	0.75 mL/min
Selection	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Min. rate

The rate at which dosing is carried out at the very beginning of the titration and in the control range at the end of the titration. This parameter has a decisive influence on the behavior at the control point. The minimum rate also has a decisive influence on how exactly the control point can be kept constant. The smaller the selected minimum rate, the longer it takes until the control point is reached for the first time.

The following rule of thumb should be considered in order to obtain a dosing at the control point as constant (regular) as possible:

$\text{Min. rate in } \mu\text{L/min} = 0.1 \cdot \text{expected reaction rate in } \mu\text{L/min}$

Input range	0.01 to 9999.00 $\mu\text{L/min}$
Default value	10.00 $\mu\text{L/min}$

Table 15 Default values of the predefined titration rates for STAT

	Reaction rate		
	50 µL/min	100 µL/min	500 µL/min
Dynamics			
– pH	1.000	1.000	1.000
– U	60.0 mV	60.0 mV	60.0 mV
Max. rate	0.25 mL/min	0.75 mL/min	2.00 mL/min
Min. rate	5.00 µL/min	10.00 µL/min	40.00 µL/min

Dosing and control range

Outside the control range the dosing rate is mainly characterized by the maximum rate. The parameters **Max. rate** and **Dynamics** should be optimized together in such a way that the titration does not overshoot too much when the control point is reached. The Dynamics should be selected in such a way that the measured value remains within the control range while the control point is maintained. A slightly larger control range should be defined for slow reactions (e.g. pH = 3, U = 180 mV). The set-point value is often set with a SET pretitration before the substrate is added. This means that the STAT titration can be started already with a small deviation from the control point.

29.7.3 Titration parameters

Under **[Titration parameters]**, the parameters influencing the run of the entire titration are defined.

Titration direction

With the setting "auto", the titration direction is determined automatically from the initial measured value and the set control point. It is recommended that you specify whether the change of the measured value is positive or negative.

Selection	+ | - | auto
Default value	auto

+

Positive measured value change by the addition of titrant, i.e. in the direction of a higher pH value or greater voltage.

-

Negative measured value change by the addition of titrant, i.e. in the direction of a lower pH value or lesser voltage.

auto

The titration direction is determined automatically from the initial measured value and the set control point.

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	0.1 to 999999.0 s
Default value	2.0 s

Start time

The measured values are not entered in the measuring point list until this time has elapsed since the start of the titration.

Input range	0 to 999999 s
Default value	0 s

Start meas. value

The measured values are not entered in the measuring point list until this start measured value has been reached.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measuring mode U:

Input range	-2000.0 to 2000.0 mV
Selection	off
Default value	off

Start rate

The measured values are not entered in the measuring point list until the dosing rate has fallen below this value. Checking this parameter is not started until 10 s after the start of the command.

Input range	0.01 to 166.00 mL/min
Selection	off
Default value	off

**NOTE**

If several of the parameters **Start time**, **Start meas. value** or **Start rate** have been defined, then all of them must be fulfilled for measured values to be entered in the measuring point list.

29.7.4 Stop conditions

The conditions for canceling the titration are defined under [**Stop conditions**].

Stop volume

The titration is stopped when the specified volume has been dosed since the start of the titration. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	0.00000 to 9999.99 mL
Default value	100,000 mL
Selection	off

Stop time

The titration is stopped when the specified time has elapsed.

Input range	0 to 999999 s
Selection	off
Default value	off

Since

This parameter can only be edited when a stop time has been defined.

This parameter defines the start of the stop time.

Selection	Start | Control point | Last dosing
-----------	--

Start

The stop time starts after the start volume has been dosed and the following pause time has elapsed.

Control point

The stop time starts as soon as the control point has been reached for the first time.

Last dosing

The stop time starts after the last increment has been dosed, i. e. the stop time is reset to zero again after each dosing step.

Stop rate

The titration is stopped when the current titration rate is lower than the value entered. Checking this parameter is not started until 10 s after the start of the command.

Input range	0.01 to 166.00 µL/min
Selection	off
Default value	off

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

29.7.5 Monitoring

Under **[Monitoring]**, the parameters for monitoring the following quantities are defined:

- Measured value
- Dosing rate (an average rate)
- Temperature

Monitoring is not used for parameterization of the control behavior. Remote signals or RS-232 commands can be assigned to the monitored quantities (*see "Communication", page 373*). These remote signals or RS-232 commands are sent if a limit has been infringed. This can be used, for example, to switch a thermostat on/off if necessary.

The parameters are identical for all monitored quantities.

Monitoring

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

Enabling and disabling the monitoring function. The monitoring of the dosing rate is not started until 10 s after the start of the titration.

Lower limit

When the monitored quantity falls below this value, the action defined in the following is triggered.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges



can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Default value	-20.000

Measuring mode U:

Input range	-2000.0 to 2000.0 mV
Default value	-2000.0 mV

Dosing rate:

Input range	0.00 to 166.00 mL/min
Default value	0.00 mL/min

Temperature:

Input range	-20.0 to 150.0 °C
Default value	-20.0 °C

Lower hysteresis

The lower hysteresis represents the tolerance range for the lower limit (*see figure 18, page 373*). When **Action = Wait** the dosing does not continue until the monitored quantity has once again exceeded the lower limit incl. the value entered here.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	0.000 to 20.000
Default value	0.020

Measuring mode U:

Input range	0.0 to 2000.0 mV
Default value	2.0 mV

Dosing rate:

Input range	0.00 to 166.00 mL/min
Default value	0.20 mL/min

Temperature:

Input range	0.0 to 150.0 °C
Default value	0.2 °C

Upper limit

When this value is exceeded, the action defined in the following is triggered.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Default value	20.000

Measuring mode U:

Input range	-2000.0 to 2000.0 mV
Default value	2000.0 mV

Dosing rate:

Input range	0.00 to 166.00 mL/min
Default value	166.00 mL/min

Temperature:

Input range	-20.0 to 150.0 °C
Default value	150.0 °C

Upper hysteresis

The upper hysteresis represents the tolerance range for the upper limit (see figure 18, page 373). When **Action = Wait**, the dosing does not continue until the monitored quantity has once again fallen below the upper limit incl. the value entered here.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	0.000 to 20.000
Default value	0.020

Measuring mode U:

Input range	0.0 to 2000.0 mV
Default value	2.0 mV

Dosing rate:

Input range	0.00 to 166.00 mL/min
Default value	0.20 mL/min

Temperature:

Input range	0.0 to 150.0 °C
Default value	0.2 °C

Action

Selection of the action which is carried out when the limits of the monitored quantity are infringed.

Selection	None | Exit method | Cancel command | Pause | Wait
-----------	---

None

No action will be taken.

Exit method

The method is stopped immediately.

Cancel command

The current command is stopped and the next command in the method will be started.

Pause

Adding reagent is stopped until the dosing is continued manually with **[Continue]**. If several quantities are monitored, the other quantities will still be monitored in the background.

Wait

Adding reagent is stopped until the value of the monitored quantity is within the limits again (incl. hysteresis). The dosing is continued automatically. If several quantities are monitored, the other quantities will still be monitored in the background.

**NOTE**

If the lower limit is infringed while monitoring the dosing rate, the settings **Action = Pause** and **Action = Wait** do not make sense because the average dosing rate becomes smaller and smaller during the waiting time. The valid range can never be reached again.

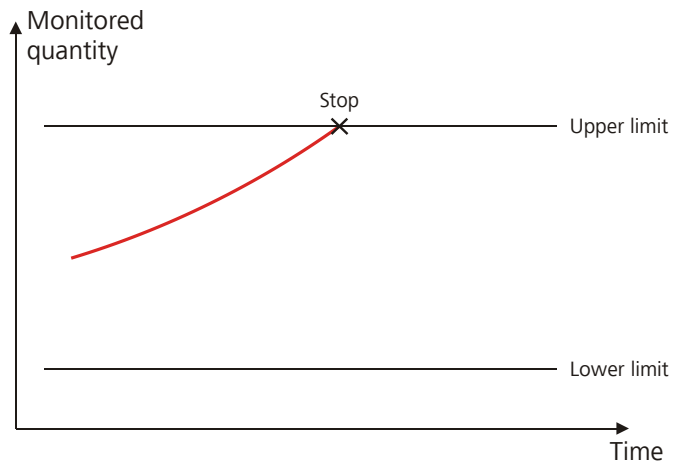


Figure 16 Action "Exit method" or "Cancel command"

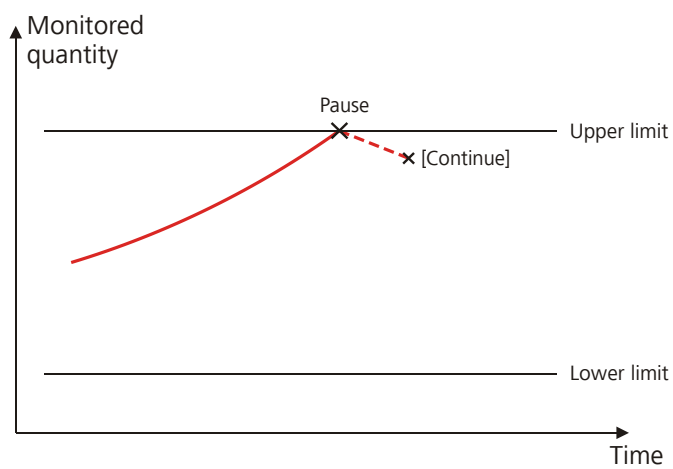


Figure 17 Action "Pause"

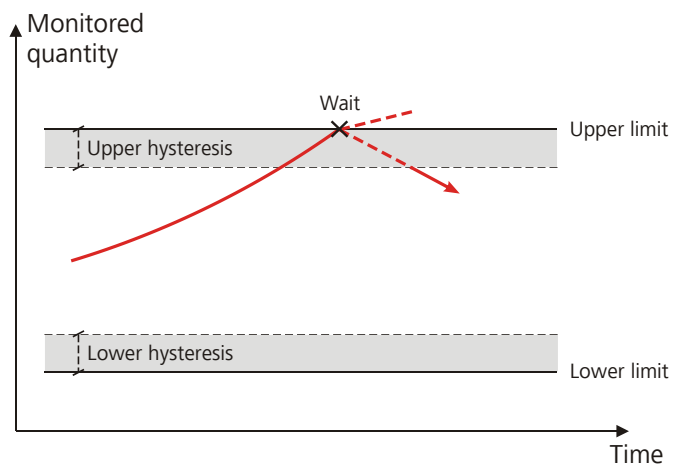


Figure 18 Action "Wait"

Communication

Under **[Communication]**, remote signals or RS-232 commands can be assigned to the monitored quantities. These remote signals or RS-232



commands are always sent, independent of the action defined for a limit infringement (see "Action", page 372).

[New]

Define a new assignment.

[Delete]

Delete the selected assignment.

[Edit]

Edit the settings for the selected assignment.

Monitored quantity

Selection of the monitored quantity to which a remote signal or an RS-232 command is to be assigned.

Selection	Measured value | Temperature | Dosing rate | any
-----------	---

any

If several quantities are monitored, the remote signal or RS-232 command set is sent as soon as a limit of one of the monitored quantities is exceeded.

Infringed limit

Indicating the limit whose infringement causes the remote signal or RS-232 command defined in the following to be sent.

Selection	upper | lower | any | back in range
-----------	--

upper

The remote signal or the RS-232 command is sent when the upper limit is exceeded.

lower

The remote signal or the RS-232 command is sent when the lower limit is exceeded.

any

The remote signal or the RS-232 command is sent when the upper or the lower limit is infringed.

back in range

The remote signal or the RS-232 command is sent when the value of the monitored quantity is within the limits again (incl. hysteresis).

Interface

Selection of the Remote Box or the serial interface via which the remote signal or the RS-232 command is sent.

Selection	Remote Box 1...4 | COM1...8
-----------	------------------------------------

Output signal

This parameter can only be edited when a Remote Box is selected under **Interface**.

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System ► Templates ► Output lines**.



NOTE

A line set active is not being reset automatically, nor at the end of the determination nor when the monitored quantity is in the range again.

Entering a bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal *******1** line 0 is set. With a pulse, the length is set to 200 ms. If it is required to set pulses with other lengths, you have to define a corresponding template.

Entry	Bit patterns containing exactly 14 characters or a max. of 24 characters for the name of the template
Default value	*****
Selection	Selection of the templates defined

Character string

This parameter can only be edited when a serial interface (COM) is selected under **Interface**.

Input of the RS-232 command as character string. All characters of the ASCII code page can be used. Control characters (Esc, FF etc.) have to be entered as a three-place, decimal ASCII code, starting with a slash. Each command is automatically terminated with the ASCII characters **CR** and **LF**.

Entry	ASCII string with a max. of 24 characters
Default value	empty

29.7.6 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.7.7 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

Electrode check

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

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.7.8 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **Sys-tem ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

Tandem dosing

A second dosing device can be defined under **[Tandem dosing]** in order to enable uninterrupted dosing. Dosing is carried out with a combination of two dosing devices so that the second dosing device is dosing while the first one is being filled and vice versa.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

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

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, only the time interval for the GLP test of the buret unit is checked at the start of the determination.

**NOTE**

The concentration, validity of the titer and the working life of the titrant are ignored.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

Filling rate

Rate at which the dosing cylinder is filled.

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

Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

However, in order to ensure uninterrupted dosing, the following points must be taken into account:

- Use the highest possible filling rate in order to keep the filling times as short as possible. The filling rate should be decreased for viscous liquids.
- When you use two buret units with different dosing cylinders, the filling rate for the larger sized cylinder must be at the minimum:

$$v_{2,Fill} \geq v_{1,Fill} \cdot \frac{V_{Cyl.2}}{V_{Cyl.1}}$$

$v_{2,Fill}$ = filling rate in mL/min for the larger sized cylinder

$v_{1,Fill}$ = filling rate in mL/min for the smaller cylinder

$V_{Cyl.2}$ = cylinder volume in mL of the buret unit of the second dosing device

$V_{Cyl.1}$ = cylinder volume in mL of the buret unit of the first dosing device

Example:

Dosing device 1: volume = 20 mL, filling rate = 50 mL/min

Dosing device 2: volume = 50 mL

Filling rate 2 \geq 50 mL/min \cdot 50 mL / 20 mL \geq 125 mL/min

- The dosing rate must not exceed 75% of the filling rate of the smaller cylinder. These values are listed in the following table, valid at maximum filling rate:

Table 16 Maximum dosing rate for different dosing cylinders

Cylinder volume	maximum dosing rate	
	Exchange unit	Dosing unit
1 mL	2.25 mL/min	–
2 mL	–	5.00 mL/min
5 mL	11.25 mL/min	12.50 mL/min
10 mL	22.50 mL/min	25.00 mL/min

Cylinder volume	maximum dosing rate	
	Exchange unit	Dosing unit
20 mL	45.00 mL/min	50.00 mL/min
50 mL	112.50 mL/min	124.50 mL/min

29.7.9 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.8 Manual titrations (MAT)


A manual titration can be carried out with a Manual Dosing Controller or with the buttons **[Dose]** and **[Cancel command]**.

In order for the manual titration to be carried out with the 6.2107.120 Manual Dosing Controller, the latter must be connected to the MSB connector of the Titrande via the 6.2148.010 Remote Box MSB.

Manual titration using the Manual Dosing Controller

- 1 Press the **[GO]** key to start the method.
- 2 Press the **[GO]** key during the **MAT** command for dosing.
- 3 End the MAT command with the **[FILL]** key.

Manual titration using the buttons

- 1 Press the  key to start the method.
- 2 Press the **[Dose]** button during the MAT command for dosing.
- 3 End the MAT command with the **[Cancel command]** button.



NOTE

Start of titration: Because of the technical implementation involved, a few microliters are already dosed at the start of a manual titration. The possibility of deviation from the actual endpoint volume is excluded, however. The already dosed volume is taken into account.

End of titration: A manual titration must always be ended with the **[Cancel command]** button (NOT with the **[]** fixed key) or with the **[FILL]** key on the Manual Dosing Controller. This is the only way to ensure that subsequent method commands will be carried out.

29.8.1 Dosing parameters

Under **[Dosing parameters]**, the parameters influencing the run of the manual titration are defined.

Dosing ramp

The dosing ramp is a delay in the dosing rate at the time of the start of a dosing step. It is advantageous primarily for manual titrations with indicator, when small volume steps are to be dosed before the equivalence point. The selectable delay time determines after which amount of time the defined dosing rate is to be reached.

Input range	0 to 10 s
Default value	2 s

Dosing rate

The rate at which dosing takes place.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	0.1 to 999999.0 s
Default value	5.0 s

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog

of the command). This value is used for temperature correction in pH measurements.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

29.8.2 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.8.3 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.8.4 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

Tandem dosing

A second dosing device can be defined under **[Tandem dosing]** in order to enable uninterrupted dosing. Dosing is carried out with a combination of two dosing devices so that the second dosing device is dosing while the first one is being filled and vice versa.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

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

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, only the time interval for the GLP test of the buret unit is checked at the start of the determination.



NOTE

The concentration, validity of the titer and the working life of the titrant are ignored.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).



However, in order to ensure uninterrupted dosing, the following points must be taken into account:

- Use the highest possible filling rate in order to keep the filling times as short as possible. The filling rate should be decreased for viscous liquids.
- When you use two buret units with different dosing cylinders, the filling rate for the larger sized cylinder must be at the minimum:

$$v_{2,Fill} \geq v_{1,Fill} \cdot \frac{V_{Cyl.2}}{V_{Cyl.1}}$$

$v_{2,Fill}$ = filling rate in mL/min for the larger sized cylinder

$v_{1,Fill}$ = filling rate in mL/min for the smaller cylinder

$V_{Cyl.2}$ = cylinder volume in mL of the buret unit of the second dosing device

$V_{Cyl.1}$ = cylinder volume in mL of the buret unit of the first dosing device

Example:

Dosing device 1: volume = 20 mL, filling rate = 50 mL/min

Dosing device 2: volume = 50 mL

Filling rate 2 \geq 50 mL/min · 50 mL / 20 mL \geq 125 mL/min

- The dosing rate must not exceed 75% of the filling rate of the smaller cylinder. These values are listed in the following table, valid at maximum filling rate:

Table 17 Maximum dosing rate for different dosing cylinders

Cylinder volume	maximum dosing rate	
	Exchange unit	Dosing unit
1 mL	2.25 mL/min	–
2 mL	–	5.00 mL/min
5 mL	11.25 mL/min	12.50 mL/min
10 mL	22.50 mL/min	25.00 mL/min
20 mL	45.00 mL/min	50.00 mL/min
50 mL	112.50 mL/min	124.50 mL/min

29.8.5 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.9 Measurements (MEAS)

29.9.1 Measuring parameters

Under **[Measuring parameters]**, the parameters influencing the run of the entire measurement are defined.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

**NOTE**

A constant measured value is often only reached after a certain time, as mixing and the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e., reaching a constant measured value takes longer and longer. Drift-controlled measured value acceptance is particularly advisable in such cases, as the measured values are only accepted when equilibrium has almost been reached.

Measuring mode pH, U, I_{pol} and Conc:

Input range	0.1 to 999.0 mV/min
Default value	10.0 mV/min
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Upol:

Input range	0.01 to 99.90 µA/min
Default value	10.00 µA/min
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode T:

Input range	0.1 to 999.0 °C/min
Default value	0.5 °C/min
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Measuring mode Cond:

Input range	0.001 to 999.000 (mS/cm)/min
Selection	off
Default value	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	0 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s The default value depends on the measuring mode.
Selection	off

off

The measurement is continued endlessly.

Stop meas. value

The measurement is canceled when the specified measured value has been reached since the start of the measurement.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measuring mode pH:

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measuring mode U, Ipol:

Input range	-2000.0 to 2000.0 mV
Selection	off
Default value	off

Measuring mode Upol:

Input range	-200.00 to 200.00 µA
Selection	off
Default value	off

Measuring mode T:

Input range	-20.0 to 150.0 °C
-------------	--------------------------



Selection	off
Default value	off

Measuring mode Conc:

Input range	0.001 to 999999.999
	The unit corresponds to the one of the standards with which the calibration of the sensor has been carried out.
Selection	off
Default value	off

Measuring mode Cond:

Input range	0.0001 to 999.9999 mS/cm
Selection	off
Default value	off

Temperature

This parameter is not available with the **MEAS T** (temperature measurement) and **MEAS Cond** (conductivity measurement) commands.

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH and concentration measurements.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	0.1 to 999999.0 s
Default value	2.0 s

**NOTE**

The algorithm is only valid for direct measurements (MEAS Conc) if the following conditions are fulfilled:

- The sample preparation must be identical for standard solutions and sample. In other words, if aqueous standard solutions were used for calibration, for example, then the sample must also be produced in aqueous medium.
- The ratio sample volume / volume auxiliary solution must be identical with the ratio volume standard solution / volume auxiliary solution when calibrating the sensor.

Temperature compensation [Temp. compens.]

The parameters for converting the measured conductivity to a reference temperature are defined under **[Temp. compens.]**. This button is available only with the **MEAS Cond** command (conductivity measurement).

Measuring temp.

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Reference temp.

The measured conductivity is converted to this temperature.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C
Selection	off

off

The temperature compensation is disabled.

Temp. compensation

Type of temperature compensation.

Selection	constant | ISO / DIN
-----------	-----------------------------

constant

The temperature compensation is carried out with the value entered for the temperature coefficient.

Concentration standard

Concentration of the standard solution used. When **Addition = manual** is defined, a numerical value has to be entered here, the selection **from list** creates an error message when starting the determination.

Input range	0.00001 to 99999.9
Selection	from list
Default value	from list

from list

The standard solution selected under **Standard addition ► Dosing device** is used.

Unit of the standard solution used.

Entry	max. 24 characters
Selection	mol/L | mmol/L | ppm | % | g/L | mg/L | µg/L
Default value	ppm

Number of additions

Number of standard additions. The more addition steps you carry out the more accurate the evaluation becomes.

Input range	1 to 19
Default value	3

Stop volume

Maximum permissible volume for the volume steps. If the sum of the volume steps is higher than this volume, an error message is displayed when starting the determination.

Input range	0.00 to 9999.90 mL
Default value	99.99 mL

Volume aux. solution

Volume of the buffer solution etc. which has to be added to the sample before the measurement can be started.

Input range	0.00 to 9999.90 mL
Default value	0.00 mL

Stirrer control

The parameters for the stirrer control during the standard addition are edited under **[Stirrer control]**. Ensure that a stirrer has been selected in the **Edit command / Stirrer** dialog.



Stir solution during measurement

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

If this parameter is activated, the stirrer will be switched on and off automatically at the start or end of the measurement.

Stir before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If the stirrer is switched off during the measurement, it will be stirred for the time entered before measuring.

Input range	0 to 999999 s
Default value	0 s

Pause before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If it is stirred before the measurement, a waiting time can be defined here before starting the measurement. No stirring or measuring occurs during this time.

Input range	0 to 999999 s
Default value	0 s

Dosing device

The parameters for the dosing device are edited under **[Dosing device]**. This button is enabled only with **Addition = auto** or **auto dos**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Standard

Selection of the standard solution from the titrant list. We recommend always selecting the standard solution. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Standard solutions are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct standard solution has been attached and whether the type of dosing drive matches. For buret units without integra-

ted data chip, the cylinder volume and the type of dosing drive are checked. For the selected standard solution, the validity of the titer, the working life of the standard solution and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

Dosing rate

Three predefined sets of parameters can be selected for the dosing rate. The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Selection	slow | medium | fast
Default value	fast

slow

The dosing rate is at 10 % of the maximum dosing rate.

medium

The dosing rate is at 50 % of the maximum dosing rate.

fast

The dosing rate is equivalent to the maximum dosing rate.

Delta U

This parameter can only be edited with **Addition = auto**.

The individual volume steps are calculated in the way that the voltage difference entered is reached.

Input range	1 to 999 mV
Default value	10 mV

Addition increments

The volume of the individual volume steps is defined under **[Addition increments]**. This button is enabled only with **Addition = auto dos** or **manual**.

Volume

Volume of a single volume step.

Input range	00.000 to 9999.900 mL
Default value	00.100 mL

Apply this value for all increments

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

If you activate this parameter, the entered volume is applied for all volume steps.

29.9.3 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.9.4 Sensor

The parameters for the sensor are edited under **[Sensor]**.

The parameters are valid for all measuring modes except for **Temp. measurement**. This parameter is not available with the **MEAS T** command (temperature measurement).

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

I(pol)

The polarization current is the current that is applied to a polarizable electrode during voltametric measurement. This parameter is available only with I(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-125.0 to 125.0 μA (Increment: 2.5)
Default value	5.0 μA
Selection	-1.0 μA | 1.0 μA

U(pol)

The polarization voltage is the voltage applied to the polarizable electrode during an amperometric measurement. This parameter is available only with U(pol) determinations.

The values that are actually adjustable may vary from the values specified here, depending on the hardware. The binding values can be found in the *Technical specifications* chapter for the control instrument used.

Input range	-1,250 to 1,250 mV (Increment: 25)
Default value	400 mV

Electrode check

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

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes
- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

**automatic**

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.9.5 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.10 Calibration of sensors (CAL)

29.10.1 Calibration parameters (CAL pH)

Under [**Calibration parameters**], the parameters influencing the run of the entire calibration are defined.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable maximum waiting time is automatically calculated except you already have modified this waiting time.

Input range	0.1 to 999.0 mV/min
Default value	2.0 mV/min
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	10 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	110 s
Selection	off

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	-20.0 to 150.0 °C
Default value	25.0 °C



Sample Processor

If the calibration is carried out with a Sample Processor, the buffers or standards are automatically changed. This is why no request for the calibration temperature appears when starting the calibration. The value entered above is used.

Selection	off | Remote | USB
Default value	off

off

For calibrations without Sample Processor. During the calibration, a request for changing the buffer/standard is displayed.

Remote

For automatic calibrations with Sample Processors, which are connected via the Remote Box.

USB

For automatic calibrations with a Sample Processor that is connected via USB(see "*Definition of the calibration positions*", page 509).

Buffers

The buffer type and the number of buffers is defined under **[Buffers]**.

Buffer type

Selection of a predefined buffer series or definition of special buffers. In the case of predefined buffer series, the instrument automatically recognizes which buffer is involved.

Selection	Metrohm | NIST | DIN | Fisher | Fluka Basel | Mettler | Merck Tit. | Beckman | Radiometer | Custom | Special | Merck Cer. | Baker | Hamilton | Precisa
Default value	Metrohm

Custom

Definition of a custom buffer series. The buffer series is defined under **System ► Templates ► Custom calib. buffers.**

Special

Up to five calibration buffers can be defined in the method. The automatic buffer detection is not activated in this case. The buffers must be measured precisely in the specified sequence.

Merck Cer.

Reference temperature = 25 °C. When using Merck CertiPUR buffers (20 °C) the buffer type **Merck Tit.** must be selected.

Number of buffers

This parameter is not visible when **Buffer type = Special** is defined.

Number of buffers that are used for calibration. If calibration is accomplished with more than two buffers, then they can be used repeatedly in order to give them more statistical weight. The first two buffers must however always be different from one another.

Selection	1 | 2 | 3 | 4 | 5
Default value	2

Buffer 1 pH

This parameter is visible only when **Buffer type = Special**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Input range	-20.000 to 20.000
Default value	7.000

Buffer 2 pH

This parameter is visible only when **Buffer type = Special**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Input range	-20.000 to 20.000
Default value	4.000
Selection	off

Buffer 3 pH

This parameter is visible only when **Buffer type = Special**.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Input range	-20.000 to 20.000
Selection	off
Default value	off

Buffer 4 pH

See **Buffer 3 pH**.

Buffer 5 pH

See **Buffer 3 pH**.

Stirrer control

The parameters for the stirrer control during the calibration are edited under **[Stirrer control]**. Ensure that a stirrer has been selected in the **Edit command / Stirrer** dialog.



NOTE

Deactivate the **Stir solution during measurement** parameter when you carry out the calibration with a Sample Processor. The stirrer control for the tower stirrer is ineffective with these instruments.

Stir solution during measurement

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

If this parameter is activated, the stirrer will be switched on and off automatically at the start or end of the measurement.

Stir before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If the stirrer is switched off during the measurement, it will be stirred for the time entered before measuring.

Input range	0 to 999999 s
Default value	0 s

Pause before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If it is stirred before the measurement, a waiting time can be defined here before starting the measurement. No stirring or measuring occurs during this time.

Input range	0 to 999999 s
Default value	0 s

29.10.2 Calibration parameters (CAL Conc)

Under **[Calibration parameters]**, the parameters influencing the run of the entire calibration are defined.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute. For this value, a suitable

maximum waiting time is automatically calculated except you already have modified this waiting time.

Input range	0.1 to 999.0 mV/min
Default value	2.0 mV/min
Selection	off

off

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	10 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. As default value, a suitable waiting time for the signal drift is automatically calculated.

Input range	0 to 999999 s
Default value	110 s
Selection	off

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Sample Processor

If the calibration is carried out with a Sample Processor, the buffers or standards are automatically changed. This is why no request for the calibration temperature appears when starting the calibration. The value entered above is used.

Selection	off | Remote | USB
Default value	off

off

For calibrations without Sample Processor. During the calibration, a request for changing the buffer/standard is displayed.

**Remote**

For automatic calibrations with Sample Processors, which are connected via the Remote Box.

USB

For automatic calibrations with a Sample Processor that is connected via USB(see "*Definition of the calibration positions*", page 509).

Standards

The concentrations of the standards as well as their units are defined under **[Standards]**.

Unit

Unit of the standard solutions used. For concentration measurements without standard addition, this unit will be used.

Selection	mol/L | mmol/L | ppm | % | g/L | mg/L | µg/L
Default value	ppm

Concentration standard 1

Concentration of the standard solution used.

Input range	00.001 to 999999.999
Default value	1,000

Concentration standard 2

Concentration of the standard solution used.

Input range	00.001 to 999999.999
Selection	off
Default value	off

Concentration standard 3

See **Concentration standard 2**.

Concentration standard 4

See **Concentration standard 2**.

Concentration standard 5

See **Concentration standard 2**.

Stirrer control

The parameters for the stirrer control during the calibration are edited under **[Stirrer control]**. Ensure that a stirrer has been selected in the **Edit command / Stirrer** dialog.

**NOTE**

Deactivate the **Stir solution during measurement** parameter when you carry out the calibration with an 814 USB Sample Processor or with an 815 Robotic USB Sample Processor XL. The stirrer control for the tower stirrer is ineffective with these instruments.

Stir solution during measurement

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

If this parameter is activated, the stirrer will be switched on and off automatically at the start or end of the measurement.

Stir before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If the stirrer is switched off during the measurement, it will be stirred for the time entered before measuring.

Input range	0 to 999999 s
Default value	0 s

Pause before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If it is stirred before the measurement, a waiting time can be defined here before starting the measurement. No stirring or measuring occurs during this time.

Input range	0 to 999999 s
Default value	0 s

29.10.3 Calibration parameters (CAL Cond)

Under **[Calibration parameters]**, the parameters influencing the run of the entire calibration are defined.

Signal drift

Maximum permissible drift for the measured value acceptance, i.e. maximum change of the measured value per minute.

Input range	00.001 to 999,000 (mS/cm)/min
Selection	off
Default value	off

**off**

Measured value acceptance will take place after the maximum waiting time has elapsed.

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The minimum waiting time is only important for drift-controlled measurements.

Input range	0 to 999999 s
Default value	0 s

Max. waiting time

If the signal drift has been switched off or has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed.

Input range	0 to 999999 s
Default value	10 s
Selection	off

off

The measurement is continued endlessly.

Measuring temp.

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Standard

The characteristics of the calibration standard used are defined under **[Standard]**. These values will be suggested in the request after the start of the calibration.

Request at calibration start

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

When this parameter is activated, then entering the following parameters will be requested after the start.

Conductivity standard

Conductivity of the calibration standard used.

Input range	0.00000 to 2000.00 mS/cm
Default value	12.8800 mS/cm

Reference temp. standard

Reference temperature at which the calibration standard has the conductivity entered above.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Temp. coefficient

Temperature coefficient belonging to the reference temperature entered above. With this temperature coefficient, the conductivity is converted to the reference temperature.

Input range	0.00 to 9.99 %/°C
Default value	1.90 %/°C

Stirrer control

The parameters for the stirrer control during the calibration are edited under **[Stirrer control]**. Ensure that a stirrer has been selected in the **Edit command / Stirrer** dialog.

Stir solution during measurement

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

If this parameter is activated, the stirrer will be switched on and off automatically at the start or end of the measurement.

Stir before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If the stirrer is switched off during the measurement, it will be stirred for the time entered before measuring.

Input range	0 to 999999 s
Default value	0 s

Pause before meas.

This parameter can only be edited when the parameter **Stir solution during measurement** is deactivated.

If it is stirred before the measurement, a waiting time can be defined here before starting the measurement. No stirring or measuring occurs during this time.

Input range	0 to 999999 s
Default value	0 s



29.10.4 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ▶ Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.10.5 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ▶ Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

Electrode check

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

This parameter is available only for the command **CAL pH**.

For the following electrodes, an electrode check can be carried out:

- pH electrodes
- Metal electrodes

- Ion-selective electrodes

A check is made that the electrode is properly connected and that no short-circuit is present. The electrode check is carried out when this command is started. Note that this electrode check has nothing to do with the electrode test (command **ELT**).

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the calibration temperature entered manually will be used.

off

The temperature will not be measured. The calibration temperature entered manually is used. The temperature is requested after the start, except the determination is carried out with a Sample Processor.

29.10.6 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

29.11 Electrode test for pH electrodes (ELT)

An automatic electrode test can be carried out for pH electrodes which will permit a qualification of the electrode used. Differentiated specifications regarding characteristic measurement properties of your pH electrode (slope, response time, etc.) will be obtained as the result. The concluding evaluation of the electrode is carried out by testing these results against the specified limit values. Once the electrode test has been successfully completed, the calibration data is stored with the sensor data of the sensor used.

These limit values are saved in the software for the following types of pH electrodes:

- Standard electrodes
- Gel electrodes
- Electrodes with a nonaqueous reference electrolyte

You can, however, also define limits of your own choosing (*see chapter 15.7, page 168*). The precise classification of the measuring chain is determined by the reference system used. You will find an overview of these electrode types and the corresponding limit values in *table 18, page 414*.

Faulty electrodes often exhibit certain combinations of measurement results of the electrode test which fall outside the intended limits. This makes it possible to have more precise data concerning possible causes of errors and recommended remedial measures.

Buffers

You will require flawless buffers in the pH values 4, 7 and 9 for carrying out the electrode test. We recommend for this purpose the appropriate Metrohm buffers. The electrode test can, however, in principle also be carried out with any of the buffer sets contained in the memory.

The buffers must be measured in the following sequence:

1. pH 9
2. pH 4
3. pH 7



NOTE

Ensure in particular the flawlessness of the pH 9 buffer. It can readily deviate from its specified pH value as the result of absorption of CO₂ from the ambient atmosphere, thus leading to incorrect test results.

Stirrer

A stirrer has to be connected to the titrator for the electrode test.

Temperature

Take care to ensure that the entire electrode test is carried out at a consistently uniform temperature. Work should be accomplished at room temperature wherever possible, in light of the fact that temperature exercises a great influence on response time. The preset limit values are calibrated to 25 °C.

29.11.1 Electrode test parameters

Under [**Electrode test param.**], the parameters influencing the sequence of the electrode test are defined.

Buffer type

Selecting a predefined buffer series.

Selection	Metrohm | NIST | DIN | Fluka Basel | Mettler | Merck Tit. | Radiometer | Merck Cer. | Baker | Hamilton | Precisa
Default value	Metrohm

Merck Cer.

Reference temperature = 25 °C. When using Merck CertiPUR buffers (20 °C) the buffer type **Merck Tit.** must be selected.

Sample Processor

If the calibration is carried out with a Sample Processor, the buffers or standards are automatically changed. This is why no request for the calibration temperature appears when starting the calibration. The value entered above is used.

Selection	off | Remote | USB
Default value	off

off

For calibrations without Sample Processor. During the calibration, a request for changing the buffer/standard is displayed.

Remote

For automatic calibrations with Sample Processors, which are connected via the Remote Box.

USB

For automatic calibrations with a Sample Processor that is connected via USB(see "*Definition of the calibration positions*", page 509).

Electrode type

Selection of the electrode type.



Selection	Standard | Gel | Non-aqueous | Custom
Default value	Standard

Standard

Electrodes which contain e.g. KCl solution as reference electrolyte.

Gel

Electrodes which contain Idrolyte as reference electrolyte.

Non-aqueous

Electrodes, which contain a non-aqueous reference electrolyte, e.g. TEABr in ethylene glycol or LiCl in ethanol.

Custom

Under **System ► Templates** a custom electrode type can be defined.

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command).

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

29.11.2 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.11.3 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the calibration temperature entered manually will be used.

off

The temperature will not be measured. The calibration temperature entered manually is used. The temperature is requested after the start, except the determination is carried out with a Sample Processor.

29.11.4 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

29.11.5 Additional information

Table 18 Limit values of the three electrode types

	Rating		
	Excellent electrode	Good electrode	Usable electrode
Electrode type "Standard"			
Streaming potential	2.5 mV	3.0 mV	4.0 mV
Drift	2.0 mV/s	2.5 mV/s	3.0 mV/s
Min. slope	96.5%	96.0%	95.0%
Max. slope	101.0%	102.0%	103.0%
Response time	45 s	50 s	60 s
Lower limit Uoff	-15 mV		
Upper limit Uoff	15 mV		
Electrode type "Gel"			
Streaming potential	3.0 mV	3.5 mV	4.5 mV
Drift	2.5 mV/s	3.0 mV/s	4.0 mV/s
Min. slope	96.5%	96.0%	95.0%
Max. slope	101.0%	102.0%	103.0%
Response time	60 s	75 s	90 s
Lower limit Uoff	-20 mV		
Upper limit Uoff	20 mV		
Electrode type "Non-aqueous"			
Streaming potential	3.0 mV	4.5 mV	6.0 mV
Drift	5.0 mV/s	7.0 mV/s	9.0 mV/s

	Rating		
	Excellent electrode	Good electrode	Usable electrode
Min. slope	88.0%	80.0%	70.0%
Max. slope	120.0%	130.0%	140.0%
Response time	60 s	75 s	90 s
Lower limit Uoff	-50 mV		
Upper limit Uoff	100 mV		

Table 19 Possible errors during the electrode test

Test criterion	Message	Remedy
<p><i>Buffer pH 9:</i></p> <p>The drift in stirred solution is > 1 mV.</p>	General problem	<ul style="list-style-type: none"> Connect an electrode. Replace the defective electrode cable. Clean the diaphragm (see leaflet for the electrode). Replace the electrode.
<p><i>Buffer pH 9:</i></p> <p>-10 mV < U(not stirred) < 10 mV</p> <p>and</p> <p>The sum of the drift values after 1, 2, 3 and 4 min is < 12 mV/min.</p>	Short circuit	Replace the electrode.
A response time does not fulfill the limit value for the rating Usable electrode .	Glass membrane / Diaphragm	Clean the diaphragm (see leaflet for the electrode).
The pH values are not defined for all the buffers at the temperature measured.	No buffer data	Repeat the electrode test at a temperature at which the pH values of all the buffers are defined.
<p>All the slopes fulfill the limit values for the rating Usable electrode.</p> <p>and</p> <p>Uoff is outside the preset limits.</p>	Unsuitable reference electrode	<ul style="list-style-type: none"> Repeat the electrode test with a suitable reference system. Replace the contaminated reference electrolyte. Select Electrode type = Custom and adjust the limits for Uoff.
The streaming potential is too high.	Contaminated diaphragm	Clean the diaphragm (see leaflet for the electrode).
Two slopes do not fulfill the limit values for the rating Usable electrode .	Wrong buffer	Repeat the electrode test with buffers pH 4, 7 and 9.
All the slopes do not fulfill the limit values for the rating Usable electrode .	Partial short circuit	<ul style="list-style-type: none"> Check the temperature sensor. Enter the correct calibration temperature.

- **EVAL FIX-EP** (fixed endpoints)
Measured quantities:
 - Measured value
 - Time
 - Volume
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL RATE** (average dosing rate)

Additional evaluations for KFT titrations

The following additional evaluations are possible:

- **EVAL FIX-EP** (fixed endpoints)
Measured quantities:
 - Measured value
 - Time
 - Volume
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL RATE** (average dosing rate)

Additional evaluations for KFC titrations

The following additional evaluations are possible:

- **EVAL FIX-EP** (fixed endpoints)
Measured quantities:
 - Measured value
 - Time
 - Amount of generated iodine
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL RATE** (average dosing rate)

Additional evaluations for BRC titrations

The following additional evaluations are possible:

- **EVAL FIX-EP** (fixed endpoints)
Measured quantities:
 - Measured value
 - Time
 - Amount of generated bromine
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL RATE** (average dosing rate)

Additional evaluations for STAT titrations

The following additional evaluations are possible:



- **EVAL FIX-EP** (fixed endpoints)
Measured quantities:
 - Measured value
 - Time
 - Volume
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL RATE** (average dosing rate)

Additional evaluations for measurements

The following additional evaluations are possible:

- **EVAL FIX-EP** (fixed endpoints)
Measured quantities:
 - Measured value
 - Time
- **EVAL MIN/MAX** (minimum/maximum)
- **EVAL BREAK** (break points)



NOTE

The commands EVAL are not available for concentration measurements (**MEAS Conc**).

29.12.1 Fixed endpoint evaluation (EVAL FIX-EP)

For the fixed endpoint evaluation, the associated values are interpolated from the measuring point list for one quantity (measured value, volume, etc.). Up to nine fixed endpoints can be evaluated with one command.

Fixed quantity

Selection of the quantity to which the associated value is interpolated from the measuring point list.

Selection	Measured value | Time | Volume | Quantity
Default value	Measured value

Quantity

Amount of iodine/bromine created (only for KFC/BRC).

Fixed EP1 at

The fixed endpoint must lie between the first and the final entry in the measuring point list.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measured value (measuring mode pH):

Input range	-20.000 to 20.000
Selection	off
Default value	off

Measured value (measuring mode U, Ipol):

Input range	-2,000.0 to 2,000.0 mV
Selection	off
Default value	off

Measured value (measuring mode Upol):

Input range	-200.00 to 200.00 µA
Selection	off
Default value	off

Measured value (measuring mode T):

Input range	-20.0 to 150.0 °C
Selection	off
Default value	off

Measured value (measuring mode Cond):

Input range	0.0001 to 999.9999 mS/cm
Selection	off
Default value	off

Time:

Input range	0.0 to 999,999.9 s
Selection	off
Default value	off

Volume:

Input range	0.00000 to 9,999.99 mL
Selection	off
Default value	off

Quantity:

Input range	0.0 to 99,999.9 µg
Selection	off
Default value	off

Fixed EP2 at...Fixed EP9 at

See **Fixed EP1 at.**

29.12.2 pK value and half neutralization potential evaluation (EVAL pK/HNP)

The pK value (pH measuring mode) or the half neutralization potential (U measuring mode) can be determined for DET and MET titrations.

The activities of conjugated acid-base pairs are linked by the so-called Henderson-Hasselbalch equation:

$$\text{pH} = \text{pK}_a + \log (a_B/a_A)$$

If the activities of the acid and the conjugated base are equal ($a_A = a_B$), then $\text{pH} = \text{pK}_a$. This is the value at the half neutralization point and can be extrapolated from the titration curve. A careful pH calibration is necessary for pK evaluations. Nonetheless, the determined pK value is only an approximation, as the ionic strength is not taken into account. In order to obtain more accurate values, titrations must be carried out with decreasing ionic strength and the results extrapolated to the ionic strength zero. pK evaluation in aqueous solution is limited to the range $3.5 < \text{pK} < 10.5$ because of the leveling effect of strong acids and the lack of jumps with very weak acids. pK values of mixtures of acids and polyvalent acids can also be determined.

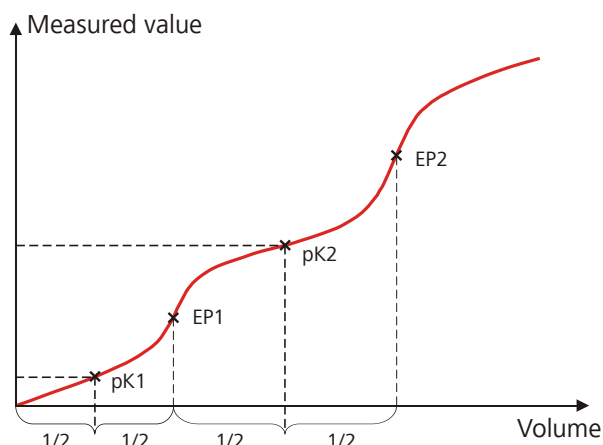


Figure 19 Evaluation of pK value / half neutralization potential

In non-aqueous solutions the half neutralization potential (HNP) is frequently used instead of the pK value. The HNP is evaluated in the same way as the pK value.

No parameters can be edited for the command **EVAL pK/HNP**.



NOTE

If a start volume is to be added then it must be smaller than the half endpoint volume.

29.12.3 Minimum and maximum evaluation (EVAL MIN/MAX)

For the minimum or maximum measured value the associated volume, time and temperature are interpolated from the measuring point list. The evaluation begins as soon as the slope of the curve exceeds a particular threshold value.

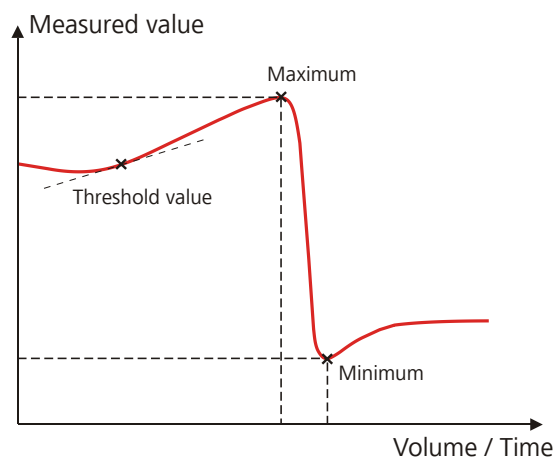


Figure 20 Evaluation of minimum and maximum

Evaluation

Selection whether the minimum or the maximum of the titration curve is being evaluated. With a command either the minimum or the maximum can be evaluated. If both values are needed, a second command has to be defined in the method.

Selection	Minimum | Maximum
Default value	Maximum

Threshold value

The evaluation of the minimum or maximum begins as soon as the slope of the curve exceeds the set threshold value. Use a lower threshold value if the minimum or maximum is not found.

Measuring mode pH:

Input range	0.1 to 20
Default value	1.0
	With titrations, the unit is pH/mL, with measurements pH/s.

Measuring mode U, Ipol:

Input range	1.0 to 2,000.0
Default value	25.0
	With titrations the unit is mV/mL, with measurements mV/s.



Measuring mode Upol:

Input range	0.5 to 10.0
Default value	5.0
	With titrations the unit is $\mu\text{A/mL}$, with measurements $\mu\text{A/s}$.

Measuring mode T:

Input range	0.1 to 20.0 °C/s
Default value	1.0 °C/s

Measuring mode Cond:

Input range	0.5 to 999.9 (mS/cm)/s
Default value	5.0 (mS/cm)/s

29.12.4 Break point evaluation (EVAL BREAK)

A break point evaluation is used to determine sharp changes of direction in the titration curve. This evaluation is primarily used for photometric and conductivity titrations. The method is based on the search for extremes in the second derivative of the curve.

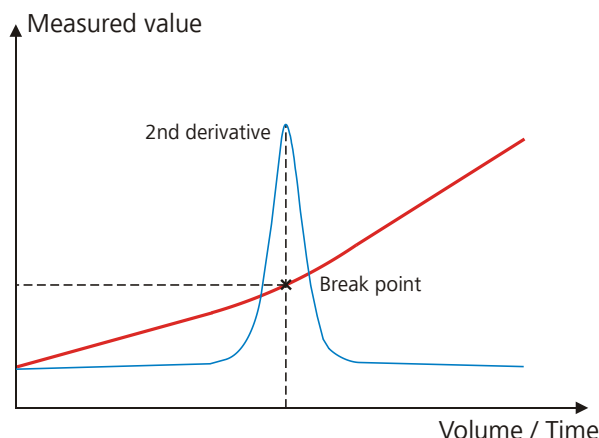


Figure 21 Evaluation of a break point

EP criterion

Measure of the minimum sharpness of the break point. The smaller the EP criterion set, the more break points will be found. As this is a relative value related to the total measured value modification, even small changes in the measured value can be evaluated as a break point for a small measured value range.

Input range	0.0 to 1.0
Default value	0.3

Slope

Minimum difference between the slope before and after the break point. The smaller the difference, the more break points will be found.

Input range	0.0 to 10.0
Default value	0.9

Smoothing factor

The higher the smoothing factor, the fewer break points will be found.

Input range	2 to 20
Default value	5

Set windows

This parameter allows to evaluate break points only in a certain range (so-called window) of the curve. Break points outside this window will not be evaluated. Only one window can be defined. Within this window however, all break points are evaluated.

Selection	off | Measured value | Time | Volume
Default value	off

off

The entire titration curve is being evaluated.

Measured value

The window is defined on the measured value axis.

Time

The window is defined on the time axis.

Volume

The window is defined on the volume axis.

Setting windows

The lower and upper limit of the window is defined under **[Set window]**.

Lower limit

Measured value, time or volume for the lower limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control instrument used.

Measured value (measuring mode pH):

Input range	-20.000 to 20.000
Default value	-20.000

*Measured value (measuring mode U, Ipol):*

Input range	-2,000.0 to 2,000.0 mV
Default value	-2,000.0 mV

Measured value (measuring mode Upol):

Input range	-200.00 to 200.00 µA
Default value	-200.00 µA

Measured value (measuring mode T):

Input range	-20.0 to 150.0 °C
Default value	-20.0 °C

Measured value (measuring mode Cond):

Input range	0.0001 to 999.9999 mS/cm
Default value	0.0001 mS/cm

Time:

Input range	0.0 to 999999.9 s
Default value	0.0 s

Volume:

Input range	0.00000 to 9,999.99 mL
Default value	0.00000 mL

Upper limit

Measured value, time or volume for the upper limit.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Measured value (measuring mode pH):

Input range	-20.000 to 20.000
Default value	20.000

Measured value (measuring mode U, Ipol):

Input range	-2,000.0 to 2,000.0 mV
Default value	2,000.0 mV

Measured value (measuring mode Upol):

Input range	-200.00 to 200.00 µA
Default value	200.00 µA

Measured value (measuring mode T):

Input range	-20.0 to 150.0 °C
Default value	150.0 °C

Measured value (measuring mode Cond):

Input range	0.0001 to 999.9999 mS/cm
Default value	999.9999 mS/cm

Time:

Input range	0.0 to 999,999.9 s
Default value	999,999.9 s

Volume:

Input range	0.00000 to 9,999.99 mL
Default value	9,999.99 mL

29.12.5 Rate evaluation (EVAL RATE)

The rate evaluation provides the median dosing rate in a defined range (so-called window). The median dosing rate is determined by means of linear regression through a minimum of three measuring points. If the dosing is carried out with only one dosing device and if more than one cylinder volume is dosed, then the median dosing rate will be reduced as a result of the filling time.

When the command is opened for the first time, a window over the entire time range is already defined. In contrary to the potentiometric evaluation of a DET/MET titration the individual windows may overlap. A maximum of 9 windows can be defined.

[New]

Define a new window.

[Delete]

Delete the selected window.

[Edit]

Edit the settings of the selected window.

Lower limit

Time for the lower limit.

Input range	0 to 999999 s
Default value	0 s

Upper limit

Time for the upper limit.

Input range	0 to 999999 s
Default value	999999 s

29.13 Calculations

The following calculation commands are available:

CALC	Defining calculations of a determination.
CALC LIVE	Defining the calculation whose result will be displayed in the live display (so-called live result) during a titration or measurement.

29.13.1 Calculations (CALC)

Calculations are defined with the command **CALC**. A method may contain a maximum of nine calculation commands. A maximum of nine calculations can be defined per command. A series of variables (raw data from the determination, previously calculated results, etc.) is available for the calculations.

The command contains the following options, among others:

- Save result as titer
- Save result as common variable
- Save result in result table
- Define result limits

Sequence / Edit command	
02 CALC	Calculation
Result	Result name
R1	Content
<div style="display: flex; justify-content: space-around;"> New Delete Edit </div>	

The result name is specified in the list for each calculation.

[New]

Define a new calculation or load an existing template, see following chapter.

[Delete]

Delete the selected calculation from the list.

[Edit]

Edit the data of the selected calculation (see chapter 29.13.1.2, page 429).

29.13.1.1 Loading a result template

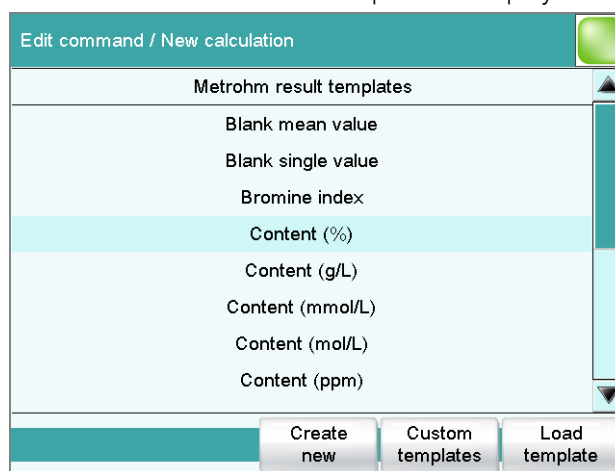
The most common calculations are already available, the so-called result templates, in order to facilitate the definition of a new calculation. You also have the option, however, of defining templates of your own (see dialog **System / Templates**).

Proceed as follows to load an existing template:

1 Select a result template

- In the **Sequence / Edit command** dialog, tap on the **[New]** button.

The list of Metrohm result templates is displayed:

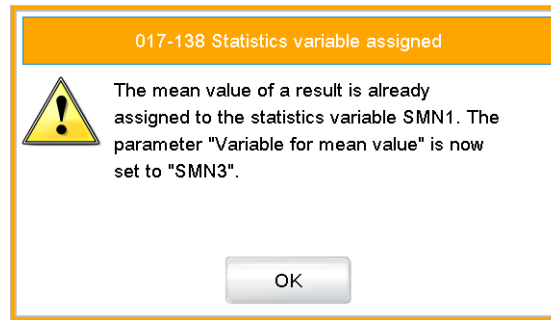


- Select the desired Metrohm result template and tap on **[Load template]**.

or

Tap on **[Custom templates]** and select a template you generated yourself.

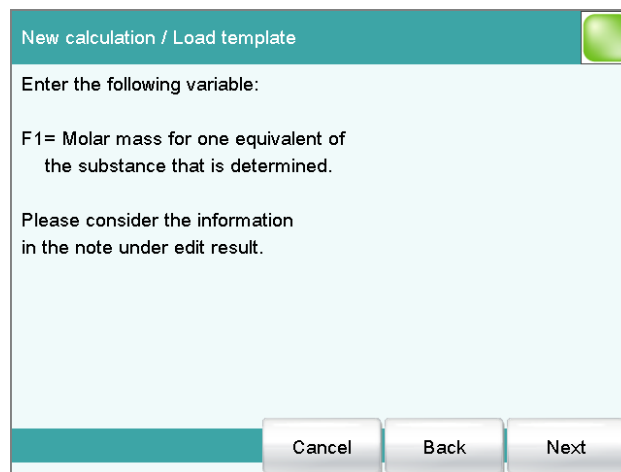
If a statistic variable SMN# (# = 1..9) is defined in the template which is already used in another calculation, then the following message will be displayed:



2 Confirm the message

- Tap on **[OK]**.

The Note dialog is displayed. This note is defined in the dialog **Edit result template / Note for wizard**.



3 Enter the numerical values of the wildcards

- Tap on **[Next]**.

The list of wildcards is displayed:

F1=	<input type="text" value="35.45"/>	F6=	<input type="text"/>
F2=	<input type="text"/>	F7=	<input type="text"/>
F3=	<input type="text"/>	F8=	<input type="text"/>
F4=	<input type="text"/>	F9=	<input type="text"/>
F5=	<input type="text"/>		

- Enter the numerical values of the wildcards.
- Tap on **[Next]**.

The editing dialog of the new calculation is displayed:

The screenshot shows a dialog box titled "Edit command / Edit calculation". Inside, there are four main fields: "Result name" with the value "Content (%)", "Calc. formula R3" with the formula "EP1*CONC*TITER*35.45*0.1/C00", "Decimal places" set to "2", and "Result unit" set to "%". Below these fields is a row of four buttons: "Note", "Result variable", "Result limits", and "Result options".

The calculation can now be edited further, e.g. define result limits, see following chapter.

29.13.1.2 Editing a calculation

Result name

The result name is the text which will be shown in the result display and in the report. The default name corresponds to the result variable.

Entry	max. 24 characters
Default value	R1...R9

Calc. formula R1...R9

Shows the calculation formula. A special editor is opened for the definition (see chapter 29.13.3, page 435). The designation **R1...R9** corresponds to the result variable. Under **[Result variable]** this can later be modified.

Entry	max. 100 characters
Default value	empty

Decimal places

Number of decimal places used to display the result.

Input range	0 to 5
Default value	2

Result unit

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

Entry	max. 10 characters
-------	---------------------------

Selection	% | mol/L | mmol/L | g/L | mg/L | mg/mL | mg/100 g | ppm | g | mg | µg | mL | µL | mg/ piece | °C | µg/min | mL/min | µL/min
Default value	%

[Note]

Entering a note on the calculation.

[Result variable]

Modifying the result variable.

[Result limits]

Defining the limits for the monitoring of the result.

[Result options]

Defining additional settings for the calculation.

Dialog "Edit calculation / Note"

In this dialog you can enter a short text, e.g. to describe the variables used.

Dialog "Edit calculation / Result variable"

When a new calculation is created, the result variable will be automatically issued. In this dialog, however, it can be modified at any time.

Result variable

To each calculation belongs an unambiguous result variable. With this result variable you can use this result in additional calculations.

Selection	R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 The selection contains only those result variables which are not issued in this calculation command yet.
-----------	---

Dialog "Edit calculation / Result limits"

For each result, limit values can be defined. These result limits are monitored when the calculation is carried out. If monitoring is activated, the results are shown as follows in the result display:

- Green, if the result falls within the limit values
- Red, if the result lies outside the limit values

Monitoring result limits

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

Enabling and disabling the monitoring function.

Lower limit

When the monitored quantity falls below this value, the action defined in the following is triggered.

Input range	0 to 9999999999
Default value	0

Upper limit

When this value is exceeded, the action defined in the following is triggered.

Input range	0 to 9999999999
Default value	9999999999

Action

Selection of the action, which is carried out when the result limits are exceeded.

Selection	Display message | Document message | Cancel determination
Default value	Display message

Display message

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

Document message

In the determination data it will be documented, that the result limits have been exceeded.

Cancel determination

The determination is stopped.

Dialog "Edit calculation / Result options"

In the dialog **Edit calculation / Result options**, settings for how to process the calculated result are defined.

Variable for mean value

If the statistic calculations have been activated (see method options), the mean value of the single results will be saved as variable SMN1 to SMN9. As default value, always the first free variable is being displayed.

Selection	SMN1 ... SMN9 | off
-----------	----------------------------

off

For the result not statistic calculations are carried out.

Save as titer

The result can be saved as titer for the selected titrant.

**NOTE**

The titer is assigned to the titrant defined in the last titration command before the calculation. Please note that the CALC command containing the titer assignment is inserted after the titration command with which the titer is determined.

Selection	Single value | Mean value | off
Default value	off

Single value

The result of the current determination is saved as titer.

Mean value

If statistic calculations are carried out for the result, the current mean value of the determination series is saved.

off

The result is not saved as titer.

Save as common variable

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

The calculated result can be saved as a method-independent variable, a so-called common variable. The result is then also available in other methods for calculations. In all cases, only the single value will be saved, even if the statistics function is enabled.

Variable

Selection of the common variable to which the result is being assigned.

Selection	CV01 ... CV25
-----------	----------------------

Display result

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

If you deactivate this parameter, the result is neither displayed in the result dialog nor printed in the result report. This can be advisable for intermediate results.

Save result in result table

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

The calculated result can be saved in the result table. This may be advisable if e.g. the results of all determinations carried out on a particular day are to be displayed clearly. A maximum of nine results from a determination can be saved in the result table.

Precision

Setting, with which accuracy the result is used in additional calculations.

Selection	Round | Truncate | Full precision
Default value	Round

Round

The result is rounded to the defined number of decimal places (commercial rounding, in accordance with the US Pharmacopeia USP). If the digit at the first dropped decimal place is **1, 2, 3 or 4**, then it will be rounded off; if this digit is **5, 6, 7, 8 or 9**, then it will be rounded up. Negative digits will be rounded in accordance with their amount, i.e. away from zero.

Truncate

The result is cut to the number of decimal places defined.

Full precision

The result is used with full accuracy (floating point number either in "single precision" (32 bit) or in "double precision" (64 bit), according to the standard IEEE 754).

29.13.2 Calculations (CALC LIVE)

The command **CALC LIVE** can be used to define a calculation, the result of which will be shown in the live display during a titration or measurement. The current volume or measured value, respectively, is used for this purpose. This is helpful, e.g. for Karl Fischer titrations, in order to be able to track the water content directly during the titration.



CAUTION

The command must be inserted directly before the corresponding titration or measuring command.

This command is identical with the **CALC** command except for the following differences:

- The number of variables is limited.
- There are no result options.
- The result cannot be monitored.
- The result variable cannot be modified.
- The result will only be displayed in the live display. It appears neither in the results dialog nor in a report.

Result name

With live calculations no custom result name can be defined, the designation **LR** cannot be modified.

Calculation formula

Shows the calculation formula. A special editor is opened for the definition (see chapter 29.13.3, page 435).

Entry	max. 100 characters
Default value	empty

Decimal places

Number of decimal places used to display the result.

Input range	0 to 5
Default value	2

Result unit

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

Entry	max. 10 characters
Selection	% | mol/L | mmol/L | g/L | mg/L | mg/mL | mg/100 g | ppm | g | mg | µg | mL | µL | mg/piece | °C | µg/min | mL/min | µL/min
Default value	%

[Note]

Entering a note on the calculation.

Dialog "Edit calculation / Note"

In this dialog you can enter a short text, e.g. to describe the variables used.

Displaying the live result

Proceed as follows to display the live result in the live display:

1 Starting a determination

- Tap on [▶].

The determination starts and the live display is shown:

2 Define the display options

- Tap on the **[View]** button.
- Tap on the **[Meas. value options]** button.
A maximum of three measured values can be shown in the live display.
- Select the option **Live result** at one of the three parameters.

3 Display the live display

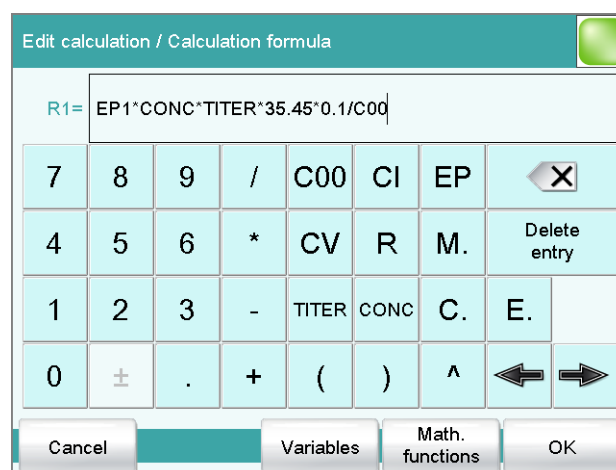
- Tap twice on [↵].

The current result is displayed,

29.13.3 Formula editor

The formulas for the calculations are entered with the formula editor. The maximum formula length is 100 characters.

The formula editor contains buttons for entering numbers, mathematical operators and variables. The variables can be selected from lists. This is advisable in order to avoid spelling mistakes. The formula editor is equipped with an automatic syntax check, which is activated when applying the formula. The standard rules of priority apply for the calculation operations.



Key	Description
C00	Sample size
CI	Sample identification CI# (# = 1 - 2)
EP	Volume of endpoint EP# (# = 1...9)
CV	Common Variable CV# (# = 1...25)
R	Result R# (# = 1 - 9)
TITER	Titer of the titrant selected in the previous command
CONC	Concentration of the titrant selected in the previous command
□	The character in front of the cursor is deleted.
Delete entry	The content of the input field is deleted completely.

Key	Description
⇐	The cursor within the input field is shifted to the left by one character.
⇒	The cursor within the input field is shifted to the right by one character.

If the method contains more than one data-generating command (titration, measurement etc.) before the calculation command, then you will have to indicate the command identification in front of the variable:

Variable	Description
#M.	Titration or measuring command
#C.	Calculation command
#E.	Evaluation command

"#" stands for a sequential number that you must enter manually. The number for each command identification will be counted separately and does not necessarily correspond to the number of the command line.

Example: The variable **1M.TITER** corresponds to the titer of the titrant selected in the first titration command.



CAUTION

The command identifications are not adjusted automatically when additional commands are subsequently inserted into the method. Check the formula for correctness in such cases.

[Variables]

Opening the list of additional variables (*see chapter 29.13.3.1, page 436*).

[Math. functions]

Opening the list with mathematical functions (*see chapter 29.13.3.2, page 437*).

29.13.3.1 Variables

All of the variables which can be used for calculations are divided up according to subject in the dialog **Calculation formula / Variables**:

- **System variable**
List of the system-specific variables. These variables describe the current status of the system.
- **Result and statistics variables**
List of the variables which are required for calculating results and statistics for the current determination.

- **Common variables**

List of common variables. All of the common variables are listed, no matter whether they possess a value or not.

You will find a detailed description of all of the variables in *chapter 29.13.3.3, page 438*.

29.13.3.2 Mathematical functions

The following mathematical functions can be utilized in a calculation formula:

Function	Description
y^z	Power function Example: $4^2 = 16$
SQRT(X)	Square root of X Example: $\sqrt{EP1}$
ABS(X)	Absolute value of X Example: ABS(C00); in order, e.g. with weighing by difference, to convert the negative sample size to a positive value for later calculations.
LN(X)	natural logarithm of X
LOG(X)	Decimal logarithm of X
FRAC(X)	Fraction of X Example: $FRAC(2.5971) = 0.5971$
INT(X)	integer part of X Example: $INT(2.5971) = 2$
TST(X,Y)	Test function If invalid variables (e.g. missing endpoints) occur in a calculation, then these can be replaced with a valid value by using this function. In this way invalid results can be avoided. <ul style="list-style-type: none"> ▪ Syntax: <ul style="list-style-type: none"> – X = variable to be tested – Y = substitute value

29.13.3.3 Variable list

The following table contains all of the variables which can be used for calculations. For variables having an index (e.g. 'EP1'), the index must be entered manually. In the following table, this index is characterized with the character "#".

Variable	Description
C00	Sample size
CI1, CI2	Sample identifications The sample identifications can be used in calculations only if numerical values are entered.
DD	Duration of the entire determination
Titration	
TITER	Titer of the titrant selected in the titration command
CONC	Concentration of the titrant selected in the titration command
Titration, measurements, calibrations	
EP#	Volume/quantity of endpoint EP# (# = 1 - 9)
EC#	Charge at endpoint EP# (# = 1 - 9)
EM#	Measured value of endpoint EP# (# = 1...9)
EF#	ERC of endpoint EP# (# = 1 - 9)
ET#	Temperature at endpoint EP# (# = 1...9)
ED#	Time at endpoint EP# (# = 1...9)
ESI#	Recognition of endpoint EP# (# = 1 - 9) Endpoint found = 1, no endpoint = 0
FMN	Mean gas flow during MEAS T/F ON to MEAS T/F OFF
TMN	Mean temperature during MEAS T/F ON to MEAS T/F OFF
TMI	Minimum temperature during MEAS T/F ON to MEAS T/F OFF
TMA	Maximum temperature during MEAS T/F ON to MEAS T/F OFF
MIM	Initial measured value, i.e. measured value prior to the processing of the start conditions
MIT	Initial temperature, i.e. temperature prior to the processing of the start conditions
MSA	Volume for start volume
MSP	Volume for start measured value
MSS	Volume for start slope
MSV	Volume for all the start conditions
MSD	Duration of start conditions
MSM	Start measured value, i.e. measured value after the processing of the start conditions
MST	Start temperature, i.e. temperature after the processing of the start conditions

Variable	Description
MCD	Total duration of the titration, measurement or calibration
MTM	Type of temperature measurement (Pt1000, NTC or manually) Format = Text
MDD	Duration of effective dosing, i.e. without filling times, pauses
MDC	Drift for drift correction
DDC	Time for drift correction
MCV	End volume, i.e. total dosed volume at the end of the titration
MCQ	End quantity, i.e. total amount of removed water or of generated bromine, respectively, at the end of the titration (in µg)
MCC	Final charge, i.e. total charge in mAs at the end of the titration
MCM	End measured value
MCT	End temperature
MMP	Number of measuring points in measuring point list
MTS	Stop type Format = Text
LV	Currently dosed volume of the ongoing determination
LM	Current measured value of the ongoing determination
LD	Current duration of the ongoing titration or measuring command
LT	Current temperature of the ongoing determination
Sensor	
MEN	Electrode zero point pH(0) or E(0)
MSL	Electrode slope
MVA	Electrode variance (mathematically only defined for 3 standards or more); CAL Conc: calculated only if calibration is carried out with a minimum of four standards
MCL	Cell constant of conductivity measuring cell
Evaluations	
FP#	Volume/amount of fixed endpoint FP# (# = 1–9)
FM#	Measured value of fixed endpoint FP# (# = 1 - 9)
FT#	Temperature at fixed endpoint FP# (# = 1 - 9)
FD#	Time at fixed endpoint FP# (# = 1 - 9)
HP#	Volume of pK value / half neutralization potential HP#
HM#	Measured value of pK value / half neutralization potential HP#
HT#	Temperature at pK value / half neutralization potential HP#
HD#	Time at pK value / half neutralization potential HP#



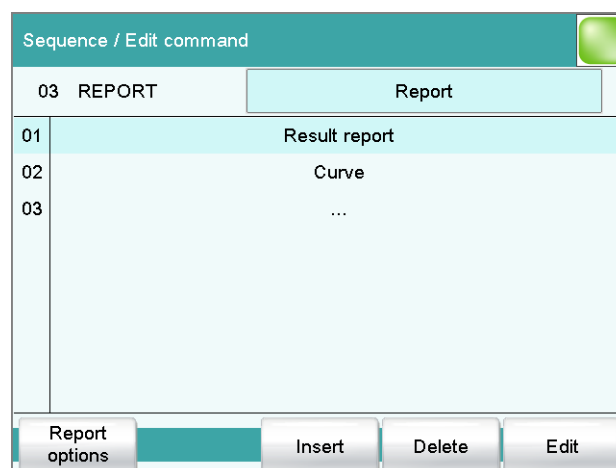
Variable	Description
XIP	Volume/quantity of minimum measured value
XIM	Minimum measured value
XIT	Temperature at minimum measured value
XID	Time at minimum measured value
XAP	Volume/quantity of maximum measured value
XAM	Maximum measured value
XAT	Temperature at maximum measured value
XAD	Time at maximum measured value
BP#	Volume of break point BP# (# = 1 - 9)
BM#	Measured value of break point BP# (# = 1 - 9)
BT#	Temperature at break point BP# (# = 1 - 9)
BD#	Time at break point BP# (# = 1 - 9)
RD#	Mean rate in time slot # (# = 1 - 9)
RDS#	Standard deviation for RD# (# = 1 - 9)
RDC#	Correlation coefficient for RD# (# = 1 - 9)
RM	Mean rate for whole range
RMS	Standard deviation for RM
RMC	Correlation coefficient for RM
Results, statistics	
R#	Result (# = 1–9)
SMN#	Mean value of result R# (# = 1–9)
SSA#	Absolute standard deviation of SMN# (# = 1 - 9)
SSR#	Relative standard deviation of SMN# in % (# = 1 - 9)
SNR#	Number of results from which the mean value SMN# was calculated (# = 1 - 9)
SSD	Number of determinations that are carried out for the statistics calculations
SNT	Statistics status (statistics activated = 1, statistics deactivated = 0)
Common variables	
CV#	Common variable (# = 1...25)
System variables	
%RN	Sample number, i.e. number that is increased by one at each start of a determination
%SC	Start counter, see dialog More determination data / Properties
%AS	Autostart status (autostart activated = 1, autostart deactivated = 0)
%AC	Autostart counter, i.e. number of autostarts already carried out

Variable	Description
%AD	Autostart setpoint counter, i.e. number of autostarts to be carried out
%SS	Status of the sample table (sample table activated = 1, sample table deactivated = 0)
%SL	Number of the current sample table line
%SE	Last sample in the sample table processed (yes = 1, no = 0)

29.14 Reports (REPORT)

The reports to be printed out are defined with the command **REPORT**. A maximum of ten reports can be defined for each command. The following reports can be inserted, among others:

- Result report
- Calculation report
- Parameter report
- System reports (system settings, sensor list, GLP data etc.)
- Method reports (method run, method parameters etc.)



[Report options]

Defining the general settings for the report output.

[Insert]

Add a new report to the list.

[Delete]

Delete the selected report from the list.

[Edit]

Edit the settings of the selected report.

29.14.1 General report options

The settings for the report printout can be adjusted in the dialog **Edit command / Report options** to indicate, for example, whether a report header, a signature line or a frame is to be printed.

Report header

Defining the output of the report header. The report header contains general information such as device type, serial number, program version and the printing date.



NOTE

You can also define your own report header, which is printed in addition to this report header (**System ► Templates ► Report header**).

Selection	off | once | on each page
Default value	on each page

off

The report header will not be printed.

once

The report header will only be printed on the first page.

on each page

The report header will be printed on every page.

Signature line

Output of a special line for date and signature. This line will be printed at the very bottom of every page.

Selection	off | once | on each page
Default value	off

off

No signature line will be printed.

once

The signature line will only be printed on the last page.

on each page

The signature line will be printed on every page.

Frame

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

If this parameter is activated, a frame is printed as lateral marking.

29.14.2 Settings of the individual reports

Fixed key []: **More reports ► Report ► Edit**

Command REPORT: **Report ► Edit**

Settings can be edited for the following reports (for details, see online help):

- **Result report**
- **Curve**
Definition of the curve size, display of the individual measuring points and grid lines, etc.
- **Measuring point list**
Definition of the method command to which the measuring point list is to be printed.
- **Calculations**
Definition of the accuracy with which the variables used as well as the results calculated are printed.
- **Statistics short**
Definition of the time at which the report is to be printed (with each determination or only at the end of a sample series).
- **Statistics overview**
Definition of the time at which the report is to be printed (with each determination or only at the end of a sample series).
- **Sample table**
- **Result table**
Definition of the time at which the report is to be printed (with each determination, at the end of a sample series or at the end of the sample table).
- **Used devices**
- **Variables**
- **Monitoring**

29.14.3 List of reports

The following reports can be inserted in the command **REPORT**:



NOTE

If you are using a **CUSTOM NEOS** printer, you can print only the reports that are marked with a **#** on the display.

Report	Contents
Result report	# Report with determination properties, sample data, calculated results, etc. If there are multiple determinations, the statistics will also be printed out.



Report	Contents
Curve	# Curve report.
Measuring point list	# Measuring point list report.
Calculations	# Details concerning the calculations carried out (parameter settings in accordance with the CALC command and the calculated results).
Used devices	The devices used for the determination, as displayed in the More determination data / Properties dialog.
Variables	All determination variables, as displayed in the results dialog.
Monitoring	Details for the monitored quantities (STAT, DOS only).
Statistics	
Statistics short	# Summary of the statistics calculations. The number of determinations, the mean value, and the absolute and relative standard deviations are printed out for each result.
Statistics overview	# Detailed statistical overview. The sample data and all individual results are printed out for each determination. The number of determinations, the mean value, and the absolute and relative standard deviations are printed out for each result.
Sample data	
Sample table	List of all determinations in the sample table with the respective sample data, as entered in the sample table.
Result table	
Result table	List of all determinations in the result table with results and with the determination data, as saved in the result table.
More reports ► Method reports	
Method sequence	Method properties and the list of all method commands.
Parameters full	Method properties and options, all method commands with all parameters. All parameters which no longer have their default settings will be printed in bold . All parameters which have been modified in comparison to the stored version of the method are indicated by an *.
Titration & measuring param.	Method properties; titration, measurement and calibration commands with all parameters. All parameters which no longer have their default settings will be printed in bold . All parameters which have been modified in comparison to the stored version of the method are indicated by an *.
Modified parameters	Method properties, all method parameters which have been modified in comparison to the stored version of the method.
Non default parameters	Method properties, all method parameters which no longer have any default settings.
More reports ► System reports	

Report	Contents
System settings	
System settings	Settings for acoustic signals and accuracy of the measured value display.
Dialog options	Settings for routine dialog and expert dialog.
Titrants	
Titrant list	List of all the titrants configured in the system.
All titrant data short	The most important titrant data of all titrants (name, concentration, titer, last titer determination).
All titrant data full	All of the titrant data of all of the titrants (working life, titer options, data concerning the exchange unit/dosing unit).
Sensors	
Sensor list	List of all the sensors configured in the system.
All sensor data short	The most important sensor data for all sensors (name, calibration data).
All sensor data full	All of the sensor data for all of the sensors (working life, complete calibration data, calibration interval).
Device manager	
Device list	List of all devices configured in the system.
All device properties	Properties of all the devices configured in the system.
GLP manager	
GLP data	All data stored in the GLP manager.
Common variables	
Common variable list	List of all the common variables defined in the system, together with their most important data (name, value, status).
All common variable properties	Properties of all common variables (name, value, validity, status).
Templates	
Templates sample data	Sample identification list and sample assignment table.
Result template list	List with all of the user-generated result templates.
All result templates details	Details of the all of the user-generated result templates (calculation formula, result options, note).
Input/Output lines	List with all of the defined input and output lines at the remote interface (name, bit pattern).
Custom calibration buffers	Temperature tables for all defined custom calibration buffers.
Rack tables	
Sample rack list	List with all of the sample racks configured in the system, together with designation, number of positions and rack code.
Miscellaneous	
Form feed	If this entry is inserted between two reports, then these will each be printed out on a separate page.



29.15 Dosing and Liquid Handling

The following dosing commands are available:

Preparing the exchange unit or dosing unit (PREP)	Rinsing the cylinder and the tubings of the exchange unit / dosing unit.
Emptying the dosing unit (EMPTY)	Emptying the cylinder and the tubings of the dosing unit.
Dosing a fixed volume (ADD)	Dosing a specified volume.
Liquid Handling (LQH)	Carrying out complex dosing tasks with a Dosing unit.
Monitored dosing (DOS)	Dosing with simultaneous monitoring of measured value and temperature.

29.15.1 Preparing an exchange or dosing unit (PREP)

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

Control device

This parameter is only displayed when several control devices are configured. Control devices are defined under **System ► Device manager**.

Selection of the control device from the list of devices. The control devices do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control devices
-----------	--

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the parameters defined for the titrant for the preparing as well as the tubing parameters (dosing unit only) are used. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place. The command is carried out with default parameters (see Chapter 32.2.2, page 504 and Chapter 32.3.2, page 505).

Cylinder volume to

This parameter can only be edited with **Titrant = not defined**.

Selection of the port via which the titrant is ejected. This setting is only relevant for dosing units, in case of preparing an exchange unit, this setting is ignored.

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

29.15.2 Emptying a dosing unit (EMPTY)

The **EMPTY** command is used to empty the cylinder and tubings of the dosing unit.

Control device

This parameter is only displayed when several control devices are configured. Control devices are defined under **System ► Device manager**.

Selection of the control device from the list of devices. The control devices do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control devices
-----------	--

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1



Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the parameters defined for the titrant for the preparing as well as the tubing parameters (dosing unit only) are used. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place. The command is carried out with default parameters (see Chapter 32.2.2, page 504 and Chapter 32.3.2, page 505).

Air inlet

This parameter can only be edited with **Titrant = not defined**.

Selection of the port via which air is aspirated. This setting is only relevant for dosing units, in case of preparing an exchange unit, this setting is ignored.

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

29.15.3 Dosing a specified volume (ADD)

You can dose a specified volume with the command **ADD**.

29.15.3.1 Dosing parameters

The parameters for the dosing are defined under **[Dosing parameters]**.

Volume

Volume which is dosed.

Input range	0.00000 to 99999.9 mL
Default value	10.0000 mL

Dosing rate

The rate at which dosing takes place.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (*see chapter 32, page 503*).

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

29.15.3.2 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.

**NOTE**

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.15.3.3 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1



Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined
No check takes place.

Tandem dosing

A second dosing device can be defined under **[Tandem dosing]** in order to enable uninterrupted dosing. Dosing is carried out with a combination of two dosing devices so that the second dosing device is dosing while the first one is being filled and vice versa.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

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

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, only the time interval for the GLP test of the buret unit is checked at the start of the determination.

**NOTE**

The concentration, validity of the titer and the working life of the titrant are ignored.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

However, in order to ensure uninterrupted dosing, the following points must be taken into account:

- Use the highest possible filling rate in order to keep the filling times as short as possible. The filling rate should be decreased for viscous liquids.
- When you use two buret units with different dosing cylinders, the filling rate for the larger sized cylinder must be at the minimum:

$$v_{2,Fill} \geq v_{1,Fill} \cdot \frac{V_{Cyl.2}}{V_{Cyl.1}}$$

$v_{2,Fill}$ = filling rate in mL/min for the larger sized cylinder

$v_{1,Fill}$ = filling rate in mL/min for the smaller cylinder

$V_{Cyl.2}$ = cylinder volume in mL of the buret unit of the second dosing device

$V_{Cyl.1}$ = cylinder volume in mL of the buret unit of the first dosing device

Example:

Dosing device 1: volume = 20 mL, filling rate = 50 mL/min

Dosing device 2: volume = 50 mL

Filling rate 2 \geq 50 mL/min \cdot 50 mL / 20 mL \geq 125 mL/min



- The dosing rate must not exceed 75% of the filling rate of the smaller cylinder. These values are listed in the following table, valid at maximum filling rate:

Table 20 Maximum dosing rate for different dosing cylinders

Cylinder volume	maximum dosing rate	
	Exchange unit	Dosing unit
1 mL	2.25 mL/min	–
2 mL	–	5.00 mL/min
5 mL	11.25 mL/min	12.50 mL/min
10 mL	22.50 mL/min	25.00 mL/min
20 mL	45.00 mL/min	50.00 mL/min
50 mL	112.50 mL/min	124.50 mL/min

29.15.3.4 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of –15 to +15. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	–15 to 15
Default value	8

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.15.4 Liquid Handling (LQH)

The command **LQH** can be used to carry out Liquid Handling tasks with a dosing device of the type **Dosino** (700 or 800). The manifold options of the Dosino can be exploited in full in combination with a Sample Processor. The four ports of the dosing units can be used at will as output or input ports. This means that not only simple dosing and filling procedures are possible. Complex Liquid Handling tasks such as pipetting or sample transfers can be carried out without difficulty. Several LQH and automation commands are required for this purpose which are best combined into subsequences.

29.15.4.1 Liquid Handling parameters

The parameters for the Liquid Handling function are defined under **[Liquid Handling param.]**.

Function

Type of Liquid Handling function.

Selection	Dose | Fill | Aspirate | Eject | Exchange position | Change port | Compensate | End volume
-----------	---

Dose

The given volume is dosed. The dosing cylinder neither is automatically filled before nor afterwards.

Fill

The dosing cylinder is filled. The valve disc then remains at the selected port.

Aspirate

Liquid is aspirated. The dosing cylinder neither is automatically filled before nor afterwards. The aspirating volume has to be aspirated with a single piston stroke.

Eject

The whole cylinder content is ejected. The piston is, in contrast to the function **End volume**, lowered to the stop point, i.e. past the maximum volume mark. This function should only be carried out for preparing a dosing unit before the pipetting procedure.

Exchange position

The dosing cylinder is filled. This means that, for example, air can be aspirated via Port 4. The valve disc is then rotated to Port 2 and the dosing drive can be removed from the dosing unit.

Change port

The stopcock is moved to the given port, but no piston movement takes place.

Compensate

Because of the fact that the dosing units are interchangeable, the coupling of the Dosino piston rod (spindle) exhibits a low mechanical tolerance that can be noticed when the piston changes its direction of movement. This tolerance can be compensated with this function. A short piston movement is first made in the same direction as the previous movement, which is then followed by a piston movement in the reverse direction.

End volume

The whole cylinder content is ejected. The piston is lowered to the maximum volume mark i.e. until 10'000 pulses have been dosed. This command should be used for pipetting functions for emptying the cylinder.

In-/Outlet

Selection of the port via which the Liquid Handling command is carried out.

Selection	Port 1	Port 2	Port 3	Port 4
Port 1	Default value, when Function = Dose, Aspirate and End volume .			
Port 2	Default value, when Function = Fill, Exchange position and Change port .			
Port 4	Default value, when Function = Eject and Compensate .			

Volume

This parameter can only be edited with **Function = Dose** and **Aspirate**.
Volume which is dosed or aspirated.

Function = Dose:

Input range	0.00000 to 99999.9 mL
Default value	1.00000 mL

Function = Aspirate:

Input range	0.00000 to 50.0000 mL
Default value	1.00000 mL

Flow rate

This parameter can only be edited with **Function = Dose, Fill, Aspirate, Eject, Exchange position** and **End volume**.

Rate at which it is dosed or filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing and filling rates depend on the cylinder volume (see chapter 32, page 503).

29.15.4.2 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.15.4.3 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.



For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined
No check takes place.

29.15.5 Monitored dosing (DOS)

With the **DOS** command, you can dose and at the same time monitor the measured value and/or the temperature.

29.15.5.1 Dosing parameters

The parameters for the dosing are defined under **[Dosing parameters]**.

Dosing criteria

Three different dosing types can be selected for the dosing. Two of the following parameters can be specified:

- Volume
- Dosing rate
- Dosing time

The third parameter is calculated according to the following formula:

$$\text{Volume} = \text{Dosing rate} \cdot \text{Dosing time}$$

If continuous dosing is necessary, tandem dosing can be used (*see chapter 29.7.8, page 377*). Tandem dosing is carried out with a combination of two dosing devices so that the second dosing device is dosing while the first one is being filled and vice-versa.

Selection	Volume/Dosing rate | Volume/Dosing time | Dosing rate/Dosing time
-----------	--

Volume/Dosing rate
Defining the volume to be dosed and and the dosing rate.

Volume/Dosing time
Defining the volume to be dosed and the dosing time.

Dosing rate/Dosing time
Defining the dosing rate and the dosing time.

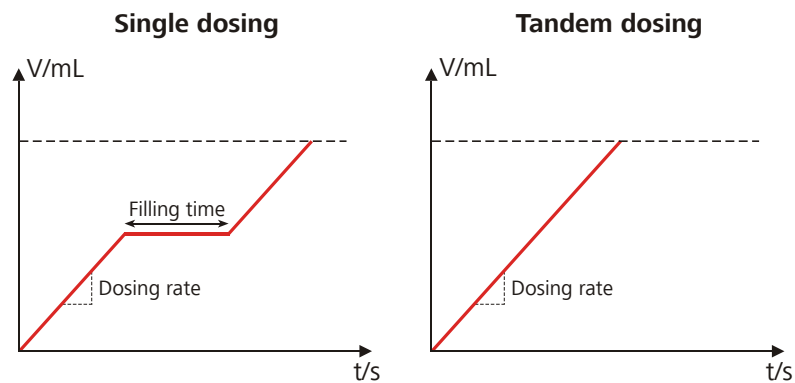
Dosing criterion "Volume/Dosing rate"

Figure 22 Dosing criterion "Volume/Dosing rate"

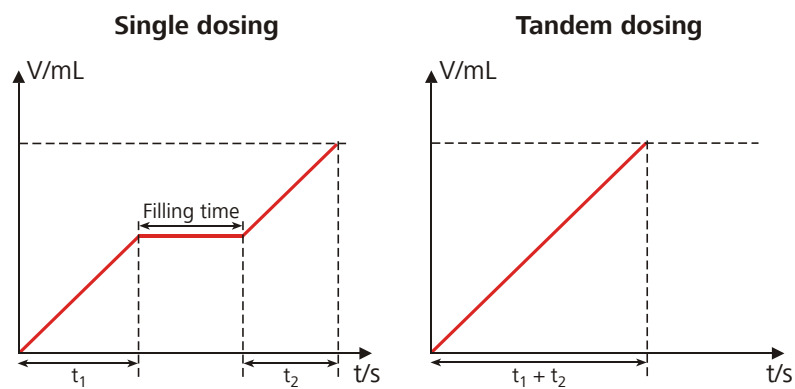
Dosing criterion "Volume/Dosing time"

Figure 23 Dosing criterion "Volume/Dosing time"

**CAUTION**

The defined time corresponds to the net dosing time t_1+t_2 , i.e. the filling time is not included in the total.

If the dosing rate resulting from the settings cannot be reached, then dosing will be carried out at the highest possible rate.

The following formula can be used to estimate whether the maximum dosing rate is being used or not:

$$v_{Dos} = q_v \cdot 2.22$$

v_{Dos} : Dosing rate in mL/min

q_v : Desired flow rate in mL/min



NOTE

This formula applies only for using a single dosing device. The dosing rate is equal to the flow rate in the case of tandem dosing.

If the required dosing rate exceeds the maximum dosing rate for the selected exchange unit or dosing unit (see chapter 32, page 503), then a larger cylinder volume must be selected.

Dosing criterion "Dosing rate/Dosing time"

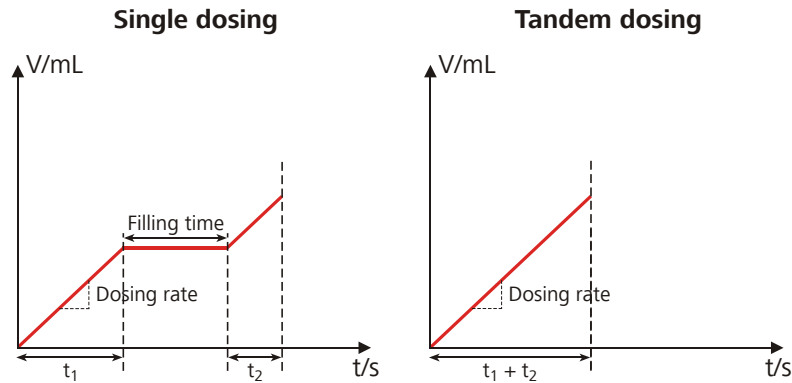


Figure 24 Dosing criterion "Dosing rate/Dosing time"

Volume

Volume which is dosed.

Input range	0.00000 to 99999.9 mL
Default value	10.0000 mL

Dosing rate

The rate at which dosing takes place.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum dosing rate depends on the cylinder volume (see chapter 32, page 503).

Dosing time

Time while dosing is carried out, i.e. the filling time is not taken into account.

Input range	0 to 999999 s
Default value	100 s

More parameters

Temperature

Temperature entered manually. The temperature is being continuously measured when a temperature sensor is connected and when **Temp. measurement = automatic** or **continuous** is defined (see sensor dialog of the command). This value is used for temperature correction in pH measurements.

Input range	-20.0 to 150.0 °C
Default value	25.0 °C

Time interval MP

Time interval for entering a measuring point in the measuring point list. The measuring point list is limited to 1000 measuring points.

Input range	0.1 to 999999.0 s
Default value	5.0 s

Pause

Waiting time, e.g. for the electrode to settle down after the start.

Input range	0 to 999999 s
Default value	0 s

Flow rate of a single dosing device

The cylinder volume and the filling time of the exchange unit or dosing unit must be taken into account for the calculation of the effective flow rate.

Table 21 Maximum flow rates for different cylinder volumes

Cylinder volume	Maximum flow rate	
	Exchange unit	Dosing unit
1 mL	approx. 80 mL/h	–
2 mL	–	approx. 180 mL/h
5 mL	approx. 400 mL/h	approx. 450 mL/h
10 mL	approx. 800 mL/h	approx. 900 mL/h
20 mL	approx. 1.6 L/h	approx. 1.8 L/h
50 mL	approx. 4 L/h	approx. 4.5 L/h

Filling times

Filling times are not included in the calculation of the dosing rate by the Titrando. The filling times (including valve switching) can be estimated according to the following formula:



$$t_{Fill} = \frac{V_{Fill,max}}{v_{Fill}} \cdot t + 4$$

t_{Fill} : Filling time in s

$v_{Fill,max}$: maximum filling rate in mL/min

v_{Fill} : current filling rate in mL/min

t : Filling time for one cylinder volume:

- 20 s (exchange unit)
- 18 s (dosing unit)

The maximum filling rate depends on the cylinder volume of the exchange unit / dosing unit attached (see chapter 32, page 503). The approximate filling times (including valve switching) are given in the table below for various cylinder volumes (exchange unit and dosing unit) at different filling rates:

Cylinder volume	Filling time in s			
	max.	100 mL/min	50 mL/min	10 mL/min
1 mL	24 / –	–	–	–
2 mL	– / 22	–	–	–
5 mL	24 / 22	–	–	34
10 mL	24 / 22	–	–	64
20 mL	24 / 22	–	28	124
50 mL	24 / 22	34	64	304

Application example

1 L reagent is to be dosed within 1 hour with a 50 mL exchange unit. How large is the dosing rate?

Conditions:

t : Total duration = 60 min

V_{Dos} : Dosing volume = 1,000 mL

t_{Fill} : Filling time = 24 s (assumption: max. filling rate)

V_{Cyl} : Cylinder volume = 50 mL

Calculation of the number of filling procedures:

$$n_{Fill,max} = \frac{V_{Dos}}{V_{Cyl}}$$

$n_{Fill,max}$: maximum number of filling procedures of the dosing cylinder

V_{Dos} : Dosing volume = 1,000 mL

$V_{Cyl.}$: Cylinder volume = 50 mL

In accordance with this formula, the dosing cylinder must be filled 20 times.

If the division results in a whole number, then the last filling procedure need not be taken into account. In our example, the dosing cylinder must be filled 19 times. There is no dosing during this time, i.e. the actual dosing time is:

Calculation of the actual dosing time:

$$t_{Dos} = t - (n_{Fill} \cdot t_{Fill})$$

t_{Dos} effective dosing time

t : Total duration = 60 min

n_{Fill} : Number of required filling procedures of the dosing cylinder = 19

t_{Fill} : Filling time = 24 s (assumption: max. filling rate)

According to this formula, the actual dosing time is 52.4 min.

This results in the following dosing rate:

Calculation of the required dosing rate:

$$v_{Dos} = \frac{V_{Dos}}{t_{Dos}} = \frac{V_{Dos}}{t - \left(n_{Fill} \cdot \frac{t_{Fill}}{60} \right)}$$

v_{Dos} : required dosing rate in mL/min

V_{Dos} : Dosing volume = 1,000 mL

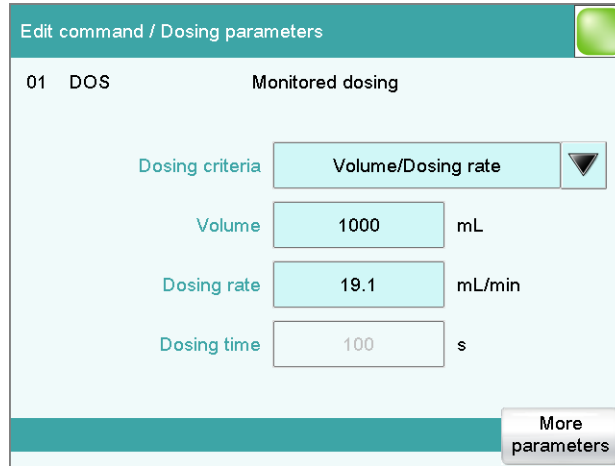
t : Total duration = 60 min

n_{Fill} : Number of required filling procedures of the dosing cylinder = 19

t_{Fill} : Filling time = 24 s (assumption: max. filling rate)

According to this formula, dosing must proceed at a dosing rate of 19.1 mL/min.

Parameterization:



29.15.5.2 Stop conditions

The conditions for canceling the dosing are defined under **[Stop conditions]**.

Stop volume

The dosing is stopped when the specified volume has been dosed since the start of the dosing. This volume should be adjusted to the size of the titration vessel in order to prevent the contents from running over.

Input range	0.00000 to 99999.9 mL
Selection	off
Default value	off

Stop time

The dosing is stopped when the specified time has elapsed since the start of the dosing.

Input range	0 to 999999 s
Selection	off
Default value	off

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

29.15.5.3 Monitoring

Under **[Monitoring]**, the parameters for monitoring the following quantities are defined:

- Measured value
- Temperature

Remote signals or RS-232 commands can be assigned to the monitored quantities (see "Communication", page 466). These remote signals or RS-232 commands are sent if a limit has been infringed. This can be used, for example, to switch a thermostat on/off if necessary.

The parameters are identical for all monitored quantities.

Measuring mode

Selection of the measuring mode to be monitored.

Selection	pH | U
Default value	pH

pH

Dosing with monitoring the pH value.

U

Dosing with monitoring the voltage.

Monitoring

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

Enabling and disabling the monitoring function.

Lower limit

When the monitored quantity falls below this value, the action defined in the following is triggered.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Measuring mode pH:

Input range	-20.000 to 20.000
Default value	-20.000

Measuring mode U:

Input range	-2,000.0 to 2,000.0 mV
Default value	-2,000.0 mV

Upper hysteresis

The upper hysteresis represents the tolerance range for the upper limit (see figure 27, page 466). When **Action = Wait**, the dosing does not continue until the monitored quantity has once again fallen below the upper limit incl. the value entered here.

The values that are actually measurable may vary from the values specified here, depending on the hardware. The binding measurement value ranges can be found in the "Technical specifications" chapter for the control device used.

Measuring mode pH:

Input range	0.000 to 20.000
Default value	0.020

Measuring mode U:

Input range	0.0 to 2,000.0 mV
Default value	2.0 mV

Temperature:

Input range	0.0 to 150.0 °C
Default value	0.2 °C

Action

Selection of the action which is carried out when the limits of the monitored quantity are infringed.

Selection	None | Exit method | Cancel command | Pause | Wait
-----------	---

None

No action will be taken.

Exit method

The method is stopped immediately.

Cancel command

The current command is stopped und the next command in the method will be started.

Pause

Adding reagent is stopped until the dosing is continued manually with **[Continue]**. If several quantities are monitored, the other quantities will still be monitored in the background.

Wait

Adding reagent is stopped until the value of the monitored quantity is within the limits again (incl. hysteresis). The dosing is continued automatically. If several quantities are monitored, the other quantities will still be monitored in the background.

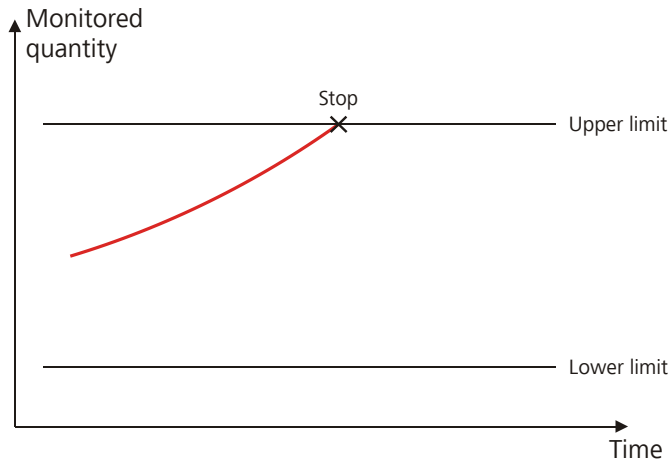


Figure 25 Action "Exit method" or "Cancel command"

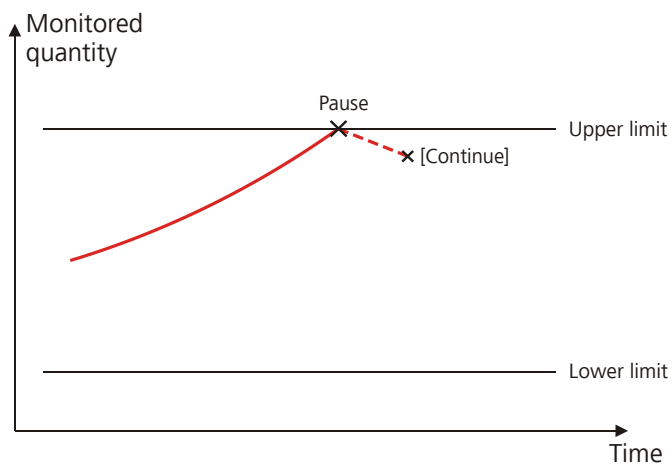


Figure 26 Action "Pause"

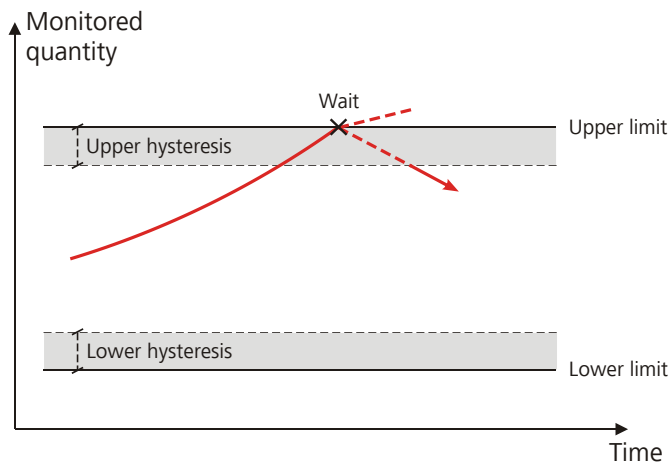


Figure 27 Action "Wait"

Communication

Under **[Communication]**, remote signals or RS-232 commands can be assigned to the monitored quantities. These remote signals or RS-232

commands are always sent, independent of the action defined for a limit infringement (see "Action", page 372).

[New]

Define a new assignment.

[Delete]

Delete the selected assignment.

[Edit]

Edit the settings for the selected assignment.

Monitored quantity

Selection of the monitored quantity to which a remote signal or an RS-232 command is to be assigned.

Selection	Measured value | Temperature | any
-----------	---

any

If several quantities are monitored, the remote signal or RS-232 command set is sent as soon as a limit of one of the monitored quantities is exceeded.

Infringed limit

Indicating the limit whose infringement causes the remote signal or RS-232 command defined in the following to be sent.

Selection	upper | lower | any | back in range
-----------	--

upper

The remote signal or the RS-232 command is sent when the upper limit is exceeded.

lower

The remote signal or the RS-232 command is sent when the lower limit is exceeded.

any

The remote signal or the RS-232 command is sent when the upper or the lower limit is infringed.

back in range

The remote signal or the RS-232 command is sent when the value of the monitored quantity is within the limits again (incl. hysteresis).

Interface

Selection of the Remote Box or the serial interface via which the remote signal or the RS-232 command is sent.

Selection	Remote Box 1...4 | COM1...8
-----------	------------------------------------



Output signal

This parameter can only be edited when a Remote Box is selected under **Interface**.

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System ► Templates ► Output lines**.



NOTE

A line set active is not being reset automatically, nor at the end of the determination nor when the monitored quantity is in the range again.

Entering a bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal *******1** line 0 is set. With a pulse, the length is set to 200 ms. If it is required to set pulses with other lengths, you have to define a corresponding template.

Entry	Bit patterns containing exactly 14 characters or a max. of 24 characters for the name of the template
Default value	*****
Selection	Selection of the templates defined

Character string

This parameter can only be edited when a serial interface (COM) is selected under **Interface**.

Input of the RS-232 command as character string. All characters of the ASCII code page can be used. Control characters (Esc, FF etc.) have to be entered as a three-place, decimal ASCII code, starting with a slash. Each command is automatically terminated with the ASCII characters **CR** and **LF**.

Entry	ASCII string with a max. of 24 characters
Default value	empty

29.15.5.4 Control instrument

The control instrument the determination is carried out with is selected under **[Control device]**. Control instruments are defined under **System ► Device manager**.



NOTE

This button is only displayed when several control instruments have been configured.

Control device

Selection of the control instrument from the list of devices. Only those devices are displayed which are able to carry out the command. The control instruments do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control instruments
-----------	--

29.15.5.5 Sensor

The parameters for the sensor are edited under **[Sensor]**.

Measuring input

Selection of the measuring input the sensor is connected to. The selection is not dependent on whether the control device has one or two measuring interfaces.

Selection	1 | 2
Default value	1

Sensor

Selection of the sensor from the sensor list. The selection depends on the measuring mode. Sensors are defined under **System ► Sensors**. You can also enter a sensor name which is not contained in the sensor list. When a determination is started there is a check whether the sensor is contained in the sensor list.

Selection	Selection of configured sensors
-----------	--

Temp. measurement

Type of temperature measurement.

Selection	continuous | automatic | off
Default value	automatic

continuous

A temperature sensor must be connected. The temperature is measured continuously.

automatic

If a temperature sensor is connected then the temperature will be measured continuously. Otherwise, the temperature entered manually will be used (see dialog of the titration and measuring parameters).

off

The temperature will not be measured. The temperature entered manually is used (see dialog of the titration and measuring parameters).

29.15.5.6 Dosing device

The parameters for the dosing device are edited under **[Dosing device]**.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. This ensures that the correct data (titer, concentration, etc.) is always used for the calculation. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in the list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without an integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, the validity of the titer, the working life of the titrant and the time interval for the GLP test of the buret unit are checked at the start of the determination.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

Tandem dosing

A second dosing device can be defined under **[Tandem dosing]** in order to enable uninterrupted dosing. Dosing is carried out with a combination of two dosing devices so that the second dosing device is dosing while the first one is being filled and vice versa.

Dosing device

Selection of the MSB connector to which the dosing device is connected. Every MSB connector will always be displayed.

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

Titrant

Selection of the titrant from the titrant list. We recommend always selecting the titrant. Titrants are defined under **System ► Titrants**. You can also enter a name which is not contained in the titrant list. When a determination is started there is a check whether the solution is contained in list.

For buret units with integrated data chip, a check is made in the method run to verify whether the correct titrant has been attached and whether the type of dosing drive matches. For buret units without integrated data chip, the cylinder volume and the type of dosing drive are checked. For the selected titrant, only the time interval for the GLP test of the buret unit is checked at the start of the determination.



NOTE

The concentration, validity of the titer and the working life of the titrant are ignored.

Selection	Selection of configured titrants | not defined
Default value	not defined

not defined

No check takes place.

Filling rate

Rate at which the dosing cylinder is filled.

Input range	0.01 to 166.00 mL/min
Selection	maximum
Default value	maximum

maximum

The maximum filling rate depends on the cylinder volume (*see chapter 32, page 503*).

However, in order to ensure uninterrupted dosing, the following points must be taken into account:

- Use the highest possible filling rate in order to keep the filling times as short as possible. The filling rate should be decreased for viscous liquids.



- When you use two buret units with different dosing cylinders, the filling rate for the larger sized cylinder must be at the minimum:

$$v_{2,Fill} \geq v_{1,Fill} \cdot \frac{V_{Cyl.2}}{V_{Cyl.1}}$$

$v_{2,Fill}$ = filling rate in mL/min for the larger sized cylinder

$v_{1,Fill}$ = filling rate in mL/min for the smaller cylinder

$V_{Cyl.2}$ = cylinder volume in mL of the buret unit of the second dosing device

$V_{Cyl.1}$ = cylinder volume in mL of the buret unit of the first dosing device

Example:

Dosing device 1: volume = 20 mL, filling rate = 50 mL/min

Dosing device 2: volume = 50 mL

Filling rate 2 \geq 50 mL/min · 50 mL / 20 mL \geq 125 mL/min

- The dosing rate must not exceed 75% of the filling rate of the smaller cylinder. These values are listed in the following table, valid at maximum filling rate:

Table 22 Maximum dosing rate for different dosing cylinders

Cylinder volume	maximum dosing rate	
	Exchange unit	Dosing unit
1 mL	2.25 mL/min	–
2 mL	–	5.00 mL/min
5 mL	11.25 mL/min	12.50 mL/min
10 mL	22.50 mL/min	25.00 mL/min
20 mL	45.00 mL/min	50.00 mL/min
50 mL	112.50 mL/min	124.50 mL/min

29.15.5.7 Stirrer

The parameters for the stirrer are edited under **[Stirrer]**.

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

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

off

No stirrer will be used.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Input range	-15 to 15
Default value	8

Switch off automatically

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

If this parameter is activated, the stirrer will be switched off automatically at the end of the titration, measurement, etc.

29.16 Communication

The following communications commands are available:

Scanning remote lines (SCAN)	Defining remote signals which are awaited before the next method command is started.
Setting remote lines (CTRL)	Defining remote signals.
Receiving RS-232 commands (SCAN RS)	Defining RS-232 commands which are awaited before the next method command is started.
Sending RS-232 commands (CTRL RS)	Defining the RS-232 commands which are sent.

29.16.1 Scanning remote lines (SCAN)

The command **SCAN** can be used to define input signals at the remote interface which are awaited before the next method command is started.

Control device

This parameter is only displayed when several control devices are configured. Control devices are defined under **System ► Device manager**.



Selection of the control device from the list of devices. The control devices do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control devices
-----------	--

Remote Box

Selection of the MSB connector the Remote Box is connected to. Every MSB connector will always be displayed. The remote signal defined is requested on this Remote Box.

Selection	1 | 2 | 3 | 4
Default value	1

Input signal

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System ► Templates ► Input lines**.

Entering a bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status

The input lines are always numbered from right to left, i.e. with the signal *******1** line 0 is expected to be active.



NOTE

We recommend masking lines that are of no interest or for which no defined condition can be predicted with an asterisk (*).

Entry	Bit patterns containing exactly 8 characters or a max. of 24 characters for the name of the template
Default value	*****
Selection	Selection of the templates defined

Timeout

When this time interval has expired without recognizing the remote signal, the action defined in the following is triggered.

Input range	0 to 999 s
Default value	0 s

Action

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

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

Display message

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

Document message

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

Cancel determination

The determination is stopped.

29.16.2 Setting remote lines (CTRL)

The command **CTRL** can be used to define output signals at the remote interface.

Control device

This parameter is only displayed when several control devices are configured. Control devices are defined under **System ► Device manager**.

Selection of the control device from the list of devices. The control devices do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control devices
-----------	--

Remote Box

Selection of the MSB connector the Remote Box is connected to. Every MSB connector will always be displayed. The remote signal defined is sent via this Remote Box.

Selection	1 | 2 | 3 | 4
Default value	1

Output signal

Selection of the signal out of the templates or entering the required bit pattern. Templates are defined under **System ► Templates ► Output lines**.



NOTE

A line set active is not being reset automatically, not even at the end of the determination.

Entering a bit pattern:

- 0 = line inactive
- 1 = line active
- * = retain line status
- p = set pulse

The output lines are always numbered from right to left, i.e. with the signal *******1** line 0 is set. With a pulse, the length is set to 200 ms. If it is required to set pulses with other lengths, you have to define a corresponding template.



NOTE

We recommend masking lines that are of no interest or for which no defined condition can be predicted with an asterisk (*).

Entry	Bit patterns containing exactly 14 characters or a max. of 24 characters for the name of the template
Default value	*****
Selection	Selection of the templates defined

29.16.3 Scanning the RS-232 interface (SCAN RS)

The command **SCAN RS** can be used to define RS-232 commands which are awaited before the next method command is started.

Serial port

Selection of the serial interface the peripheral device is connected to. The RS-232 command defined is requested on this interface.

Selection	COM1 | COM2 | COM3 | COM4 | COM5 | COM6 | COM7 | COM8
Default value	COM1

Character string

Input of the RS-232 command as character string. All characters of the ASCII code page can be used. Control characters (Esc, FF etc.) have to be entered as a three-place, decimal ASCII code, starting with a slash. Each

command is automatically terminated with the ASCII characters **CR** and **LF**. The ***** can be used for one or more characters.

Entry	ASCII string with a max. of 24 characters
Default value	!*R

Timeout

When this time interval has expired without recognizing the RS-232 command, the action defined in the following is triggered.

Input range	0 to 999 s
Default value	0 s

Action

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

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

Display message

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

Document message

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

Cancel determination

The determination is stopped.

29.16.4 Defining RS-232 commands (CONTROL RS)

The command **CONTROL RS** can be used to define the RS-232 commands which are sent.

Serial port

Selection of the serial interface the peripheral device is connected to. The RS-232 command defined is sent via this interface.

Selection	COM1 | COM2 | COM3 | COM4 | COM5 | COM6 | COM7 | COM8
Default value	COM1

Special beaker

Special beakers, which are defined in the rack table, can be directly moved to. Enter the number of the special beaker (**1...16**) in field to the right.

Rack position

Any rack position. Enter the number of the rack position (**1...999**) in the field to the right.

Current sample +

Starting from the current sample (defined by the sample variable) the rack is moved forward by the number of rack positions (**1...999**) entered in the field to the right.

Current sample -

Starting from the current sample (defined by the sample variable) the rack is moved backward by the number of rack positions (**1...999**) entered in the field to the right.

Next position

Starting from the current rack position, the rack is moved forward by one position.

Prev. position

Starting from the current rack position, the rack is moved backward by one position.

Calibration pos.

For automatic calibrations with a Sample Processor(see "*Definition of the calibration positions*", page 509).

rotate +

Moving the rack forward by a certain increment. The rotation increment is defined in the properties of the tower.

rotate -

Moving the rack backward by a certain increment. The rotation increment is defined in the properties of the tower.

swing +

Swinging the robotic arm outward by a certain increment (towards higher angular degrees). The swing increment is defined in the properties of the Swing Head.

swing -

Swinging the robotic arm towards the center of the rack by a certain increment (towards lower angular degrees). The swing increment is defined in the properties of the Swing Head.

Beaker test action

This parameter can only be edited with **Destination = Sample, Next position** or **Prev. position**.



Selection of the action which is carried out when the beaker sensor does not detect any vessel at the sample position moved to. In addition, enable the beaker sensor in the rack table.

Selection	Rotate rack | Display message
Default value	Display message

Rotate rack

The rack is moved to the next vessel on a sample position. **Exception:** If the sample variable is newly defined in the method before this command (command **SAMPLE**), then the option **Display message** is automatically valid.

Display message

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



NOTE

This parameter is ignored with the 885 Compact Oven SC.

Options

Shift rate

Rate at which the sample rack is moved.

Input range	3 to 20 °/s
Default value	20 °/s



NOTE

This parameter is ignored with the 885 Compact Oven SC.

Shift direction

Direction in which the rack is moved.

Selection	auto | + | -
Default value	auto

auto

A shift direction, with which the shorter way has to be passed, is automatically selected.

+

Counterclockwise rotation.

-

Clockwise rotation.

Swing rate

Rate at which the robotic arm is swung.

Input range	10 to 55 °/s
Default value	55 °/s

29.17.2 Moving the lift (LIFT)

The lift of a Sample Processor is moved with the command **LIFT**. The movement can, however, only be carried out if the Sample Processor is located at a valid rack position. This will not be the case, for example, after a Rack Reset.

Tower

Selection of the tower, with which the command is carried out. Both Tower 1 and Tower 2 can always be selected, even if your Sample Processor has only one tower.

Selection	1 | 2
Default value	1

1

View from the front, the right tower.

2

View from the front, the left tower.

Lift position

Selecting a predefined lift position or enter any lift position. The predefined lift positions are defined in the device properties of the Sample Processor. They can, however, also be assigned in the manual control.

Input range	0 to 235 mm
Selection	Work position | Shift position | Rinse position | Special position | Home position
Default value	Work position

Home position

The lift is being located at the upper stop position, i.e. at the position 0 mm.

For the 885 Compact Oven SC, the position 0 mm is approached when **Shift position**, **Rinse position** and **Special position** is selected.

Lift rate

Speed at which the lift is moved.

Input range	5 to 25 mm/s
Default value	20 mm/s

**NOTE**

This parameter is ignored with the 885 Compact Oven SC.

29.17.3 Controlling pumps (PUMP)

The **PUMP** command is used to control the pumps mounted on or connected to the tower of the sample changer.

Tower

Selection of the tower, with which the command is carried out. Both Tower 1 and Tower 2 can always be selected, even if your Sample Processor has only one tower.

Selection	1 | 2
Default value	1

1

View from the front, the right tower.

2

View from the front, the left tower.

Pump

Selection of the pump.

Selection	1 | 2 | 1 + 2
Default value	1

1

Pump 1 of the selected tower is switched.

2

Pump 2 of the selected tower is switched.

1 + 2

Both pumps of the selected tower are switched at the same time.

Status/Duration

Switching the pump(s) on and off.

Input range	0 to 999 s (Increment: 1) The pump is running during this time.
Selection	on | off
Default value	on

on

The pump is switched on. The pump is running until it is explicitly switched off. If the determination is canceled with the key [], the pump is also switched off.

off

The pump is switched off.

29.17.4 Resetting the rack (RACK)

The following actions are carried out with the command **RACK**:

- Rack, lift and robotic arm are being reset.
- The rack code of the rack attached is being read out and the corresponding rack data is transferred to the Sample Processor.
- The sample variable is reset to the value 1.

Check rack

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

Activate this parameter when the rack attached is to be checked. For this you, however, have to additionally select the rack in the dialog **Method options / Start options** at the option **Check rack**.

**NOTE**

This option is not available with the 885 Compact Oven SC. Therefore, this parameter must be set to **no**.

29.17.5 Defining the sample variable (SAMPLE)

The sample variable describes the current position of the sample on the rack of the Sample Processor. It is automatically increased by 1 after the end of a method run. In the following cases, the sample variable is automatically reset to the value 1:

- if the autostart counter is reset.
- if the sample rack is reset.

The sample variable can be altered specifically with the command **SAMPLE**.

Sample variable

Modifying the sample variable.

Selection	= | + | -
Default value	+

=

The sample variable corresponds to the number entered in the field **Value**.

+

The sample variable corresponds to the current value plus the number entered in the field **Value**.

-

The sample variable corresponds to the current value minus the number entered in the field **Value**.

Value

Value by which the current sample variable is to be modified.



NOTE

The sample variable can only be set on rack positions which are not defined as special beakers.

Input range	1 to 999
Default value	1

29.17.6 Creating a subsequence (SUBSEQ)

It is useful, particularly with more complex tasks, e.g. rinsing sequences or Liquid Handling, to combine individual command sequences into a single subsequence. Subsequences are managed the same as method commands. A maximum of 99 commands can be combined to form a single subsequence. There is no limit to the number of subsequences within one method.

[Load/ Save]

Loading a saved subsequence or saving the current subsequence.

[Subseq. options]

Defining various settings which correspond to the entire subsequence.

[Insert command]

Insert a new method command. It is inserted before the selected command.



NOTE

Not all commands are available for subsequences. Commands which cannot be inserted into subsequences are disabled.

[Delete command]

Delete the selected method command.

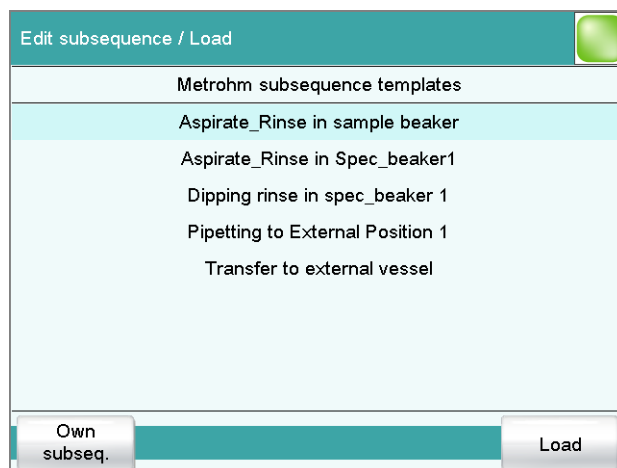
[Edit command]

Edit the selected method command.

29.17.6.1 Loading / saving a subsequence

[Load/ Save] is used to load stored subsequences or to save new subsequences. This means that they are available for all methods and only have to be created once.

Loading a subsequence



[Own subseq.]

Opening the list of own subsequences.

[Load]

Loading the selected subsequence.

Saving a subsequence

Custom-made subsequences are saved in the internal memory.



NOTE

In order to be able to use the subsequences also for other titration systems, you have to create a backup. You can only restore the subsequences from this backup on another system.

File name

File name of the subsequence.

Entry	max. 32 characters
-------	---------------------------

[Save]

Saving the subsequence to the internal memory.

[Display options]

Definition when the note is being displayed.

Automatically after loading the subsequence

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

If this parameter is activated, the note is displayed when loading the subsequence. It can otherwise only be read in this dialog.

29.17.7 Controlling the heating (HEATER)

The heating on the 885 Compact Oven SC is controlled with the **HEATER** command.

Status

Switch the heater on or off.

Selection	on | off
Default value	on

on

The heater is switched on. The command is displayed in the method run until the specified temperature is reached. The heater runs in the background until it is explicitly switched off. The current temperature can be seen in the Manual control.

off

The heater is switched off.

Temperature

Temperature to which the oven is heated.

Input range	50 to 250 °C (Increment: 1)
Default value	110 °C

29.17.8 Controlling the gas flow (FLOW)

The gas flow is controlled on the 885 Compact Oven SC with the **FLOW** command.

Status

Switch the gas flow on or off.

Selection	on | off
Default value	on

on

The gas flow is switched on. The gas flow runs until it is switched off. The current gas flow can be seen in the Manual control.

off

The gas flow is switched off.

29.18 Miscellaneous commands

29.18.1 Controlling a stirrer (STIR)

A stirrer is controlled with the command **STIR**.

Control device

This parameter is only displayed when several control devices are configured. Control devices are defined under **System ► Device manager**.

Selection of the control device from the list of devices. The control devices do not have to be connected. This allows to transfer methods more easily from one system to another.

Selection	Selection of configured control devices
-----------	--

Stirrer

Selection of the MSB connector the stirrer is connected to. Every MSB connector will always be displayed.

Selection	1 | 2 | 3 | 4
Default value	1

Status/Duration

Switching the stirrer on or off.

Input range	0 to 999 s (Increment: 1) During this time the stirrer is running.
Selection	on | off
Default value	on

on

The stirrer is switched on. The stirrer runs until it is explicitly switched off. If the determination is canceled with the key [], the stirrer is also switched off.

off

The stirrer is switched off.

Stirring rate

Setting the stirring rate. It can be set in steps of -15 to $+15$. The default setting **8** corresponds to 1000 rpm. The formula for calculating the rotational speed is specified in *chapter 32.4, page 505*. The optimum stirring rate can be tested in the manual control.

The algebraic sign of the stirring rate changes the direction in which the stirring is done. When the stirrer is viewed from above, this means:

- "+": counterclockwise rotation
- "-": clockwise rotation

Selection	off | Identification 1 | Identification 2 | ID1 & ID2
Default value	off

Sample size

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

If this parameter is activated, then the value for the sample size will be requested.

Sample size unit

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

If this parameter is activated, then the unit for the sample size will be requested.

Common variable

Selection of the common variable which is queried in the method run.

Selection	CV01...CV25 | off
Default value	off

Hold sequence

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

If this parameter is activated, then the run will be paused during the request. If this parameter is deactivated, then the method continues in the background until the following measurement or titration has been completed.

29.18.4 Defining an acoustic signal (BEEP)

The **BEEP** command can be used to produce an acoustic signal.

Duration

Approximate playing time in seconds of the permanently stored melody.

Input range	1 to 9
Default value	1

29.18.5 Signing a determination (SIGN)

A determination can be signed with the **SIGN** command. The method run is automatically paused as soon as this command is reached. At the same time a switch is made to the result view. The run will not be continued until the determination has been signed or the **SIGN** command has been canceled. You can specify whether a routine user is allowed to cancel the **SIGN** command in the setting **System ► System settings ► Dialog options ► Routine dialog**. No parameters can be edited for this com-

30 Operation and maintenance

30.1 System initialization

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



CAUTION

If you carry out a system initialization, then all user data except the methods will be deleted.

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

Proceed as follows for the system initialization:

1 Switching off the instrument

- Press the power switch at the rear.

2 Switching on the instrument

- Press the power switch at the rear.
An image with a frog will be displayed after a couple of seconds.
- While the image is being displayed, press the power switch again and hold it down.
- Do not release the power switch until an acoustic signal sounds.

A system message is displayed.

3 Confirm system initialization

- Confirm the message with **[Yes]**.
A second security prompt is displayed.
- Confirm this message with **[Yes]** as well.

Initialization is started. After the initialization has been completed, the 900 Touch Control is started automatically.

31 Troubleshooting

31.1 Editing methods

Problem	Cause	Remedy
The method command cannot be inserted.	<i>The method command is disabled.</i>	In the dialog Dialog options / Command list , activate the desired command (<i>see chapter 7.2, page 26</i>).
	<i>No control instrument which supports the method command is configured in the device manager.</i>	Add a control instrument which supports the desired method command to the list of devices (<i>see chapter 11, page 81</i>).
The additional evaluations (EVAL commands) cannot be inserted.	<i>A titration or measuring command to which the evaluation can be applied is missing.</i>	<ol style="list-style-type: none"> 1. Insert a titration or measuring command. 2. Insert the EVAL command directly after it.
A MEAS T/F ON command or MEAS T/F OFF command is depicted in red in the command list.	<i>The corresponding MEAS T/F ON command or MEAS T/F OFF command is missing or not inserted in the correct order in the method run. To be able to execute a method, both MEAS T/F commands are needed in the method run.</i>	Insert the missing MEAS T/F command and observe the logical order of the commands.
An EVAL command is depicted in red in the command list.	<i>The associated titration or measuring command has been deleted or replaced by a different one, e.g. DET pH by DET U.</i>	<ol style="list-style-type: none"> 1. Delete the EVAL command. 2. Insert a titration or measuring command. 3. Insert the EVAL command directly after it.


31.2 Sample table

Problem	Cause	Remedy
The method cannot be entered in the sample table.	The option Use sample assignment table is activated. The method assigned to the sample identification will be loaded automatically at the start of the determination.	Deactivate the option (see chapter 15.1, page 152).


31.3 Results/Statistics

Problem	Cause	Remedy
No statistics are carried out for a result.	Statistics is not activated.	In the method options, activate the option Statistics (see chapter 16.5, page 177).
	No statistics variable has been assigned to the calculation.	In the result options (command CALC), define a variable for the mean value (see "Variable for mean value", page 158).
	Statistics is not activated.	In the control dialog, activate the Statistics option (see chapter 18, page 191).
A result has been removed from the statistics, the mean value has not been reassigned to the common variable or to the TITER variable.	Assignment is not carried out automatically with retroactive modifications.	Recalculate the determination manually (see chapter 24, page 219).
The result is not displayed in the result table.	The column display in the result table is incorrectly configured.	Modify the settings for the display accordingly (see chapter 26.1, page 242).
	The parameter Save result in result table is not activated.	In the result options (command CALC), activate the parameter (see "Save result in result table", page 159).

31.4 Printing

Problem	Cause	Remedy
Tapping on the fixed key [] has no effect.	<i>The fixed key is disabled.</i>	In the Dialog options / Fixed keys dialog, activate the Print option (see chapter 7.2, page 26).
	<i>A determination is running.</i>	Wait until the determination is finished.

31.5 Manual control

Problem	Cause	Remedy
Tapping on the fixed key [] has no effect.	<i>The fixed key is disabled.</i>	In the Dialog options / Fixed keys dialog, activate the Manual control option (see chapter 7.2, page 26).
	<i>The required hardware is either not connected or incorrectly connected.</i>	<ol style="list-style-type: none"> 1. Switch off the 900 Touch Control. 2. Connect the hardware correctly. 3. Switch the 900 Touch Control back on.
A button in the manual control is disabled.	<i>The required hardware is being used in the ongoing determination.</i>	Wait until the determination is finished.

31.6 Miscellaneous

Problem	Cause	Remedy
The 900 Touch Control cannot be switched on.	<i>The Touch Control is connected to an MSB socket on the control instrument.</i>	Plug in the Touch Control at the Controller connector (see manual for control instrument).

31.7 SET titration

Problem	Cause	Remedy
The titration will not be finished.	<i>The minimum dosing rate is too low.</i>	Define Titration rate = user and increase the minimum rate (Min. rate) (see chapter 29.3.2, page 320).
	<i>The stop criterion is unsuitable.</i>	Adjust the control parameters (see chapter 29.3.2, page 320):

Problem	Cause	Remedy
		<ul style="list-style-type: none"> ▪ Increase the stop drift. ▪ Select a short delay time.
The sample is over-titrated.	<i>The control parameters are unsuitable.</i>	Adjust the control parameters (see chapter 29.3.2, page 320): <ul style="list-style-type: none"> ▪ Select Titration rate = slow. ▪ Define Titration rate = user and increase the control range. ▪ Define Titration rate = user and reduce the maximum rate (Max. rate). ▪ Define Titration rate = user and reduce the minimum rate (Min. rate). ▪ Stir faster. ▪ Arrange the electrode and buret tip to an optimum .
	<i>The electrode responds too slowly.</i>	Replace the electrode.
The titration time is too long.	<i>The control parameters are unsuitable.</i>	Adjust the control parameters (see chapter 29.3.2, page 320): <ul style="list-style-type: none"> ▪ Select Titration rate = optimal or fast. ▪ Define Titration rate = user and reduce the control range. ▪ Define Titration rate = user and increase the maximum rate (Max. rate). ▪ Define Titration rate = user and increase the minimum rate (Min. rate).
The results are spread widely.	<i>The minimum dosing rate is too high.</i>	Define Titration rate = user and reduce the minimum rate (Min. rate) (see chapter 29.3.2, page 320).
	<i>The control range is too small.</i>	Define Titration rate = user and increase the control range.
	<i>The electrode responds too slowly.</i>	Replace the electrode.

31.8 Volumetric Karl Fischer Titration

Problem	Cause	Remedy
The drift is very high during conditioning.	<i>The titration cell is leaking.</i>	<ul style="list-style-type: none"> ▪ Check the seals and the septum. Replace if necessary.



Problem	Cause	Remedy
		<ul style="list-style-type: none"> Replace the molecular sieve.
The drift becomes greater after each titration.	<i>The sample releases water very slowly.</i>	<ul style="list-style-type: none"> Adjust the method. Add solubility promoter. Increase the temperature (possibly using a KF oven). See technical literature.
	<i>A side reaction is taking place.</i>	<ul style="list-style-type: none"> Use special reagents. Adjust the method (increase/decrease the temperature, external extraction). See technical literature.
	<i>The pH value is no longer in the optimum range.</i>	Add buffer, see technical literature.
The titration will not be finished.	<i>The titration cell is leaking.</i>	<ul style="list-style-type: none"> Check the seals and the septum. Replace if necessary. Replace the molecular sieve.
	<i>The minimum increment is too low.</i>	Define Titration rate = user and increase the minimum volume increment (Min. increment) (see chapter 29.4.2, page 333).
	<i>The stop criterion is unsuitable.</i>	Adjust the control parameters (see chapter 29.4.2, page 333): <ul style="list-style-type: none"> Increase the stop drift. Select a short delay time.
	<i>See also: The drift becomes greater after each titration.</i>	
The sample is over-titrated.	<i>The increments at the end of the titration are too high.</i>	<ul style="list-style-type: none"> Define Titration rate = user and reduce the dosing rate (Max. rate) (see chapter 29.4.2, page 333). The following experiment provides a clue for the optimum dosing rate: During conditioning, display the drift and add sample without starting the titration. Select a value below the highest drift as dosing rate. Stir faster.
	<i>The amount of methanol in the working medium is too low.</i>	<ul style="list-style-type: none"> Replace the working medium. Reduce the amount of solubility promoter, if working with solvent mixtures, see technical literature.

Problem	Cause	Remedy
	<i>The electrode may be covered.</i>	Wipe off the electrode with ethanol or a suitable solvent.
The solution becomes darker after each titration.		Replace the working medium.
	<i>The electrode may be covered.</i>	Wipe off the electrode with ethanol or a suitable solvent.
	<i>The electrode has a short circuit.</i>	1. Check the Pt wires. 2. Activate the electrode check.
The endpoint is reached too quickly.	<i>The dosing rate outside the control range is too high.</i>	Define Titration rate = user and reduce the dosing rate (Max. rate) (see chapter 29.4.2, page 333).
The titration times with volumetric titration are constantly longer.	<i>The buffer capacity of the solvent can be exhausted for two-component reagents.</i>	Replace the working medium.

31.9 Coulometric Karl Fischer titration

Problem	Cause	Remedy
The drift is very high during conditioning.	<i>The titration cell is leaking.</i>	<ul style="list-style-type: none"> ▪ Check the septum and replace it if necessary. ▪ Replace the molecular sieve. ▪ Check the ground-joint sleeves for frayed edges. If necessary, trim the edges neatly or replace the ground-joint sleeves.
	<i>Deposits containing water can be found in the titration cell.</i>	<ul style="list-style-type: none"> ▪ Shake the titration cell.
	<i>The reagent is exhausted or contaminated.</i>	<ul style="list-style-type: none"> ▪ Replace the reagent.
	<i>The catholyte is old or moist.</i>	<ul style="list-style-type: none"> ▪ The catholyte must be replaced at least once per week. ▪ Dry the catholyte with KF one-component reagent.
	<i>The diaphragm of the generator electrode is contaminated.</i>	<ul style="list-style-type: none"> ▪ Clean the diaphragm (in accordance with directions in the leaflet for the generator electrode).

Problem	Cause	Remedy
	<i>The drift correction is too small (e.g. for the use of a KF oven or for manual drift correction).</i>	<ul style="list-style-type: none"> Start the titration as long as the gas flow still exists between the conditioning vial and the titration cell. Set the parameter Drift correction to auto (= automatic drift correction).
The result is too low.	<i>The sample releases iodine.</i>	<ul style="list-style-type: none"> Consider using a KF oven. See technical literature.
	<i>The parameter Stop drift is set too high.</i>	<ul style="list-style-type: none"> Set the Stop drift lower.
	<i>The drift correction is too large (e.g. with excessively high start drift, with fluctuating drift or with manual drift correction).</i>	<ul style="list-style-type: none"> Ensure stable and lower drift. Set the parameter Drift correction to auto (= automatic drift correction).
	<i>The parameter Min. rate is set too low.</i>	<ul style="list-style-type: none"> Set the parameter Min. rate higher. Reset the Control parameters to default values.
The results are spread widely.	<i>The sample is nonhomogeneous.</i>	<ul style="list-style-type: none"> Homogenize the sample if possible. Possibly use a larger sample size.
	<i>The sample addition is difficult to reproduce.</i>	<ul style="list-style-type: none"> Observe the instructions in .
	<i>The drift fluctuates.</i>	<ul style="list-style-type: none"> Ensure stable drift.

31.10 STAT titration

Problem	Cause	Remedy
The control point is not kept stable. The measured value is at times too high and at times too low. The controller "oscillates".	<i>The control parameters are unsuitable.</i>	Adjust the control parameters (see chapter 29.7.2, page 364): <ul style="list-style-type: none"> Reduce the Max. rate and possibly also the Min. rate. Increase control range.
	<i>The stirring is not optimal.</i>	Check and optimize efficiency of the stirring.
	<i>The arrangement of electrode and buret tip is not optimum.</i>	Arrange the electrode and buret tip to an optimum (see manual of the instrument).



Problem	Cause	Remedy
	<i>The cylinder volume of the exchange/dosing unit might be too large.</i>	Use an exchange/dosing unit with a smaller cylinder volume (yields a smaller volume increment per pulse).
The control point is not reached for too long.	<i>The control parameters are unsuitable.</i>	Adjust the control parameters (see chapter 29.7.2, page 364): <ul style="list-style-type: none">▪ Reduce control range.▪ increase Min. rate.▪ increase Max. rate.

32 Appendix

32.1 Manual Dosing Controller, optional accessory for manual titration

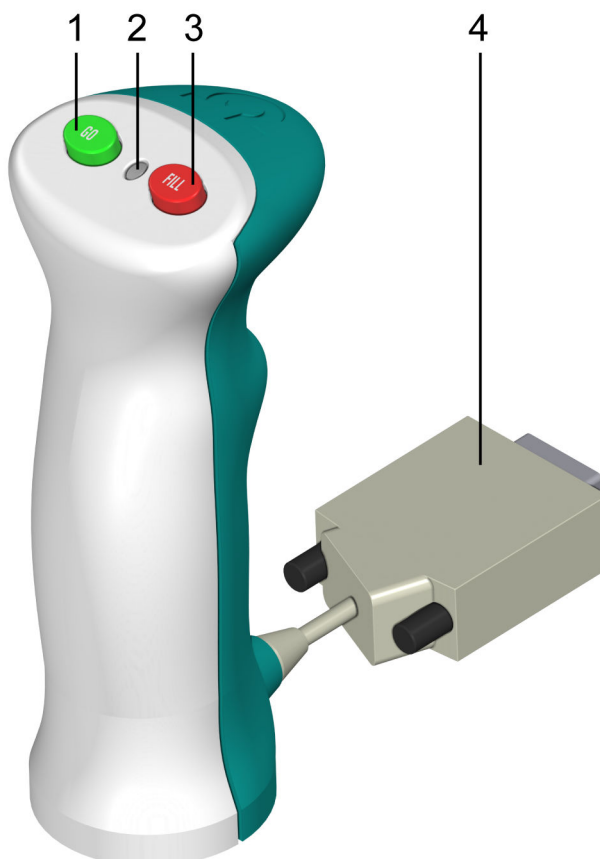


Figure 28 Manual Dosing Controller 6.2107.120 – Overview

1 Start/Dosing key [GO]

For starting the method and for dosing during the MAT command.

2 Status LED

Indicates whether the instrument is ready.

3 Cancel command button [FILL]

For canceling the running command.

4 Connector plug

With 25-pin D-sub plug.

32.2 Dosing unit

32.2.1 Maximum dosing and filling rate

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

Cylinder volume	Maximum rate
2 mL	6.67 mL/min
5 mL	16.67 mL/min
10 mL	33.33 mL/min
20 mL	66.67 mL/min
50 mL	166.00 mL/min

Independent of the cylinder volume, values ranging from 0.01 to 166.00 mL/min can always be entered. When the function is carried out the rate will be, if necessary, decreased automatically to the highest possible value.

32.2.2 Default parameters for preparing (PREP) and emptying (EMPTY)

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

The command **EMPTY** is used to empty the cylinders and the tubings of the dosing unit.

If no titrant is selected in the command, preparing and emptying will be carried out with the following default parameters:

- The entire cylinder volume is dosed at the maximum dosing rate through Port 1.
- The cylinder is filled at the maximum filling rate through Port 2.
- The following dimensions apply for the tubings:
 - Tubing at Port 1: length = 40.0 cm, diameter = 2 mm
 - Tubing at Port 2: length = 25.0 cm, diameter = 2 mm

32.3 Exchange unit

32.3.1 Maximum dosing and filling rate

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

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

Independent of the cylinder volume, values ranging from 0.01 to 166.00 mL/min can always be entered. When the function is carried out the rate will be, if necessary, decreased automatically to the highest possible value.

32.3.2 Default parameters for preparing (PREP)

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

If no titrant is selected in the command, preparing will be carried out with the following default parameters:

- The entire cylinder volume is dosed twice at the maximum dosing rate.
- The cylinder is filled at the maximum filling rate.

32.4 Stirring rate

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

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

$$\text{Rotational speed/min (r/min)} = 125 \cdot \text{Stirring rate}$$

Example:

Configured stirring rate: 8

Rotational speed in revolutions per minutes = $125 \cdot 8 = 1,000$

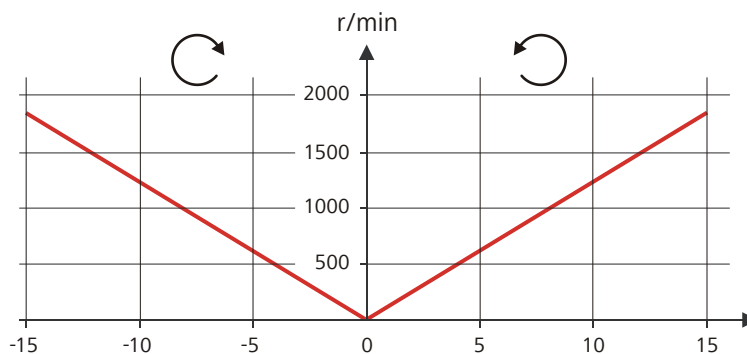


Figure 29 Rotational speed depending on the stirring rate

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

32.5 Balance

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

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

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



NOTE

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

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

Mettler AX

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

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

32.6 Result variables as parameter setting

For most of the numerical parameters, the result of a calculation can also be utilized in place of a number. This result must be calculated in a preceding calculation command (command **CALC**). A typical application is the use of a relative start volume.

The following example is used to explain how this method is used to define a sample size-dependent start volume for a titration. Proceed as follows:

1 Create a new calculation

- Insert the calculation command **CALC** in front of the titration command.
- Enter the calculation formula, e.g. $R1 = C00 \cdot 3$.

The screenshot shows a software interface for editing a calculation command. The title bar reads 'Edit command / Edit calculation'. The main area displays the following settings:

- Command ID: 01
- Command Name: CALC
- Title: Calculation
- Result name: Relative start volume
- Calc. formula R1: C00*3
- Decimal places: 3
- Result unit: mL

At the bottom of the dialog, there are four buttons: 'Note', 'Result variable', 'Result limits', and 'Result options'.

2 Define a result variable as parameter setting

- In the titration command, enter the variable **R1** as the start volume.

02 DET pH Dynamic pH titration

Start volume mL

Dosing rate mL/min

Pause s

The selection of the result variables is displayed in the number editor.



NOTE

If the method before the command with the result variables applied contains more than one calculation commands (possibly with result variables bearing the same name), then the result variable of the preceding calculation command will always be used.

Please note that the result must be within the input range of the parameter, as otherwise the determination run will be stopped when the parameter is accessed.

32.7 Electrode calibration with Sample Processors

Basic framework for a method for automatic calibrations

If the calibration of electrodes is carried out with a Sample Processor, then the basic framework of the method will appear as follows:

1. Subsequence with the commands required for the calibration (command **SUBSEQ**)
 - a. Command for change of buffer/standard (command **MOVE**)
 - b. Command for moving the lift (command **LIFT**)
 - c. Calibration command (command **CAL pH** or **CAL Conc**)
 - d. ...
2. ...

In the interest of general comprehensibility, other commands which are required are not listed here. A method template is available for an automatic pH calibration with subsequent measurement.

Command parameterization

The following special settings are required with the individual commands:

- Command **SUBSEQ**:
The setting **Cycles = Calibration** must be adjusted in the Subsequence options dialog.
- Command **MOVE** for changing the buffer/standard:
The only definition made in this command is that a calibration position is to be moved to. The setting **Destination = Calibration pos.** must be adjusted for this purpose. The question of which rack positions are used as calibration positions must be defined in the rack table (see below).
- Command **CAL pH** or **CAL Conc**:
The setting **Sample Processor = USB** must be adjusted in the Calibration parameters dialog.

Definition of the calibration positions

The positions of the individual buffers/standards on the rack are defined in the rack table of the rack used. The following options are available:

- **Utilization of sample positions**
The desired rack position for the first buffer/standard must be entered in the dialog **Sample rack / Edit rack data** for the parameter **1. Calibration pos.**. In this case, it is imperative that the remaining buffers/standards be placed on the rack positions directly following.
- **Utilization of special beakers**
Any rack position can be defined as a special beaker. It is, however, preferable to set them at high rack positions in order to be able to begin sample series at rack position 1. The special beakers are moved to in ascending order.
The list of special beakers is displayed in the dialog **Sample rack / Edit rack data** by pressing **[Special beakers]**. The number of buffers/standards used for calibration will determine the number of special beakers to be defined. We recommend defining special beakers 1-n. Afterwards, in the dialog **Sample rack / Edit rack data**, for the parameter **1. Calibration pos.**, the option **Special beaker 1** must be selected for the first buffer/standard.



32.8 Stored buffer series for pH calibration

The temperature-dependent pH values of several common pH buffers are stored in the Touch Control for automatic buffer recognition during pH calibration. In addition to the Metrohm buffer solutions, other reference buffers and technical buffers are also included in the tables.

The following tables provide an overview of the stored pH(T) series.

pH values printed in **bold** are the values for the reference temperature of the respective buffer set.

pH values printed in *italics* are interpolated or extrapolated values, all the others correspond to the manufacturer's specifications.

32.8.1 Metrohm

Table 23 Metrohm buffer solutions

Temp. (°C)	Metrohm		
	pH 4.00	pH 7.00	pH 9.00
0	3.99	7.11	9.27
5	3.99	7.08	9.18
10	3.99	7.06	9.13
15	3.99	7.04	9.08
20	3.99	7.02	9.04
25	4.00	7.00	9.00
30	4.00	6.99	8.96
35	4.01	6.98	8.93
40	4.02	6.98	8.90
45	4.03	6.97	8.87
50	4.04	6.97	8.84
55	4.06	6.97	8.81
60	4.07	6.97	8.79
65	4.09	6.98	8.76
70	4.11	6.98	8.74
75	4.13	6.99	8.73
80	4.15	7.00	8.71
85	4.18	7.00	8.70

Temp. (°C)	Metrohm		
	pH 4.00	pH 7.00	pH 9.00
90	4.20	7.01	8.68
95	4.23	7.02	8.67

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept up to date as far as possible.

However, they may be changed by the respective manufacturers.

32.8.2 NIST (according to DIN standard 19266, 2015)

Table 24 NIST buffer solutions

Temp. (°C)	NIST (according to DIN standard 19266, 2015-05)				
	pH 1.679	pH 4.005	pH 6.865	pH 9.180	pH 12.454
0	1.666	4.000	6.984	9.464	-
5	1.668	3.998	6.951	9.395	13.207
10	1.670	3.997	6.923	9.332	13.003
15	1.672	3.998	6.900	9.276	12.810
20	1.675	4.000	6.881	9.225	12.627
25	1.679	4.005	6.865	9.180	12.454
30	1.683	4.011	6.853	9.139	12.289
35	1.688	4.018	6.844	9.102	12.133
40	1.694	4.027	6.838	9.068	11.984
45	1.700	4.038	6.836	9.040	11.841
50	1.707	4.050	6.833	9.011	11.705
55	1.715	4.075	6.834	8.985	11.574
60	1.723	4.091	6.836	8.962	11.449
65	1.733	4.108	6.841	8.942	-
70	1.743	4.126	6.845	8.921	-
75	1.754	4.145	6.852	8.903	-
80	1.766	4.164	6.859	8.885	-



Temp. (°C)	NIST (according to DIN standard 19266, 2015-05)				
	pH 1.679	pH 4.005	pH 6.865	pH 9.180	pH 12.454
85	1.779	4.184	6.868	8.868	-
90	1.792	4.205	6.877	8.850	-
95	1.806	4.227	6.886	8.833	-

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

The NIST buffers are identical to the buffer solutions that are used in Chinese pharmacopoeia.

32.8.3 DIN (according to DIN standard 19267, 2012)Table 25 *DIN buffer solutions*

Temp. (°C)	DIN (according to DIN standard 19267, 2012-08)					
	pH 1.09	pH 3.06	pH 4.65	pH 6.79	pH 9.23	pH 12.75
0	1.08	-	4.67	6.89	9.48	-
5	1.08	-	4.66	6.86	9.43	-
10	1.09	3.10	4.66	6.84	9.37	13.37
15	1.09	3.08	4.65	6.82	9.32	13.15
20	1.09	3.07	4.65	6.80	9.27	12.96
25	1.09	3.06	4.65	6.79	9.23	12.75
30	1.10	3.05	4.65	6.78	9.18	12.61
35	1.10	3.05	4.66	6.77	9.13	12.44
40	1.10	3.04	4.66	6.76	9.09	12.29
45	1.10	3.04	4.67	6.76	9.04	12.13
50	1.11	3.04	4.68	6.76	9.00	11.98
55	1.11	3.04	4.69	6.76	8.97	11.84
60	1.11	3.04	4.70	6.76	8.92	11.69
65	1.11	3.04	4.71	6.76	8.90	11.56

Temp. (°C)	DIN (according to DIN standard 19267, 2012-08)					
	pH 1.09	pH 3.06	pH 4.65	pH 6.79	pH 9.23	pH 12.75
70	1.11	3.04	4.72	6.76	8.88	11.43
75	1.12	3.04	4.74	6.77	8.86	11.30
80	1.12	3.05	4.75	6.78	8.85	11.19
85	1.12	3.06	4.77	6.79	8.83	11.08
90	1.13	3.07	4.79	6.80	8.82	10.99
95	-	-	-	-	-	-

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

32.8.4 Fisher

Table 26 Fisher buffer solutions (valid up to and including firmware version 5.900.0043)

Temp. (°C)	Fisher			
	pH 2.00	pH 4.00	pH 7.00	pH 10.00
0	-	4.01	7.13	10.34
5	1.98	3.99	7.10	10.26
10	1.98	4.00	7.07	10.19
15	2.02	3.99	7.05	10.12
20	2.00	4.00	7.02	10.06
25	2.00	4.00	7.00	10.00
30	2.00	4.01	6.99	9.94
35	2.02	4.02	6.98	9.90
40	2.01	4.03	6.97	9.85
45	2.01	4.04	6.97	9.81
50	2.01	4.06	6.97	9.78
55	-	4.07	6.97	9.74



Temp. (°C)	Fisher			
	pH 2.00	pH 4.00	pH 7.00	pH 10.00
60	-	4.09	6.98	9.70
65	-	4.11	6.99	9.68
70	-	4.13	7.00	9.65
75	-	4.14	7.02	9.63
80	-	4.16	7.03	9.62
85	-	4.18	7.06	9.61
90	-	4.21	7.08	9.60
95	-	4.23	7.11	9.60

Table 27 Fisher buffer solutions (valid from firmware version 5.900.0044)

Temp. (°C)	Fisher			
	pH 2.00	pH 4.00	pH 7.00	pH 10.00
0	-	4.01	7.13	10.34
5	1.98	3.99	7.10	10.26
10	1.98	4.00	7.07	10.19
15	2.02	3.99	7.05	10.12
20	2.00	4.00	7.02	10.06
25	2.00	4.00	7.00	10.00
30	2.00	4.01	6.99	9.94
35	2.02	4.02	6.98	9.90
40	2.01	4.03	6.97	9.85
45	2.01	4.04	6.97	9.81
50	2.01	4.06	6.97	9.78
55	-	4.07	6.97	9.74
60	-	4.09	6.98	9.70

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

32.8.5 Honeywell Fluka

Table 28 Buffer solutions Honeywell Fluka

Temp. (°C)	Fluka		
	pH 4.000	pH 7.000	pH 9.000
0	4.030	7.130	9.240
5	4.025	7.090	9.175
10	4.020	7.050	9.110
15	4.010	7.020	9.055
20	4.000	7.000	9.000
25	4.000	6.990	8.965
30	4.000	6.980	8.930
35	4.000	6.975	8.895
40	4.000	6.970	8.860
45	4.000	6.965	8.830
50	4.000	6.960	8.800
55	4.000	6.960	8.775
60	4.000	6.960	8.750
65	4.000	6.965	8.730
70	4.000	6.970	8.710
75	4.000	6.975	8.690
80	4.000	6.980	8.670
85	4.000	6.990	8.655
90	4.000	7.000	8.640

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

32.8.6 Mettler Toledo

Table 29 *Mettler Toledo buffer solutions*

Temp. (°C)	Mettler Toledo				
	pH 2.00	pH 4.01	pH 7.00	pH 9.21	pH 11.00
0	2.03	4.01	7.12	9.52	11.90
5	2.02	4.01	7.09	9.45	11.72
10	2.01	4.00	7.06	9.38	11.54
15	2.00	4.00	7.04	9.32	11.36
20	2.00	4.00	7.02	9.26	11.18
25	2.00	4.01	7.00	9.21	11.00
30	1.99	4.01	6.99	9.16	10.82
35	1.99	4.02	6.98	9.11	10.64
40	1.98	4.03	6.97	9.06	10.46
45	1.98	4.04	6.97	9.03	10.28
50	1.98	4.06	6.97	8.99	10.10
55	1.98	4.08	6.98	8.96	-
60	1.98	4.10	6.98	8.93	-
65	1.98	4.13	6.99	8.90	-
70	1.99	4.16	7.00	8.88	-
75	1.99	4.19	7.02	8.85	-
80	2.00	4.22	7.04	8.83	-
85	2.00	4.26	7.06	8.81	-
90	2.00	4.30	7.09	8.79	-
95	2.00	4.35	7.12	8.77	-

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

32.8.7 Beckmann

Table 30 Beckmann buffer solutions (valid up to and including firmware version 5.900.0043)

Temp. (°C)	Beckmann		
	pH 4.00	pH 7.00	pH 10.01
0	4.00	7.12	10.32
5	4.00	7.09	10.25
10	4.00	7.06	10.18
15	4.00	7.04	10.12
20	4.00	7.02	10.06
25	4.00	7.00	10.01
30	4.01	6.99	9.97
35	4.02	6.99	9.93
40	4.03	6.98	9.89
45	4.05	6.98	9.86
50	4.06	6.97	9.83
55	4.08	6.98	-
60	4.09	6.98	-
65	4.11	6.99	-
70	4.12	6.99	-
75	4.14	7.00	-
80	4.16	7.00	-
85	4.18	7.01	-
90	4.19	7.02	-
95	4.21	7.03	-

Table 31 Beckmann buffer solutions (valid from firmware version 5.900.0044)

Temp. (°C)	Beckmann		
	pH 4.01	pH 7.00	pH 10.01
0	4.00	7.12	10.32
5	4.00	7.09	10.25
10	4.00	7.06	10.18
15	4.00	7.04	10.12
20	4.00	7.01	10.06
25	4.01	7.00	10.01
30	4.01	6.99	9.97
35	4.02	6.99	9.93
40	4.03	6.97	9.89
45	4.05	6.97	9.86
50	4.06	6.97	9.83



NOTE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

32.8.8 Radiometer Analytical

Table 32 Radiometer Analytical buffer solutions (valid up to and including firmware version 5.900.0043)

Temp. (°C)	Radiometer Analytical			
	pH 1.679	pH 4.005	pH 7.000	pH 9.180
0	1.666	4.000	7.118	9.464
5	1.668	3.998	7.087	9.395
10	1.670	3.997	7.059	9.332
15	1.672	3.998	7.036	9.276
20	1.675	4.001	7.016	9.225

Temp. (°C)	Radiometer Analytical			
	pH 1.679	pH 4.005	pH 7.000	pH 9.180
25	1.679	4.005	7.000	9.180
30	1.683	4.011	6.987	9.139
35	1.688	4.018	6.977	9.102
40	1.694	4.027	6.970	9.068
45	1.700	4.038	6.965	9.038
50	1.707	4.050	6.964	9.011
55	1.715	4.064	6.965	8.985
60	1.723	4.080	6.968	8.962
65	1.732	4.097	6.974	8.941
70	1.743	4.116	6.982	8.921
75	1.754	4.137	6.992	8.900
80	1.765	4.159	7.004	8.885
85	1.778	4.183	7.018	8.867
90	1.792	4.210	7.034	8.850
95	-	4.240	-	-

Table 33 Radiometer Analytical buffer solutions (valid from firmware version 5.900.0044)

Temp. (°C)	Radiometer Analytical			
	pH 1.679	pH 4.005	pH 7.000	pH 9.180
0	1.666	4.000	7.118	9.464
5	1.668	3.998	7.087	9.395
10	1.670	3.997	7.059	9.332
15	1.672	3.998	7.036	9.276
20	1.675	4.001	7.016	9.225
25	1.679	4.005	7.000	9.180
30	1.683	4.011	6.987	9.139
35	1.688	4.018	6.977	9.102
40	1.694	4.027	6.970	9.068
45	1.700	4.038	6.965	9.038
50	1.707	4.050	6.964	9.010



Temp. (°C)	Radiometer Analytical			
	pH 1.679	pH 4.005	pH 7.000	pH 9.180
55	1.715	4.064	6.965	8.985
60	1.723	4.080	6.968	8.962
65	1.732	4.097	6.974	8.941
70	1.743	4.116	6.982	8.921
75	1.754	4.137	6.992	8.900
80	1.765	4.159	7.004	8.884
85	1.778	4.183	7.018	8.867
90	1.792	4.208	7.034	8.850

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

32.8.9 Baker

Table 34 Baker buffer solutions

Temp. (°C)	Baker			
	pH 4.00	pH 7.00	pH 9.00	pH 10.00
0	4.00	7.13	9.23	10.30
5	4.00	7.09	9.17	10.24
10	4.00	7.05	9.10	10.17
15	4.00	7.03	9.05	10.11
20	4.00	7.00	9.00	10.05
25	4.00	6.98	8.96	10.00
30	4.01	6.98	8.91	9.96
35	4.02	6.98	8.88	9.93
40	4.03	6.97	8.84	9.89
45	4.04	6.97	8.81	9.86
50	4.05	6.96	8.78	9.82

Temp. (°C)	Baker			
	pH 4.00	pH 7.00	pH 9.00	pH 10.00
55	4.07	6.96	8.76	9.79
60	4.08	6.96	8.73	9.76
65	4.10	6.97	8.71	9.74
70	4.12	6.97	8.69	9.72
75	4.14	6.98	8.68	9.70
80	4.16	6.98	8.66	9.68
85	4.19	6.99	8.64	9.66
90	4.21	7.00	8.62	9.64

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

32.8.10 Hamilton DURACALTable 35 *Hamilton DURACAL buffer solutions*

Temp. (°C)	Hamilton DURACAL			
	pH 4.01	pH 7.00	pH 9.21	pH 10.01
0	-	-	-	-
5	4.01	7.09	9.45	10.19
10	4.00	7.06	9.38	10.15
15	4.00	7.04	9.32	10.11
20	4.00	7.02	9.26	10.06
25	4.01	7.00	9.21	10.01
30	4.01	6.99	9.16	9.97
35	4.02	6.98	9.11	9.92
40	4.03	6.97	9.06	9.86
45	4.04	6.97	9.03	9.83
50	4.06	6.97	8.99	9.79

**NOTE****Update**

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible.

However, they may be changed by the respective manufacturers.

32.8.12 Merck CertiPUR 20 / Titrisol

Table 37 Merck CertiPUR 20 / Titrisol buffer solutions (valid up to and including firmware version 5.900.0043)

Temp. (°C)	Merck CertiPUR 20 / Titrisol				
	pH 2.00	pH 4.00	pH 7.00	pH 9.00	pH 12.00
0	2.01	4.05	7.13	9.24	12.58
5	2.01	4.04	7.07	9.16	12.41
10	2.01	4.02	7.05	9.11	12.26
15	2.00	4.01	7.02	9.05	12.10
20	2.00	4.00	7.00	9.00	12.00
25	2.00	4.01	6.98	8.95	11.88
30	2.00	4.01	6.98	8.91	11.72
35	2.00	4.01	6.96	8.88	11.67
40	2.00	4.01	6.95	8.85	11.54
45	2.00	4.00	6.95	8.82	11.435
50	2.00	4.00	6.95	8.79	11.33
55	2.00	4.00	6.95	8.76	11.185
60	2.00	4.00	6.96	8.73	11.04
65	2.00	4.00	6.96	8.715	10.97
70	2.01	4.00	6.96	8.70	10.90
75	2.01	4.00	6.96	8.68	10.80
80	2.01	4.00	6.97	8.66	10.70
85	2.01	4.00	6.98	8.65	10.59
90	2.01	4.00	7.00	8.64	10.48
95	-	4.00	7.02	-	-

Table 38 Merck CertiPUR 20 / Titrisol buffer solutions (valid from firmware version 5.900.0044)

Merck CertiPUR 20 / Titrisol					
Article no.	109433	109435	109477	109476	109462
Temp. (°C)	pH 2.00	pH 4.00	pH 7.00	pH 9.00	pH 11.00
0	2.01	4.05	7.13	9.24	11.45
5	2.01	4.04	7.07	9.16	11.32
10	2.01	4.02	7.05	9.11	11.20
15	2.00	4.01	7.02	9.05	11.10
20	2.00	4.00	7.00	9.00	11.00
25	2.00	4.01	6.98	8.95	10.90
30	2.00	4.01	6.98	8.91	10.81
35	2.00	4.01	6.96	8.88	10.72
40	2.00	4.01	6.95	8.79	10.64
45	2.00	4.00	6.95	8.82	10.56
50	2.00	4.00	6.95	-	10.48



NOTE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible. However, they may be changed by the respective manufacturers.

32.8.13 Merck CertiPUR 25

Table 39 Merck CertiPUR 25 buffer solutions (valid up to and including firmware version 5.900.0043)

Merck CertiPUR (25°C)				
Temp. (°C)	pH 4.00	pH 7.00	pH 9.00	pH 10.00
0	-	-	-	-
5	4.05	7.09	9.22	10.22
10	4.04	7.08	9.16	10.16
15	4.02	7.04	9.10	10.10

Temp. (°C)	Merck CertiPUR (25°C)			
	pH 4.00	pH 7.00	pH 9.00	pH 10.00
20	4.01	7.02	9.06	10.05
25	4.00	7.00	9.00	10.00
30	3.99	6.98	8.98	9.94
35	3.98	6.98	8.93	9.90
40	3.98	6.97	8.89	9.86
45	3.98	6.97	8.86	9.80
50	3.98	6.97	8.84	9.73

Table 40 Merck CertiPUR 25 buffer solutions (valid from firmware version 5.900.0044)

Article no.	Merck CertiPUR (25°C)			
	109445	109407	109408	109409
Temp. (°C)	pH 4.00	pH 7.00	pH 9.00	pH 10.00
0	-	-	-	-
5	4.05	7.09	9.22	10.22
10	4.04	7.08	9.16	10.16
15	4.02	7.04	9.10	10.10
20	4.01	7.02	9.05	10.05
25	4.00	7.00	9.00	10.00
30	3.99	6.98	8.96	9.94
35	3.98	6.98	8.93	9.90
40	3.98	6.97	8.89	9.86
45	3.98	6.97	8.86	9.80
50	3.98	6.97	8.84	9.73



NOTE

Update

The values of the individual buffers with the corresponding temperatures are kept as up to date as possible. However, they may be changed by the respective manufacturers.

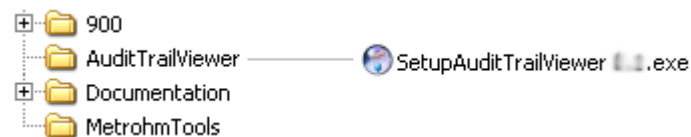
32.9 Using AuditTrailViewer

When you work in accordance with the *FDA Guidance 21 CFR Part 11*, logs with detailed user activities (Audit Trail) are important. The *AuditTrailViewer* supports you in your efforts to compile, filter and export logs of this type as TXT files.

First you must install the *AuditTrailViewer* on your PC. Afterwards, you must create a backup of your Touch Control (see chapter 12.3, page 132). The Audit Trail is generated automatically when you create the backup. The file name of the Audit Trail is **log.madt**. In the following you will find detailed information about how you must proceed.

32.9.1 Installing AuditTrailViewer

You will find the file for installing the *AuditTrailViewer* on the USB flash drive provided.



Proceed as follows:

- 1 Double-click on the file **SetupAuditTrailViewer 1.2.3.exe**.
The dialog **Welcome to the AuditTrailViewer Setup Wizard** is displayed.
- 2 Click on **[Next >]**.
The **License Agreement** dialog is displayed.
- 3 Click on **[I Agree]** to accept the contractual conditions.
The **Choose Install Location** dialog is displayed. A memory location for the *AuditTrailViewer* is suggested in this dialog.
- 4 If you accept the suggested memory location, click on **[Next >]**.
or
Select a different memory location and click on **[Next >]**.
The **Confirm Installation** dialog is displayed.
- 5 Click on **[Install]** to install the *AuditTrailViewer*.

As soon as the installation is completed, the dialog **Installation Complete** is displayed.

6 Click on **[Next >]**.

The dialog **Completing the AuditTrailViewer Setup Wizard** is displayed.

7 If the *AuditTrailViewer* should not be started immediately, deactivate the check box **Run AuditTrailViewer**.

8 Click on **[Finish]**.

If the preceding instruction step has been skipped, then the *AuditTrailViewer* will start.

32.9.2 Opening the Audit Trail

Create a backup of the data and of the settings of your Touch Control (see chapter 12.3, page 132).

1 Open the backup on your PC.

2 Open the file **log.madt** with the *AuditTrailViewer*.

AuditTrailViewer dialog window









File Filter Info					
No.	Date	User	Category	Action	Details
1	2011-10-31 11:30:22	Johnson	Method	New	01 Dynamic Titration pH
2	2011-10-31 11:30:34	Johnson	Method	Delete command	New method V0 03 REPORT
3	2011-10-31 11:30:40	Johnson	Method	Edit	New method V0 01 DET pH Stirrer off
4	2011-10-31 11:30:43	Johnson	Method	Edit	New method V0 01 DET pH Titrant not defined
5	2011-10-31 11:30:43	Johnson	Method	Edit	New method V0 01 DET pH Titrant
6	2011-10-31 11:30:48	Johnson	Method	Load result template	New method V0 Content (g/L)
7	2011-10-31 11:30:52	Johnson	Method	Edit	New method V0 Calc. formula EP1*CONC*TITER*3/C00
8	2011-10-31 11:31:08	Johnson	System	Message	003-908 Number of autostarts Yes/OK
9	2011-10-31 11:31:14	Johnson	Method	Start	Start key pressed
10	2011-10-31 11:31:15	Johnson	Method	Start	New method V0 1.0 g
11	2011-10-31 11:31:28	Johnson	Method	Manual stop	New method V0
12	2011-10-31 11:31:36	Johnson	System	Message	002-907 Method modified Yes/OK
13	2011-10-31 11:31:36	Johnson	Security	Logout	
14	2011-10-31 11:31:55	Meier	Security	Login message	Wrong password
15	2011-10-31 11:31:57	Johnson	System	Message	002-102 Wrong password Yes/OK
16	2011-10-31 11:31:58	Meier	Security	Log in	
17	2011-10-31 11:32:27	Meier	Method	Load	KFT 2 V1 Internal memory
18	2011-10-31 11:32:32	Meier	Security	Logout	
19	2011-10-31 11:32:45	Meier	Security	Login message	Wrong password
20	2011-10-31 11:32:47	Meier	System	Message	002-102 Wrong password Yes/OK
21	2011-10-31 11:33:01	Meier	Security	Change password	
22	2011-10-31 11:33:03	Meier	Security	Login message	Wrong password
23	2011-10-31 11:33:05	Meier	System	Message	002-102 Wrong password Yes/OK
24	2011-10-31 11:33:08	Meier	Security	Log in	
25	2011-10-31 11:33:12	Meier	Method	Start	Start key pressed
26	2011-10-31 11:33:13	Meier	Method	Start	KFT 2 V1 1.0 g
27	2011-10-31 11:33:14	Meier	System	Message	009-111 Stirrer missing Yes/OK
28	2011-10-31 11:33:15	Meier	Security	Logout	
29	2011-10-31 11:33:27	Chang	Security	Log in	
30	2011-10-31 11:33:32	Chang	Method	New	01 Dynamic Titration pH
31	2011-10-31 11:33:38	Chang	Method	Delete command	New method V0 03 REPORT
32	2011-10-31 11:33:43	Chang	Method	Edit	New method V0 01 DET pH Start volume 5 mL
33	2011-10-31 11:33:48	Chang	Method	Load result template	New method V0 Content (g/L)

32.9.3 Contents of the Audit Trail

In the following you will find a description of the dialog window and of the menu bar of the *AuditTrailViewer*.

Table 41 Dialog window

Column	Content
No.	Each entry is numbered in sequence.

Column	Content
Symbol	Classification of the entry: <ul style="list-style-type: none"> ▪  Actions that are neither relevant to safety nor alter the determination data. ▪  Actions, e.g. changes to the login options and recalculation of determinations. ▪  Errors that occur, e.g. entry of an incorrect password.
Date	Precise time of the event.
User	User who triggered the action.
Category	Category to which the entry belongs.
Action	Designation of the action.
Details	Details of the action.
Menu bar	
 Print	Print Audit Trail. An Audit Trail can be printed by means of the  symbol.
 Update	Update view. The list is updated automatically only at the time the dialog window is opened.
 Quick filter	Filter the Audit Trail.
 Show all	Display all entries once again.


32.9.4 Filtering the Audit Trail


The entries in the Audit Trail can be filtered. You can set the following filter criteria:

- **Date**
- **User**
- **Category**
- **Action**

Proceed as follows:

- 1 Click in a cell that contains the desired filter criterion (e.g. **Category** = **Method**).

2 Click on the  icon or the menu item **Filter ► Quick filter**.
The only entries which will be displayed are those which correspond to the desired filter criterion.

3 Click on the  icon or the menu item **Filter ► Show all**.
All of the entries are displayed once again.

32.9.5 Exporting the Audit Trail

You can export the Audit Trail as .txt file. This way, the Audit Trail can be archived and is available as required for inspections.

Proceed as follows:

1 Use the menu item **File ► Export** to open the dialog window for the export.

2 Enter the path and file name with the extension **.txt**.

3 Click on **[Open]** and then on **[Export]**.

The Audit Trail is exported.

32.10 Diagnosis

System ► Diagnosis

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

The following functions are available:

- **LCD test**
Check the display for faulty pixels (*see chapter 32.10.1, page 531*).
- **Temperature control**
Measure the operating temperature of the connected control instrument (*see chapter 32.10.2, page 532*).
- **Format storage medium**
Format the external storage medium (*see chapter 32.10.3, page 532*).

- **Remove storage medium**
Remove the external storage medium safely (see chapter 32.10.4, page 532).
- **Touch adjustment**
Adjust the touch-sensitive screen (see chapter 32.10.5, page 532).
- **Touch screen test**
Test the function of the touch-sensitive screen (see chapter 32.10.6, page 533).
- **Software update**
Update the software of Touch Control and of the control instruments (see chapter 32.10.7, page 534).
- **822 Curve Simulator**
Simulate titration curves for checking titrators (see chapter 32.10.8, page 538).
- **Service**
Special functions for the service technician (see chapter 32.10.9, page 540).

32.10.1 LCD test

System ► Diagnosis ► LCD test

You can use the LCD test to check the display for faulty pixels. To do this, various test images are displayed one after the other.



NOTE

The [↶] fixed key is used to display the preceding test image; the test can be stopped at any time with the [🏠] fixed key.

Proceed as follows:

- 1 ▪ Tap on **[LCD test]**.
The entire display turns white.
- 2 ▪ Check the display for pixel errors and other irregularities.
 - Continue the test with [▶].
 Other colors and patterns will be displayed one after the other.
- 3 ▪ Repeat step 2 until the **System / Diagnosis** dialog is displayed again.
- 4 ▪ Contact your Metrohm representative in the event of faults or irregularities.

32.10.2 Temperature monitoring

System ► Diagnosis ► Temperature control

You can use temperature monitoring to display the operating temperature of a connected control instrument. The temperature is measured in the interior of the housing. The display is updated with the **[Update]** button.

32.10.3 Formatting an external storage medium

System ► Diagnosis ► Format storage medium

With this function, you have the option of formatting an external storage medium directly on the 900 Touch Control (quick formatting).

The following file systems can be selected:

- FAT
- FAT32
- ExFAT



CAUTION

If you format the storage medium with the **ExFAT** file system, it is possible that it will no longer be recognized by a PC. Read the pertinent information from Microsoft Support at <http://support.microsoft.com>.

Do not use this file system unless you need to be able to save more than 999 files in a single group.

32.10.4 Removing an external storage medium

System ► Diagnosis ► Remove storage medium

As long as the stored data is not being accessed (reading/saving data), you can plug in and disconnect the storage medium without difficulty at any time. The **[Remove storage medium]** function offers additional protection. This ensures that the storage medium cannot be removed while any data is being transferred.


32.10.5 Adjusting the touch screen

System ► Diagnosis ► Touch adjustment

With time the touch-sensitive screen may not register touches at their precise position. You can readjust the screen in this dialog.

Proceed as follows:

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

- 2 Tap on **[Diagnosis]**.
- 3 Tap on **[Touch adjustment]**.
A message in English and a crosshair will appear in the center of the screen.
- 4 Touch a stylus (a special pen-shaped instrument for operating devices with touch screens) to the center of the crosshair and maintain this position until the cross hair moves to a new position on the screen.
- 5 Repeat this process as long as the crosshair continues to be repositioned on the screen.
A message in English will appear.
- 6 Tap at any location on the screen to confirm the adjustment.
- 7 Press [] to finish the adjustment.

32.10.6 Testing the touch screen

System ► Diagnosis ► Touch screen test

You can use this test to check the function of the touch-sensitive monitor screen.

A calibration is not possible with this test. If the Touch screen does not work correctly anymore, it will need to be replaced. For that please contact your Metrohm representative.



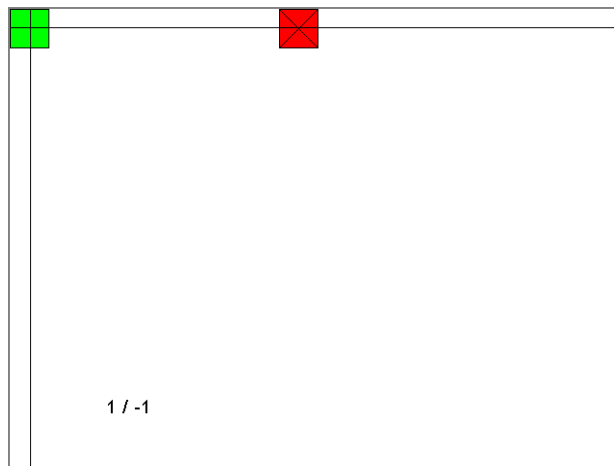
NOTE

You can use the [] fixed key to stop the test at any time.

Proceed as follows:

- 1 Tap on **[Touch screen test]**.
A red square is displayed at the upper left.
- 2 Tap on the square as close to the center as possible.
The actual detected point of contact will be displayed by a crosshair, and the deviation from the center will also be displayed on the lower edge of the image.

The next red square will also be displayed.



- 3** Repeat step 2 until all of the areas in the display have been tested.

A list with fixed keys will appear.

- 4** Tap on all of the fixed keys one after the other in any sequence.

The result is displayed in each case with a short information text, e.g. **[Print] key OK**.

- 5** Finish Touch screen test with [].

32.10.7 Software update (loading program versions and language files)

System ► Diagnosis ► Software update

New program versions or language files can be loaded from an external storage medium (e.g. USB flash drive). The corresponding files must be stored on the storage medium in the **900/SwUpdates** directory (see "Directory structure", page 131).



NOTE

The software update to version 5.900.0046 is possible only if version 5.900.0045 is installed. If a software version older than 5.900.0045 is used, then the control software must first be updated to version 5.900.0045.

**NOTE**

It is imperative that you first update the control software of the Touch Control before you update the device program (firmware) of the control device (Titrande, Dosing Interface, etc.).

**NOTE**

The memory will be reformatted when updating from software version 5.900.0043.

Before carrying out the software update, make a backup in order to save your data and the system settings (*see chapter 12.3, page 132*).

Use a separate USB flash drive for the software update. It must be removed from the instrument after the successful software update.

Program files

The files are instrument-specific. The file names are structured as follows:

- Control software for 900 Touch Control:
 - 5XXXyyyy.BIN**
 - 5XXXyyyy.MBIN**
 - XXX = device type (i.e. "900" for the 900 Touch Control)
 - yyyy = program version
- Firmware of the control instrument:
 - 5XXXyyyy.BIN**
 - XXX = device type (e.g. 907 for the 907 Titrande)
 - yyyy = program version

Language files

Language files may have the following content:

- one or more additional dialog languages
- the online help for one or more additional dialog languages
- supplements for existing dialog languages/online help documents

They can be recognized by means of the two-digit language code in the file name. The file name has the following structure:

- **5XXXyZZZML.BIN**
- 5XXXyZZZML.MBIN**
 - XXX = device type (i.e. "900" for the 900 Touch Control)
 - y = version number of the language package
 - ZZZ = program version

32.10.7.1 Carrying out a software update



CAUTION

Make sure that the power supply is guaranteed during the entire update process. Otherwise there is the chance that the instrument will no longer be able to be switched on and that it will need to be sent in for repair.



NOTE

Make sure that no USB/RS-232 adapter is connected!

Proceed as follows:

1 Copying files to an external storage medium

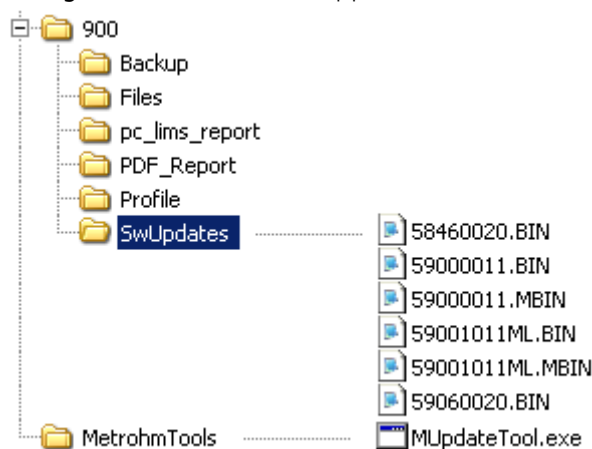


NOTE

In the case of the program versions and language files for the Touch Control, it is imperative that both the BIN file and the associated MBIN file be copied.

- Copy the files to the "SwUpdates" directory.

- Copy also the "MetrohmTools" folder with the "MUpdate-Tool.exe" file to the external storage medium. Make sure that the file is stored at the top level of the external storage medium. This also applies to the "900" folder.



For the program versions 5.900.0043 to 5.900.0045, an additional folder that is on the same level as Metrohm-Tools with the name SRVPRF900 containing the file St900_SrPrf.cfg is required

If this structure is not maintained, then the files will not be found, because the directories are accessed directly during the update process.

- Plug in the external storage medium at the Touch Control.

2 Opening the update dialog

- Under **System ► Diagnosis**, tap on the button **Software update**.

3 Selecting the instrument

- Tap on the **Control device** list box and select the instrument to be updated.

4 Selecting file

- Tap on the **Binary file** list box. The selection list with the BIN files saved in the "SwUpdates" directory is opened.
- Select the required file.
- Tap on **[Select]**.
- Update of the Touch Control: Continue with Step 5.
Update of the control instrument: Continue with Step 6.

1 Connecting the curve simulator



NOTE

Note that the dosing device is always located as the last device, after the curve simulator, if there is a chain of MSB devices (e.g. Titrando-MSB – stirrer – curve simulator – dosing device).

If the internal dosing drive on the Titrando is used, then the curve simulator must be connected to MSB connector 2.

- Switch off the Touch Control.
- Connect the analog output of the curve simulator to the electrode connector of the Titrando.
 - Use the 6.2116.020 cable.
 - Electrode connector **Ind.**: Simulation of an acid-base titration.
 - Electrode connector **Pol.**: Simulation of a Karl Fischer titration.
- Connect the curve simulator to an MSB connector on the Titrando.

2 Configuring the Touch Control

- Switch on the Touch Control.
- In the **System / Diagnosis** dialog, tap on the **[822 Curve Simulator]** button.
The **Diagnosis / 822 Curve Simulator** dialog is displayed.
- Activate the parameter **Send dosing signals to MSB2** and confirm with **[Set]**.
- Tap on **[Home]**.

The signals from the dosing device will now be copied to the MSB connector 2.

3 Simulating a titration

- Create a titration method or load an existing one.
- Tap on **[▶]**.

The titration is started. After the completion of the titration, the results dialog is displayed.

4 Finishing the simulation mode

- Switch off the Touch Control.

Mean value:

$$\bar{x}_k = \frac{1}{n} \cdot \sum_{i=1}^n R_{k,i}$$

Absolute standard deviation:

$$Sabs_k = +\sqrt{\frac{\sum_{i=1}^n (R_{k,i} - \bar{x}_k)^2}{n-1}}$$

Relative standard deviation (in %):

$$Srel_k = 100 \cdot \frac{Sabs_k}{\bar{x}_k}$$

Explanations

The individual values are incorporated in the statistics in the selected Precision (Round, Truncate or Full precision).

7 significant places are yielded when the 32 bit numerical format is applied for the floating point number in decimal presentation. For the 64 bit numerical format, there are 15 significant places.

The accuracy can be controlled by the selection of the prefix of the unit (milli, micro) and the number of decimal places.

Example (64-bit numerical format):

The result displayed, **1234.56789158763 mg/L**, has 15 significant places. It should be rounded off to three decimal places according to the above rounding-off process:

- **1234.568 mg/L.**

If the same result is expressed in "g/L" (**1.23456789158763 g/L**), and is also rounded off to three decimal place, this yields

- **1.235 g/L.**

I.e. you obtain the lowest losses in accuracy with rounding when you select the application and the numerical format in such a way that the numbers displayed have as many places before the decimal point as possible.

A complete recalculation of the statistics using a pocket calculator or PC calculation programs may exhibit deviations. This can be explained by the different binary numerical formats used by these computers.



NOTE

The above losses of accuracy by rounding off in the range of significant places are only relevant theoretically. Most of the time they are lower by several orders of magnitude than – as an example – the uncertainties resulting from weighing out the sample.



33 Technical specifications

33.1 Touch screen

<i>Display</i>	VGA color display (640 pixels x 320 pixels), diagonal approx. 5.7"
<i>Touch panel</i>	resistive
<i>Resistance to chemicals</i>	<p>resistant to the following chemicals (no visible changes after 24 h of duration of action):</p> <ul style="list-style-type: none">▪ without protective cover:<ul style="list-style-type: none">– Methanol– Toluene– Ethyl acetate– Acetone– Dichloromethane– Hydrochloric acid $c(\text{HCl}) = 2 \text{ mol/L}$▪ with protective cover (order number 6.2723.300):<ul style="list-style-type: none">– Methanol– Propanol– Toluene– Xylene– Acetone– Chloroform– Formamide– Sulfuric acid $c(\text{H}_2\text{SO}_4) = 2 \text{ mol/L}$– Hydrochloric acid $c(\text{HCl}) = 2 \text{ mol/L}$– Caustic soda $c(\text{NaOH}) = 2 \text{ mol/L}$– Composite 5.0– 1-butanol– 1-hexanol– Decanol

33.2 Interfaces

<i>Connection cable</i>	8-pin, 1025 mm, Mini DIN plug with lock release mechanism
<i>USB connector</i>	For connecting USB devices.
<i>Standard</i>	USB 1.1 (full speed), high power
<i>Plug</i>	Type A
<i>Ethernet connector</i>	For connection to a data network (LAN).
<i>Standard</i>	10BASE-T and 100BASE-TX (IEEE 802.3)
<i>Plug</i>	Modular 8P8C (RJ-45) with integrated status LEDs

33.3 Energy supply

<i>Nominal voltage</i>	5 V DC
<i>Power consumption</i>	3.5 W (typical)
<i>Battery</i>	1 x lithium manganese dioxide button cell CR2032 (needs to be replaced only in the event of servicing). The battery must be removed and turned in for proper recycling when the device needs to be disposed of.

33.4 Declarations of Conformity

Up-to-date information on the *EU conformity* and the *requirements for electromagnetic compatibility* for your product can be found on the Internet under <https://www.metrohm.com/en-us/products-overview/>.

Using the article number, you can download the *Declaration of conformity for ...* under the documents of the product.



33.5 Ambient conditions

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

33.6 Dimensions

<i>Material of the housing</i>	Poly(butylene terephthalate) (PBT)
<i>Touch screen film material</i>	Polyester
<i>Width</i>	193 mm
<i>Height</i>	71 mm
<i>Depth</i>	approx. 180 mm (without cable)
<i>Weight</i>	1493 g


33.7 Storage capacity

<i>Random access memory</i>	128 MB
<i>Internal memory</i>	1 GB of which 900 MB available.
<i>Required memory per method</i>	3–6 KB

34 Displaying accessories

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

1 Searching for a product on the website

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

The search result is displayed.

2 Displaying product information

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

Detailed information regarding the product is displayed.

3 Displaying accessories and downloading the accessories list

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



NOTE

Metrohm recommends keeping the accessories list for reference purposes.

- Statistics data 193
- DET 1, 12, 286
- Determination
 - Calibration data 223
 - Cancel 212
 - Carry out 210
 - Data 219
 - Define filters 230
 - Delete signatures 190
 - Endpoint details 222
 - List of saved determinations 228
 - Load 227
 - Measuring point list 222
 - Message 223
 - Properties 224
 - Recalculate 234
 - Reevaluate 234
 - Save 232
 - Save automatically 187
 - Send PC/LIMS report 187
 - Sign 189
 - Titrant data 223
- Determination run 210
- Device
 - 885 Compact Oven SC 111
 - Add 82
 - Balance 118
 - Conductivity Module 89
 - Configure 82
 - Delete 81
 - Dosing Interface 89
 - Edit 81
 - New 81
 - pH Module 89
 - Printer 114
 - Sample Processor 94
 - Titrandos 89
 - USB/RS-232 adapter 120
- Device manager 81
 - 885 Compact Oven SC 111
- Diagnosis 530
- Dialog language 24
- Dialog options 26
- Dialog settings
 - System-specific 26
- Directory structure 131
- DOS 456
- Dosing 261
 - Continuous 263
 - Fixed volume 265
- Dosing curve 232
- Dosing device
 - Parameters
 - 301, 317, 330, 342, 377, 384, 449, 455, 470
 - Dosing key 503
 - Dosing parameters
 - ADD 448
 - DOS 456
 - MAT 382
 - Dosing port 49
 - Dosing rate
 - Maximum 504, 505
 - Dosing unit
 - Data 48
 - GLP test 58
 - Preparing parameters 49
 - Replace reagent 269
 - Tubing parameters 51
- E**

 - E-mail 84
 - E(0)
 - Intervention limit 75
 - Warning limit 75
 - Electrode 68
 - Parameters
 - 299, 315, 328, 341, 351, 360, 376, 383, 396, 408, 413, 469
 - Electrode slope
 - Intervention limit 75
 - Warning limit 75
 - Electrode test parameters 411
 - Electrode type
 - Custom 168
 - Electrostatic charge 7
 - ELT 410
 - EMPTY 447
 - Default parameters 504
 - Emptying 268
 - Default parameters 504
 - END 492
 - Endpoint details 222
 - ERC 299, 315
 - EVAL BREAK 422
 - EVAL FIX-EP 418
 - EVAL MIN/MAX 421
 - EVAL pK/HNP 420
 - EVAL RATE 425
 - Evaluation 416
 - Break point 422
 - DET 298
 - Fixed endpoint 418
 - HNP 420
 - Maximum 421
 - Exchange unit
 - Data 54
 - GLP test 58
 - Preparing parameters 56
 - Tubing parameters 57
 - Expiry date
 - Sensor 71
 - Titrant 47
 - External position
 - Swing angle 101
- F**

 - Favorite 195
 - Add 196
 - Delete 196
 - Edit 196
 - FDA Guidance 21 CFR Part 11 30, 41
 - File
 - Copy 128
 - Properties 129
 - Rename 128
 - File manager 126
 - Filling 269
 - Filling rate
 - Maximum 504, 505
 - Filter
 - Determination 230
 - Result table 244
 - Fixed endpoint
 - Evaluation 418
 - Fixed key 9
 - FLOW 487
 - Format storage medium 532
 - Formula editor 435
- G**

 - GLP manager 134
 - GLP test "Measurement" .. 136
 - GLP test "Titration" 136
 - System validation 140
 - Test tool 135
 - GLP test
 - Dosing unit 58
 - Exchange unit 58
 - Sensor 75

- MOVE 478
 PREP 446
 PUMP 482
 RACK 483
 REPORT 441
 REQUEST 490
 SAMPLE 483
 SCAN 473
 SCAN RS 476
 SET 318
 SIGN 491
 STAT 362
 STIR 489
 SUBSEQ 484
 WAIT 490
 Password
 Forgotten 39
 Options 37
 PC/LIMS report
 Save 85
 Send 187
 PDF settings 115
 Peripheral devices 81
 pH(0)
 Intervention limit 75
 Warning limit 75
 pK value
 Evaluation 420
 Potentiometric evaluation
 DET 294
 MET 310
 PREP 446
 Default parameters ... 504, 505
 Parameters for the dosing unit
 49
 Parameters for the exchange
 unit 56
 Preparing 267
 Default parameters ... 504, 505
 Parameters for the dosing unit
 49
 Parameters for the exchange
 unit 56
 Printer 114
 PDF settings 115
 Printing 247
 Troubleshooting 496
 Program version
 Touch Control 83
 Properties
 885 Compact Oven SC 111
 Determination 224
 File 129
 Method 185
 Oven module 113
 Swing Head 97
 Tower 95, 112
 PUMP 482
R
 Rack
 Copy 102
 Delete 102
 Edit 102
 Load 102
 RACK 483
 Rack adjustment 110
 Rack name 95
 Rack offset 105
 Rate evaluation 425
 Reagent 63
 Add 63
 Delete 63
 Edit 63
 Replace 269
 Reagent monitoring 64
 Reagent replacement 66
 Reason 40
 Modification option 39
 Recalculation 234
 Reevaluation 234
 Remote lines
 Manual control 272
 Report 247
 Print 247
 REPORT 441
 Report header 167
 REQUEST 490
 Resolution
 Measured value display 42
 Result 219
 Calculation formula 429
 Limits 430
 Save as a common variable
 150
 Template 156
 Result table 241
 Define filters 244
 Delete automatically 245
 Save 246
 Result variable 430
 As parameter setting 507
 Robotic arm 99
 Max. swing angle 99
 Rotation offset 100
 Swing direction 100
 Swing increment 99
 Swing offset 99
 Swing radius 100
 Swing rate 279, 280, 481
 Rotation increment 97
 Rotation offset 100
 Routine dialog 28
 Standard configuration 28
S
 Safety 5
 Safety instructions 6
 SAMPLE 483
 Sample assignment table 152
 Sample data 199
 Modify live 213
 Settings 181
 Sample identification
 Modify designation 181
 Modify the designation 209
 Sample identification list 152
 Sample Processor 273
 Sample rack 102
 Sample series
 Perform 211
 Sample size
 Fixed 181
 Limit value 184
 Limits 182
 Send from a balance 506
 Sample table 202
 Save as favorite 195
 Troubleshooting 495
 Save
 Determination 232
 Result table 246
 Sample table 204
 SCAN 473
 SCAN RS 476
 Sensor 68
 Add 69
 Calibration data 72
 Calibration interval 79
 Delete 69
 Edit 69
 Expiry date 71
 GLP test 75
 Parameters
 299, 315, 328, 341, 351, 360,
 376, 383, 396, 408, 413, 469
 Working life 71
 Sensor list 68
 Serial number
 Dosing cylinder 49, 55
 Dosing unit 48
 Exchange unit 55

Index

- Service 6, 540
SET 2, 13, 318
Set the date 25
Set the time 25
Sign
 Determination 189
 Method 189
SIGN 491
Signature
 Delete 190
Software update 534
Special beakers
 Edit 107
Spooler 118
Standard addition 392
Start conditions
 DET 286
 KFT 331
 MET 302
 SET 318
 STAT 362
Start options 178
STAT 2, 14, 362
Statistics 193, 236
 Delete 193
 Troubleshooting 495
Status LED 503
STIR 489
Stirrer
 Parameters
 302, 318, 330, 343, 352, 361,
 380, 387, 398, 409, 413, 452,
 472
Stirring 270
Stirring rate 505
Stop 503
Stop conditions
 BRC 357
 DET 293
 DOS 462
 KFC 347
 KFT 337
 MET 309
 SET 325
 STAT 368
Stop criterion
 BRC 355
 KFC 345
 KFT 335
 SET 322
Stop options 180
SUBSEQ 484
Subsequence 484
 Load 485
 Note 486
 Options 486
 Save 485
Supply voltage 7
Swing direction 100
Swing Head
 Properties 97
Swing increment 99
Swing offset 99
Swing radius 100
Swing rate 279, 280, 481
Switch off 18
Switch on 17
System initialization 493
System settings 24
System test 135
System validation 140
- T**
- Tandem dosing
..... 378, 385, 450, 470
Temperature monitoring 532
Template
 Calibration buffers 165
 Electrode type 168
 Input line 160
 Output line 162
 Report header 167
 Result template 156
 Sample assignment table .. 152
 Sample identification list ... 152
Templates 152
Text input 21
Time zone 25
Titer
 History 61
 Intervention limit 62
 Properties 60
 Warning limit 62
Titrant 43
 Add 44
 Delete 44
 Edit 44
 Expiry date 47
 Working life 47
Titrant data 223
Titrant list 43
Titration curve 232
Titration mode
 BRC 3
 DET 1
 KFC 2
 KFT 2
 MAT 2
MET 2
SET 2
STAT 2
Titration parameters
 BRC 356
 DET 289
 KFC 346
 KFT 336
 MET 305
 SET 324
 STAT 366
Touch Control 83
Touch screen 18
 Test 533
Tower
 Properties 95, 112
Tubing parameters
 Dosing unit 51
 Exchange unit 57
- U**
- Uninterrupted dosing
..... 378, 385, 450, 470
Update 534
USB/RS-232 adapter 120
User profile
 Create 35
- V**
- Validation interval 142
Validity
 Calibration 79
 Common variable 149
 Titer 60
Valve disk
 Shift direction 54
- W**
- WAIT 490
Warning limit
 Cell constant 75
 E(0) 75
 Electrode slope 75
 pH(0) 75
 Titer 62
Water determination according to
Karl Fischer 13
Working life
 Sensor 71
 Titrant 47
Write protection
 External memory 130