

799 GPT Titrino

Short Instructions for Use

Table of contents

1. Getting started	1
1.1 Principle of data input	2
1.2 Development of a method	3
1.3 Storing methods	7
1.4 Working with several dosing units	10
2. Titration, dosing and measuring modes.....	12
2.1 Survey of the titration modes	12
2.2 Mode DET and MET, parameters	14
2.3 Mode SET, parameters	15
2.4 Mode KFT, parameters.....	16
2.5 Mode STAT, parameters	17
2.6 Mode DOS, parameters	19
2.7 Mode DOC, parameters	20
2.8 Mode MEAS and CAL, parameters	21
2.9 Mode TIP, parameters.....	22
2.10 Calculations	23
3. Other functions	25
3.1 Method memory	25
3.2 User name, key <user>	27
3.3 Sample data, keys <smpl data> and <sil>	27
3.4 Configuration, key <configuration>	28
Index.....	30

Summary of the most important signs

Signs in the Titrino dialog:

> Title of inquiry groups. Press <ENTER> to go to the inquiries.

: Values can be chosen with keys <←> or <→>.

Signs that are used in the instructions for use

<> sign for "key", e.g. <ENTER> or <←>.

1 Getting started

This is a step by step introduction into the operation of the Titrino.

You learn how to go round with the Titrino and you get an idea of the possibilities that the Titrino offers you.

1.1 Principle of data input

<CONFIG>

```
configuration
>monitoring
>peripheral units
>auxiliaries
>RS232 settings COM1
>RS232 settings COM2
>common variables
>prep.dosing elements
```

Press <STOP> if the Titrino is busy. It is now in the inactive standby state.

Then press the <CONFIG> key.

The first line indicates the "path", which means the place where you are right now: You pressed the <CONFIG> key and are now in the "configuration" inquiries.

In the next lines you find a list of the inquiry groups of key <CONFIG>. They are all marked with ">". This sign means that you get to the inquiries with <ENTER>.

The inquiry group ">monitoring" is inverted, which means that the cursor is placed on this line. You can move the cursor up and down with the <↑> and <↓> keys.

<↓>
<ENTER>

Set the cursor to ">auxiliaries" and open this inquiry group with <ENTER>.

```
configuration
>auxiliaries
  dialog:      english
  date        2002-04-08
  time        15:23
  run number   0
  auto start   OFF
  start delay  0 s ↓
```

The arrow in the lower right corner means that there are more inquiries. They appear if you move the cursor below.

Set the cursor to the inquiry "dialog:". You may select a different dialog language with the keys <←> or <→> (Key <→> "turns" forward, <←> backward).

<←> or <→>
<ENTER>

Select any language and press <ENTER>.

Note the sign ":" in the text "dialog:". If you see this sign in the dialog text you can always use the <←> or <→> keys to select a value.

Readjust the language to "english" again.

2 x <QUIT>

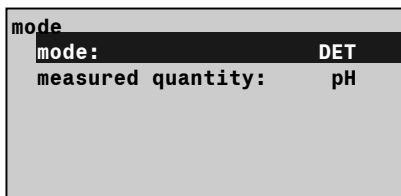
Quit the inquiries in the <CONFIG> key pressing <QUIT> twice.

1.2 Development of a method

You learn how to elaborate a method .
First you select a titration mode. A general survey of the different titration modes is given on page 12.

Selecting the mode

<MODE>

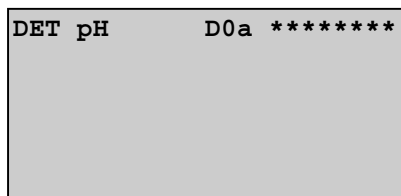


<<-> or <->>
<ENTER>

Press the <MODE> key.

Select the mode DET with <<-> or <->> keys, press <ENTER>, select the measured quantity "pH" and press <ENTER> again.

DET stands for **D**ynamic **E**quivalence point **T**itration. In this titration, the size of the volume increments vary as a function of the slope of the titration curve. After each increment, a preset measured value drift (or time) is awaited until the next increment is added (so called "equilibrium titration"). After the titration, the equivalence points are evaluated automatically.



<START>

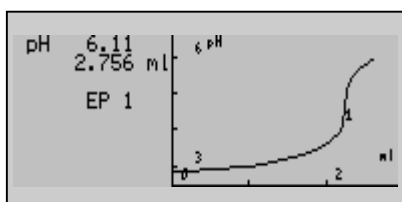
You are now ready to titrate. You titrate with the internal dosing unit D0, i.e. the Exchange Unit on the Titrino.

Mount an Exchange Unit with NaOH, c=0.1 mol/L on the Titrino.

Plug a combined pH glass electrode into measuring input ("Ind I").

Pipette 2 mL HCl, c =0.1 mol/L into the titration vessel, dilute it with ca. 20 mL. dist. water, adjust the stirrer and press <START>.

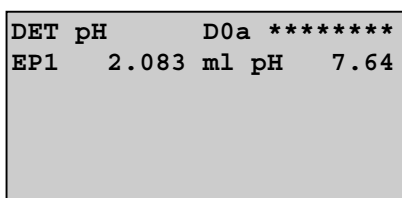
During the titration the titration curve is displayed. To the left of the curve, the current measured values (pH and volume) are displayed.



<STOP>

As soon as the Titrino has found an equivalence point, it will also be shown the left.

Let the titration continue for a short while, e.g. until ca. pH=11.50. Now stop it with <STOP>.



The equivalence point is displayed.

Calculation of the result, entry of a formula

<DEF>

```
def
>formula
>silco calculations
>common variables
>report
>mean
>temporary variables
```

<ENTER>

<1>

```
def
>formula
RS1=EP1*C01*C02/C00
```

<ENTER>

You may calculate results with the equivalence point. Press <DEF>.

Press <ENTER> to move on to the formula entry. The display now shows "RS?".

Press "1", i.e. the first formula.

You can now enter a formula. Note here the inscriptions in the right corner of the keys and the numbers.

You can use mathematical operations, parentheses as well as the following symbols:

EP# EP's with 1-digit number, e.g. EP1.

RS# Previously calculated results, e.g. RS1 in the second formula.

C## Calculation values, e.g. C01. C00 is reserved for the sample size. The meaning of the different calculation values is given on page 24.

Calculate the content of your hydrochloric acid in g/L:

$RS1 = EP1 * C01 * C02 / C00$

EP*conc(titrant)*molar mass/sample size

If you made a typing mistake, you can delete the symbols one by one with <CLEAR>.

Confirm the formula with <ENTER>.

```
def
>formula
RS1=EP1*C01*C02/C00

RS1 text          RS1
RS1 decimal places  2
RS1 unit:          g/l
RS1 limit control: OFF
```

2 x <QUIT>

You may enter a text for the result output, see page 7. Enter the desired number of decimal places for the result.

Select the unit g/l with <←> or <→> or enter a text as unit.

Quit the formula entry by pressing <QUIT> twice.

Instead of the equivalence point, the calculates result will be displayed. It is 0 because the calculation values C01 and C02 are still zero.

Entry of the calculation constants

<C-FMLA>

```
C-fmla
C01 0.0
C02 0.0
```

Press <C-FMLA>, to enter the calculation values.

The constants which have been used in the formula are requested:

C01: Concentration of your titrant = 0.1 mol/L

C02: Molar mass of HCl = 36.47 g/mol

The result is recalculated.

Entry of the sample size

<SMPL DATA>

```
smp1 data
id#1 or C21
id#2 or C22
id#3 or C23
smp1 size          1.0 g
smp1 unit:         g
```

You also need the sample size for the calculation of your result. Enter it with the <SMPL DATA> key: Place the cursor to "smp1 size" and enter 2.

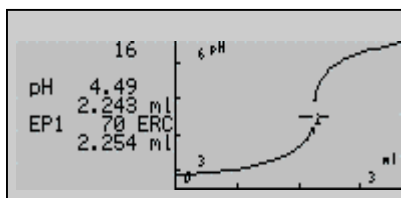
Select the unit "ml" for the sample size using the <←> or <→> keys and confirm with <ENTER>.

The result is recalculated.

Viewing the titration curve

<←> or <→>

You can view the titration curve after the titration using the <←> or <→> keys.



With the <↑> and <↓> you can trace the curve. To the left the measured values of the current point are displayed. On the first line you will find the index of the point.

At the equivalence point, you find its ERC (see Instructions for Use page 21, 22) and its volume.

<←> or <→>

Quit the curve display with <←> or <→> key.

Selection of the automatic report output

<DEF>
<↓>
<ENTER>
<←> or <→>

If you have a printer connected, you can select the report blocks to be printed out automatically at the end of the titration.

Press <DEF> and place the cursor to ">report". Press <ENTER> to define the report output. (If you have your printer connected to COM2 press <ENTER> once again.)

```
def
>report
report COM1:curve;full
```

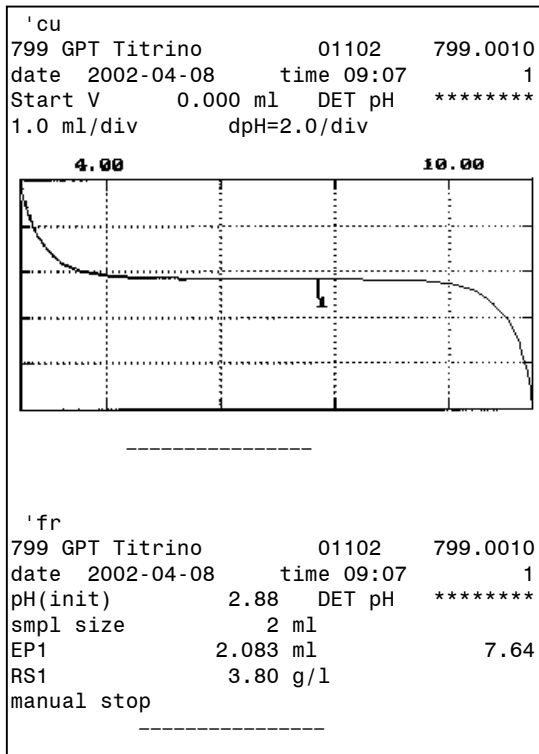
Select the individual report blocks with the <←> or <→> keys. Use a ";" as delimiter between the report blocks. If you wish to print out a curve and a full result report, set "curve;full".

<ENTER>

Confirm the entry with <ENTER> and quit the inquiries with <QUIT>

2 x <QUIT>

Press <PRINT> <REPORTS> <ENTER> to print your reports. Your printout will look as follows:



Identification of report type (cu = curve)

Start volume and method identification
Scaling of curve axis

Instrument type with identification and program version
Initial pH

Volume and pH value of EP1
Calculated result

Entry of a stop criterion

<PARAM>
<↓>
<ENTER>

You don't want to stop your titration manually each time. Let us enter an automatic stop criterion.

Press <PARAM> and place the cursor to ">stop conditions". Press <ENTER> to go to this inquiry group.

parameters	
>stop conditions	
stop V:	abs.
stop V	99.99 ml
stop pH	aus
stop EP	g
filling rate max.	ml/min

The absolute stop volume. It can be used as a safety volume to prevent overflow of the titration vessel. Enter a value for the stop volume that appears suitable for your titration vessel.

Entries <ENTER>

Set the pH value, e.g. 11.5 as stop criterion.

2 x <QUIT>

If several stop criteria have been set, the one that is reached first, applies.

Confirm the input with <ENTER> and quit the inquiry with <QUIT>.

Try another titration with this method.

1.3 Storing methods

You learn how to operate the method memories.

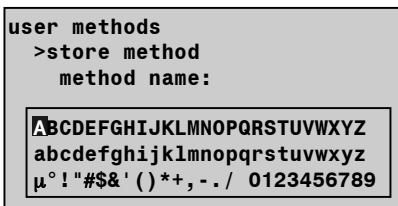
The Titrino offers 2 types of method memories:

- Internal method memory, key <USER METH>
- External method memory on the card, key <CARD>

Storing a method in the internal method memory

<USER METH>
<↓>
<ENTER>

Press <USER METH>, place the cursor to ">store method" and press <ENTER>.



Press <CLEAR> to delete the existing method name (*****).

Open text entry with key <ABC>.

A field with letters and symbols appears. You can select a letter with the cursor keys and confirm this letter with <ENTER>. The letter then appears in the input field of the method name.

Entries <ENTER>

Enter an identification for your method, e.g. HCl:

If you made a typing error you can delete the characters one by one with <CLEAR>.

<QUIT>
<ENTER>

Quit the text input with <QUIT> when you completed your name.

Confirm the name with <ENTER>. The method will be stored in the internal method memory.

The method runs now under the identifier "HCl".

A list of contents of the method memory can be printed with the key sequence <PRINT> <USER METH> <ENTER>.

```
'um
799 GPT Titrino      01102  799.0010
date 2002-04-08    time 07:49
user methods                               bytes
DET pH      Titer_pH DO      190
DET U       Blank DO        178
DET U       Chloride DO     234
MET U       Diazo DO        208
MET Ipol    Br-Index DO     226
DET U       Perox.No DO     172
DET pH      HCl DO          108
remaining bytes                               98684
-----
```

mode and meas.quantity

method name

dosing unit, that is being used

Recall a method from the internal method memory

<USER METH>
<ENTER>

```

user methods
>recall method
  method name: *****
  
```

<←> or <→>
<ENTER>

Stored methods can always be recalled into the working memory.

Press <USER METH> and <ENTER> to go to ">recall method".

You can select a method with <←> or <→> or enter its name directly.

Recall the method with <ENTER>.

The method is now ready to work.

Method memory on the card

The card offers additional memory space for methods. It may be used e.g.

- as a backup-medium for the internal method memory
- as an extended method memory, where the methods can be organized in various directories
- if every user wants to store his methods on his own card
- for exchanging methods between various laboratories, apparatus, and/or users

The card has a battery, which should be exchanged periodically, see page 91 of the Instructions for Use.

As an example, perform a backup from the internal method memory to the card. If the card is not formatted, see page 91 of the Instructions for Use.

<CARD>
<↓>
<ENTER>

```

user meth.
>backup
  dir.name: Backup
  
```

<←> or <→>
<ENTER>

Press <CARD> and place the cursor to ">backup".

Confirm this function with the key <ENTER> and give a name for the backup directory.

If you wish to overwrite an existing directory, choose a name with <←> or <→>. Then press <ENTER>

The backup will be effected.

Printing a list of contents of the card

The following card reports can be printed:

Current directory

<PRINT> <CARD> <ENTER>

name of the current directory

methods in this directory

remaining bytes on this card

```
'ad
799 GPT Titrino      01102  799.0010
date 2002-04-08    time 07:49
card label: Appl.799 dev.label:
KF Titr.                bytes
KFT Ipol      TarTiter D0      150
KFT Ipol      H2OTiter D0      150
KFT Ipol      Blank_KF D0     132
KFT Ipol      KF-Blank D0     206
KFT Ipol      KF D0           170
                    remaining bytes      121892
                    -----
```

Contents of the whole card

<PRINT> <←> or <→> <ENTER>
 Press <←> or <→> repeatedly until
 "mem card" appears in the display.

bytes that are being used in the directory "user meth."

the directory "KF Titr." contains 5 methods

```
'cd
799 GPT Titrino      01102  799.0010
date 2002-04-08    time 07:50
card label: Appl.799 dev.label:

directory: user meth.
Acid          Tit.NaOH    Tit.HCl
W-Liquor
bytes: 620

directory: KF Titr.
TarTiter      H2OTiter    Blank_KF
KF-Blank      KF
bytes: 808
                    remaining bytes on card: 121892
                    -----
```

1.4 Working with several dosing units

Here you will learn how to work with several dosing units. Several dosing units can be used

- if a working station will be permanently installed for specific analysis, e.g. having a dosing unit specially prepared for Karl Fisher titrations
- if several titrations are being carried out in the same sample. The linking of various methods is possible with TIP (**T**itration **P**rocedure), see page 85 of the Instructions for Use.
- for addition of auxiliary solutions

Selection of the dosing unit in the titration method

The dosing unit is selected in the method. The method runs always with the selected dosing unit. Connect the dosing unit D1 and arm it with an Exchange Unit (the Dosino with a Dosing Unit, resp.).

Recall the method "HCl" from the user memory: Press <USER METH>, then <ENTER>.

Select the method name "HCl" with the keys <←> or <→> and recall the method with <ENTER>.

The dosing unit of this method is D0, i.e. the Titrino itself.

<PARAM>
<ENTER>
<↓>

```

parameters
>titration parameters
dos.rate.      max. ml/min
signal drift   50 mV/min
equilibr.time  26 s
start V:       OFF
pause         0 s
dos.element:  internal D0
  
```

<←> or <→>
<ENTER>
2 x <QUIT>

```

DET pH      D1      HCl
  
```

To change the dosing unit, press <PARAM>, then <ENTER>. You are now in the inquiry group ">titration parameters".

Place the cursor on "dos.element:".

Choose the dosing unit with keys <←> or <→>:

internal D0: Dosing unit of the Titrino

external D1: External dosing unit, connected to 1 or 2.

Choose e.g. "external D1", confirm the input with <ENTER> and quit with the key <QUIT>.

The display shows now e.g. "DET pH D1 HCl". D1 means, that in this method the external dosing unit D1 is being used.

Start the method.

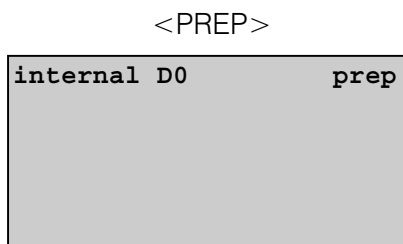
After the titration "D1a" appears in the display. "a" means "active", the dosing unit D1 is now active.

Manual dosing

- to prepare an Exchange Unit (or Dosing Unit, resp.)
- for quick dosing

If you press the key <DOS>, the dosing unit from the method is working. This dosing unit appears in the display.

If you wish to dose with another dosing unit, use the key <PREP> to select the dosing unit and press <DOS> to dose.



Press <PREP>. In the display appears "internal D0 prep", i.e. the dosing unit of the Titrimetric has been selected.

Press <PREP> again. In the display appears "external D1: prep".

Press the key <DOS> on the Titrimetric: The external dosing unit D1 doses. If you press the key <STOP/FILL> on the Titrimetric, it will fill again.

With <START>, the function "prep" is started. This prepares the dosing units. (The parameters for "prep" are under the key <CONFIG>, in the group ">prep.dosing elements").

Attention: With the function "prep", liquid will be expelled!

If the dosing unit D1 is a Dosino, you can empty the dosing unit completely (e.g. for cleaning). Choose the function "empty" with the key <←> or <→> and start with <START>.

Attention: With the function "empty", liquid will be expelled!

Quit the selection of dosing units with <QUIT>.

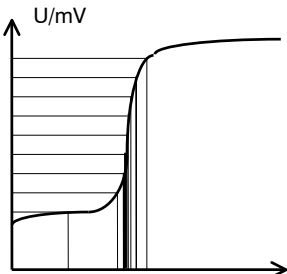
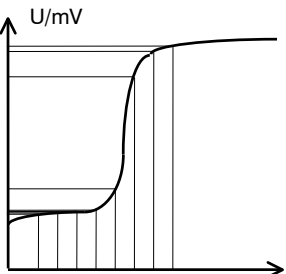
<PREP>
<DOS>, <STOP/FILL>

<QUIT>

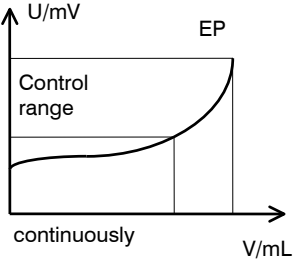
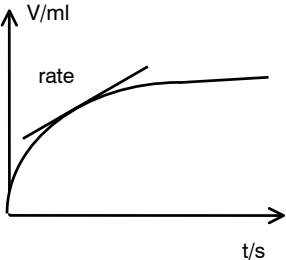
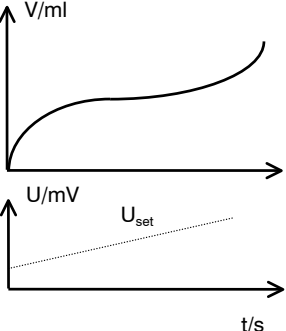
2 Titration, dosing and measuring modes

This chapter gives you a survey over the titration, dosing and measuring modes. You will find the parameters of all modes. The standard values are printed in bold face in the following tables.

2.1 Survey of the titration modes

	DET Dynamic Equivalence point Titra- tion	MET Monotonic Equivalence point Titra- tion
Titration	<p>Reagent feeding: Variable volume increments, depend- ing on the slope of the curve.</p>  <p>Drift controlled ("equilibri^{V/mL} titation") and/or after a fixed equilibration time.</p>	<p>Reagent feeding: Constant volume increments, inde- pendent of the slope of the curve.</p>  <p>Drift controlled^{V/mL} librium titration") and/or after a fixed equilibration time.</p>
Evaluation	<p>The evaluation of EP' s is based on the zero crossing of the second deri- vative with a Metrohm correction for the distortion of the curve from super- imposed jumps. Can be combined with selectable recognition criteria.</p> <p>Recognition criteria: as for MET</p>	<p>The evaluation of EP's is based on the Fortuin interpolation.</p> <p>Recognition criteria: all EP's only the last EP only the greatest EP EP windows</p>
Applications	<p>Suitable titration mode for most prob- lems. Specially recommended if jumps lie very close together and for very flat jumps.</p> <p>Note: The reagent feeding algorithm is based on measured data. The curve should therefore not deviate markedly from S-shape.</p>	<p>For</p> <ul style="list-style-type: none"> • slow titration reactions (diazota- tions, coupling reactions) • sluggish electrode response.

If you are looking for more information to the different quantities, you will find the display text as a keyword in the index of the Instructions for Use.

SET, KFT Endpoint Titration	STAT Holding a measured value	DOC Controlled dosing
<p>Titration to preset end-point.</p> 	<p>The reagent addition is controlled such that a preset measured value is adhered to as accurately as possible.</p> 	<p>The dosing function is controlled such that a nominal measured value is adhered to as accurately as possible. The nominal measured value follows a linear ramp.</p> 
<p>Volume that has been dispensed up to the endpoint (EPX in mL).</p>	<p>Evaluation of</p> <ul style="list-style-type: none"> • rates dV/dt in the set time windows and the mean rate over the entire measuring point list. • volumes associated with a preset time (fix V). • times associated with a preset fraction of the total volume (fix time). 	<p>The total volume (C41) and the time needed for dosing (C42) can be used for calculation.</p>
<ul style="list-style-type: none"> • For rapid, quantitative determinations in analytical chemistry. Requirement: EP of the titration reaction is known and does not change during a determination series. • If an excess of titrant must be avoided. • KFT: Determinations of water contents. 	<p>For</p> <ul style="list-style-type: none"> • the controlled dosing to a preset endpoint in the synthesis laboratory. • activity determinations, e.g. of enzymes. • kinetic investigations (first order kinetics). 	<p>Sweeping a measured value gradient for reaction formulations in the syntheses laboratory.</p>

2.2 Mode DET and MET, parameters

Display	Meaning	Input range
>titration parameters meas.pt.density min.incr. [V step] dos.rate signal drift equilibr.time start V: start V factor dos.rate pause dos.element: meas.input: temperature	Measuring point density. Minimum increment for DET. Volume increment for MET. Dosing rate for increments. Drift for measured value acquisition. Waiting time for value acquisition. Type of start volume: absolute, relative. Volume for absolute start volume. Factor for calculation of relative start volume: factor * smpl size. Dosing rate for start volume. Waiting time, e.g. after start volume. Selection of the dosing unit. Measuring input for pH and U. Titration temperature.	0...4...9 0... 10.0 ...999.9 μ L 0... 0.10 ...9.999 mL 0.01...150 mL/min, max. pH, U: 0.5... 50 ...999 mV/min, OFF 0... 26 ...9999 s, OFF abs., rel., OFF 0...999.99 mL 0... \pm 999 999 0.01...150 mL/min, max. 0...999 999 s internal D0 , external D1/D2 1, 2, diff. -170.0... 25.0 ...500.0 $^{\circ}$ C
>stop conditions stop V: stop V factor stop pH stop EP filling rate	Type of stop volume: absolute or relative. Volume for absolute stop volume. Factor for calculation of relative stop volume: factor * smpl size. Stop at measured value pH, U, I. Stop after a number of EP's have been found. Filling rate after the titration.	abs., rel., OFF 0... 99.99 ...9999.99 mL 0... \pm 999 999 pH: 0.00... \pm 20.00, OFF U: 0... \pm 2000 mV, OFF 1... 9 , OFF 0.01...150 mL/min, max.
>statistics status: mean n= res.tab: delete n=	Status of statistics calculation. Number n of single values for statistics. Result table for statistics calculation. Delete data from sample number n.	ON, OFF 2...20 original , delete n, delete all 1...20
>evaluation EPC EP recognition: fix EP1 at pH pK/HNP:	Endpoint criterion. Type of EP recognition: all EP's, only greatest EP, only last EP, only EP's in windows, no evaluation. If "window" is selected, lower and upper limits of windows are inquired. Interpolation of volume at given pH, U, or I, resp. Up to 9 fix EP's. Evaluation of pK or half neutralization potential (HNP).	DET 0... 5 ...200 MET pH: 0.10... 0.50 ...9.99 U: 1... 30 ...999 mV all , greatest, last, window, OFF pH: 0.00... \pm 20.00, OFF U: 0... \pm 2000 mV, OFF ON, OFF
>preselections	Preselections for the sequence see DOS, page 19.	

2.3 Mode SET, parameters

Display	Meaning	Input range
>SET1 EP at pH dynamics max.rate min.rate stop crit: stop drift t(delay) stop time	Individual parameters for EP1. Preset EP1 at pH, U, or I, resp. Distance from EP where constant dosing stops and controlling begins. Maximum dosing rate. Minimum dosing rate. Type of stop criteria. Titration stops if stop drift is reached. Stop if there is no dosing during t(delay). If t(delay) is "INF": stop after a time.	pH: 0.00...±20.00, OFF (0...±2000 mV, 0.0...±200.0 µA) pH: 0.01...20.00, OFF (1...2000 mV, 0.1...200.0 µA) 0.01... 10 ...150 mL/min, max. 0.01... 25.0 ...9999 µL/min drift , time 1... 20 ...999 µL/min 0... 10 ...999 s, INF 0...999 999 s, OFF
>SET2	Parameters for EP2. Identical as SET1.	
>titration parameters titr.direction: pause 1 start V: start V factor dos.rate pause 2 extr.time dos.element meas.input: temperature time interval	General titration parameters. +: Titration to higher pH, voltage, or current. Auto: Direction is set automatically. Waiting time before start volume. Type of start volume: absolute or relative. Volume for absolute start volume. Factor for calculation of relative start volume: factor * smpl size. Dosing rate for start volume. Waiting time after start volume. Extraction time. Selection of the dosing unit. Measuring input for pH and U. Titration temperature. Time interval for measured value acquisition.	+, -, auto 0...999 999 s abs., rel., OFF 0...999.99 mL 0...±999 999 0.01...150 mL/min, max. 0...999 999 s 0...999 999 s internal D0 , external D1/D2 1, 2, diff. -170.0... 25.0 ...500.0 °C 1... 2 ...999 999 s
>stop conditions stop V: stop V factor filling rate	Type of stop volume: absolute or relative. Volume for absolute stop volume. Factor for calculation of relative stop volume: factor * smpl size. Filling rate after titration.	abs. , rel., OFF 0... 99.99 ...9999.99 mL 0...± 999 999 0.01...150 mL/min, max.
>statistics	Statistics calculation see at DET, page 14.	
>preselections conditioning: display drift: drift corr: drift value req.ident: req.smpl size: limit smpl size: activate pulse:	Automatic conditioning of titration vessel Display of drift during conditioning. Type of drift correction. Value for manual drift correction. Request of identifications after start. Request of sample size after start. Limit control of sample size. Pulse output on I/O line L6.	ON, OFF ON, OFF auto, man., OFF 0.0...99.9 µL/min id1, id1 & 2, all, OFF value, unit, all, OFF ON, OFF first, all, cond., OFF

2.4 Mode KFT, parameters

Display	Meaning	Input range
>control parameters EP at ... dynamics max.rate min.volume incr. stop crit: stop drift t(delay) stop time	Controlling parameters for KFT. Endpoint for Ipol. Endpoint for Upol Distance from EP where constant dosing stops and controlling begins. Maximum dosing rate. Minimum volume increment Type of stop criteria. Titration stops if stop drift is reached. Stop if there is no dosing during t(delay). If t(delay) is "INF": stop time.	U: -2000 ... 250 ...2000 mV I: -200.0... 25.0 ...200.0 μ A U: 1... 100 ...2000 mV I: 0.1... 10 ...200.0 μ A 0.01...150 mL/min, max. 0.1...9.9 μ L, min drift , time 1... 20 ...999 μ L/min 0... 10 ...999 s, INF 0...999 999 s, OFF
>titration parameters titr.direction: pause 1 start V: start V factor dos.rate pause 2 extr.time dos.element I(pol) U(pol) electrode test: temperature time interval	General titration parameters. +: Titration to higher voltage or current. auto: Direction is set automatically. Waiting time before start volume. Type of start volume: absolute or relative. Volume for absolute start volume. Factor for calculation of relative start volume: factor * smpl size. Dosing rate for start volume. Waiting time after start volume. Extraction time. Selection of the dosing unit. Polarization current for Ipol or - voltage for Upol in 10 mV-intervals. Performing of electrode test Titration temperature. Time interval for measured value acquisition.	+, -, auto 0 ...999 999 s abs., rel., OFF 0 ...999.99 mL 0 ... \pm 999 999 0.01...150 mL/min, max. 0 ...999 999 s 0 ...999 999 s internal D0 , external D1/D2 -127... 50 ...127 μ A or. -1270... 400 ...1270 mV ON , OFF -170.0... 25.0 ...500.0 $^{\circ}$ C 1... 2 ...999 999 s
>stop conditions stop V: stop V factor filling rate	Type of stop volume: absolute or relative. Volume for absolute stop volume. Factor for calculation of relative stop volume: factor * smpl size. Filling rate after the titration.	abs. , rel., OFF 0 ... 99.99 ...9999.99 mL 0 ... \pm 999 999 0.01...150 mL/min, max.
>statistics	Statistics calculation see at DET, page 14.	
>preselections conditioning: display drift: drift corr: drift value req.ident: req.smpl size: limit smpl size: oven: activate pulse:	Automatic conditioning of titration vessel. Display of drift during conditioning. Type of drift correction. Value for manual drift correction. Request of identifications after start. Request of sample size after start. Limit control of sample size. RS-COM of Titrimo where Oven is connected. Pulse output on I/O line L6.	ON , OFF ON , OFF auto, man., OFF 0.0 ...99.9 mL/min id1, id1 & 2, all, OFF value, unit, all, OFF ON , OFF COM1, COM2, OFF first, all, cond., OFF

2.5 Mode STAT, parameters

Display	Meaning	Input range
>control parameters EP at pH dynamics max.rate min.rate	Endpoint, control point: This value is kept constant. Distance from EP where constant dosing stops and controlling begins. Maximum dosing rate Minimum dosing rate	pH: 0.00...±20.00, OFF (0...±2000 mV, 0.0...±200.0 µA) pH: 0.01...1...20.00, OFF (1...60..2000 mV, 0.1..6..200.0µA) 0.01...10...150 mL/min, max. 0.01...25.0...9999 µL/min
>titration parameters start V: start V factor dos.rate pause start time start pH start rate time interval titr.direction: dos.element meas.input: temperature	General titration parameters. Type of start volume: absolute or relative. Volume for absolute start volume. Factor of relative start volume. Dosing rate for start volume. Waiting time, after start volume. Start time for data acquisition. Start measured value for data acquisition. Start rate for data acquisition. Time interval for data acquisition. +: Titration to higher pH, U or I. auto: Direction is set automatically. Selection of dosing unit. Measuring input for pH and U. Temperature.	abs., rel., OFF 0...999.99 mL 0...±999 999 0.01...150 mL/min, max. 0...999 999 s 0...999 999 s pH: 0.00...±20.00, OFF (0...±2000 mV, 0.0...±200.0 µA) 0.01...150 mL/min, OFF 1...2...999 999 s +, -, auto internal D0 , external D1/D2 1, 2, diff. -170.0...25.0...500.0 °C
>stop conditions stop time: stop time factor t(delta) t(delay) stop V: stop V factor stop rate filling rate	Type of stop time: absolute or relative. Time for absolute stop time. Factor for calculation of relative stop time. Time after EP is once reached. Time after last dosing step. Type of stop volume: absolute or relative. Volume for absolute stop volume. Factor of relative stop volume. Stop when the dosing rate is smaller than.. Filling rate.	abs., rel., delta, delay, OFF 0...999 999 s 0...±999 999 0...999 999 s 0...999 999 s 0...999 999 s abs. , rel., OFF 0...99.99...9999.99 mL 0...±999 999 0.01...150 mL/min, OFF 0.01...150 mL/min, max.
>statistics	Statistics calculation see at DET, page 14.	
>evaluation low lim. up lim. fix V1 fix time 1	Evaluation of dosing rates within programmed time windows (→ C8X). Max. 9 windows. Interpolation of volumes at fixed times (→ C5X). Up to 9 fix V's. Interpolation of times at fixed volume ratios of the end volume (→ C6X). Up to 9 fix times.	0...999 999 s, OFF 0...999 999 s, OFF 0...999 999 s, OFF 0.01...1, OFF

Display	Meaning	Input range
>monitoring meas.val: low lim.pH up lim.pH action: rate: temperature: assign output L10: violated limit: output L10: assign output L1X:	Monitoring of measured values. Limits for measured values. Action, if a limit is exceeded. End: Abort. Wait: Dosing interrupted, until measured value is within limits again, then continue. Monitoring of rate (same actions as above). Monitoring of temperature (same actions as above). Assignment of output L10 to monitored quantity. Assignment of output to violated limit. Set a signal when limits are violated. For lines L11, L12, and L13 as for L10.	ON, OFF pH: 0.00...±20.00 (0...±2000 mV, 0.0...±200.0 µA) end, hold, wait, none ON, OFF ON, OFF meas, temp, rate, all, none any , upper, lower active, pulse
>preselections req.ident: req.smp1 size: limit smp1 size: display rate: activate pulse:	Request of identifications after start. Request of sample size after start. Limit control of sample size. Display of rate. Pulse output on I/O line L6.	id1, id1 & 2, all, OFF Value, unit, all, OFF ON, OFF ON, OFF ON, OFF

2.6 Mode DOS, parameters

Display	Meaning	Input range
>dosing parameters dispensing type: volume disp.crit: rate disp.time pause time interval dos.element temperature	Volume, time or rate. Inquiry of 2 values. 3rd value is calculated . 1st criterion i.e. volume. Selection of 2nd criterion. 2nd value, i.e. rate or dispensing time. Waiting time before start. Time interval for data acquisition. Selection of the dosing unit Temperature.	volume, time, rate 0... 10 ...99 999.99 mL time, rate 0.001...150 mL/min, max. 1... 100 ...999 999 s 0...999 999 s 1... 10 ...999 999 s internal D0 , external D1/D2 -170.0... 25.0 ...500.0 °C
>stop conditions stop V: stop V factor filling rate	Type of stop volume: absolute or relative. Volume for absolute stop volume. Factor of relative stop volume: Filling rate.	abs., rel., OFF 0... 99.99 ..99 999.99 mL 0...± 999 999 0.01...150 mL/min, max.
>statistics	Statistics calculation see at DET, page 14.	
>monitoring meas.mode: meas.input: low lim.pH up lim.pH action: temperature: low lim. up lim. action: assign output L10: violated limit: output L10: assign output L1X:	Measured quantity for monitoring. Meas. input for pH and U. Limits for measured values. Action, if a limit is exceeded. End: Abort. Wait: Dosing interrupted, until measured value is within limits again, then continue. Monitoring of temperature. Limits for temperature. Action, if a limit is exceeded . Assignment of output L10 to monitored quantity. Assignment of output to violated limit. Set a signal when limits are violated. For lines L11, L12, and L13 as for L10.	pH, U, I(pol), U(pol), OFF 1, 2, diff pH: 0.00...±20.00 (0...±2000 mV, 0.0...±200.0 µA) end, hold, wait, none ON, OFF -170.0...500.0 °C -170.0... 500.0 °C end, hold, wait, none meas, temp, all, none any, upper, lower active, pulse
>preselections req.ident: req.smpl size: limit smpl size: activate pulse:	Request of identifications after start. Request of sample size after start. Limit control of sample size. Pulse output on I/O line L6.	id1, id1 & 2, all, OFF value, unit, all, OFF ON, OFF ON, OFF

2.7 Mode DOC, parameters

Display	Meaning	Input range
>dosing parameters begin at end at sweep time dynamics max.rate min.rate direction: start V: start V factor dos.rate pause time interval dos.element meas.input: temperature	Begin of measured value sweep. End of measured value sweep. Time required for sweep. Distance from EP where constant dosing starts. OFF means no constant dosing. Maximum dosing rate. Minimum dosing rate. Direction of sweep. +: Titration to higher pH, voltage, or current. Auto: Direction is set automatically. Type of start volume: absolute or relative. Volume for absolute start volume. Factor for of relative start volume: Dosing rate for start volume. Waiting time, after start volume. Time interval for data acquisition Selection of dosing unit. Meas. input for pH and U. Temperature.	pH: 0.00...±20.00, init (0...±2000 mV, 0.0...±200.0 µA) pH: 0.00...±20.00, OFF (0...±2000 mV, 0.0...±200.0 µA) 0... 300 ...999 999 s pH: 0.01... 0.25 ...20.00, OFF (1... 15 ...2000 mV, 0.1... 6 ...200 µA) 0.01...150 mL/min, max. 0.01... 5 ...9999 µL/min +, -, auto abs., rel., OFF 0 ...999.99 mL 0 ...±999 999 0.01...150 mL/min, max. 0 ...999 999 s 1... 10 ...999 999 s internal D0 , external D1/D2 1 , 2, diff. -170.0... 25.0 ...500.0 °C
>stop conditions stop V: stop V factor filling rate	Type of stop volume: absolute or relative. Volume for absolute stop volume. Factor of relative stop volume. Filling rate.	abs. , rel., OFF 0... 99.99 ...9999.99 mL 0...± 999 999 0.01...150 mL/min, max.
>statistics	Statistics calculation see at DET, page 14.	
>monitoring meas.val: temperature:	Monitoring see at STAT, page 18. Monitoring of measured value. Monitoring of temperature.	
>preselections req.ident: req.smpl size: Limit smpl size: display rate: activate pulse:	Request of identifications after start. Request of sample size after start. Display of rate. Limit control of sample size. Pulse output on I/O line L6.	id1, id1 & 2, all, OFF value, unit, all, OFF ON, OFF ON, OFF ON, OFF

2.8 Mode MEAS and CAL, parameters

MEAS

Display	Meaning	Input range
>measuring parameters signal drift equilibr.time meas.input: temperature time interval	Drift for measured value acquisition. Waiting time for meas. value acquisition. Measuring input for pH and U. Measuring temperature. Time interval for measured value acquisition.	pH, U: 0.5..999 mV/min, OFF T: 0.5...999 °C/min, OFF 0...9999 s, OFF 1, 2, diff. -170.0... 25.0 ...500.0 °C 1...2...999 999s
>statistics	Statistics calculation see at DET, page 14.	
>preselections req.ident: req.smpl size: Limit smpl size: activate pulse:	Request of identifications after start. Request of sample size after start. Limit control of sample size. Pulse output on I/O line L6.	id1, id1 & 2, all, OFF value, unit, all, OFF ON, OFF ON, OFF

CAL

Display	Meaning	Input range
>cal. parameters meas.input: cal.temp. buffer 1 pH signal drift equilibr.time electr.id sample changer cal: activate pulse:	Measuring input. Calibration temperature. pH-value for buffer 1. up to 9 buffer. Drift for measured value acquisition. Waiting time for meas. value acquisition. Electrode identification. Calibration with Sample Changer. Pulse output on I/O line L6.	1, 2, diff. -20.0... 25.0 ...120.0 °C 0...±20.00 0.5..2...999 mV/min, OFF 0... 110 ...999 s, OFF up to 8 ASCII characters ON, OFF all, first, OFF
>statistics	Statistics calculation see at DET, page 14.	

2.9 Mode TIP, parameters

With TIP, methods and other functions can be linked to a titration sequence. Press the key <DEF> to define the titration sequence.

Display	Meaning	Input range
>sequence method: pause L4 output: L6 output: info prep stirrer:	Method from the internal method memory or from the card. Waiting time. Can be aborted with <QUIT>. Set a signal when on I/O line L4. Set a signal when on I/O line L6. The sequence will be held and an info appears in the display. Preparation of the dosing unit. Switching the stirrer ON/OFF.	method name 0 ...999 999 s, inf. active, inactive, pulse, OFF active, inactive, pulse, OFF up to 16 characters internal D0 , external D1/D2 ON , OFF
>statistics	Statistics calculation see at DET, page 14.	
>preselections req.ident: req.smpl size: limit smpl size: meas.mode: meas.input: temperature	Request of identifications after start. Request of sample size after start. Limit control of sample size. Selection of the measured quantity for <MEAS/HOLD>. Measuring input for pH and U. Temperature for the compensation of the pH values.	id1, id1 & 2, all, OFF value, unit, all, OFF ON , OFF pH, U, I(pol), U(pol), T, OFF 1 , 2, diff. -170.0...500.0 °C

2.10 Calculations

The results are calculated with the formulas given in the method. For the calculation, the raw values, determined in the method (EP's and C variables), are available.

The results and the raw values can be assigned for further calculations, e.g. for statistics or as common variables.

Formula input and assignments, key <DEF>

Display	Meaning	Input range
>formula RS? RS1=EP1*C01/C00 RS1 text RS1 decimal places RS1 unit: RS1 limit control: RS1 low lim. RS1 up.lim. RS1 L13 output:	Input of formula. Enter result number. Enter formula by means of 3 rd functions of keyboard. Text for result output. Number of decimal places for result output. Select result unit. Limit control of the result. Lower limit for RS1. Upper limit for RS1 Output on line L13 if the result is out of limits. Enter values of calculation variables with <C-FMLA>.	1...9 RS1 or up to 8 ASCII characters 0...2...5 %, ppm, g/L, mg/mL, mg/pc, mol/L, mmol/L, g, mg, mL, s, mL/min, no unit or up to 6 ASCII characters ON, OFF 0.0...999 999 0.0...999 999 OFF, active, pulse
>silos calculations C24= C25= match id:	Allocations for silo calculation, see page 96 of the Instructions for Use. Enter values to be stored in the silo memory. Indication which id's must coincide for the statistical evaluation in the silo memory.	RSX, EPX, CXX id1, id1 & 2, all, OFF
>common variables C30=	Allocations of common variables C30...C39. Assign RSX, EPX, CXX, or MNX.	RSX, MNX, EPX, CXX
>report report COM1: report COM2:	Selection of report blocks for data output at COM1. Depends on the selected mode. If you wish several reports, use ";" as separator. As for COM1.	full, short, mplist, curve, derive, comb, meas crv, temp crv, scalc full, scalc srt, calc, param, calib, ff
>mean MN1=	Allocations for statistics. Assign RSX, EPX, or CXX.	RSX, EPX, CXX
>temporary variables C70=	Allocations of temporary variables for calculations under TIP.	RSX, EPX, CXX

Meaning of the calculation variables

C variables are

- determined by the method (C24...C27, C4X, C5X, C6X, C7X, C8X)
- entered as sample specific data (C00, C21...C23)
- given as fixed constants in the methods (C01...C19)

Variable	Meaning
C00	Sample size, key <SMPL DATA>.
C01...C19	Method specific calculation values, such as molecular mass, factors, key <C-FMLA>.
C21...C23	Sample specific calculation values, such as dilution factors, key <SMPL DATA>.
C24, C25	Variables for storing determination results in the silo memory.
C26, C27	Means from silo calculations.
C30...C39	Common variables, e.g. for titer.
C40	Initial measured value of the sample, last measured value for MEAS.
C41	End volume.
C42	Determination time.
C43	Volume drift for KFT and SET with conditioning.
C44	Temperature.
C45	Dispensed start volume.
C46	Asymmetry pH (pH calibration).
C47	Electrode slope (pH calibration).
C48	Volume at the point of the curve with maximum voltage.
C49	Volume at the point of the curve with minimum voltage.
C51...C59	Fix EP for DET and MET or fix V for STAT.
C61...C69	pK/HNP values for DET and MET or fix times for STAT.
C70...C79	Temporary variables for calculations in TIP.
C80	Mean rate for STAT: Overall rate, evaluated over all points of the measuring list.
C81...C89	Rates, evaluated in preset time windows for STAT.

Sample data, key <SMPL DATA>

- Sample identifications or sample specific calculation values C21...C23
- Sample size C00

For working with the silo memory, see page 27.

Display	Meaning	Input range
id#1 or C21 id#2 or C22 id#3 or C23 smp1 size smp1 unit:	Inquiries with silo = OFF (LED "silo" is OFF): } Sample identification. Can be used as } sample specific calculation values. Sample size Unit of sample size	up to 8 ASCII characters or 0...±999 999 -999 999...1...999 999 g, mg, mL, µL, pc, no unit or up to 5 ASCII characters

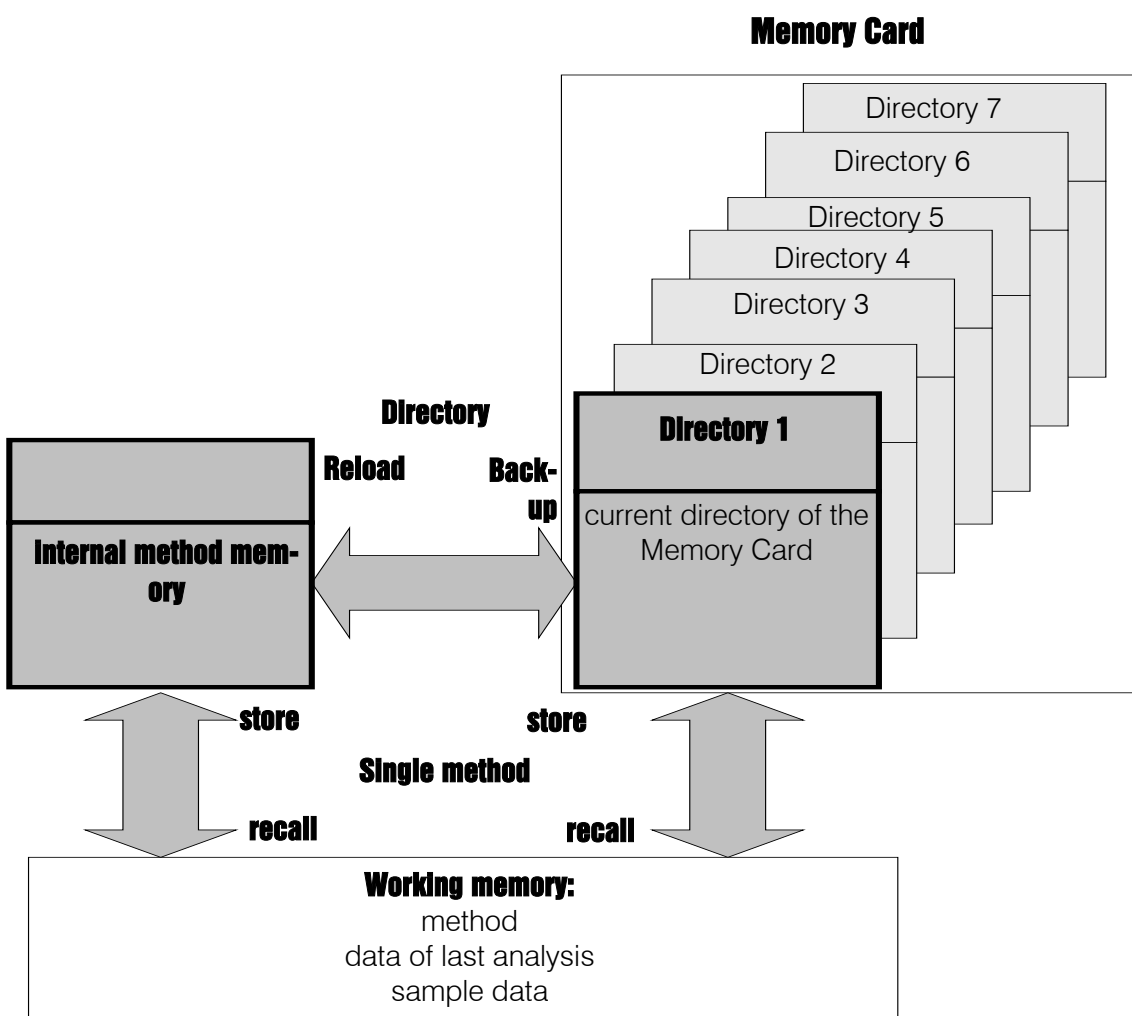
3 Other functions

This chapter gives you a survey over other functions of the Titrino.

If you are looking for more information to the different quantities, you will find the display text as a keyword in the index of the Instructions for Use.

3.1 Method memory

Methods can be stored in the internal method memory or on the memory card. These method memories are organized as follows:



Internal method memory, key <USER METH>

Display	Meaning	Input range
>recall method method name:	Recall method from the internal method memory to the working memory.	up to 8 characters
>store method method name:	Store method from the working memory to the internal method memory.	up to 8 characters
>delete method method name:	Delete method from the internal method memory.	up to 8 characters

Method memory on the card, key <CARD>

Display	Meaning	Input range
>recall method method name:	Recall method from the card (current directory) to the working memory.	up to 8 characters
>store method method name:	Store method from the working memory to the current directory on the card.	up to 8 characters
>delete method method name:	Delete method from the current directory on the card.	up to 8 characters
>change directory dir.name:	Change current directory on the card.	up to 10 characters
>create directory dir.name:	Create new directory on the card.	up to 10 characters
>delete directory dir.name:	Delete directory on the card together with its methods.	up to 10 characters
>backup dir.name:	Backup of the internal method memory on the card.	up to 10 characters
>reload dir.name:	Reload of the whole directory from the card to the internal method memory.	up to 10 characters
>format card label format:	Card formatting. Card labeling. Confirm formatting.	up to 8 characters ON, OFF
>change battery date	Date for changing the card battery.	YYYY-MM-DD

3.2 User name, key <USER>

If a user name is entered it will be printed in in the print-out.

Display	Meaning	Input range
name:	User name. Select a name with keys <←> or <→>.	up to 10 ASCII characters
>delete name:	Deletes a user name.	up to 10 ASCII characters

3.3 Sample data, keys <SMPL DATA> and <SILO>

In the silo memory sample data can be stored on reserve.

For working without the silo memory see page 24 of the instructions for use.

Press the key <SILO> for working with the silo memory, and the key <SMPL DATA> to input data.

Display	Meaning	Input range
>edit silo lines silo line method: id#1 or C21 id#2 or C22 id#3 or C23 smp1 size smp1 unit:	Input for the silo memory: Silo line number. Method name. } Sample identification. Can be used as } specific calculation values. Sample size Unit of sample size.	1...255 up to 8 ASCII characters up to 8 ASCII characters -999 999...1...999 999 g, mg, mL, µL, pc, no unit or up to 5 ASCII characters
>delete silo lines delete line n	Delete individual silo lines. Line number of the line to be deleted.	1...255, OFF
>delete all silo lines delete all:	Delete all silo lines. Confirmation.	ON, OFF
cycle lines: save lines:	With "ON", worked off silo lines will be copied to the highest line of the silo memory. Determination results will be stored as C24 or C25 in the silo memory according to the allocations in the methods, see page 23.	ON, OFF ON, OFF

3.4 Configuration, key <CONFIG>

Display	Meaning	Input range
>monitoring validation: time interval time counter calibration: meas.input: time counter service: next service system test report:	Monitoring functions Validation of Titrino. Time interval for the validation. Time elapsed since the validation. PH calibration Measuring input. Time interval for the calibration. Service of instrument. Date for the next service. Print-out of the system test report after switching on the Titrino.	ON, OFF 1... 365 ...9999 d 0...9999 d ON, OFF 1, 2, diff. 0...9999 d ON, OFF YYYY-MM-DD ON, OFF
>peripheral units send to COM1: send to COM2: man.reports to COM: balance: stirrer control: remote box: keyboard: barcode:	Settings of peripheral units. Selection of printer at COM1. as for COM1. Output of manually triggered reports. Selection of balance. Stirrer control in titration sequences. Connection of a remote box. Type of the PC keyboard connected to the remote box. Target for data entered by a barcode reader.	Epson, Seiko, Citizen, HP, IBM 1, 2, 1&2 Sartorius , Mettler, Mettler AT, AND, Precisa ON, OFF ON, OFF US, deutsch, francais, espanol, schweiz. input , method, id1, id2, id3, smpl size
>auxiliaries dialog: date time run number auto start start delay result display: dev.label program	General settings. Selection of dialog language. Current run number for result output. Automatic starts of titrations. Waiting time before start of titration. Result display at the end of determination. Device label. Program version.	English , deutsch, français, español, italiano, portugese, svenska YYYY-MM-DD HH:MM 0...9999 1...9999, OFF 0...999 999 s bold , standard up to 8 characters read only
>RS232 settings COM1 baud rate: data bit: stop bit: parity: handshake:	RS232 settings for COM1. Baud rate. Data bit. Stop bit. Parity. Handshake.	300,600,1200,2400, 4800, 9600 , 19200, 38400, 57600, 115200 7, 8 1, 2 none , odd, even HWs , Swchar, Swline, none
>RS232 settings COM2	as for COM1.	
>common variables	Values of common variables C30...C39.	

<p>>prep.dosing elements</p> <p>power ON prep:</p> <p>report:</p> <p>dos.element:</p> <p>warn.interv.</p> <p>dos.drive:</p> <p>volume DX</p> <p>cycle DX</p> <p>dos.rate DX</p> <p>fill rate DX</p> <p>output:</p> <p>len.dos.tub.</p> <p>diam.dos.tub.</p> <p>len.asp.tub.</p> <p>diam.asp.tub.</p> <p>dos.rate DX</p> <p>fill rate DX</p>	<p>Preparation of titration burets.</p> <p>Warning after power ON.</p> <p>Report.</p> <p>Selection of dosing unit.</p> <p>Warning interval.</p> <p>Selection of type of dosing unit.</p> <p><i>Parameters for the internal dosing unit and for 685 Dosimat:</i></p> <p>Volume.</p> <p>Number of cycles.</p> <p>Dosing rate.</p> <p>Filling rate.</p> <p><i>Parameters for the 700 Dosino:</i></p> <p>Location, where liquid is expelled.</p> <p>Length of the dosing tube.</p> <p>Diameter of the dosing tube.</p> <p>Length of the aspiration tube.</p> <p>Diameter of the aspiration tube.</p> <p>Dosing rate.</p> <p>Filling rate.</p>	<p>ON, OFF</p> <p>ON, OFF</p> <p>internal D0, external D1/D2</p> <p>5...9999 min, OFF</p> <p>Dosimat, Dosino</p> <p>0...3.5...99 999.99 mL</p> <p>1...2...9</p> <p>0.01...150 mL/min, max.</p> <p>0.01...150 mL/min, max.</p> <p>tip, flask</p> <p>1.0...40.0...999.9 cm</p> <p>0.1...2.0...9.9 mm</p> <p>1.0...25.0...999.9 cm</p> <p>0.1... 2.0...9.9 mm</p> <p>0.01...150 mL/min, max.</p> <p>0.01...150 mL/min, max.</p>
--	---	--

4 Index

Backup.....	8, 26	Recall methods.....	8
Balance.....	5	Report	5
Burets	10	- Definitions	23
C-Variables	24	Result	
CAL	21	- Calculation	4
Calculations	4, 23	- Printing.....	5
Calibration	21	- View.....	5
Card	8, 25	Sample data	24, 27
Configuration.....	28	Sample size	5
Data input	2, 7	Selection	
DET	14	- Mode	3
Dialog language	2	- Report	5
DOC	20	SET	15
DOS	19	Silo calculation	23
Dosing unit	10	Silo memory	27
Formula	4, 23	STAT	17
Internal method memory.....	7, 26	Stop criteria	6
KFT	16	Store methods.....	7, 25
Linkage	22	Summary	1
Manual dosing.....	11	Survey.....	12
MEAS.....	21	Text input.....	7
MET.....	14	TIP.....	22
Method memory	25	Titration modes.....	12ff
- Printing.....	9	-Survey	12
Methods		-Selection	3
- Backup.....	8	Titration procedure.....	22
- Development.....	3	Titration stop.....	6
- Recalling	8	User name	27
- Storing.....	7	Variables	24
Modes	12ff	Weight.....	5
- Selection	3		
- Survey	12		
Operands.....	4, 24		
Parameters	14ff		
pH Stat.....	17		
Printing	5		