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736 GP Titrino

Short instructions for use

8.736.1023

95.12 Ti/pr

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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

Entering data, setting the dialog language

<configuration>

Press <STOP> if the Titrino is busy. It is now in the inactive standby state. Then press the <configuration> key. The display shows:

```
>peripheral units
```

This is the title of the inquiry group "peripheral units". This group contains various inquiries about peripheral units.

Press the <configuration> key once more. You see the title of a new group of inquiries:

```
>auxiliaries
```

This is the title of the "auxiliaries" group. This group contains the inquiry for the dialog language. Note the ">" sign. All titles are prefixed by this sign.

<enter>

Pressing the <enter> key takes you to the different inquiries of the group "auxiliaries". The display shows

```
dialog:          english
```

<select>

This is the selection of the dialog language. You select the various dialog languages with the <select> key. Note the ":" sign after the word "dialog". It appears if the values can be selected with key <select>. Press <select> repeatedly until "english" appears in the display.

```
dialog:          deutsch
```

<enter>

Accept the new "value" with <enter> and the next inquiry appears.

```
date           1997-12-16
```

Other inquiries of the "auxiliaries" group are not of interest at the moment. Exit the inquiries with <QUIT>. Press <QUIT> once again to exit the inquiries of the <configuration> key.

2 x <QUIT>

Summary of the most important signs

Signs in the Titrino dialog:

> Title of inquiry groups, e.g. ">auxiliaries"

: Values can be chosen by the key <select>, e.g. "dialog:"

Signs that are used in the instructions for use

<> sign for "key", e.g. <select>

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>

mode	DET

<enter>

Press <mode> repeatedly until "DET" appears in the display. 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. Confirm "DET" with <enter>.

DET:	U

<select>

DET:	pH

Now select the measured quantity: Press <select> until "pH" appears in the display.

Confirm the measured quantity "pH" with <enter>.

<enter>

DET pH	DOa ********

You are now ready to titrate.

For the titration, you need an Exchange Unit with NaOH, c=0.1 mol/L. If you have not yet prepared an Exchange Unit, see page 188 ff of the Instructions for Use.
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 first line of the display shows the current measured value and the volume already dispensed:

pH 2.78	0.351 ml

As soon as the instrument has found an equivalence point, this is shown on the second line:

	EP1

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

The second line shows the equivalence point found, e.g.:

EP1 2.083 ml pH	7.64

If more than one equivalence point has been found, the second equivalence point can be viewed with <enter>

Calculation of the result, entry of a formula

You may calculate results with the equivalence point.

<def>

Press <def> . The display shows

```
>formula
```

<enter>

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

```
RS?
```

<1>

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

```
RS1=EP1*C01*C02/C00
```

<enter>

You can now enter a formula. Note here the top inscription on the keys of the keypad 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 23.

Calculate the content of your hydrochloric acid in g/L:
RS1=EP1*C01*C02/C00
EP*conc(titrant)*molar mass/sample size

Confirm the formula with <enter>.

<enter>

```
RS1 text                RS1
```

You may enter a text for the result output, see page 7.

<enter>

```
RS1 decimal places      2
```

Enter the desired number of decimal places for the result.

<enter>

```
RS1 unit:               %
```

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

<select>
<enter>

2 x <QUIT>

Quit the formula entry by pressing <QUIT> twice.

Entry of the calculation constants

<C-fmla>

Press <C-fmla>. The constants which have been used in the formula are requested:

```
C01
```

0.1 <enter>

C01: Concentration of your titrant = 0.1 mol/L.
C02: Molar mass of HCl = 36.47 g/mol

```
C02
```

36.47 <enter>

Entry of the sample size

4 x <smpl data>

Press <smpl data> repeatedly until "smpl size" appears in the display.

```
smpl size          1.0 g
```

Enter 2 (= 2 ml).

2 <enter>

```
smpl unit:           ml
```

Use <select> to select the unit "ml" and confirm the new value with <enter>.

<select>
<enter>

The result is now calculated and can be displayed in place of the equivalence point. If your method already includes a formula at the end of the titration, the calculated result is displayed directly after the titration. As we have entered the formula later, we now have to select the result display:

Display of the result

<select>

```
>display results
```

Press <select> repeatedly until ">display results" appears in the display.

<enter>

```
RS1              3.80 g/l
```

Press <enter> to move on to the result display.

Selection of the automatic report output

If you have a printer connected, you can have the curve and a result report printed out automatically at the end of the titration.

4 x <def>

```
>report
```

Press <def>repeatedly until the display shows ">report".

Press <enter> to move to the definition of reports.

<enter>

```
report:
```

With <select> you select the individual report blocks Use a ";" as delimiter between the report blocks. If you wish to print out a curve and a full result report, enter "curve;full".

<select>

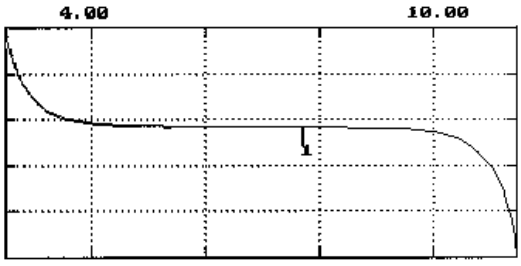
```
report:curve;full
```

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

<enter>
<QUIT>

Press <print> <reports> <enter> .
Your printout will look as follows:

```
 'cu
736 GP Titrino          05325    736.0010
date 1997-12-16      time 09:07         1
start V      0.000 ml   DET pH   ********
1.0 ml/div       dpH=2.0/div
```




```
 'fr
736 GP Titrino          05325    736.0010
date 1997-12-16      time 09:07         1
pH(init)         2.88   DET pH   ********
smpl size             2 ml
EP1             2.083 ml              7.64
RS1              3.80 g/l
manual stop
```

Identification of the report type (cu = curve)

Start volume and method identification
Scaling of curve axis

- Identification of the report type

- Initial pH and method with identification

- Volume and pH value of EP1
- Calculated result with result text

Entry of a stop criterion

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

2 x <parameters>

```
>stop conditions
```

Press <parameters> twice to display the title ">stop conditions".

<enter>

```
stop V:          abs.
```

The absolute stop volume. It can be used as a safety volume to prevent overflow of the titration vessel.

<enter>

```
stop V        99.99 ml
```

Enter a value for the stop volume that appears suitable for your titration vessel.

<enter>

```
stop pH           OFF
```

Set the pH value, e.g. 11.5 as stop criterion.
If several stop criteria have been set, the one that is reached first, applies.

11.5 <enter>

2 x <QUIT>

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

2 x <user meth>

```
>store method
```

Press key <user meth> repeatedly until ">store method" appears in the display.

<enter>

```
method name:   ********
```

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

< **<** >

```
method name:   ABCDEFGH
```

Press key < **<** >. The display shows a row of letters. The first position of this row is blinking. This is the input position.

< **<** > + < **>** >
<enter>

```
method name:   HIJKLMNO
```

You can move this row of letters pressing the < **<** > and < **>** >. Press < **>** > until an "H" appears in the blinking position and confirm it with <enter>.

:

```
method name:   HClmnopq
```

The next position is now blinking. Enter the next letter here, confirm it with <enter> etc.

<QUIT>

```
method name:    HCl
```

If the identifier is complete, quit the text input with <QUIT>.

<enter>

```
DET pH     DOa      HCl
```

Confirm the value with <enter>. The method is stored in the 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
736 GP Titrino          02103   736.0010
date 1997-09-13     time  07:49
user methods                    bytes
DET  pH       Titer_pH D0         190
DET  U           Blank D0         178
DET  U        Chloride D0         234
MET  U           Diazo D0         208
MET  Ipol     Br-Index D0         226
DET  U           Ca-Mg D0         278
DET  U        EDTA-NTA D0         216
DET  U          Metals D0         190
DET  U        Perox.No D0         172
DET  pH            HCl D0         108
     remaining bytes              7330
          ------------
```

mode and measured quantity

method name

dosing unit, that is being used

Recall a method from the internal method memory

Stored methods can always be recalled into the working memory.

<user meth>

```
>recall method
```

Press the key <user meth>. In the display appears ">recall method".

<enter>

```
method name:          HCl
```

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

<select>
<enter>

Recall the method with <enter>.

```
DET pH      DOa       HCl
```

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 85 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 86 of the Instructions for Use.

7 x <card>

```
>backup
```

Press the key <card> repeatedly until ">backup" appears in the display.

<enter>

```
directory:
```

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 <select>.

name + <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
736 GP Titrino          02103   736.0010
date  1997-09-13     time  07:49
card label: appl.736 dev.label:
KF Titr.                          bytes
KFT  Ipol     TarTiter DO           150
KFT  Ipol     H2OTiter DO           150
KFT  Ipol     Blank_KF DO           132
KFT  Ipol     KF-Blank DO           206
KFT  Ipol           KF DO           170
      remaining bytes            121892
         ------------
```

Contents of the whole card

<print><select><enter>
Press <select> 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
736 GP Titrino          02103   736.0010
date  1997-09-13     time  07:50
card label: appl.736 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 (**Ti**tration **P**rocedure), see page 81 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.).

<user meth>

```
>recall method
```

Recall the method "HCl" from the user memory: Press the key <user meth>. In the display appears ">recall method". Press <enter>.

<enter>

```
method name:
```

Select the method name "HCl" with the key <select> and recall the method with <enter>.

<select>, <enter>

```
DET pH      D0        HCl
```

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

n x <parameters>

```
>titration parameters
```

To change the dosing unit, press the key <parameters> repeatedly until ">titration parameters" appears in the display.

m x <enter>

```
dos.element:internal D0
```

Press <enter> until "dos.element:" appears. With <select> you can choose between
internal D0: Dosing unit of the Titrino
external D1: externally connected dosing unit 1, or 2, resp.
Choose e.g. "external D1", confirm the input with <enter> and quit with the key <QUIT>.

<select>
<enter>
2 x <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.

```
DET pH      D1        HCl
```

Start the method.

<START>

```
DET pH      D1a       HCl
```

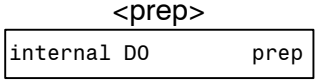
After the titration "D1a" appears in the display. "a" means "active", the dosing unit D1 is now active.

Manual dosing

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

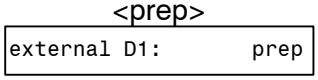
If you press the key <DOS>, the dosing unit from the method is working. This dosing unit appears in the display.
If you wish to dose with another dosing unit, use the key <prep> to select the dosing unit and press <DOS> to dose.

<prep>



Press the key <prep>. In the display appears "internal D0 prep", i.e. the dosing unit of the Titrino has been chosen.

<prep>



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

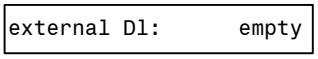
<DOS>
<FILL>

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

<START>

With <START>, the function "prep" is started. This prepares the dosing units. (The parameters for "prep" are under the key <configuration>, in the group ">prep.dosing elements").
Attention: With the function "prep", liquid will be expelled!

<select>



<START>

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 <select> and start with <START>.
Attention: With the function "empty", liquid will be expelled!

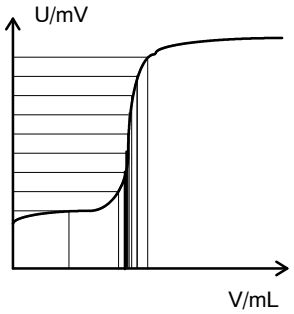
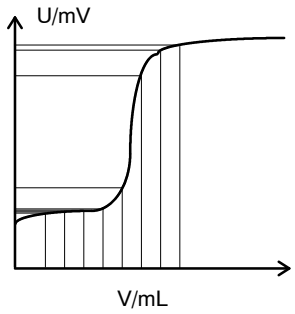
<QUIT>

Quit the selection of dosing units with <QUIT>.

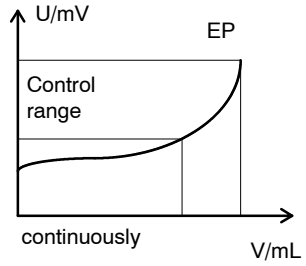
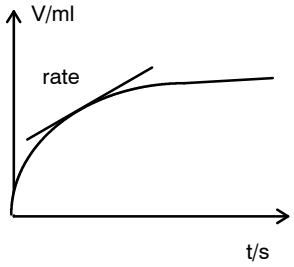
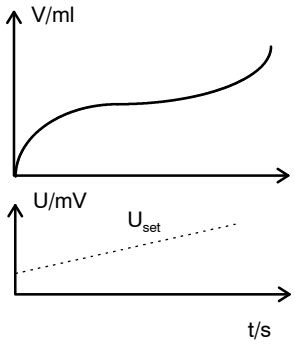
2 Titration, dosing and measuring modes

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 Titration**	**MET** **Monotonic Equivalence point Titration**
Titration	Reagent feeding: Variable volume increments, depending on the slope of the curve.  Drift controlled ("equilibrium titration") and/or after a fixed equilibration time.	Reagent feeding: Constant volume increments, independent of the slope of the curve.  Drift controlled ("equilibrium titration") and/or after a fixed equilibration time.
Evaluation	The evaluation of EP' s is based on the zero crossing of the second derivative with a Metrohm correction for the distortion of the curve from superimposed jumps. Can be combined with selectable recognition criteria. **Recognition criteria**: as for MET	The evaluation of EP's is based on the Fortuin interpolation. **Recognition criteria**: all EP's only the last EP only the greatest EP EP windows
Applications	Suitable titration mode for most problems. Specially recommended if jumps lie very close together and for very flat jumps. **Note**: The reagent feeding algorithm is based on measured data. The curve should therefore not deviate markedly from S-shape.	For • slow titration reactions (diazotations, 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**
Titration to preset end-point. 	The reagent addition is controlled such that a preset measured value is adhered to as accurately as possible. 	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. 
Volume that has been dispensed up to the endpoint (EPX in ml).	Evaluation of • 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).	The total volume (C41) and the time needed for dosing (C42) can be used for calculation.
• 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.	For • the controlled dosing to a preset endpoint in the synthesis laboratory. • activity determinations, e.g. of enzymes. • kinetic investigations (first order kinetics).	Sweeping a measured value gradient for reaction formulations in the syntheses laboratory.

2.2 Mode DET and MET, parameters

Display	Meaning	Input range
>titration parameters		
meas.pt.density	Measuring point density.	0...**4**...9
min.incr.	Minimum increment for DET.	0...**10.0**...999.9 ul
[V step]	Volume increment for MET.	0...**0.10**...9.999 ml
titr.rate	Dosing rate for increments.	0.01...150 ml/min, **max.**
signal drift	Drift for measured value acquisition.	pH, U:0.5..**50**..999 mV/min, OFF
equilibr.time	Waiting time for value acquisition.	0...**26**...9999 s, OFF
start V:	Type of start volume: absolute, relative.	abs., rel., **OFF**
start V	Volume for **absolute** start volume.	**0**...999.99 ml
factor	Factor for calculation of **relative** start volume: factor * smpl size.	**0**...±999 999
dos.rate	Dosing rate for start volume.	0.01...150 ml/min, **max.**
pause	Waiting time, e.g. after start volume.	**0**...999 999 s
dos.element:	Selection of the dosing unit.	**internal D0,** external D1/D2
meas.input:	Measuring input for pH and U.	**1**, 2, diff.
temperature	Titration temperature.	-170.0...**25.0**...500.0 °C
>stop conditions		
stop V:	Type of stop volume: absolute or relative.	**abs.**, rel., OFF
stop V	Volume for **absolute** stop volume.	0...**99.99**...9999.99 ml
factor	Factor for calculation of **relative** stop volume: factor * smpl size.	0...**±999 999**
stop pH	Stop at measured value pH, U, I.	pH: 0.00...±20.00, **OFF** U: 0...±2000 mV, **OFF**
stop EP	Stop after a number of EP's have been found.	1...**9**, OFF
filling rate	Filling rate after the titration.	0.01...150 ml/min, **max.**
>statistics		
status:	Status of statistics calculation.	ON, **OFF**
mean n=	Number n of single values for statistics.	**2**...20
res.tab:	Result table for statistics calculation.	**original**, delete n, delete all
delete n=	Delete data from sample number n.	**1**...20
>evaluation		
EPC	Endpoint criterion.	DET 0...**5**...200 MET pH: 0.10...**0.50**...9.99 U: 1...**30**...999 mV
EP recognition:	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.	**all**, greatest, last, window, OFF
fix EP1 at pH	Interpolation of volume at given pH, U, or I, resp. Up to 9 fix EP's.	pH: 0.00...±20.00, **OFF** U: 0...±2000 mV, **OFF**
pK/HNP:	Evaluation of pK or half neutralization potential (HNP).	ON, **OFF**
>preselections	Preselections for the sequence see DOS, page 19	

2.3 Mode SET, parameters

Display	Meaning	Input range
>SET1	Individual parameters for EP1.	
EP at pH	Preset EP1 at pH, U, or I, resp.	pH: 0.00...±20.00, **OFF** (0...±2000 mV, 0.0...±200.0 uA)
dynamics	Distance from EP where constant dosing stops and controlling begins.	pH: 0.01...20.00, **OFF** (1...2000 mV, 0.1...200.0 uA)
max.rate	Maximum dosing rate.	0.01...**10**...150 ml/min, max.
min.rate	Minimum dosing rate.	0.01...**25.0**...999.9 ul/min
stop crit:	Type of stop criteria.	**drift**, time
stop drift	Titration stops if stop drift is reached.	1...**20**...999 ul/min
t(delay)	Stop if there is no dosing during t(delay). If t(delay) is "INF":	0...**10**...999 s, INF
stop time	stop after a time.	0...999 999 s, **OFF**
>SET2	Parameters for EP2. Identical as SET1.	
>titration parameters	General titration parameters.	
titr.direction:	+:Titration to higher pH, voltage, or current. Auto: Direction is set automatically.	+, -, **auto**
pause 1	Waiting time **before** start volume.	**0**...999 999 s
start V:	Type of start volume: absolute or relative.	abs., rel., **OFF**
start V	Volume for **absolute** start volume.	**0**...999.99 ml
factor	Factor for calculation of **relative** start volume: factor * smpl size.	**0**...±999 999
dos.rate	Dosing rate for start volume.	0.01...150 ml/min, **max.**
pause 2	Waiting time **after** start volume.	**0**...999 999 s
extr.time	Extraction time.	**0**...999 999 s
dos.element	Selection of the dosing unit.	**internal D0**, external D1/D2
meas.input:	Measuring input for pH and U.	**1**, 2, diff.
temperature	Titration temperature.	-170.0...**25.0**...500.0 °C
>stop conditions		
stop V:	Type of stop volume: absolute or relative.	**abs.**, rel., OFF
stop V	Volume for **absolute** stop volume.	0...**99.99**...9999.99 ml
factor	Factor for calculation of **relative** stop volume: factor * smpl size.	0...±**999 999**
filling rate	Filling rate after titration.	0.01...150 ml/min, **max.**
>statistics	Statistics calculation see at DET, page 14	
>preselections		
conditioning:	Automatic conditioning of titration vessel	ON, **OFF**
display drift:	Display of drift during conditioning.	**ON**, OFF
drift corr:	Type of drift correction.	auto, man., **OFF**
drift value	Value for manual drift correction.	**0.0**...99.9 ul/min
req.ident:	Request of identifications after start.	id1, id1 & 2, all, **OFF**
req.smpl size:	Request of sample size after start.	value, unit, all, **OFF**
activate pulse:	Pulse output on I/O line L6.	first, all, cond., **OFF**

2.4 Mode KFT, parameters

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

2.5 Mode STAT, parameters

Display	Meaning	Input range
>control parameters		
EP at pH	Endpoint, control point: This value is kept constant.	pH: 0.00...±20.00, **OFF** (0...±2000 mV, 0.0...±200.0 uA)
dynamics	Distance from EP where constant dosing stops and controlling begins.	pH: 0.01...**1**...20.00, OFF (1..**60**..2000 mV, 0.1.**6**..200.0uA)
max.rate	Maximum dosing rate	0.01...**10**...150 ml/min, max.
min.rate	Minimum dosing rate	0.01...**25.0**...999.9 ul/min
>titration parameters	General titration parameters.	
start V:	Type of start volume: absolute or relative.	abs., rel., **OFF**
start V	Volume for **absolute** start volume.	**0**...999.99 ml
factor	Factor of **relative** start volume.	**0**...±999 999
dos.rate	Dosing rate for start volume.	0.01...150 ml/min, **max.**
pause	Waiting time, **after** start volume.	**0**...999 999 s
start time	Start time for data acquisition.	**0**...999 999 s
start pH	Start measured value for data acquisition.	pH: 0.00...±20.00, **OFF** (0...±2000 mV, 0.0...±200.0 uA)
start rate	Start rate for data acquisition.	0.01...150 ml/min, **OFF**
time interval	Time interval for data acquisition.	1...**2**...999 999 s
titr.direction:	+: Titration to higher pH, U or I. auto: Direction is set automatically.	+, -, **auto**
dos.element	Selection of dosing unit.	**internal D0,** external D1/D2
meas.input:	Measuring input for pH and U.	**1**, 2, diff.
temperature	Temperature.	-170.0...**25.0**...500.0 °C
>stop conditions		
stop time:	Type of stop time: absolute or relative.	abs., rel., delta, delay, **OFF**
stop time	Time for **absolute** stop time.	0...**999 999** s
factor	Factor for calculation of **relative** stop time.	0...±**999 999**
t(delta)	Time after EP is once reached.	0...**999 999** s
t(delay)	Time after last dosing step.	0...**999 999** s
stop V:	Type of stop volume: absolute or relative.	**abs.**, rel., OFF
stop V	Volume for **absolute** stop volume.	0...**99.99**...9999.99 ml
factor	Factor of **relative** stop volume.	0...±**999 999**
stop rate	Stop when the dosing rate is smaller than..	0.01...150 ml/min, **OFF**
filling rate	Filling rate.	0.01...150 ml/min, **max.**
>statistics	Statistics calculation see at DET, page 14	
>evaluation		
low lim.	Evaluation of dosing rates within	0...999 999 s, **OFF**
up lim.	programmed time windows (→ C8X). Max. 9 windows.	0...999 999 s, **OFF**
fix V1	Interpolation of volumes at fixed times (→ C5X). Up to 9 fix V's.	0...999 999 s, **OFF**
fix time 1	Interpolation of times at fixed volume rations of the end volume (→ C6X). Up to 9 fix times.	0.01...1, **OFF**

Display	Meaning	Input range
>monitoring		
meas.val:	Monitoring of measured values.	ON, **OFF**
low lim.pH	Limits for measured values.	pH: 0.00...±20.00
up lim.pH		(0...±2000 mV, 0.0...±200.0 uA)
action:	Action, if a limit is exceeded. End: Abort. Wait: Dosing interrupted, until measured value is within limits again, then continue.	end, hold, wait, **none**
rate:	Monitoring of rate (same actions as above).	ON, **OFF**
temperature:	Monitoring of temperature (same actions as above).	ON, **OFF**
assign output:	Assignment of output L4 for monitoring.	meas, temp, rate, all, **none**
L4 output:	Set a signal when values are out of limit.	active, **pulse**
>preselections		
req.ident:	Request of identifications after start.	id1, id1 & 2, all, **OFF**
req.smpl size:	Request of sample size after start.	Value, unit, all, **OFF**
display rate:	Display of rate.	ON, **OFF**
activate pulse:	Pulse output on I/O line L6.	ON, **OFF**

2.6 Mode DOS, parameters

Display	Meaning	Input range
>dosing parameters		
dispensing type:	Volume, time or rate. Inquiry of 2 values. 3rd value is calculated .	**volume**, time, rate
volume	1st criterion i.e. volume.	0...**10**...99 999.99 ml
disp.crit:	Selection of 2nd criterion.	time, **rate**
rate	2nd value, i.e. rate or	0.001...150 ml/min, **max.**
disp.time	dispensing time.	1...**100**...999 999 s
pause	Waiting time before start.	**0**...999 999 s
time interval	Time interval for data acquisition.	1...**10**...999 999 s
dos.element	Selection of the dosing unit	**internal D0**, external D1/D2
temperature	Temperature.	-170.0...**25.0**...500.0 °C
>stop conditions		
stop V:	Type of stop volume: absolute or relative.	abs., rel., **OFF**
stop V	Volume for **absolute** stop volume.	0...**99.99**..99 999.99 ml
factor	Factor of **relative** stop volume:	0...±**999 999**
filling rate	Filling rate.	0.01...150 ml/min, **max.**
>statistics	Statistics calculation see at DET, page 14	
>monitoring		
meas.mode:	Measured quantity for monitoring.	pH, U, I(pol), U(pol), **OFF**
meas.input:	Meas. input for pH and U.	**1**, 2, diff
low lim.pH	Limits for measured values.	pH: 0.00...±20.00
up lim.pH		(0...±2000 mV, 0.0...±200.0 uA)
action:	Action, if a limit is exceeded. End: Abort. Wait: Dosing interrupted, until measured value is within limits again, then continue.	end, hold, wait, **none**
temperature:	Monitoring of temperature.	ON, **OFF**
low lim.	Limits for temperature.	**-170.0**...500.0 °C
up lim.		-170.0...**500.0** °C
action:	Action, if a limit is exceeded .	end, hold, wait, **none**
assign output:	Assignment of output L4 for monitoring.	meas, temp, all, **none**
L4 output:	Set a signal when values are out of limit.	active, **pulse**
>preselections		
req.ident:	Request of identifications after start.	id1, id1 & 2, all, **OFF**
req.smpl size:	Request of sample size after start.	value, unit, all, **OFF**
activate pulse:	Pulse output on I/O line L6.	ON, **OFF**

2.7 Mode DOC, parameters

Display	Meaning	Input range
>dosing parameters		
begin at	Begin of measured value sweep.	pH: 0.00...±20.00, **init** (0...±2000 mV, 0.0...±200.0 uA)
end at	End of measured value sweep.	pH: 0.00...±20.00, **OFF** (0...±2000 mV, 0.0...±200.0 uA)
sweep time	Time required for sweep.	0...**300**...999 999 s
dynamics	Distance from EP where constant dosing starts. OFF means no constant dosing.	pH: 0.01...**0.25**...20.00, OFF (1...**15**...2000 mV, 0.1...**6**...200 uA)
max.rate	Maximum dosing rate.	0.01...150 ml/min, **max.**
min.rate	Minimum dosing rate.	0.01...**5**...999.9 ul/min
direction:	Direction of sweep. +: Titration to higher pH, voltage, or current. Auto: Direction is set automatically.	+, -, **auto**
start V:	Type of start volume: absolute or relative.	abs., rel., **OFF**
start V	Volume for **absolute** start volume.	**0**...999.99 ml
factor	Factor for of **relative** start volume:	**0**...±999 999
dos.rate	Dosing rate for start volume.	0.01...150 ml/min, **max.**
pause	Waiting time, **after** start volume.	**0**...999 999 s
time interval	Time interval for data acquisition	1...**10**...999 999 s
dos.element	Selection of dosing unit.	**internal D0**, external D1/D2
meas.input:	Meas. input for pH and U.	**1**, 2, diff.
temperature	Temperature.	-170.0...**25.0**...500.0 °C
>stop conditions		
stop V:	Type of stop volume: absolute or relative.	**abs.**, rel., OFF
stop V	Volume for **absolute** stop volume.	0...**99.99**...9999.99 ml
factor	Factor of **relative** stop volume.	0...±**999 999**
filling rate	Filling rate.	0.01...150 ml/min, **max.**
>statistics	Statistics calculation see at DET, page 14	
>monitoring		
meas.val:	Monitoring of measured value.	ON, **OFF**
low lim.pH	Limits for measured value.	pH: 0.00...±20.00
up lim.pH		(0...±2000 mV, 0.0...±200.0 uA)
action:	Action, if a limit is exceeded. End: Abort. Wait: Dosing interrupted, until measured value is within limits again, then continue.	end, hold, wait, **none**
temperature:	Monitoring of temperature.	ON, **OFF**
low lim.	Limits for temperature.	**-170.0**...500.0 °C
up lim.		-170.0...**500.0** °C
action:	Action, if a limit is exceeded .	end, hold, wait, **none**
assign output:	Assignment of output L4 for monitoring.	meas, temp, all, **none**
L4 output:	Set a signal when values are out of limit.	active, **pulse**
>preselections		
req.ident:	Request of identifications after start.	id1, id1 & 2, all, **OFF**
req.smpl size:	Request of sample size after start.	value, unit, all, **OFF**
display rate:	Display of rate.	ON, **OFF**
activate pulse:	Pulse output on I/O line L6.	ON, **OFF**

2.8 Mode MEAS and CAL, parameters

MEAS

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

CAL

Display	Meaning	Input range
>cal. parameters		
meas.input:	Measuring input.	**1**, 2, diff.
cal.temp.	Calibration temperature.	-20.0...**25.0**...120.0 °C
buffer 1 pH	pH-value for buffer 1. up to 9 buffer.	0...±20.00
signal drift	Drift for measured value acquisition.	0.5..**2**...999 mV/min, OFF
equilibr.time	Waiting time for meas. value acquisition.	0...**110**...999 s, OFF
electr.id	Electrode identification.	up to 8 ASCII characters
sample changer cal:	Calibration with Sample Changer.	ON, **OFF**
activate pulse:	Pulse output on I/O line L6.	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:	Method from the internal method memory or from the card.	method name
pause	Waiting time. Can be aborted with <QUIT>.	**0**...999 999 s, inf.
L4 output:	Set a signal when on I/O line L4.	active, inactive, pulse, **OFF**
L6 output:	Set a signal when on I/O line L6.	active, inactive, pulse, **OFF**
info	The sequence will be held and an info appears in the display.	up to 16 characters
prep	Preparation of the dosing unit.	**internal D0**, external D1/D2
>statistics	Statistics calculation see at DET, page 14.	
>preselections		
req.ident:	Request of identifications after start.	id1, id1 & 2, all, **OFF**
req.smpl size:	Request of sample size after start.	value, unit, all, **OFF**
meas.mode:	Selection of the measured quantity for <meas/hold>.	pH, U, I(pol), U(pol), T, **OFF**
meas.input:	Measuring input for pH and U.	**1**, 2, diff.
temperature	Temperature for the compensation of the pH values.	-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	Input of formula.	
RS?	Enter result number.	1...9
RS1=EP1*C01/C00	Enter formula by means of 3rd functions of keyboard.	
RS1 text	Text for result output.	**RS1** or up to 8 ASCII characters
RS1 decimal places	Number of decimal places for result output.	0...**2**...5
RS1 unit:	Select result unit.	**%**, 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
	Enter values of calculation variables with <C-fmla>.	
>silo calculations	Allocations for silo calculation,see page 93 of the Instructions for Use.	
C24=	Enter values to be stored in the silo memory.	RSX, EPX, CXX
C25=		
match id:	Indication which id's must coincide for the statistical evaluation in the silo memory.	id1, id1 & 2, all, **OFF**
>commmon variables	Allocations of common variables C3X.	
C3?=	Enter the number of the common variable and RSX, EPX, CXX, or MNX.	RSX, MNX, EPX, CXX
>report	Selection of report blocks for data output.	
report:	Depends on the selected mode. If you wish several reports, use ";" as separator.	full, short, mplist, curve, derive, comb, meas crv, temp crv, scalc full, scalc srt, calc, param, calib, ff
>mean	Allocations for statistics.	
MN?=	Enter mean number and result RSX, EPX, or CXX.	RSX, EPX, CXX
>temporary variables	Allocations of temporary variables for calculations under TIP.	
C7?=		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.
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).
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.

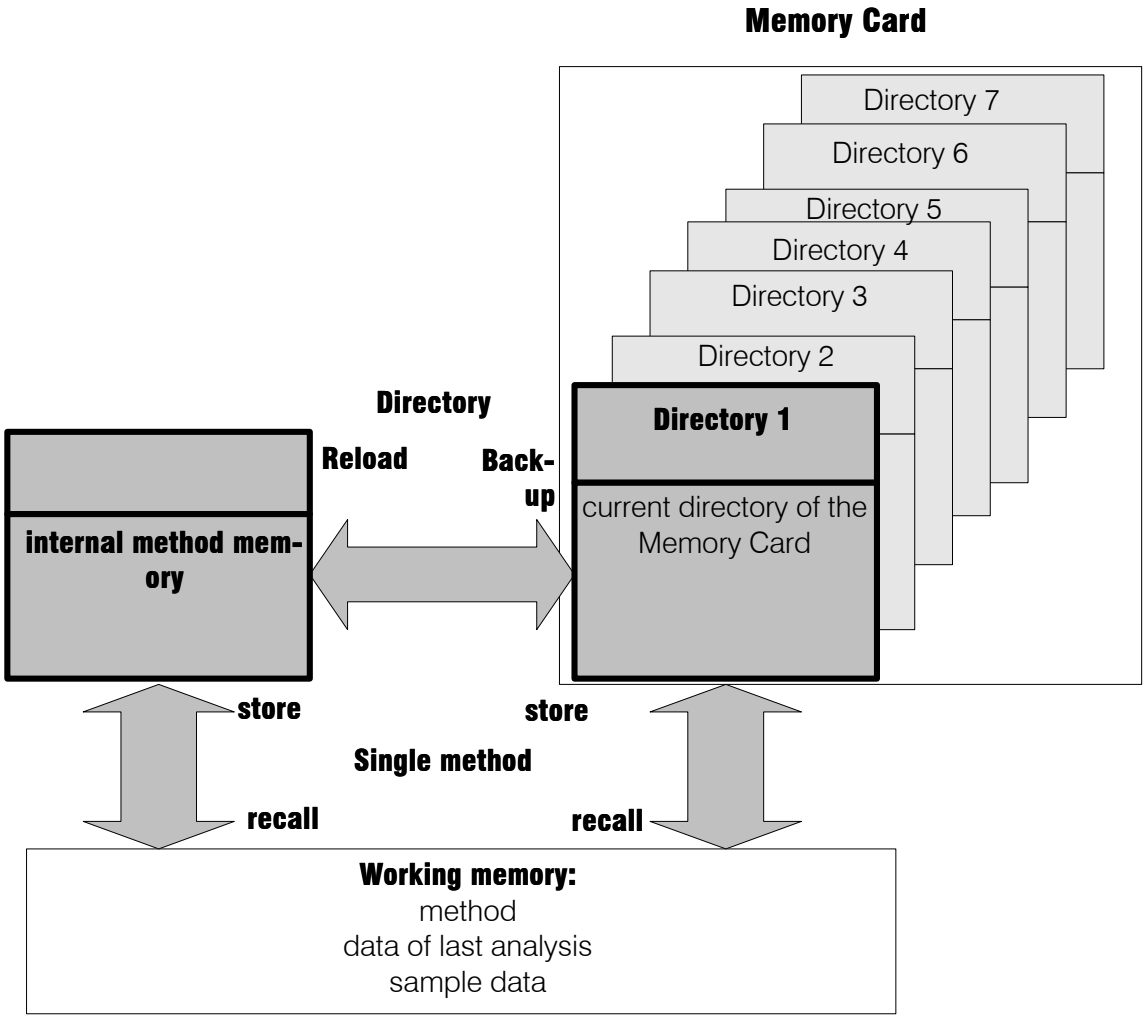
Display	Meaning	Input range
	Inquiries with silo = OFF (LED "silo" is OFF):	
id#1 or C21 **id#2 or C22** **id#3 or C23**	Sample identification. Can be used as sample specific calculation values.	up to 8 ASCII characters
smpl size	Sample size	-999 999...**1**...999 999
smpl unit:	Unit of sample size	**g**, mg, ml, ul, 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 Sample data, keys <smpl data> and <silo>

In the silo memory sample datas 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 datas.

Display	Meaning	Input range
>edit silo lines	Input for the silo memory:	
id#1 or C21 **id#2 or C22** **id#3 or C23**	Sample identification. Can be used as specific calculation values.	up to 8 ASCII characters
smpl size	Sample size	-999 999...**1**...999 999
smpl unit:	Unit of sample size.	**g**, mg, ml, ul, 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...99, **OFF**
>delete all silo lines **delete all:**	Delete all silo lines. Confirmation.	ON**, OFF**
cycle lines:	With "ON", worked off silo lines will be copied to the highest line of the silo memory.	ON, **OFF**
save lines:	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**

3.3 Configuration, key <configuration>

Display	Meaning	Input range
>peripheral units	Settings of peripheral units.	
send to:	Selection of printer.	Epson, Seiko, Citizen, HP, **IBM**
balance:	Selection of balance.	**Sartorius**, Mettler, Mettler AT, AND, Precisa
record:	Selection of record at the analog output.	**U**, dU/dt, V, dV/dt, U(rel), T
>auxiliaries	General settings.	
dialog:	Selection of dialog language.	**english**, deutsch, français, español, portuguese, italiano, svenska
date		YYYY-MM-DD
time		HH:MM
run number	Current run number for result output.	**0**...9999
auto start	Automatic starts of titrations.	1...9999, **OFF**
start delay	Waiting time before start of titration.	**0**...999 999 s
dev.label	Device label.	up to 8 characters
program	Program version.	read only
>RS232-settings	Settings of RS232 interface.	
baud rate:	Baud rate.	300,600,1200, 2400, 4800, **9600**
data bit:	Data bit.	7, **8**
stop bit:	Stop bit.	**1**, 2
parity:	Parity.	**none**, odd, even
handshake:	Handshake.	**HWs**, HWf, SWchar, SWline, none
RS control:	Receiving of commands via RS.	**ON**, OFF
>common variables	Common variables C30...C39.	
>prep.dosing elements	Preparation of titration burets.	
power ON prep:	Warning after power ON.	ON, **OFF**
report:	Report.	ON, **OFF**
dos.element:	Selection of dosing unit.	**internal D0**, external D1/D2
warn.interv.	Warning interval.	5...9999 min, **OFF**
dos.drive:	Selection of type of dosing unit.	**Dosimat**, Dosino
	Parameters for the internal dosing unit and for 685 Dosimat:	
volume DX	Volume.	0...**3.5**...99 999.99 ml
cycle DX	Number of cycles.	1...**2**...9
dos.rate.DX	Dosing rate.	0.01...150 ml/min, **max.**
fill rate.DX	Filling rate.	0.01...150 ml/min, **max.**
	Parameters for the 700 Dosino:	
output:	Location, where liquid is expelled.	**tip**, flask
len.dos.tub.	Length of the dosing tube.	1.0...**40.0**...999.9 cm
diam.dos.tub.	Diameter of the dosing tube.	0.1...**2.0**...9.9 mm
len.asp.tub.	Length of the aspiration tube.	1.0...**25.0**...999.9 cm
diam.asp.tub.	Diameter of the aspiration tube.	0.1... **2.0**...9.9 mm
dos.rate DX	Dosing rate.	0.01...150 ml/min, **max.**
fill rate DX	Filling rate.	0.01...150 ml/min, **max.**

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